Design well, build better

A guide for planning, creating, overseeing, and making decisions about social infrastructure designs

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Infrastructure and Energy Sector

Social Sector

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Social Infrastructure

Design WELL Build Better

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BID

Contents

Background

In 2017, the management of the Infrastructure and Energy Sector (INE/INE) and the Social Sector (SCL/SCL) agreed to create the Social Infrastructure Unit to provide specialized technical support for programs and projects with infrastructure components financed by the Bank's Social Sector.

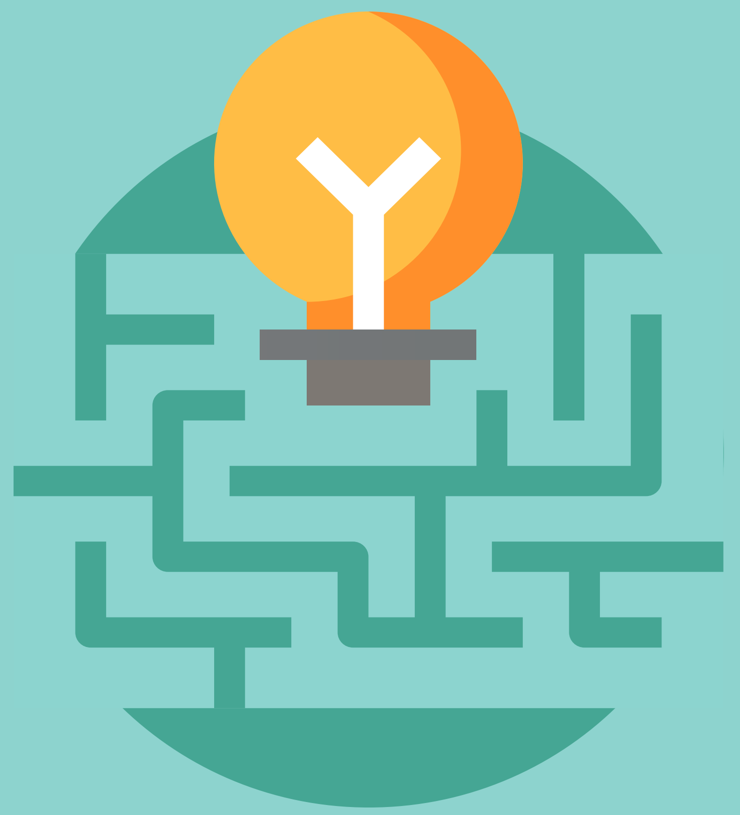
The Social Infrastructure Unit has the following objectives: (i) strengthen social sector teams, and therefore executing units, by providing them with the technical expertise to draft, execute, and oversee infrastructure components of the operations portfolio; and (ii) generate knowledge to promote best practices for social infrastructure planning, procurement, design, construction, and oversight.

This document is the fruit of these experiences and is intended to guide Social Sector specialists and Executing Units through the Design Process, from initial concept to Final Design.

This guide was created with the invaluable support of Livia Minoja, Iciar Hidalgo Roca and Juliana de Moraes (INE/INE) from the Social Infrastructure Unit, who revised and enhanced the text.

Originally written in Spanish, this guide was translated to English by Caitlin Jones and revised by Juliana de Moraes.

Introduction



Experience tells us that design failures are one of the chief causes of cost overruns, poor quality, and missed deadlines during infrastructure projects.

In its procurement policies, the Inter-American Development Bank (IDB) establishes procedures for contracting goods and works **(GN-2349-9)** and contracting consultants **(GN-2350-9)**. Additionally, the IDB even has standard bidding documents that borrowing member countries must use when applicable.

The IDB's standard bidding and procurement documents for **major works**, **smaller contracts**, and **request for proposals**, establish general and specific terms for bidders and for contracts. These terms are, to a certain extent, standardized and overseen by the IDB so that a "no objection" can be granted before the invitation to bid is published.

But borrowing member countries are solely responsible for determining the Design Scope and Technical Specifications of any designs or infrastructure.[1]

There are several ways to develop a design for subsequent construction. The infrastructure can be designed by staff from the executing unit or another public institution within the borrowing country. The Executing Agency may hire consultants or a specialized firm and then hire a construction firm separately. Or they may hire a company to create the design and then build it through a design-build contract (D+B), which may or may not include the infrastructure's equipment and/or operation and maintenance for a set period of time.

Regardless of the method, the resulting design, or Final Design, should be high quality—a single, complete, coherent deliverable—and contain everything needed for all stakeholders to comfortably move forward without conflicts or claims, inflated costs, quality loss, or expanded timelines.

The purpose of this document is to help borrowing member countries improve the Design Process and identify best practices and their use in programs financed by the IDB.

1 In the standard bidding documents for major works, the Scope and Technical Specifications are included in Section VI; in documents for smaller works, Section VII and VIII; and in standard request for proposal documents, Section VII.

Each project, country, and situation is different; each one is contingent on the people in charge understanding the situation and finding the best solution. Therefore, this guide doesn't provide any set instructions. Instead, it offers recommendations, tools, and content to facilitate the process of contracting for and designing social infrastructure.

This guide has four sections, plus this introduction and the annexes:

Section 1 gives an overview of the guide's content, basic concepts and definitions, stakeholders in the Design Process, and hiring guidelines.

Section 2 is for team leaders and Executing Agencies,[2] who lead the Design Process, including the strategy, the hiring method, and the objective, oversight, and approval of the design.

Section 3 is for Executing Agencies, who set conditions for bids and requests for proposals or design agreements as well as the design's Technical Specifications and the Scope of Work.

Section 4 offers conclusions, which highlight key parts of the Design Process and serve as general guidelines for the Executing Agency.

Lastly, the annexes list the design's content and different technical deliverables that the Designer may be asked to complete. This will help the Executing Agency clearly establish the Design Scope. The Executing Agency should adapt the content to the specific infrastructure project at hand.

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2 For some projects, this may be an Executing Unit. See Section 1, **Chapter 4**.

Section 1

Conceptual framework

1. Objectives

Overall objective

Help project implementers clearly decide what information should be included in a design for it to be considered complete, thereby minimizing cost overruns, poor quality, and missed deadlines during the construction process.

Specific objectives

a. Evaluate the different methods for designing social infrastructure, considering the pros and cons of each option.

b. Lay out the stages of the Design Process, including the roles and responsibilities of each project stakeholder.

c. Determine the Technical Specifications needed for each design method.

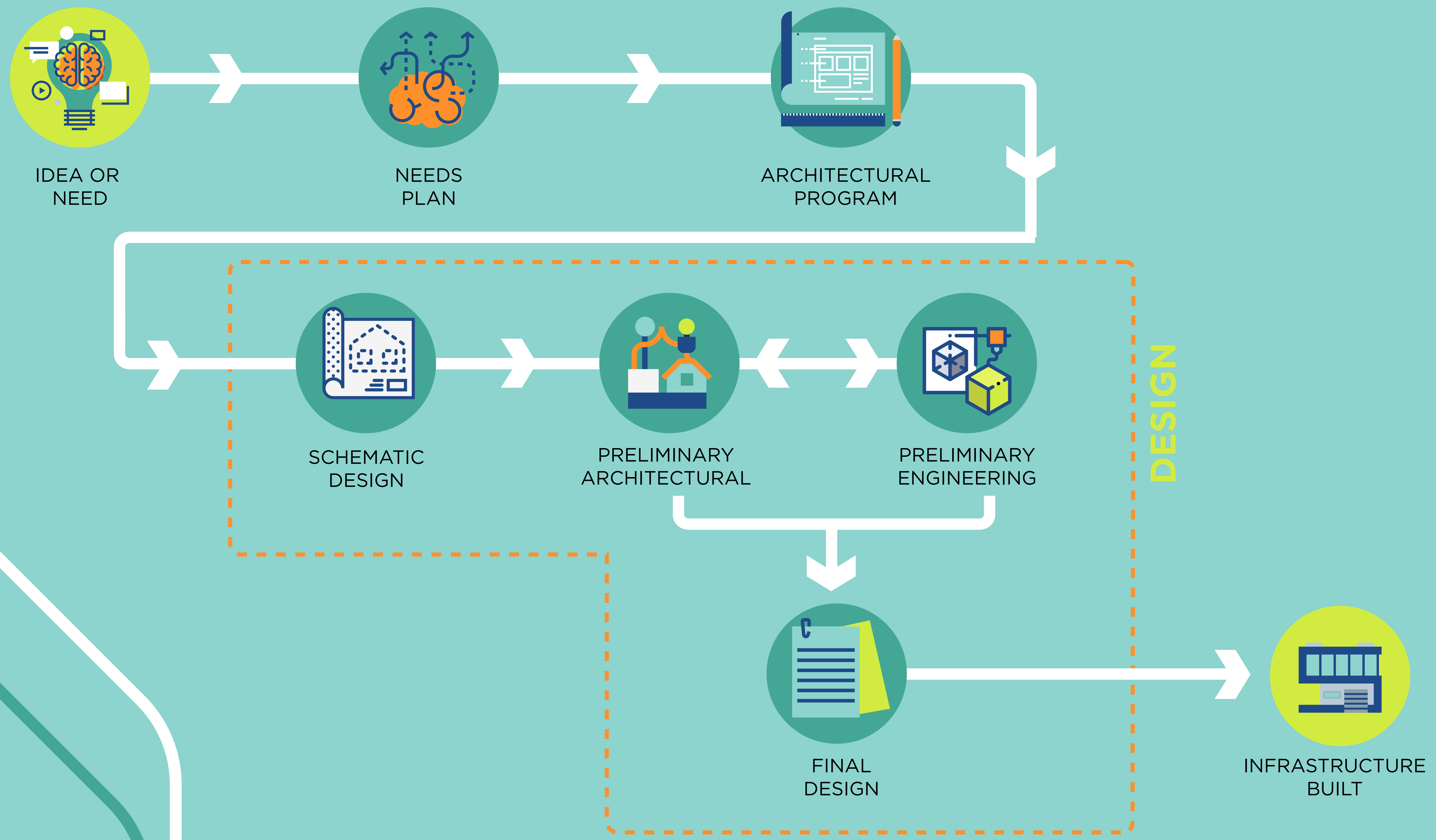
d. Determine the minimum amount of information needed in each design deliverable to start the bidding process.

2. Stages of the Design Process

A design is the result of a process. Based on a concrete idea or the need of a specific user, certain stakeholders take steps to develop a model or design that will be built to meet that original need. The process starts with an idea, and the end goal is for this idea to become physical infrastructure.

This guide identifies the stages of that process, defining what is included in each step and who is responsible so that the process moves forward in an orderly way. This ensures that the project maintains its original scope, quality, cost, and timeline.

The following page shows a summary of the process from the original idea to construction.


IDEA OR NEED
NEEDS PLAN
ARCHITECTURAL PROGRAM
SCHEMATIC DESIGN
PRELIMINARY ARCHITECTURAL
PRELIMINARY ENGINEERING
DESIGN
FINAL DESIGN
INFRASTRUCTURE BUILT

3. Glossary

DESIGN SCOPE: The description of what the Executing Agency expects the Designer to create and deliver as part of their design. The Design Scope will include studies to be conducted, paperwork and administrative procedures, and design content (including how the design will be presented).

PRELIMINARY DESIGN: A more advanced design than the Schematic Design, but not sufficiently developed for the project to be tendered and/or built. It includes floor plans, sections, and facades, as well as the main wiring for installations in the building and on the land, with its preliminary location and dimensions. For buildings, the Preliminary Design is done in two stages: first, the architectural aspects (Preliminary Architectural Design), and then the engineering elements (Preliminary Engineering Design), so that an agreed-upon and tested plan is in place before designing the engineering systems (apart from the usual adjustments made over the course of a project). Depending on the project, the Preliminary Design may be done by the Designer or by someone else.

DESIGN: The collection of technical architectural and engineering documents that shows the Designer's spatial and functional solution—on a particular land—to the problems presented in the Needs Plan and the Architectural Program. The design goes through several stages: first the Schematic Design, then the Preliminary Designs, and then the Final Design.

TECHNICAL SPECIFICATIONS: The collection of technical and regulatory requirements the design must meet. It includes the size of the project, mandatory regulations, all information related to the land and the availability of public utilities, technical and aesthetic criteria, and the functional plans or starting point that the Designer will use for their work.

SCHEMATIC DESIGN:[3] The first draft of the design (including floor plans and possibly perspective drawings) on a given land using the dimensions and spaces listed in the Architectural Program. The purpose of the Schematic Design is to find the best way to position the new building on the land by examining the different alternatives before starting the Preliminary Design so that the final choice is viable, approved, and supported by all stakeholders. The Schematic Design may be done by the Designer or by someone else.

3 In some countries, the terms concept design or basic project is used.

DESIGN PROCESS: The creative process of designing an infrastructure project to be tendered, built, overseen, and operationalized. It starts with the Schematic Design for a specific land, which is based on the Architectural Program. This leads to the Preliminary Design, and then to the Final Design. As the name suggests, a series of activities (design) takes place over a period of time (process) that includes several phases of oversight, approvals, adjustments, feedback, and coordination between the architects and engineers.

ARCHITECTURAL PROGRAM: This document is based on the Needs Plan presented by the Sector Agency. It includes changes to the Needs Plan based on applicable regulations, professional experience, and the Final Beneficiary's functional requirements (if these were not already included). The Architectural Program provides a detailed list of the spaces that will make up the design, including their number, type, and size, and sets the minimum number of square meters needed to build the project as required by the Sector Agency. The Executing Agency should create the Architectural Program and get final confirmation from the Sector Agency and Final Beneficiary before moving forward with the design.

NEEDS PLAN: A document in which the Sector Agency states its needs or wishes for the design, which the Executing Agency will use to define the Design Scope. The Final Beneficiary should sign off on the Needs Plan so that it can make sure the Sector Agency's plan is appropriate for its needs. The degree of detail in the Needs Plan may vary, but it should at least define the required spaces and operating procedures such as schedules, uses and users, or different access points. The Sector Agency is always advised to sign the Needs Plan to formalize its requests.

FINAL DESIGN:[4] The outcome of the Design Process, the definitive and completed version based on the Preliminary Design. The Final Design should be thought of and presented as a whole, so that the different components are consistent and coherent. They should include all the images and documents needed to tender, build, oversee, maintain, and operate the structure properly and safely for all involved. They also include the calculations and justification for all technical solutions. The Designer assembles the Final Design.

LAND: The lot or property selected for the project, chosen from the different options available within a specific location based on several factors. Before moving forward with the design, it's important to make sure that the chosen land is suitable so that it doesn't have to be changed once the design is underway.[5] Many stakeholders can propose potential land, but the Executing Unit is responsible for evaluating and approving the final land before the Design Process can begin.

4 In some countries, the term technical dossier is used. Ver Sección I, **Chapter 4**.

5 See **Do It Here, Not There: Guide for the Selection of Land to Build Social Infrastructure.**

4. Stakeholders in the Design Process

BENEFICIARIES

» SECTOR AGENCY
» FINAL BENEFICIARY

EXECUTORS

» EXECUTING AGENCY
» EXECUTING UNIT

SUPPLIERS

» DESIGNER
» CONTRACTOR

There are three kinds of stakeholders in the Design Process: beneficiaries, implementers, and suppliers.

SECTOR AGENCY: The government agency in charge of sector regulation and planning (education, health, social development, etc.). Establishes needs and priorities and represents the project client, owner, or beneficiary. Receives and accepts the completed infrastructure at the end of the project. For multi-sector programs, there may be more than one Sector Agency. In that case, tasks will be delegated to just one Agency or to another entity. The Sector Agency may also be the Executing Agency, whether in a single-sector or multi-sector program.

FINAL BENEFICIARY: Represented by the Sector Agency, the Final Beneficiary is not usually a single, centralized entity, but rather a local agency or institution, local or indigenous community, staff and even students (of education centers), or patients (in health centers or hospitals). Although the Sector Agency is usually the one that will receive the infrastructure and assume responsibility for its operation and maintenance, the Final Beneficiary may do this as well. It's rare for the Final Beneficiary to participate in the planning process, but it should—the project is meant to serve it.

EXECUTING AGENCY: The government agency designated in the IDB loan contract that implements the program and corresponding projects. This agency will be responsible for hiring someone to develop the design and build the infrastructure in accordance with requirements established either by itself or the Sector Agencies. The Executing Agency often creates an operational unit (the Executing Unit) that is responsible for selecting the land, setting strategies, and designing and building the infrastructure. The Executing Agency may also sometimes be the Sector Agency.

EXECUTING UNIT: The entity designated or created by the Executing Agency to implement the project, including selecting the land, hiring the Designer, hiring a contractor, and if applicable, equipping the structure. Sometimes the Executing Unit may already exist. In other cases, the Executing Unit may be created specifically for the project. The Executing Agency may also assign the project to one or more internal divisions or to another agency.

DESIGNER: The technical team that designs the infrastructure. An interdisciplinary team, especially made up of architects and engineers, that works together on the stages of the Design Process.

CONTRACTOR: The construction company that builds the infrastructure. With design-build contracts, the Contractor will also assume the role of Designer.

Section 2

Design Planning

1. Determining the object of the Design

The Executing Agency and the Sector Agency should decide what to design at the start of the planning process so that they can determine the best way to make it a reality.

Deciding on the object of the design means having clarity on the building type, its location, and its use. It also means determining whether the project is a new construction, a remodel, or an addition (or a combination of all three), and whether the design will be used for multiple buildings, or each structure will be unique.

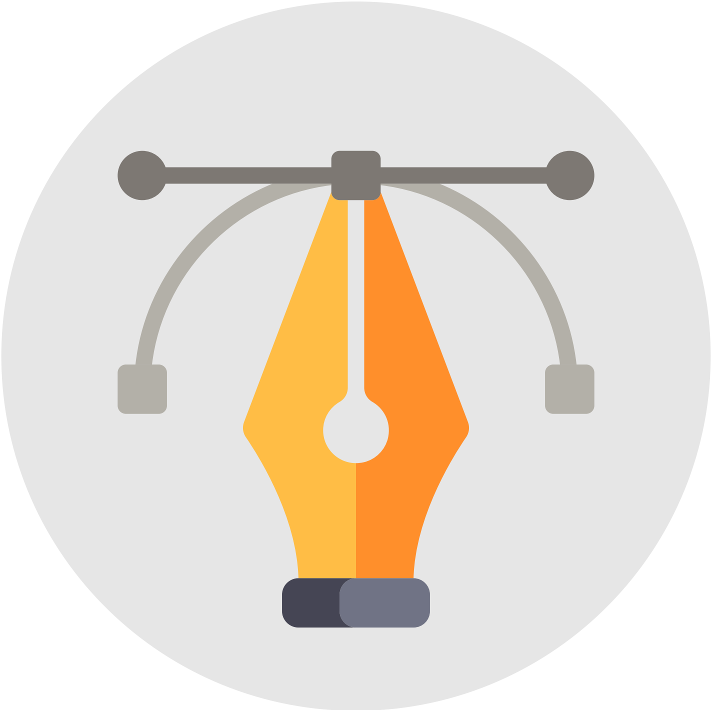
Understanding the specific constraints that stem from a project's location is important, especially if it is being built in a remote area, somewhere without public utilities, or in an extreme environment like a flood zone.

Consider whether the Executing Agency or Sector Agencies already have preliminary or previous design elements that can be utilized. This could reduce the time and cost of creating the Final Design.

Think about whether the project will include furnishing and equipping the building and/or operating and maintaining it or whether these will be handled separately.

Once the object of the design has been determined, the Executing Agency can choose a strategy to develop the design it needs.

2. Design development Models



Developing the design requires a group of professionals from different disciplines, principally architects and engineers, who work on the project as a team.

The design team may come from the public sector (from the Sector Agency, the Executing Agency, or another entity), or the Executing Agency may assemble a team especially for the project by hiring individual consultants. The team may come from a design firm hired through a request for proposal or be affiliated with a contractor who may subcontract the design work under a design-build contract (D+B). In some cases, the design-build contract may also include equipment and/or operations and maintenance.

Each of these four models and their key requirements are described below.

	TYPE OF AGREEMENT	SIGNATORIES
Public sector design team	Agreement	Executing Agency and public entity
Team of individual consultants	Individual consulting contracts	Executing Agency and individual consultants
Design firm	Consulting contract	Executing Agency and consulting firm
Design-build (D+B)	Design-build contract	Executing Agency and contractor (construction company)

Public sector design team

Sector Agencies, Executing Agencies, or other government entities often have offices or departments that are responsible for building and designing infrastructure. For example, a Ministry of Education or Ministry of Public Works may have a department that routinely designs, tenders, and oversees infrastructure projects. A department may even have the capacity to build small works, though this may or may not be the same department that designs them.

These technical teams are typically directly associated with the Sector Agency and have direct communication with whoever makes the Needs Plan, which is subsequently used to develop the project.

IDB-financed programs are commonly implemented by divisions of the Executing Agency or Executing Unit created for that purpose. They are in charge of issuing tenders for infrastructure projects based (in this case) on a design created—either completely or partially—by a team from another government entity.

Team of individual consultants

The Executing Agency may assemble a technical team to create part of all of the design by hiring individual consultants.

The design coordinator is particularly important in these cases, especially when the team is hired to assemble the Final Design, because they are dealing with a multidisciplinary team with diverse experiences.

When hiring individual consultants, the Executing Agency should follow the relevant IDB policies (**GN-2350-9** or the policy in place at the time of the loan's approval) and define each person's scope of work in the terms of reference. The contracts should also be included in the corresponding procurement plan.

Generally, the Executing Agency will draw up the tender for construction separately. The design will be included once it is finalized and approved.

Design firm

The Executing Agency can hire a consulting firm to develop part or all of a design and tender its construction once the finished design is in hand. This is typically an architecture firm that completes and delivers the Final Design, which is incorporated into the bidding documents.

When hiring consulting firms, the Executing Agency should follow the relevant IDB policies (**GN-2350-9** or the policy in place at the time of the loan's approval) and define the Technical Specifications in the request for proposal (RFP) so that the design meets the expected scope, quality, cost, and construction timeline.

Generally, the Executing Agency will draw up the tender for construction separately. The design will be included once it is finalized and approved.

Design work under a design-build contract (D+B)[6]

The Executing Agency may use a bidding process to hire a Contractor (generally a construction company or a partnership, consortium, or association) to develop the design. Once the design is approved, the Agency may engage the company for construction under the same contract. In some cases, the contractor may also be able to equip and/or operate and maintain the infrastructure.

The Executing Agency should apply the relevant IDB policies (**GN-2349-9** or the applicable policy in place at the time of the loan's approval) and define the Technical Specifications in the request for proposal (RFP) so that the design meets the expected scope, quality, cost, and construction timeline.

6 This document addresses a general design work under a design-build contract (D+B) model, including other alternatives that cover equipment, operation, and/or maintenance. The contractor is always responsible for the Design (which is typically handed off to a specialized consulting firm) under the framework of a broader contract. The D+B bidding document should include qualifications for the design firm.

3. Design development Strategies

Choosing who will create the design is a strategic decision that should be examined from several angles. The Executing Agency should consider the appropriate risks when making the decision. Here are some things to keep in mind:

1) The availability, capacity, and experience of the team (public sector, individual consultants, consulting firm, or contractor) to develop the design at the scale, quality, cost, and timeline required.

2) Yearly and multi-year programming regarding timelines and costs of the design and construction, including the hiring processes.[7]

3) Progress made in selecting the land and acquiring the necessary construction permits, including environmental feasibility study.

4) Getting approvals during the various phases of the Design Process, which may depend on the Executing Agency, Sector Agency, or someone else. Consider the number of approvals required and the time it will take to get each one.

5) Project status when starting the Final Design. A project that still needs an Architectural Program will look different from one that already has a Preliminary Architectural Design approved by the Sector Agency.

The Executing Agency should choose the best option after considering these factors and each option's implications for the loan program.

This decision is extremely important. It will affect the program's timeline and cost and determine which hiring processes to use, which should be defined in the procurement plan.

Even though there is no hiring process when working with public sector teams, the Executing Agency and the department(s) in charge of the design should sign administrative agreements or conventions. These should define the Design Scope and Technical Specifications.

The advantages and disadvantages of each model are listed in the following pages.

7 This topic is addressed in **Chapter 3.**

Public sector team

WHEN TO USE IT?

- When the country has well-established departments with broad experience in the type of project needed.
- When designing new construction or renovations that are small to medium in size and/or have low complexity.

ADVANTAGES

- Does not require hiring a separate team.
- The financial costs are not typically incorporated into the program, although they are an expense for the country.
- The design team is often familiar with the Sector Agency and Executing Agency, and sometimes with the Final Beneficiary, area, and market.
- The design team is already well-established because it has worked together before.
- It is easier to ensure that the design team remains in place during construction and even after operations begin.

DISADVANTAGES

- Without a contract, even a signed agreement is typically not powerful enough to demand that the project meet the expected scope, cost, timeline and quality. If the Executing Agency and public sector team have not signed an agreement, the situation may be even worse.
- The design team often has less experience with innovative designs and technologies, mainly utilizing traditional building systems or designs that are out of step with new trends.
- It is often impossible to assess the design team's capacity and experience.
- It is very hard to demand changes or insist that the team accept responsibility for the design when problems arise during construction. This can lead to attempts to blame the builder—usually unsuccessfully.

Team of individual consultants

WHEN TO USE IT?

- When a relatively simple design is needed within a short time frame.
- When there is no public sector team and some elements of the Design Process still need to be completed before hiring someone to create the Final Design.
- When the Executing Agency needs support from consultants to define the design's Technical Specifications or obtain approvals.

ADVANTAGES

- Typically less expensive than a design firm, with a faster hiring process.
- It provides flexibility during the initial stages of the design.
- The Executing Unit will have the professional resources to help them make decisions.
- If the consultants are local, they generally understand the market and context of the project.

DISADVANTAGES

- There is a separate hiring process for each consultant, plus another for construction.
- Putting together a new team requires an adjustment period to ensure a good working dynamic and a coherent design.
- Sometimes there is resistance from Executing Agency or Sector Agency experts that makes the process harder, especially when getting approvals.

Design firm

WHEN TO USE IT?

- When constructing new buildings of a certain complexity or size, and to allow for the inclusion of technology and new design and operational trends.
- When there is no internal design team, or when the design should be created by a consulting firm that specializes in a certain type of infrastructure.

ADVANTAGES

- If the firm is well-chosen, the design will be high-quality in terms of its function and construction because the firm is specialized and experienced.
- If a firm creates the design, it will assume technical and legal responsibility if necessary.

DISADVANTAGES

- This method involves two hiring processes: one for design and another for construction.
- Sometimes consulting firms are not familiar enough with the context or market where the project is being implemented.
- Sometimes consulting firms are chosen for the quality of their staff, but the work is passed on to junior employees once the contract is underway.
- Sometimes there is resistance from Executing Agency or Sector Agency experts that makes the process harder.

Design and build

WHEN TO USE IT?

- Generalmente cuando se trata de edificaciones medianas o grandes, pero de características simples o medianamente estandarizadas, en donde una empresa constructora pueda subcontratar una firma de diseño.

ADVANTAGES

- Simplifies the hiring process because only one company is hired.
- If the bid documents and contract are well-written and the selection process is good, the Contractor will be responsible for any defect in the design that could affect costs.
- Avoids the problem of determining whether an issue is due to an error in design or construction, as the Contractor is responsible for both.

DISADVANTAGES

- If the Technical Specifications are unclear, the Contractor may raise the price of the design-build quote. They may raise the price and/or try to recoup additional costs to minimize their risk.
- Contractors may create lower-cost designs in order to maximize profits, sometimes to the detriment of construction quality or aesthetics.
- Sometimes there is resistance from Executing Agency or Sector Agency experts that makes the process harder.

4. Design development timeline and costs

How long the process will take depends on several factors regardless of which one of the four models is chosen. As indicated in **Chapter 3**, process duration one of the aspects to consider when defining the strategy that will be followed to obtain the Designs. However, time should not be the only consideration.

At first glance, it may seem that the fewer hiring processes are involved, the less time a strategy will take. By this logic, the quickest way to develop the design would be to use a public sector team. However, fulfilling inter-agency agreements within government usually takes a long time and internal processes are often slow.

Hiring individual consultants means undertaking several hiring processes. But this can be done relatively quickly, and all consultants can be hired at once.

The difference between hiring a design firm and using a design-build contract is more apparent. The latter option only requires one procurement process, whereas the former requires two.

The following table provides an assessment of how long each option will take, based on hypothetical timelines for a social infrastructure project. The Executing Agency can examine these timetables with the advice of the project leader and IDB Procurement Specialist, as these timetables are just theoretical. Several circumstances should be taken into account, such as the local market, risk of protests, etc.

NUMBER OF HIRING PROCESSES (for design and construction)	
Public sector design team	Only one for construction once the design is finalized
Team of individual consultants	One for each consultant and one for construction
Design firm	One for the design firm and one for construction
Design-build (D+B)	One that includes both design and construction

Months

	1	2	3	4	5	6	7	8	9	10	11	12
Public sector design team	Design specifications and inter-agency agreement prepared			Inter-agency agreement signed		Design prepared and approved/Bidding documents prepared		Invitation to bid with no prequalification for construction			Construction begins	
Team of individual consultants	Design specifications and TOR for individual consultants prepared		Individual consultants hired	Design prepared and approved/Bidding documents prepared		Invitation to bid with no prequalification for construction			Construction begins			
Design firm	Design specifications and Request for Proposal prepared			Design firm hired			Design prepared and approved/Bidding documents prepared		Invitation to bid with no prequalification for construction			Construction begins
Design and build (D+B)	Design specifications and bidding documents prepared			Invitation to bid with no prequalification for design and construction			Design prepared and approved		Construction begins			

This table show the following average timelines:[8]

- Time to prepare the Technical Specifications and construction bidding documents: 90 days
- Time to sign an inter-agency agreement: 60 days
- Time to prepare and approve design: 60 days
- Time to select and hire individual consultants: 30 days
- Time to select and hire design firm: 90 days
- Time to issue invitation to bid with no prequalification: 90 days

Design costs may vary, and many factors should be kept in mind when developing an estimate. Nevertheless, cost should not be the only factor in deciding how to create the design.

The following are some of the variables that may affect the costs:

- The complexity of the infrastructure—designing a health center is easier than designing a hospital.
- The number of repeated features—one design repeated several times is different from multiple unique designs.
- Designing a renovation may cost more than creating a design from scratch—the first option may require studies to determine the state of the existing infrastructure.
- Professional fees are regulated in some countries, which could affect the cost of the design.
- Hiring renowned and experienced design professionals or firms may cost more than hiring less prominent professionals.
- The design model—working with a public sector team may not add to project costs (although it is a cost for the country), while hiring a specialized firm may cost more.

When estimating the design cost, expect it to be around 5% to 10% of the construction cost.

8 Timelines may vary by country. Adapt this table to the project context when assessing the various options.

5. Design foundations

For all the four design models, the Executing Agency should establish a framework so that the Design Process and the agreement or contract is executed within the specified time frame and the outcome meets its expectations.[9]

Most importantly, the Executing Agency should clearly establish Technical Specifications and the Design Scope, which is explained in **Section 3.**

To structure this framework, the Executing Agency needs staff with enough experience in the relevant project type, as well as open and continuous communication with the Sector Agency and Final Beneficiary. These may be internal staff or consultants hired for that purpose.

If there are no existing designs or concepts, and the Executing Agency believes that providing the designer with some sort of previously completed design work would speed up the process, it should decide the best way to obtain it. The table on the following page summarizes potential options for preparing the initial stages of the design.

If a public sector team is preparing the design, it generally handles the entire thing, including the Final Design. But if the team is part of an agency other than the Executing Agency, then the Executing Agency may need to be the one to carry out the initial design stages.

If individual consultants are involved, they may prepare the entire design. Otherwise, the Executing Agency may take care of the initial stages.

If a design firm is used, it will prepare the Final Design. However, the initial stages of the design may still be prepared by the Executing Agency, consultants, or even the public sector team.

If using a design-build contract, the contractor will prepare the Final Design, but the previously completed design work delivered to them should be prepared by the Executing Agency, the public sector team, or even a team of consultants.

There are several possible combinations—even some that may not appear in the table. In every case, think about how the design will be prepared and remember the following:

A) The Executing Agency is responsible for creating the Architectural Program. This includes getting approval from Sector Agency and seeking the Final Beneficiary's endorsement.

B) Understand the internal approval procedures (for the Executing Agency) and external ones (for the Sector Agency and other entities) for the design and how these will impact the timelines and contracts.

Lastly, the Designer is always responsible for the design, even if it meets the Technical Specifications and matches the previously completed design work provided by the Executing Agency. Therefore, the Designer should assess the Specifications and approve them before starting the design.

9 The Executing Agency should include these ground rules in Section VI of standard bid documents for major works. For smaller contracts, include them in Sections VII and VIII. For standard requests for proposal, include them in Section VII.

Previously Completed Design Work

WHO IS PREPARING THE DESIGN?	ARCHITECTURAL PROGRAM[10]	SCHEMATIC DESIGN	PRELIMINARY ARCHITECTURAL DESIGN	PRELIMINARY ENGINEERING DESIGN	FINAL DESIGN
Public sector team	Executing Agency	Executing Agency / Public sector team	Executing Agency / Public sector team	Public sector team	Public sector team
Team of individual consultants	Executing Agency	Executing Agency / Team of individual consultants	Executing Agency / Team of individual consultants	Team of individual consultants	Team of individual consultants
Design firm	Executing Agency	Executing Agency / Public sector team / Design firm	Executing Agency / Public sector team / Design firm	Public sector team / Design firm	Design firm
Design-build	Executing Agency	Executing Agency / Public sector team / Team of individual consultants / Contractor	Executing Agency / Public sector team / Team of individual consultants / Contractor	Public sector team / Team of individual consultants / Contractor	Contractor

10 The Executing Agency may assign the Architectural Program to a staff member or an individual consultant.

6. Design oversight and approval

The Designer is always technically responsible for the design and this should be made clear in the contracts and agreements between the Executing Agency and the Designer. Similarly, the Executing Agency is always responsible for overseeing and approving the design. The Executing Agency's approval of the design never releases the Designer from their responsibility.

Oversight and approval should happen under the framework of a signed contract or agreement that sets partial delivery dates, deliverables, scope, presentation methods, etc.

If the Technical Specifications and Design Scope are well-defined when the contract is signed (the objective of this guide), oversight and approval will merely consist of checking that the design meets them. If the Designer delivers the product as requested, the oversight and approval process will be fast.

Remember that no changes to the Technical Specifications should be requested during the oversight process. If they are changed or modified, the Designer is within their rights to request more money and more time to complete the additional work. Therefore, the Sector Agency and Final Beneficiary need to approve the Technical Specifications before the Designer is hired as explained in **Chapter 7**.

If the Designer presents a design that does not meet the Technical Specifications (i.e. it doesn't comply with standards or deviates from established design criteria) or the Design Scope (i.e. it leaves out certain plans or calculations), the Executing Agency may reject the design and the Designer must assume responsibility for noncompliance under the stipulations of the contract or agreement.

The contract between the two parties directly ties the Executing Agency's approval of the design to payments. Its approval marks the end of the design phase and means that the design deliverables can be added to the construction bid documents. For design-build contracts, this means that construction can begin.

The Designer is responsible for getting this approval, which can only be given by the Executing Agency. The design will be approved if it fulfills the Technical Specifications, Design Scope, and time frames outlined in the contract.

7. Support for the design

The Executing Agency should have a strategy for communicating with the Final Beneficiary and obtaining its support for the design. That way, the Final Beneficiary can rest assured that the design will meet its needs and expectations, and the Executing Agency and Designer can be sure that the design and construction will be accepted.

In some countries, third parties such as ministries or funding agencies must also approve some stages of the design as highlighted in **Chapter 3**. Keep this in mind when choosing a strategy.

Under the project management framework, the Executing Agency is also in charge of identifying partners and key decision makers to maintain an open and informative dialogue with these groups.

Mechanisms for bringing together stakeholders should be in place from the beginning of the Design Process, not delayed until the Final Design is complete. These processes often take time and waiting would put the project timeline at risk.

The Executing Agency should include these mechanisms in the program timeline, monitor and manage their progress, and commit to meeting established deadlines.

The deliverables that should be approved by the Sector Agency and Final Beneficiary are listed below:

WHAT?	WHEN?	WHY?
NEEDS PLAN	When choosing the project.	The Sector Agency and Final Beneficiary can represent the project owners. They set the needs.
TECHNICAL SPECIFICATIONS	Before issuing a tender/RFP for the design or signing an agreement with a public sector team.	This ensures that the design will meet the needs and expectations of the Sector Agency and Final Beneficiary. The Sector Agency and Final Beneficiary will know the size and features of the infrastructure project.
SCHEMATIC DESIGN, IF NOT PART OF THE PREVIOUSLY COMPLETED DESIGN WORK	After hiring someone to prepare the design, when the Schematic Design is completed, especially if there are several viable options and the Executing Agency needs to consult the Sector Agency and Final Beneficiary. If the Designer must pause their work for this consult, it may increase costs and delay the project (unless this circumstance is included in the contract). If there is a chance this may happen, include it in the contract.	The Schematic Design will help everyone understand the proposed design and make a final decision, if there is more than one viable option. At this point, the Executing Agency may accept suggestions from the Designer that the Sector Agency had not considered, if and when they do not change the project scope or quality or increase costs and time frames. If the Sector Agency and Final Beneficiary endorse the Schematic Design, the design will be on a solid foundation, ensuring its acceptance by stakeholders.

WHAT?	WHEN?	WHY?
PRELIMINARY ARCHITECTURAL DESIGN[11] PRELIMINARY ENGINEERING DESIGN	When the Preliminary Architectural and Engineering Designs are finished and the project has a budget estimate. If the Designer must pause their work for this consult, it may increase costs and delay the project (unless this circumstance is included in the contract). If there is a chance this may happen, include it in the contract.	If the Sector Agency and Final Beneficiary have seen the Preliminary Designs before work on the Final Design begins, they can see how the design includes the Architectural Program and their design criteria, and the Executing Agency can rest easy knowing that the design is acceptable to the client. The Sector Agency and the Final Beneficiary need to know what the facilities will be like once they are built—after all, they will be operating and maintaining them, and they need to be able to do so correctly once the project is complete. The Sector Agency should know the estimated budget, especially if there is reason to think the initial estimate may change.
FINAL DESIGN AND FINAL BUDGET	Once the Final Design are finished and the final budget is set.	This is formal act of approval, especially necessary in cases where the final budget is much higher than the estimated budget.

11 It is recommended to share 3D images, drawings, or renderings of the Design with the Sector Agency and Final Beneficiary to gain their support.

Section 3

Design Foundations

1. Determining the technical specifications

As previously mentioned, no matter which of the four methods is used to develop the design, the Executing Agency should set the Technical Specifications that the design needs to meet. These should be comprehensive enough to ensure (i) that the Design Process (through agreement or contract) unfolds within a set time frame, and that the deliverables match the requested Design Scope; and (ii) that the design is complete enough to safely tender (if not using a design-build contract), build, and oversee for all parties.

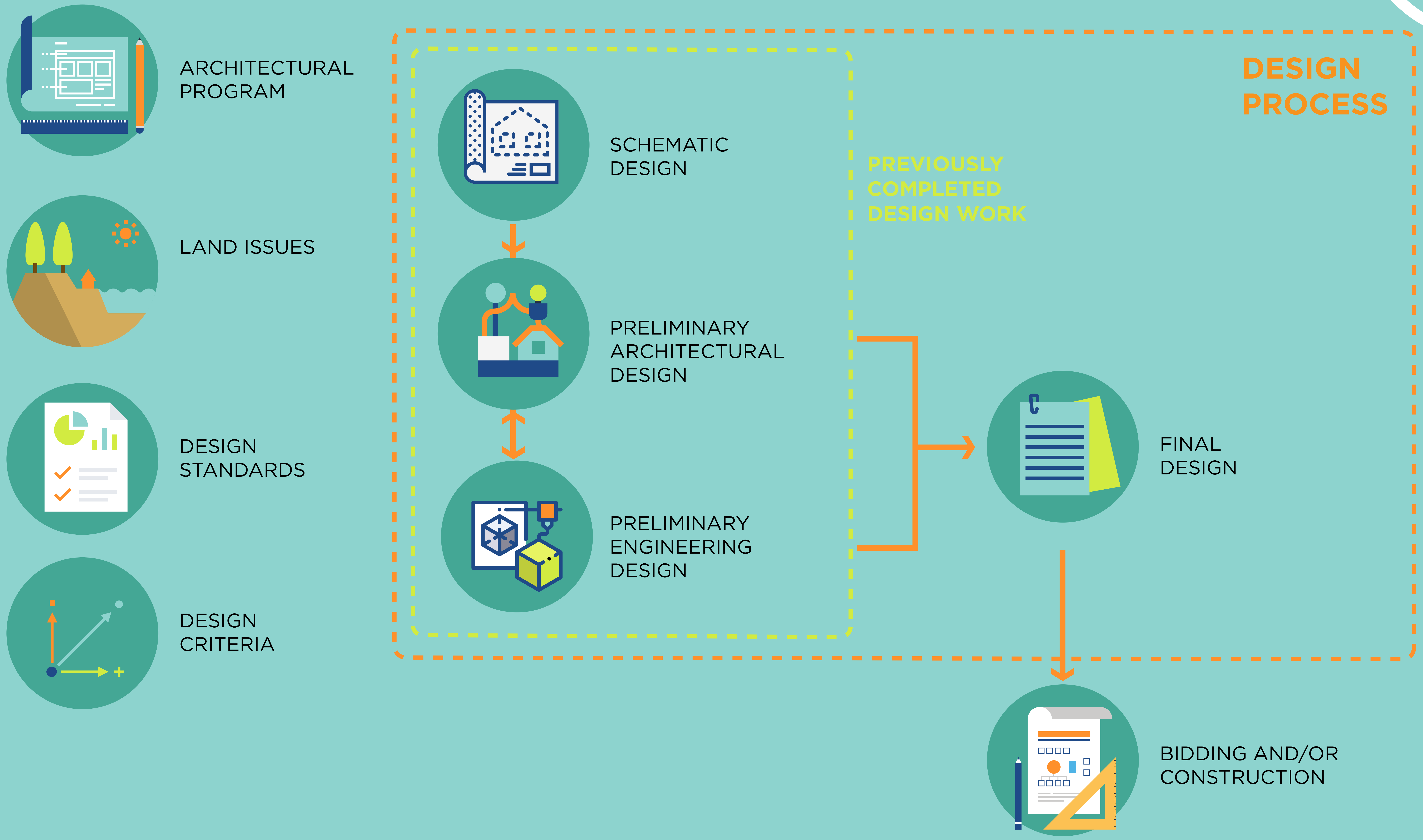
Developing a design is a creative process by a group of designers, and therefore its outcome is subjective. To ensure that the design is approved quickly and fairly, the Technical Specifications should be clear, and the Design Scope clearly defined. There should be no question about what is expected of the Designer. Expectations should be clear to all stakeholders.

If certain elements are not included in the Technical Specifications and are subsequently requested by the design supervisor or another individual or institution, the Designer is not obligated to include these new requests. Instead, this may lead to complaints that will likely mean higher costs and longer timelines.

The following elements should be added to the Technical Specifications before a Designer is hired: the Architectural Program, land issues, design standards, the Executing Agency's design criteria, and any previously completed design work.

All components of the Technical Specifications will be set by the Executing Agency, with the support of the Sector Agency and Final Beneficiary.

Chapter 3, includes a checklist to help the Executing Agency make sure that nothing is left out of the Technical Specifications.


ARCHITECTURAL PROGRAM
LAND ISSUES
DESIGN STANDARDS
DESIGN CRITERIA
DESIGN PROCESS
PREVIOUSLY COMPLETED DESIGN WORK
SCHEMATIC DESIGN
PRELIMINARY ARCHITECTURAL DESIGN
PRELIMINARY ENGINEERING DESIGN
FINAL DESIGN
BIDDING AND/OR CONSTRUCTION

Architectural Program

The Executing Agency should create the Architectural Program using the Needs Plan[12] (provided by the Sector Agency), existing standards, best practices, and any features specific to the project . Once it is completed, the Sector Agency and Final Beneficiary should approve it.

The Architectural Program will state—in detail—the number, type, and area of the spaces that make up the design and the minimum and maximum number of square meters.

Regulations may set minimum dimensions for certain spaces, so the designer will not be able to make these smaller than allowed by the standards and/or the Architectural Program. Because the Architectural Program is a theoretical exercise, the designer should have the freedom to expand the area by a reasonable amount. Typically, the design should not increase the area in the Architectural Program by more than 5%, although some situations may call for more flexibility.[13][14]

The Technical Specifications should always set a realistic minimum and maximum area for the design. The Architectural Program is the best way to do this.

More information about the Architectural Program and its contents can be found in **Annex 1.**

Land issues

The Technical Specifications should include all the information about the land where the project will be built. The land should be clearly identified, with all legal, technical, and financial issues settled and clarified.

Having a chosen land is helpful because the Designer can make practical design suggestions, as well as include designs for the foundation and all the utilities the building will need.[15] Changing the land once the design is underway means that it will have to be redone, leading to increased costs and delays.

The Executing Agency should give the Designer all the background materials it has, such as surveys or soil samples, topographic surveys, plans of existing construction on the land, etc. If the Executing Agency does not have this information, the Technical Specifications should explicitly request it from the Designer.

Even when the Executing Agency has performed a topographic survey and soil survey based on samples from the land, it should ask the Designer for its completed surveys (their conclusions and recommendations are related to their design.) This puts the responsibility for the results of those surveys on the Designer.[16]

The Executing Agency should also provide the Designer with all information related to the availability of utilities on the site that have been certified by a utility company. However, the Designer should still verify and/or rectify their status.

12 The Executing Agency should request the Needs Plan from the Sector Agency. The Sector Agency should create a short document that expresses its needs in the greatest possible detail. Ultimately, this is the object of the project. Often, the Sector Agency lacks a clear idea of its needs and completing a Needs Plan will help it determine what they are. Having a signed Needs Plan will lend support the Executing Agency's execution of the project and avoid future misunderstandings.

13 In some cases, e.g. when the terrain is very sloped, the Design may need more area for circulation to install ramps than what was proposed in the Architectural Program. Give the Designer greater flexibility in these circumstances.

14 Setting a maximum area during the design stage (prior to accepting construction bids) is meant to control the owner's total cost. D+B contracts can be more flexible (e.g. 10%), with the understanding that the Contractor will only increase the area if it does not increase costs; otherwise, the Contractor will have to assume the costs of the project.

15 Use **Do it Here, Not There**: Guide for the Selection of Land to Build Social Infrastructure.

16 The Designer should take soil samples from the exact spots where the buildings will be constructed. In some countries, this is required by local law.

Design Standards

The Technical Specifications should explicitly state which design and construction standards will apply to the project. These should include standards related to planning, the sector, the environment, building and construction codes, and specific standards for certain facilities.

- Planning standards[17] are generally local or municipal regulations that set requirements for soil use, fill factor, and construction setbacks and heights. Land use plans or master plans for cities and regions fall into this category.
- Sector standards are specific to fields like education or health and set certain design conditions for these kinds of projects. Accessibility regulations also fall under this category.
- Environmental standards are typically set by the national body that makes environmental policy. This category also includes any requirements that may arise from IDB environmental and social safeguarding policies.
- Design and building codes are specific technical requirements for construction methods, acceptable materials, sourcing, and testing of materials and equipment. They are listed by specialty, e.g. earthquake resistance for structural calculations, or codes and regulations for electricity, sanitation, fire protection, and climate control. These codes may be country-specific or internationally recognized standards used by various professional groups, such as NFPA or ASHRAE.

Design standards may even include rules about the scale and characteristics of technical drawings.

Design Criteria

The Technical Specifications should include a document with all the criteria—or elements that are not included in any regulation or standard—that the Sector Agency, Executing Agency, or Executing Unit want in the design.

The Executing Agency should take the time to determine what it wants from the Design. For example, it may want the Designer to consider renewable energy solutions, include tile floors, or use locally sourced materials. It may also want to decide in advance on the plumbing, lighting, or climate control system, or even stipulate that the structure be able to expand to double its capacity.

This exercise can also be done in reverse, where the Executing Agency explicitly states what it does not want in the design. For example, it can decide that it does not want a roof made from lightweight materials, or that it doesn't want the building to be two stories, or that the building should not be too modern because it will clash with the neighborhood, etc. The Executing Agency is strongly advised to clarify all subjective elements of the design with the Designer.

17 They may also be called territorial plan regulations or urban planning regulations.

Although these requirements should be as detailed as possible, they can never override the applicable standards. For example, no matter how strongly the Executing Agency feels about not installing a certain fire suppression system, it must be included if national standards require it.

The Executing Agency can also decide which software will be used to create the design, or if it prefer a specific calculation method. If the design needs to be rendered in three dimensions (Revit, Achicad, or other software), the Executing Agency can request that information about component costs be included so it can be integrated into the budget.[18]

Although equipping the infrastructure is not part of the Designer's job, the design criteria should include what kind of equipment and/or furniture will be installed. This will allow the Designer to imagine the space, access, electrical loads, and required pre-installations.

If there are no regulations on the subject, this section can include how the project should be presented graphically. 3D images can also be included that allow stakeholders to share what the structure will look like once built.

The Executing Agency can also set a maximum value for construction costs, especially when the Technical Specifications leave some of the design elements up to the Designer.

Some of these criteria can be clarified in the previously completed design work given to the Designer, particularly in the design briefs.

Previously completed Design work

As stated in **Section 1**, the Design Process consists of several stages, from the Schematic Design to the Final Design.

When drawing up the Technical Specifications, think about which stages have already been completed and which ones the Designer will be responsible for. The completed stages can be thought of as "previously completed design work." For example, if the Executing Agency already has a Schematic Design or a Preliminary Architectural Design, these can be included in the Technical Specifications.[19]

Broadly speaking, the more details the Designer has about what the client wants, the better and faster the design and approval processes will be. However, this shouldn't stand in the way of Designer introducing new ideas or adding value, and it does not release the Designer from their responsibility for the design.

By accepting the project, the Designer indicates that they have studied the Technical Specifications—particularly the previously completed design work—and agrees to prepare the design based on the information provided. Adding the previously completed design work to the Technical Specifications means only that the Executing Agency has studied the situation and believes there is a solution that can meet its needs.

In many cases, the public sector design teams prepare the early stages of the design, including the Architectural Program, and then the Designer continues the process. In others, a consultant may be hired to create the Schematic Design or Preliminary Architectural Design.

18 For D+B contracts, this extends to the management and oversight during construction.

19 The stages of the Design Process are called Schematic Design, Preliminary Designs, and Final Design for the purposes of this guide. The content of each one is in Annexes 3, 4, and 5. However, the Executing Agency may have some documentation such as drawings, plans, or other designs that do not correspond to any of these stages. These would not constitute a complete Schematic Design, so they should be included as design criteria and not as previously completed design work. and at the same time. The Design Scope should include the completion of a Schematic Design as described in this guide.

This table summarizes the pros and cons for the Executing Agency of including each stage of the previously completed design work in the tender, as well as some recommendations. Providing more previously completed design work reduces the time it takes for the Designer to prepare the design, and it speeds up approval to an extent. However, it increases the Executing Agency's influence on the results.

PREVIOUSLY COMPLETED DESIGN WORK	ADVANTAGES OF INCLUDING IT	DISADVANTAGES OF INCLUDING IT	RECOMMENDATION
SCHEMATIC DESIGN	Giving the Designer the Schematic Design for the chosen land ensures that they will place the building in the desired location, with the orientation and access points that the Sector Agency wants. The Schematic Design determines the functional organization and circulation plan within the building, reducing the number of alternatives for the Designer to consider and speeding up the Design Process.	The Schematic Design limits the Designer's ability to propose new options for the design. The Executing Agency should have technical staff who can assess the background information and have time to develop the Schematic Design proposal.	Providing the Schematic Design is recommended when the Sector Agency knows that the functional organization is appropriate for its needs or for a predetermined design, or in certain kinds of buildings where the functional relationship between certain areas is key (e.g. health).
PRELIMINARY ARCHITECTURAL DESIGN	Providing the Preliminary Architectural Design helps to clarify the Executing Agency's specifications. It also reduces the time needed to create and approve the Final Design, which speeds up the process.	Providing the Preliminary Architectural Design limits the Designer's ability to include new technologies or alternative materials in the design. By providing the Preliminary Architectural Design, the Executing Agency is assuming that it complies with the corresponding standards and that if the design follows it, it will be approved and built. The Executing Agency should have a design team with the time and capacity to create the Preliminary Architectural Design.	In some countries, the Preliminary Architectural Design must be approved by a public body. In these cases, giving the approved design to the Designer is recommended.
PRELIMINARY ENGINEERING DESIGN	Providing the Preliminary Engineering Design helps to clarify the Specifications that the Executing Agency wants for its project and ensure that the proposed technical solution is the best fit for the Agency's needs. It shortens the discussion phase during its creation and approval, which speeds up the process.	Providing the Preliminary Engineering Design means that Executing Agency limits the Designer's ability to include new technologies or alternative materials in the design. The Executing Agency should have a design team with the time and capacity to develop the Preliminary Engineering Design in a coordinated fashion.	If there isn't much time to develop the Final Design, giving the Preliminary Design to the Designer is recommended so that their work is based on the Agency's preferred option. If there is no Preliminary Engineering Design, individual consultants can be hired to create on incorporate one that will be included in the Technical Specifications, if appropriate.

2. Establish the designer's scope of work

The Executing Agency should establish the Design Scope and the Designer's scope of work, i.e. the deliverables it expects and what they include.

Clearly defining the Design Scope and the Designer's scope of work is essential for quick oversight and approval

Annexes 2, **3**, **4** and **5**, describe the content of each deliverable that should be requested from the Designer. This includes those that are part of the Design Process (Schematic Design, Preliminary Designs, and Final Design) as well as the Architectural Program and other frequently requested deliverables, such as a topographic report of the land, a soil survey, paperwork, permits, and licenses.

If the Executing Agency creates any of these deliverables and incorporates them into the Technical Specifications, they should include the information described in the Annexes.

The information in this Guide lays out what should be expected from the deliverables (Scope) and, where applicable, what should be included in each document given to the Designer as part of the Technical Specifications.

Chapter 3, also includes a checklist to help the Executing Agency ensure that it has correctly established the Design Scope.

Surveys, paperwork, and permits

If the Executing Agency requires it, the Designer should do some preliminary surveys before preparing the Architectural and Engineering Designs. These surveys will help with the Design Process. Which surveys to do depends on the features of the project and its location.

Some examples include topographic surveys, soil surveys, environmental assessments, detailed disaster risk studies, hydrogeological studies, water quality studies, structural surveys of existing buildings, etc.[20] The requested surveys and their content should be clearly defined in the Design Scope.

The Executing Agency generally hands over any previous studies, including previous samples and soil surveys, along with the Technical Specifications. Nevertheless, ask the Designer to conduct a complete soil survey once the Schematic Design is complete and the building's position on the land has been determined (before starting the Preliminary Architectural Design).

Just like with the surveys, include the paperwork and permits the Designer is responsible for (and who will pay for them) in the Design Scope. These may include municipal permits, environmental permits, utility permits, or permits from the communities themselves. Address them one at a time, and don't simply include statements such as "the contractor is responsible for all paperwork and permits." Although this shifts the responsibility to the Designer, it can lead to future conflicts, especially if the permitting process takes longer than expected.

If the Executing Agency decides that the Designer will handle all the paperwork and permits, it should be clear about which ones it needs. If there are concerns about whether the list is complete, the Executing Agency can include a statement at the end that says: "In addition to those listed above, the Designer is responsible for any other procedure or permit needed for the design and construction."

For D+B contracts, all paperwork and permits needed during the construction phase should be included, including permits for construction and equipment where applicable.

20 For more information about these surveys and when to use them, see **Do It Here, Not There**: Guide for the Selection of Land to Build Social Infrastructure.

Architectural and engineering designs

The Architectural and Engineering Designs are the core of the social infrastructure design, and their scope should be clearly defined so that the Designer knows exactly what to include and what not to include.

The Design Scope should define the deliverables and their content as well as their format and the number of copies.

Annexes 3, **4** and **5** describe the content commonly included in the architectural and engineering designs, which the Executing Agency will adapt to its project.

Utility design

When planning the project, remember that for the infrastructure needs utilities to work once it is built, mainly water, sanitation, electricity, and internet.

Urban areas typically have public or private companies (often licensees) that provide and manage service networks that various buildings are connected to. However, in Latin America and the Caribbean the availability of utilities in urban areas is not a given.

The situation may be even worse in suburban or rural areas, where providing these utilities has be part of the infrastructure project.

The challenge is that these services often must be built outside the boundaries of the land and require very specific designs and costly construction.[21]

For each project, the Executing Agency should identify which utilities are needed, who will design them, and how long it will take, so that they can be completed at the same time as the building.

Utility providers can develop the designs (and build them) or they can be included within the project's design. This should be apparent in the Technical Specifications.[22]

21 There are several possibilities. As an example, the land may not have sanitation, but the system passes by 500 meters from the property. The system's expansion to the edge of the land would have to be included in the Design.

22 For more information, see **Incorporación de servicios públicos en proyectos de infraestructura social: Una guía para su implementación.**

3. Checklists

Information to give the designer: technical specifications

The following list summarizes the main elements the Executing Agency should make sure are included in the Technical Specifications:

TECHNICAL SPECIFICATIONS

1. Architectural Program	YES	NO	N/A
Fulfills the Needs Plan			
Includes all project zones			
Includes main spaces by zone			
Includes additional spaces by zone			
Includes minimum number and area of all spaces			
Includes internal circulation and walls for each sector			
Potential effects of equipment have been considered			
Includes exterior spaces such as gatehouses, storage, etc.			
Includes circulation and walls of entire building			
Includes a summary table with totals and subtotals organized by sector			
Formulas have been reviewed for accuracy			
Minimum and maximum number of square meters set			
Has Sector Agency approval			
Has Final Beneficiary approval			

This section will depend on the particular project and land, especially concerning any previous surveys, permits, or utility certificates the Executing Agency has. It should include as much information as possible.

2. Land Issues	YES	NO	N/A
Land information, registration number, boundaries, deed			
Topographical plan with land boundaries			
Soil surveys with foundation recommendations			
Soil tests (laboratory)			
Location of water table			
Plans for existing construction			
Certificate of availability for potable water			
Certificate of availability for sanitation			
Certificate of availability for electricity			
Certificate of availability for internet			
Hydrogeological study for well installation			
Other available studies			

This section will depend on the particular project and its geographical and administrative region, as well as existing legislation and utility company requirements.

3. Design Standards	YES	NO	N/A
Applicable sector regulations (e.g. health, education, etc.)			
Structural design regulations			
Water/sanitation system rules and regulations			
Fire regulations			
Electrical rules and regulations			
Information and communication technology (ICT) rules and regulations			
Natural gas or propane rules and regulations			
Climate control and mechanical ventilation regulations			
Elevator system regulations			
Air filtration system regulations			
Renewable energy system regulations			
Accessibility regulations			
Local or urban regulations			
Design regulations for the land			
Environmental regulations			
Design drawing and presentation regulations			
Applicable construction codes and regulations			

This section may include as many components Executing Agency wants to resolve on its own or leave up to the designer. The Executing Agency should review all possible issues.

4. Design Criteria	YES	NO	N/A
Orientation on the land and access points, views, and location of parking			
Number of floors, type of roof, and architectural style			
Elements to keep, such as certain trees			
Provisions for future expansion			
Construction phases			
Construction system for the foundation, supports, and roof			
Materials and labor to use during construction			
Materials for openings, floors, roofs, and ceilings			
Construction needed for outdoor spaces			
Energy-saving measures to be incorporated into the design			
Use of renewable energies or bioclimatic design			
Water-saving measures			
Rainwater collection and reuse			
Facilities for maintenance activities			
Information, dimensions, type, and electrical load of equipment to be installed			
Information, dimensions, and type of furniture to be installed			

4. Design Criteria	YES	NO	N/A
Emergency generator and fuel requirements			
Elevators and other industrial equipment			
Need for hot water and/or steam system			
Need for centralized oxygen and medicinal gases			
Need for climate control and filters in certain areas			
Software that will be used for various calculations			
Criteria for creating and presenting drawings			
Need for 3D images, renderings and presentations			
Maximum price of construction			
Other design criteria			

This section will include all the previously completed design work done by the Executing Agency.

5. Previously Completed Design Work	YES	NO	N/A
Schematic Design			
Preliminary Architectural Design			
Preliminary Engineering Design			
Other previously completed design work			

Information to request from the designer: design scope

The following list summarizes the deliverables that the Executing Agency should request from the Designer.

DESIGN SCOPE Checklist	YES	NO	N/A
1. Design scope			
2. Preliminary Architectural Design			
3. Preliminary Engineering Design			
4. Final Design			
5. Other products			
Topographic Report			
Soil Survey			
Permits and licenses (specify)			
Other			

Each of these deliverables is described in more detail in **Annexes 3**, **4** and **5**, but this table below provides a summary:

Content	Schematic Design	Preliminary Architectural Design	Preliminary Engineering Design	Final Design
Design Brief	⊗	⊗	⊗	⊗
Architectural Program	⊗	⊗		⊗
Land and Project Zone Tables	⊗	⊗		⊗
Layout diagrams	⊗	⊗	⊗	⊗
General drawings and sections at 1/100 scale		⊗	⊗	⊗
Certificates of availability for utilities			⊗	⊗
Load list and single-line diagram			⊗	⊗
Heat balance			⊗	⊗
Index of drawings and documents		⊗	⊗	⊗
Detail drawings and sections				⊗
Calculation report				⊗
Technical Specifications or Construction Brief				⊗
Budget		⊗	⊗	⊗
Quantity lists				⊗
Unit price analysis [23]				⊗
Construction timeline				⊗

23 Unless using a D+B contract.

Section 4

Summary and Conclusions

Summary and Conclusions

1. Developing a design is a process that requires information, time, resources, and experts from different fields, who come together with proper planning and technical coordination to achieve quality results within the specified time frame.

2. "Quality" means that the design is complete (has all the necessary components) and cohesive (all the parts come together to make a homogeneous design.) The design's quality is a guarantee that it can be tendered (if not using a design-build contract), built, overseen, maintained, and operated without cost overruns, extensions, or delays, which will help avoid complaints from stakeholders.

3. There are several ways to go about obtaining a design: using a public sector team, hiring a team of individual consultants, contracting a specialized design firm, or hiring a contractor under a D+B contract. The best method will depend on the Executing Agency's strategic focus, based on the project's specific traits.

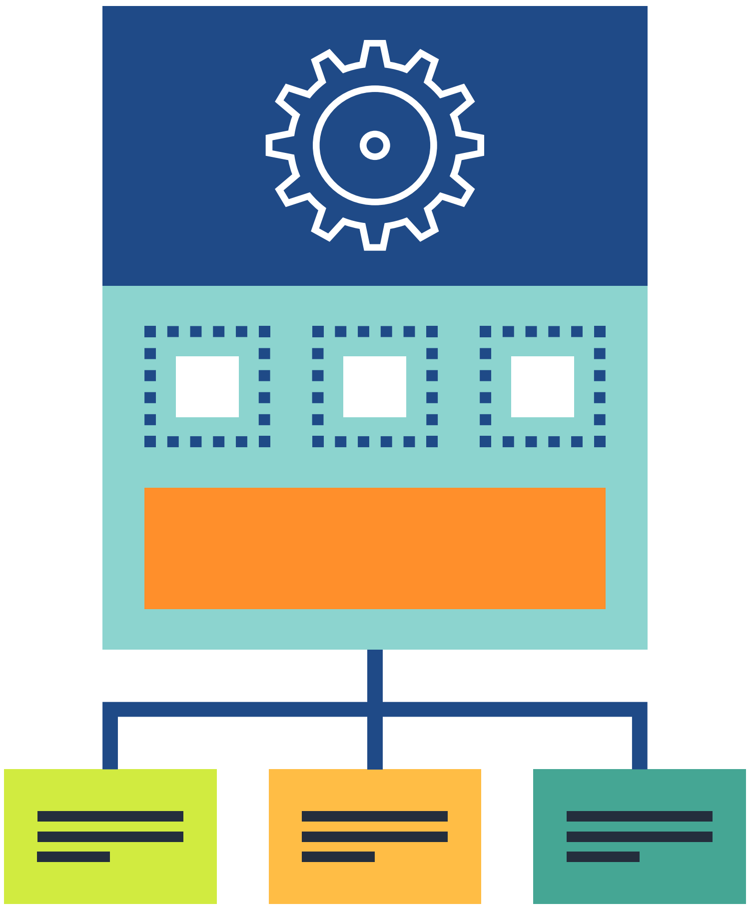
4. Before hiring a Designer, the Executing Agency should determine the following: (i) the Technical Specifications, which define what the Executing Agency needs the Designer to do, and (ii) the Design Scope, which specifies in detail the content of the deliverables that the Executing Agency expects from the Designer so that it can oversee and approve thems.

5. Once the design has been contracted, any changes or requirements to the design that have not been clearly defined in the Technical Specifications will be subject to claims from the Designer, with direct impacts on project costs and timelines. Allow enough time to clearly define the Technical Specifications and Design Scope ahead of time and ensure that oversight focuses on whether these are fulfilled rather than on any subjective criteria.

6. The Executing Agency should lead the entire process, from requesting the Needs Plan from the Sector Agency to getting the Final Beneficiary's support for the design. The Executing Agency should consistently track and monitor variables that could affect the project's cost, timeline, scope, and quality.

Annexes

Annex 1: Architectural Program



The Sector Agency and the Final Beneficiary work together to create a document called the Needs Plan, which is based on their sectoral planning. This document defines what the beneficiary needs from their new facility in terms of space and function.

The Sector Agency may say that it needs a school with 11 classrooms, or enough classrooms for 500 students and 80 teachers with a gym, patio, and cafeteria that operates in three shifts, with recreational areas can be used for extracurricular activities. However, it may leave out details about the number of bathrooms or offices. The Needs Plan usually provides just a general idea that needs to be expanded.

Ask the Sector Agency to provide as complete a Needs Plan as possible that includes the building's design criteria and basic aspects of its operations, such as schedules, uses and users, access points, etc.

Based on this initial information, the Executing Agency should develop the Architectural Program and determine the size of the design it needs. Once this is done, the Designer will be able to start their design on solid ground, which will help avoid changes during construction.

As previously stated, it is the Executing Agency's job to make sure that the Architectural Program is endorsed by the Sector Agency and Final Beneficiary. This will ensure their support of the design.

The Architectural Program can be prepared by a staff member or a consultant hired for that purpose.

Architectural program content

The Architectural Program shows the different zones and subzones of the project and determines the minimum number of square meters needed to complete it in the form requested by the Sector Agency.

When creating the Architectural Program, consider the following:

1) Organize the document by department or zone of the building, e.g. administration, cafeteria, gymnasium, teaching, laboratories, inpatient care, etc.

2) What are the main spaces within each zone, and which areas accompany those spaces? Group these spaces together. In administration, there are offices, and then bathrooms, storage rooms, or a waiting area. In an inpatient area, there are patient rooms, the nurses' station, dressing rooms, bathrooms, etc.

3) Decide which additional areas can be shared to optimize project area, such as waiting rooms and bathrooms.

4) Allocate a minimum area for each space based on standards or best practices. Use standardized criteria to allocate an equal area for all offices and bathrooms, or an equal student-per-square-meter ratio for all classrooms. Use logical and objective criteria to allocate space, noting when an area requires more space than the minimum.

5) Verify that the area allocated for each space will allow it to function correctly once equipment is installed and operational. Equipment should be able to fit in a laboratory and people should be able to use it comfortably.

6) Allocate a percentage for circulation and walls for each sector. Although this is unpredictable and depends on experience and each particular sector, it affects the project area and is therefore important. Circulation for classrooms or surgical areas would be a higher percentage than for an administrative area. Generally, this percentage falls between 20% and 30%.

7) Don't forget general services areas like storage, staff rooms, and operations and maintenance. Consult with engineers to decide (even preliminarily) how much space each system will need, e.g. electrical rooms, substation, pump rooms, etc.

8) Don't forget spaces that may be located outside the main building, such as gatehouses, waste storage, or garages.

9) Make a summary table with totals and subtotals organized by zone. This table will be the basis for the Schematic Design.

The Architectural Program is a concept document that determines the minimum number of square meters required for the design. If it is complete, the design area should be within 5% of the total indicated in the Program. Whether this objective is met will depend on the designer's skill.

The Architectural Program should be completed by staff with experience in space operation and equipment. The Final Beneficiary should also endorse it.

Sample architectural program

1 ADMINISTRATIVE ZONE
1.1 MANAGEMENT AND ADMINISTRATION

No.	Spaces	Proposed area		
		# of units	AREA (m^2)	TOTAL AREA (m^2)
	Functional units			
1	Closed office - principal	1	10,00	10,00
2	Closed office - vice principal	1	6,00	6,00
3	Closed office - coordinator	1	6,00	6,00
4	Open workspace - secretary's office and administrative files	1	8,00	8,00
5	Open workspaces	8	4,00	32,00
6	File storage	1	6,00	6,00
7	Conference room for 10 people	1	15,00	15,00
	Additional areas			
8	Waiting room	1	6,00	6,00
9	Public restroom by gender	2	3,00	6,00
10	Employee restroom by gender	2	3,00	6,00
	Subtotal			**101,00**
	Walls and circulation 20%			**20,20**
	Total			**121,20**

2 TEACHING ZONE
2.1 CLASSROOMS

No.	Spaces	Proposed area		
		# of units	AREA (m^2)	TOTAL AREA (m^2)
	Functional units			
1	Classrooms for children ages 6-12	6	50,00	300,00
2	Classrooms for children ages 3-5 with bathroom and sink	3	60,00	180,00
3	Multipurpose room (70 people)	2	80,00	160,00
4	Multipurpose room (10 people)	2	15,00	30,00
	Additional areas			
5	Teacher’s lounge with bathroom	1	15,00	15,00
6	Bathroom with sink	1	2,00	2,00
7	Temporary waste storage	4	2,00	8,00
	Subtotal			**695,00**
	Walls and circulation 30%			**208,50**
	Total			**903,50**

3 GENERAL ZONE - GENERAL SERVICES
3.1 FOOD

No.	Spaces	Proposed area		
		# of units	AREA (m^2)	TOTAL AREA (m^2)
	Functional units			
1	Food receiving and weighing area with counter and wash basin	1	15,00	15,00
2	Assembly and distribution area with counter	1	15,00	15,00
3	Disposal area with counter and wash basin	1	10,00	10,00
4	Dining hall	1	120,00	120,00
	Additional areas			
5	Open workspace for administration	1	4,00	4,00
6	Bathroom	1	3,00	3,00
7	Kitchenware storage	1	4,00	4,00
8	Temporary waste storage	1	2,00	2,00
	Subtotal			**173,00**
	Walls and circulation 25%			**43,25**
	Total			**216,25**

3 GENERAL ZONE - GENERAL SERVICES
3.2 STORAGE FACILITIES

No.	Spaces	Proposed area		
		# of units	AREA (m^2)	TOTAL AREA (m^2)
	Functional units			
1	Office supplies and consumables storage	1	15,00	15,00
2	Furniture and equipment storage	1	15,00	15,00
3	Educational materials storage	1	20,00	20,00
4	Other storage	1	6,00	6,00
	Subtotal			**56,00**
	Walls and circulation 25%			**14,00**
	Total			**70,00**

3 GENERAL ZONE - GENERAL SERVICES
3.3 FACILITY OPERATIONS AND MAINTENANCE

No.	Spaces	Proposed area		
		# of units	AREA (m²)	TOTAL AREA (m²)
	Functional units			
1	Maintenance workshop with one workstation	1	10,00	10,00
2	Generator box	1	12,00	12,00
3	Electrical substation	1	12,00	12,00
4	Electrical distribution room	1	6,00	6,00
5	Underground water tanks (consumption, fire)	1	0,00	0,00
6	Underground hydraulic pump room (always net positive suction head)	1	8,00	8,00
7	Storage for recyclables and ordinary waste	1	10,00	10,00
8	Communications and server rack	0	0,00	0,00
9	Air conditioning equipment (over roof slab)	1	0,00	0,00
10	Underground water treatment (wastewater)	1	0,00	0,00
	Subtotal			**58,00**
	Walls and circulation 25%			**14,50**
	Total			**72,50**

3 GENERAL ZONE - GENERAL SERVICES
3.4 CHANGING ROOMS

No.	Spaces	Proposed area		
		# of units	AREA (m²)	TOTAL AREA (m²)
	Functional units			
1	Staff changing room with bathroom and shower by gender	2	6,00	12,00
2	Bathroom	1	2,00	2,00
	Subtotal			**14,00**
	Walls and circulation 20%			**2,80**
	Total			**16,80**

4. OTHER ZONES

No.	Spaces	Proposed area		
		# of units	AREA (m²)	TOTAL AREA (m²)
	Functional units			
1	Main lobby (2%)	1	28,01	28,01
2	External gatehouse	1	6,00	6,00
3	Covered patio	1	120,00	120,00
	Total			**154,01**

SUMMARY TABLE		
Spaces	**Proposed area**	
ADMINISTRATIVE ZONES		121,20
Management and Administrative Services	121,20	
TEACHING ZONES		903.50
Classrooms	903,50	
GENERAL ZONES		375,55
Food	216,25	
Storage	70,00	
Operations and Maintenance	72,50	
Changing rooms	16,80	
OTHER ZONES		154,01
Services subtotal		**1554,26**
Walls and circulation 20%		**310,85**
TOTAL AREA TO BE BUILT		**1865,11**

Source: Prepared by the authors

Annex 2: Surveys, paperwork, and permits

In addition to designing the infrastructure, the Designer may also have to provide other deliverables or perform other design-related activities. The Executing Agency should make it perfectly clear what these are.

They may include topographic surveys, soil surveys, Environmental and Social Management Plans (ESMPs) or Environmental Impact Assessments (EIAs), paperwork, construction permits and/or licenses, etc.[24]

The Executing Agency will be responsible for defining and specifying one of these and, if applicable, including them in the Design Scope and Technical Specifications.

Some of these deliverables are described on the following pages. ESMP and EIA specifications should be based on guidelines provided by the project leader on the advice of an environmental specialist and within the framework of the **IDB's environmental and social safeguarding policies.**

Topographic report

The topographic report[25] will be based on an on-site survey of the topography. This survey should take place before the soil survey because its results will be included in the latter. It is also a reference document for the boreholes and general construction at the proposed land.

The topographic survey will generally be conducted within the boundaries of the land and in nearby areas. In exceptional cases, if the Designer thinks it is necessary or if the Executing Agency requests it, the area can be expanded to check other things, e.g. the heights of riverbanks or elevations that could be at risk for landslides.

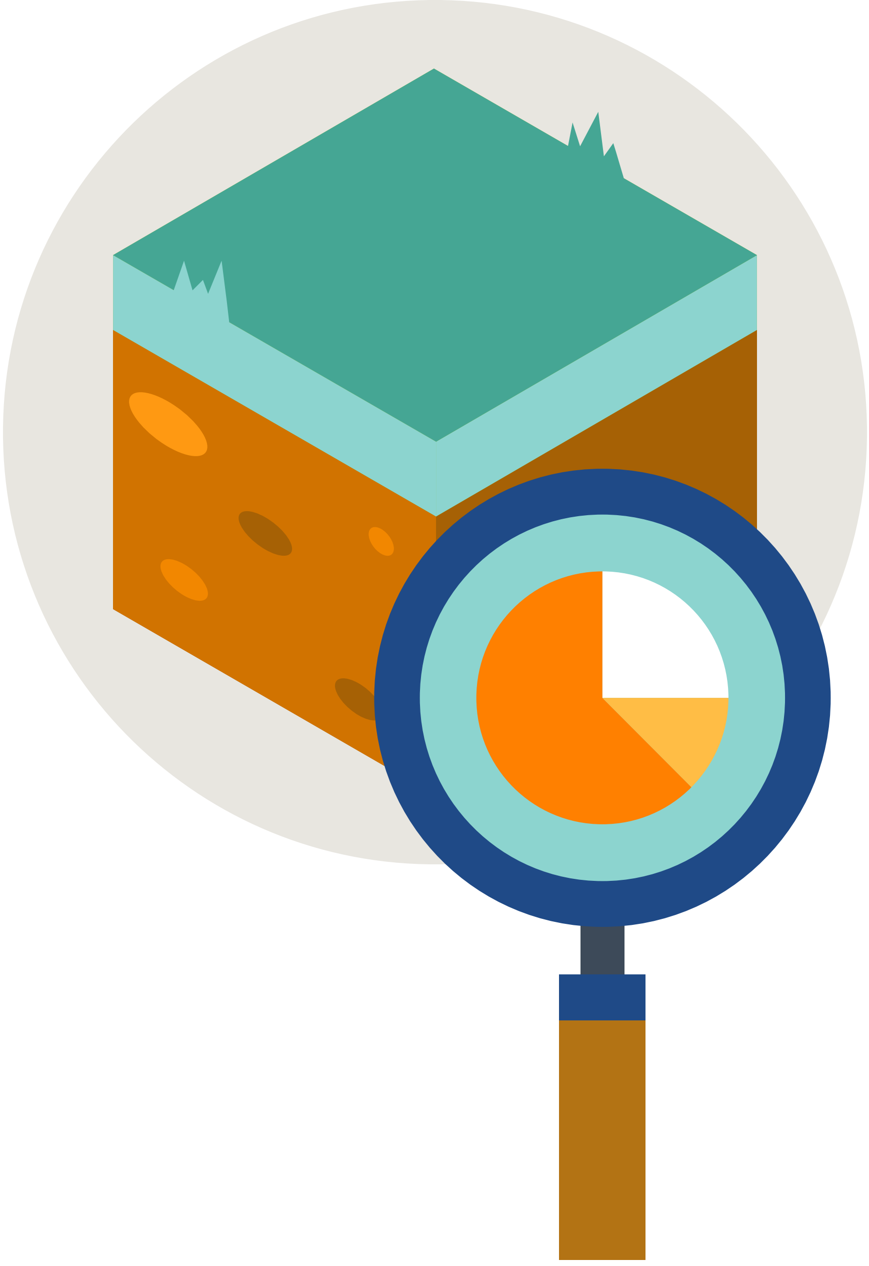
The topographic survey of the land should include, at minimum, the following technical information:

- Land elevation with contours every 50cm
- Measurements, including boundaries, roads, existing construction, and other elements such as:
    - Electrical installations or facilities such as: substations, urban lighting, transformers, etc.
    - Waterworks: sumps, drains, culverts, hydrants, etc.
    - Other: gas lines, networks, etc.

24 The Social Infrastructure Unit (INE/INE) is planning to release a guide on the studies required prior to the Design Process, examining which ones are important and when they are needed.

25 The topographic survey is one of the key activities. The Executing Agency generally conducts one before hiring the Designer and gives it to them along with the Technical Specifications. However, the Executing Agency can also request one from the Designer, who should do it prior to starting the Preliminary Architectural Design.

At minimum, it should include one floor plan and two cross sections (one transverse and one longitudinal) to allow for a better understanding of the land. It should also include a location plan for the land, the date of the survey, and the names of the professionals who conducted it.



The topographical drawings should be georeferenced and presented at 1:100 scale on paper and in digital format.

In addition to the topographical drawings, the report should include technical information about the land—such as relevant findings, warnings, or anything else the expert wishes to highlight—the equipment used, and a photographic record of the survey.

Soil survey

The soil survey should be done based on an analysis of secondary information and on-site boreholes and lab tests on the collected samples. The survey should end with the characteristics of the land and necessary recommendations for whoever oversees the structural design.

The studies listed in this section are minimum requirements and should be adapted to each project. Their purpose is to support the creation of an optimal, clear design and provide recommendations that will be helpful during the design and construction phases.

The geotechnical investigation and soil sampling should only move forward once the Schematic Design is complete and the building's position on the land has been determined. That way the Designer can be sure that the survey is adapted to the needs of the design and avoid any surprises during construction.

In some countries, especially where there are earthquake risks, there are standards that strictly regulate what must be included in a soil survey. This section should be checked against local regulatory requirements.

Soil survey content

The survey should include the guidelines, calculations, analyses, and considerations listed in the relevant standards (if these exist in the country in question). If there are no specific regulations, the list below includes the main components that should be included in a soil survey:

1) Description, preliminary surveys, and background information

- Introduction, objectives, and scope.
- Description and location of the project.
- Review of existing information such as drawings, existing studies, photographs at a regional scale, geology, general topographical features, geological and geomorphological features, hydrology, hydraulics, risk studies, unstable areas, and any other secondary information available.

- Site visit report: description, land conditions, unstable areas if there are any, photographic record.
- Schematic Design of the project created by the Designer, including the location of the building and roads, parking and loading zones, and pedestrian installations.
- Description of the project's structural components.

2) Geological and geomorphological description

- Introduction and scope.
- Regional geology: stratigraphy, structures, geological history.
- Local geology: geomorphology, structures, stratigraphy.
- Geological hazards.
- Benchmarks used.

3) Investigation and laboratory tests

- Description and drawing of location: the samples should be correctly labeled with coordinates and depths on the topographic survey diagram, made using high-precision GPS.
- Description of the investigative plan and its justification.
- Table summarizing the investigation, lab tests, and mechanical properties of the strata, including cross section, groundwater level, granulometry, Atterberg limits, natural moisture, dry and wet unit weight, unconfined compressive strength, and the cohesion and friction of each layer of soil.
- Soil profile. If different profiles are found, geotechnical zoning for each one identified.
- Photographic record, including the method used, the investigative process, the location on the property and the samples with the codes required for the tests.
- Annexes: laboratory tests.

4) Seismic design parameters (if in a seismic zone)

- Seismic hazard zone.
- Seismic design force.
- Local impacts when a seismic study is conducted on a specific land.
- Coefficient of importance.
- Soil parameters for the soil-structure interaction assessment.

5) Calculations, designs, results and foundation recommendations.

- Description.
- Calculation, design, and results: the calculation report, including references and the methods used, should be attached. The calculations should include, as needed, bearing capacity for surface and deep foundations, immediate settling, settling from compaction, ballast grading, stability assessment under different load scenarios, earth pressure coefficients, limit states, soil collapse potential evaluation, expansion, liquefaction, and other relevant concerns.

- Approach, analysis, design, comparison of alternatives, and a recommendation for the best alternative.
- Geotechnical Model: profile that describes the soil stratigraphy, indicating heights and depths, as well as the recommended mechanical features of the foundation materials and structures.
- Recommendations based on the geotechnical model, including recommended construction, backfill, and mechanical properties of the subsoil.
- Description and characterization of all the materials that will be used and a description of the construction process, including recommendations for the structural designer and the builder.
- Annexes: Stratigraphic profiles, lab tests, and calculation reports

6) Final conclusions and recommendations

Investigations and laboratory tests

Geotechnical investigations (ditches, boreholes, and more), surveys, lab tests, and field tests are needed to identify and classify the soil and rock and quantify the features of the subsoil—physical, mechanical, and hydraulic. The information below should be considered a minimum and will vary depending on the project.

Boreholes

The number and depth of the boreholes will be determined by the engineer in charge of the survey, after they conduct a preliminary assessment of the land and familiarize themselves with the project and its location. It will also depend on the relevant standards. The Designer should be told the minimum number of boreholes and the minimum length of soil and rock that need to be sampled.[26]

Depending on the soil, the survey may use classic mechanical methods including standard penetration tests and vane shear tests at minimum. Other methods include a piezocone probe (clay soil) or other geophysical methods, etc.

Field tests will be performed to determine the mechanical properties of the soil. These include the standard penetration test, cone penetration tests or vane shear tests. Always perform the appropriate lab tests such as direct shear, compaction, unconfined compression,[27] etc. to determine the optimal parameters to use in the studies and designs.

26 In some countries, this is included in the construction codes.

27 Also known as a simple compression test.

Laboratory Tests

- Granulometry, classification, Atterberg limits, natural moisture for each stratum and each sample
- Unit weight and unconfined compression for a sample of each soil strata and each sample
- Direct shear for each strata of the soil profile
- Compaction tests
- CBR test
- Point load test (rocky material)
- RQD test (rocky material)

All tests should comply with applicable national and recognized international standards. The equipment calibration records should be included, and the labs should be certified, particularly for direct shear tests and compaction tests.

For basic tests such as granulometry and Atterberg limits, laboratories close to the site may be used even if they are not certified.

Construction paperwork, permits and licenses

During the Design Process, paperwork will need to be delivered and permits and licenses requested, generally involving third parties.

The Executing Agency should prepare in advance a list of what these are, who they need to come from, and when they need to be obtained in order to assign responsibility and pay the respective fees.

Typically, there are three main actors involved:

- The owner, generally the Executing Agency or Sector Agency.
- The expert in charge, generally whoever is responsible for the design or construction
- The entity that receives the application and either accepts it or not, generally an agency, but possibly a utility company or a national or municipal authority.

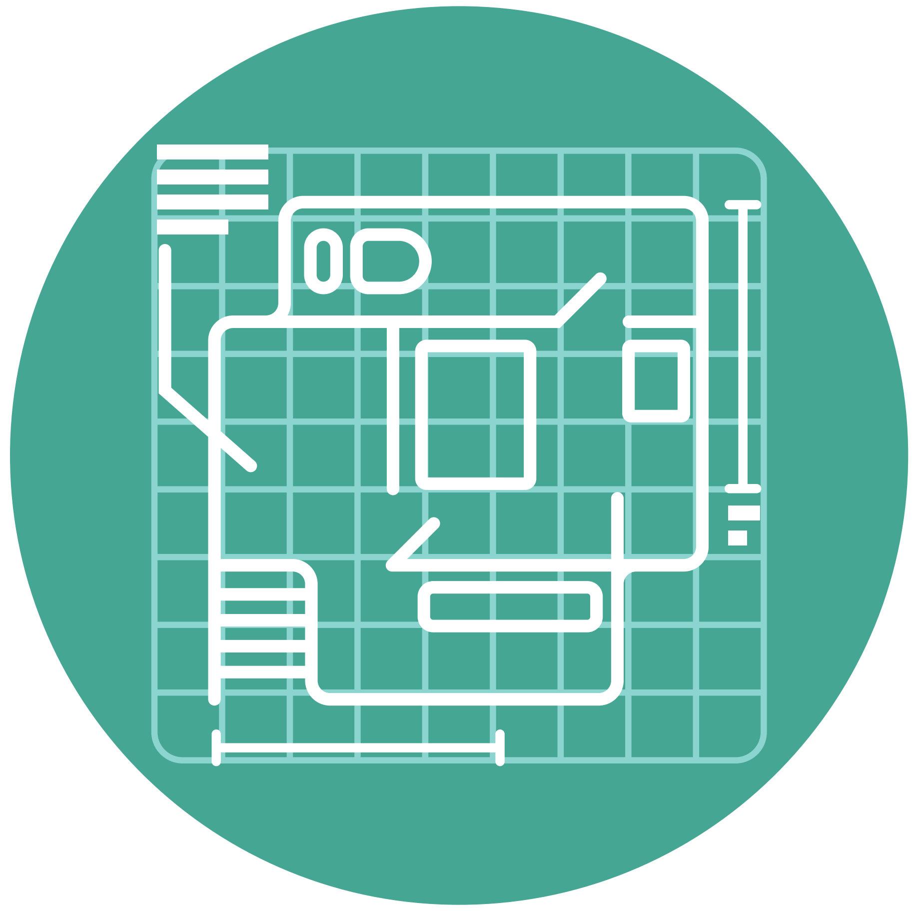
Be sure to do the following:

1) Even if a utility provider has already confirmed availability before the design gets underway, ask the Designer to repeat the confirmation process, with the signature of one of their professionals. That person then assumes technical responsibility for the design, the supporting documentation, and the cost.

2) The Designer should handle the paperwork with the appropriate environmental authorities and the costs and the fees for the permit(s).

3) The Designer should apply for the construction licenses or permits from the relevant authority, assume the technical responsibility for the design, and pay any fee for the process and the documents that must be submitted.

Annex 3: Schematic Design



The Schematic Design is the first draft of the design on a specific land. Its purpose to find the best way to situate the new building on the land and assess the different options before beginning the Preliminary Design.

The objective is to review all options and choose the most appropriate one so that the Architectural Program is based on something feasible and acceptable to all stakeholders.

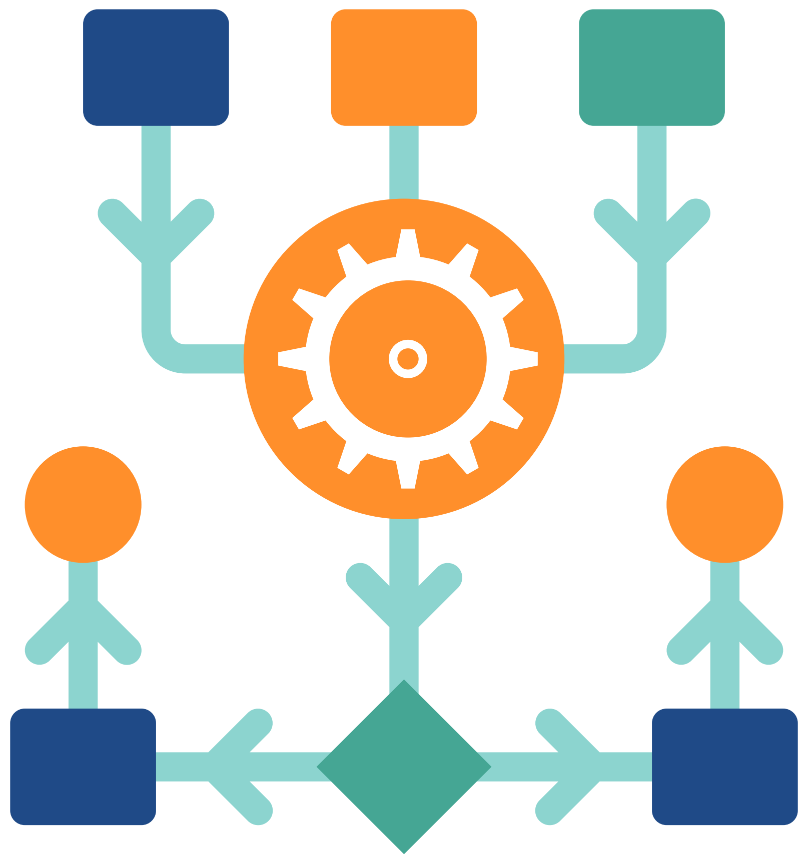
Remember the following when creating the Schematic Design:

1) Have an approved Architectural Program that includes totals and subtotals of minimum area by building zone, so that the size of the project is clear.

2) Create a functional sketch to understand how the building operates and how the different zones are related: classrooms (for schools), administration, support services, recreation, circulation, etc.

3) Consider the design standards to choose the best possible placement for the building, including the orientation, number of floors, location of access points, etc. based on the chosen land.

There may be several options once this assessment is complete. Choose the most suitable one in terms of cost and functionality.



Schematic design content

- **Design brief**[28] that specifies, at minimum: (i) the basic features of the project; (ii) the different placement options that were examined and why this one was chosen; (iii) the design and land regulations that applied to the Schematic Design; (iv) basic definitions of the proposed construction system and its justification (technical and financial), as well as elements that may affect engineering systems later on; and (v) photographs of the land and construction if needed. The design brief should match the Technical Specifications previously defined by the Executing Agency.
- **Architectural Program** as created by the Executing Agency, the document the Schematic Design is based on.
- **Project zones table** clisting number of square meters and total and partial percentages of the various spaces. The zones and areas should match the Architectural Program. The table should show that the proposed draft is within 5% of the area in the Architectural Program.
- **Land zones table** indicating the land area, constructed area, paved area, and green area, as well as land occupation and permeable zone percentages for it.
- **Floor plans and drawings** showing the same zones as the project zones table, as well as access points, circulation (vertical and horizontal), exterior spaces, etc. The drawings should show the location of main architectural and engineering elements that may be required (e.g. treatment plants or areas for solar panels), as well as options for expanding the building, if these have been requested.

The Schematic Design should strictly match the Technical Specifications: Architectural Program, land, design standards and design criteria.

The following pages include examples of a Project Zone Table, a Land Zone Table, and a Schematic Design.

28 This may also be called the Executive Summary.

Sample project zones table

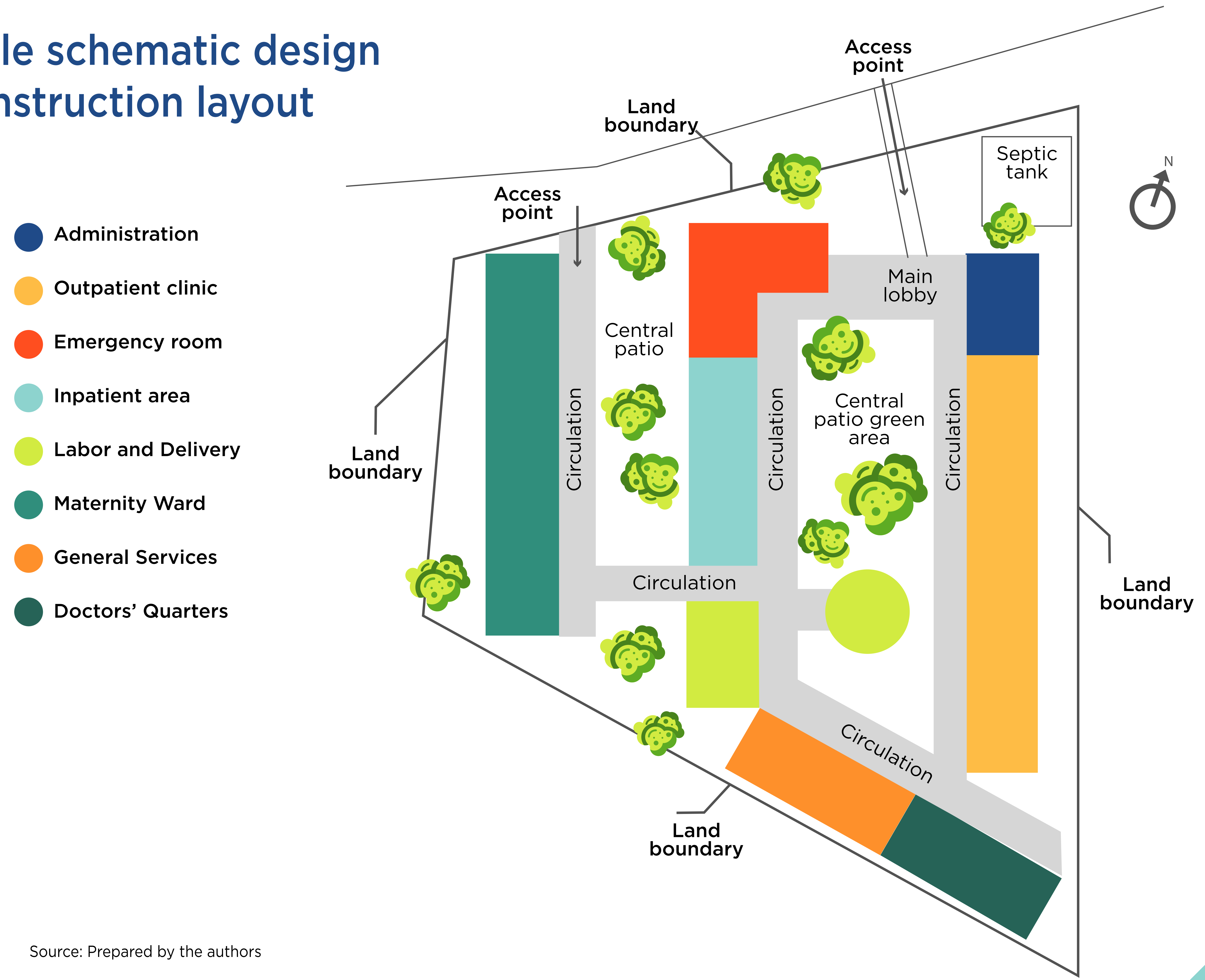
Zone	m²	%	m²	%
ADMINISTRATIVE ZONES			121,20	6,50
Management and Administrative Services	121,20	100,00		
TEACHING ZONES			903,50	48,44
Classrooms	903,50	100,00		
GENERAL ZONES			375,55	20,14
Food	216,25	57,58		
Storage	70,00	18,64		
Operations and Maintenance	72,50	19,31		
Changing rooms	16,80	4,47		
OTHER ZONES			154,01	8,26
Walls and circulation			310,85	16,67
TOTAL			1865,11	100,00

Sample land zone table

Total land area	3277,00	m²
Usable land area	3119,00	m²
Total area to be built	1865,00	m²
Area to be built on the ground floor	1322,00	m²
Land occupancy	42,38	%
Construction index	59,78	%
Exterior paved area	326,56	m²
Exterior green area	1470,44	m²
Permeability index	47,14	%

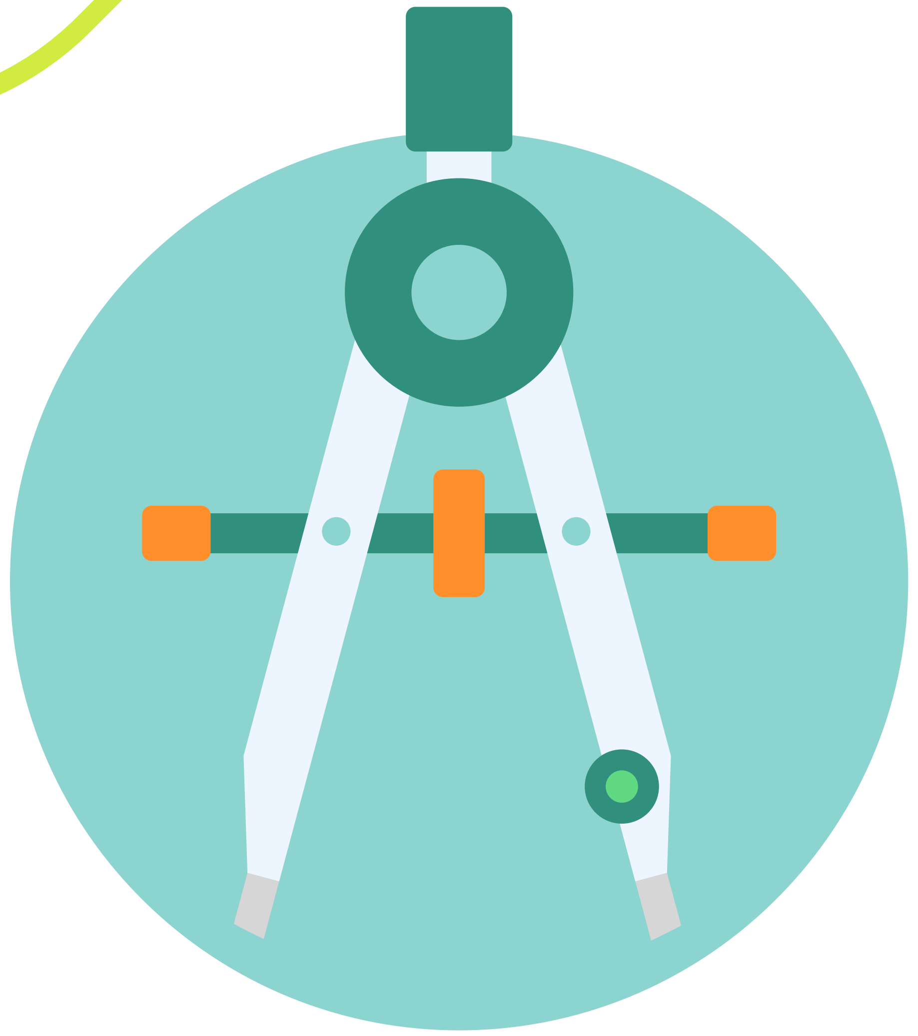
Source: Prepared by the authors

Sample schematic design of construction layout



Source: Prepared by the authors

Annex 4: Preliminary Design



The Preliminary Design is a more advanced step in the Design Process than the Schematic Design. It includes floor plans, sections, facades, and the core wiring for installations inside the building and on the land, along with their preliminary location and dimensions. The Preliminary Design should be developed in two stages; a Preliminary Architectural Design (stage 1) should be in place before the Preliminary Designs for the various engineering systems (stage 2) get underway (apart from the usual adjustments that happen once a project begins).

Specify that the plans should always be delivered at 1:100 scale digitally (PDF) and in an editable format (DWG or REVIT).

Step 1: Preliminary Architectural Design

Step 2: Preliminary Engineering Design[29]

- Structure
- Water and sanitation and fire systems
- Natural gas or propane systems
- Electrical and ICT systems
- Mechanical ventilation and climate control systems.

29 The engineering systems may vary depending on the project and its geographic location. The systems listed in this document represent the basic engineering elements of any social infrastructure project.

Preliminary architectural design

This stage includes the following documentation:

- **The Architectural Program,** created by the Executing Agency, that includes spaces and their theoretical minimum area. Areas from the Preliminary Design should be included in a separate column, so the design can be adjusted as needed.
- **Project Zone Table** listing number of square meters and total and partial percentages of the various spaces. This table will be updated and adapted to the table presented in the Schematic Design.
- **Land Zone Table** indicating the land area, constructed area, paved area, and green area, as well as land occupation and permeable zone percentages for the land. This table will be updated and adapted to the table in the Schematic Design.

• **Design brief** specifying at least: (i) the basic features of the project: number of floors, type of construction, etc.; (ii) the different construction options and why this one was chosen; (iii) the applicable design and land regulations that governed the creation of the Preliminary Plan, which should be indicated in the Technical Specifications or previously approved by the Executing Agency; (iv) basic definitions of the proposed construction system and its justification (technical and financial), as well as things that may affect engineering systems in the future; (v) general descriptions of the relevant finishes and materials; (vi) bioclimatic design elements and/or energy efficiency measures that were considered, and (vii) photographs of the land and construction systems if needed. This table will be updated and adapted to the one in the Schematic Design.

• **Floor plans and drawings** that were included in the Schematic Design, with the necessary changes and the same zones as the updated project zones table, that also show access points, circulation, exterior spaces, etc. The drawings should show the location of any necessary main engineering systems (e.g. treatment plants or areas for solar panels), as well as possibilities for expansion, if these have been requested.

• **Drawings and sections** based on the designated land and the related Architectural Program. This should include at least: (i) a diagram of the location that makes sense of the land's surroundings, including the use of adjacent buildings, the closest population centers, access roads, etc.; (ii) floorplans by level, including the roof (the diagrams should designate north, heights, and any fittings); (iii) any sections needed to understand the building and structural system (these should include levels of the building and the land; (iv) facades; and (v) any perspectives or images needed to understand the project.

Although this phase of the Preliminary Design deals with architecture, it should still include at least the following technical installations. Otherwise it may have to be changed due to lack of foresight:[30]

a. Identify the structural system that will be used and consider the pre-dimensioned columns, noting the area's earthquake risk rating.

b. Place the substation on the first floor with street access, if applicable

c. Identify the emergency generator and the room with the main electrical panel, if applicable

d. Place the water pump room adjacent to the tank, if required.

e. Make the fire protection pump an independent system, if applicable.

f. Identify the type of water treatment system and where it will go, if applicable.

g. Identify where the climate control system will go, if applicable.

h. Identify the temporary waste storage area.

i. Identify any other equipment or installations as necessary.

Every engineer on the design team should participate and endorse the Preliminary Architectural Design before it is presented to the Executing Agency.

30 The Architectural Program should also include any specific facilities that are required.

Preliminary engineering design

The Preliminary Engineering Design includes the following documentation for each system:

• **Design brief** that includes, among other things: (i) a short description of the architectural plan, indicating the area and number of floors; (ii) design criteria for the building and its justification (technical and financial); (iii) the calculation method and software used; (iv) applicable regulations, which should be listed in the Technical Specifications or be approved by the Executing Agency prior to use; (v) how the building might be expanded in the future, and the projections, if applicable; (vi) proposed climate change mitigation or adaptation measures listed by system, if applicable; and (vii) information about the viability and/or availability[31] of public utilities provided by the Executing Agency and how any deficits will be addressed.

• **Drawings, sections, and diagrams** will vary by system, but should all include the main components, position and distribution of the installations. All elements in the drawings should be pre-measured. This includes an assessment of the building's evacuation routes.

Make sure that all the engineering drawings are done using the latest version of the Preliminary Architectural Design.

For the **STRUCTURE**, the Architectural Program should include the following:

• The **design brief** should contain:

» The structural system used, the predominant material used, the foundation type recommended by the soil survey, bearing capacity of the land, the foundation depth, and other important details about the building. This information should coincide with the soil survey.

» Where applicable, the exact location of the building on the earthquake risk map so parameters can be set for structural design and analysis.

» A description of the materials used in the structural design and analysis, such as their strength, origin, etc., and a short description of the construction system (prefabricated, in situ, etc.) If certain construction systems are being considered (prefabricated, pre-tensioned, or post-tensioned), the brief should include an analysis of the system and justification for its use.

» An explanation of possibilities for expansion, if applicable. If expansion is considered feasible and/or desirable, the Architectural Program should consider future loads.

• The **drawings and sections** should show the general plan of the structural system and the structure within the Preliminary Architectural Design.

31 For utilities such as water, sanitation, electricity, and telephony, utility companies will typically provide proof that they can provide service to a land under certain conditions. The information in these certificates is a Design input and can determine the exact point where the infrastructure will connect to the utility or the load or volume that can be supplied or received.

For **WATER AND SANITATION AND FIRE INSTALLATIONS**, the Preliminary Design should include the following:

- The **design brief** should contain: the municipal water supply and sewer systems or the systems that will be used for the project, the rainwater disposal system, waste water and contaminated water treatment systems (if applicable), the proposed fire suppression installations, the selected systems, materials, etc. It should include the method for collecting, storing, and treating rainwater where applicable.

- **If there are no utilities** on the site, include an alternative solution with a description of the proposal and justification (technical and financial), as well as an assessment of alternatives.

- **If there are utilities,** include the confirmation of availability for:

  a) POTABLE WATER: the confirmation (e.g. a certificate) should clearly identify the point where the building connects to network, as well as the diameter, material, and depth of existing pipes, and feasible connection diameters.

  b) SANITATION: the confirmation (e.g. a certificate) should clearly identify the point where the building connects to the sanitation network, as well as the diameter, material, gradient, and depth of existing pipes, and the location and depth of wells.

  c) RAINWATER: if there is a rainwater system, the confirmation (e.g. a certificate) should clearly identify the point where the building connects to the drainage network, as well as the diameter, material, gradients, and depth of existing pipes, and the location and depth of wells. If there is no separate rainwater system, include the designer's recommendation for whether to divert rainwater to the roadway or use a combined system.

- The **drawings and sections** should include:

  » Information about the connection to the water system, location of water tanks, pump systems, the distribution of potable water to the building and the location of supply lines for hot and cold water.

  » Information about the connection to the sewer system, the location of treatment plants or septic tanks, and, if applicable, the distribution of drains by type and location of drain lines.

  » Information about rainwater disposal and the rainwater collection system.

  » Information about areas where rainwater is collected, the location of pipes, tanks, pump systems, and water treatment and distribution networks, if applicable.

  » Information about the fire suppression system, the location of pipes, and the tank with its pump system.

  » If there are no public utilities on the property, the drawings should include the suggested alternative system.

For the **NATURAL GAS OR PROPANE INSTALLATIONS**, the Preliminary Design should include the following:

- The **design brief** should cover the technical and financial reasons that make gas installation necessary, the connections, general distribution, the equipment that will run on natural gas or propane, materials, applicable regulations, etc. It should list the types, position, and capacity of any equipment that requires natural gas to operate.

- **If there are no utilities** on the site, include an alternative solution with a description of the proposal and justification (technical and financial), as well as an assessment of alternatives, consumption calculation, and frequency of supply.

- **If there are utilities**, include the **confirmation** of availability for:

  a) NATURAL GAS: the confirmation (e.g. a certificate) should identify the feasible volume and potential capacity.

- The **drawings and sections** should show at minimum the connection, the location of equipment or installations that require gas, and how the main lines are distributed.

For **ELECTRICAL AND ICT INSTALLATIONS**, the Preliminary Design should include the following:

• The **design brief** should identify the electricity supply system, connection type (underground or aerial), required capacity, the availability of medium and low voltage, the need for a substation, the proposed communication and data system, internet, fire detection system, the emergency power and light system, auxiliary services, materials and proposed lighting, etc. Include the technical and financial justification for these solutions.

• **If there are no utilities** on the site, include an alternative solution with a description of the proposal and its justification (technical and financial), as well as an assessment of alternatives.

• **If there are utilities,** include the **confirmation** of availability for:

a) ELECTRICITY: the confirmation (e.g. a certificate) should show the availability of the service in a way that makes the connection and available capacity clear.

b) DATA AND TELEPHONY: the confirmation (e.g. a certificate) should state that data and telephony services are available (these may be provided by different entities) and clearly identify where the services connect to the building.

• The list of planned loads, including equipment, lighting, and other loads that should be considered in the system design. This list should be divided by project zone.[32]

• A preliminary one-line diagram of the project.

• The **drawings and sections** should include key elements of the design: connection, substation, generator, control room and distribution of main systems and secondary controls, etc.,

» The preliminary plans for lighting and outlet placement should include the location of furnishing.

» If applicable, pre-measure the generator and list the criteria for its selection, fuel used, etc.

32 This can be included in the design brief.

» The information about the air conditioning and mechanical ventilation equipment load should match the mechanical ventilation and climate control design.

If the project calls for other systems, such as closed-circuit television (CCTV), surveillance, or access control systems, include similar documents to those mentioned in this section.

For **MECHANICAL VENTILATION AND CLIMATE CONTROL,** the Preliminary Design should include the following:

• The **design brief** should have the information and justification for the climate control systems chosen for the space, the criteria for their selection, the alternative and its justification (technical and financial) based on the land features, and all the criteria for the design, including materials and proposed filtration system, if applicable.

• **Heat balance.**[33]

• The **drawings and sections** should include the layout of blowers and other equipment, indicating access points, the layout of main ducts, etc.

Estimated Budget

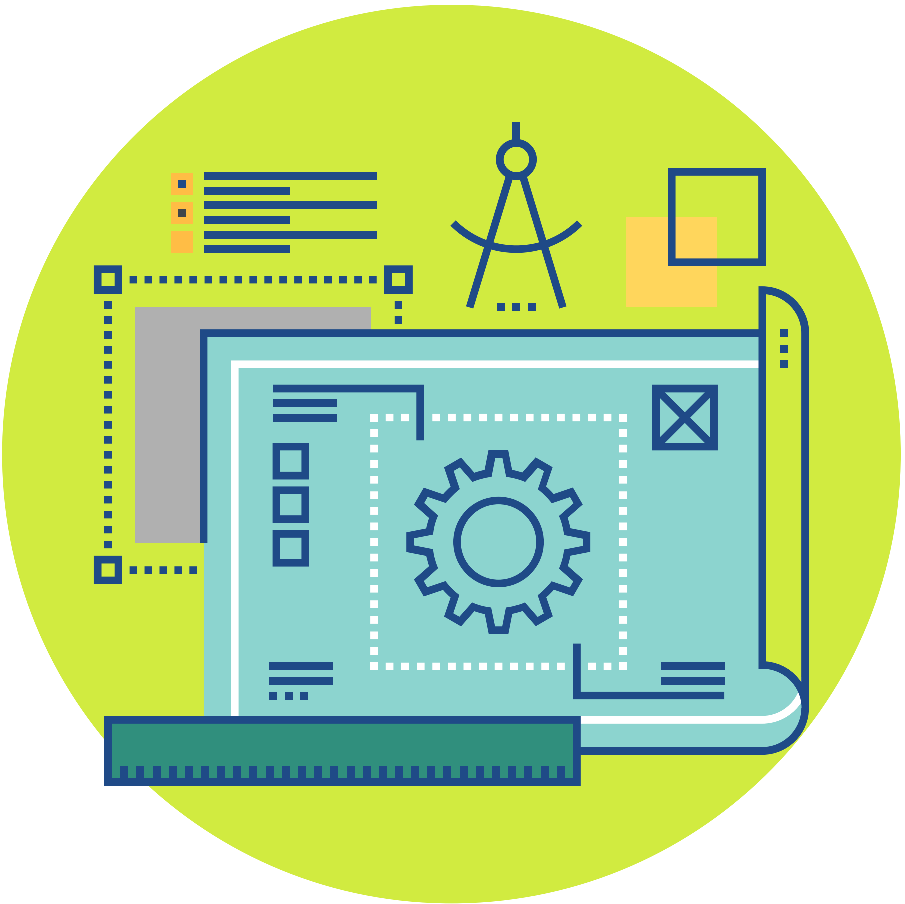
Stage two should include a summary of the total estimated budget for the project,[34] including construction and each system. The summary should include totals and percentages.

Important note: to optimize time and resources during the design phase, only start the Preliminary Engineering Design once the Preliminary Architectural Design (stage 1) is approved. Otherwise, the engineers may start working and making calculations based on a design that is subject to change.

33 This can be included in the design brief.

34 Requesting the estimated budget is unnecessary if using a design-build (D+B) model.

Annex 5: Final Design



The Final Design is the end result of the Design Process and corresponds to the definitive, completed version of the Preliminary Architectural and Engineering Designs. It should be visualized and presented as a comprehensive document, with total consistency and coherence between the different components. It should include all the images and documents that each stakeholder needs to tender (if not using a design-build contract), build, manage, maintain, and operate the structure well and safely. It should also include the calculations and justification for the technical solutions chosen for each field.

The fields required for each design may vary depending on the project type, but they are essentially:

- Construction work: architecture and external construction and structure.
- Systems: water and sanitation and fire, natural gas or propane, electrical and ICT, and mechanical ventilation and climate control

For each system, the Final Design should include:

- Table of contents for the drawings and documents.
- Design brief.
- Calculation report.
- General and detailed drawings.
- Technical Specifications or construction brief.
- Budget.
- Quantity lists (without pricing) and unit price analysis.[35]

35 These components are unnecessary if using a design-build contract (D+B).

The Final Design should also include the following:

- Table of contents for the Final Design with all the drawings and documentation.
- Surveys and background information (performed by the Designer or provided by the Executing Agency).
- The full estimate for the Final Design including all the systems, so that the total cost of the project and total quantities list are apparent.[36]
- Construction timeline.

The Final Design should include the following unless otherwise indicated:

- Architecture and Structure
  - » Construction design that ensures safe pedestrian and vehicular access from the existing road to the building. This should include the required earthwork, exterior lighting, and drains.
  - »Architectural and structural design of the property enclosure.

36 These components are unnecessary if using a design-build contract (D+B).

» Architectural and structural design of all elements external to the building that are necessary for its operation: retaining walls, water tanks, stand-alone structures, etc.

» Include any required demolition work in the drawings and the budget.

» Identification of landfills and quarries with registered materials that were considered when creating the budge

- Water and sanitation and fire systems

» Designs of wastewater treatment systems (if required due to lack of sewer system) to the collection point or final disposal.

» For health-related infrastructure, design for a hazardous liquid separation system in all cases, even when a sewer system is present, and its connection to the system.

» Water purification system when the water source is not potable and its connection to the source or system that provides water. Identify the water source.

» If the proposed solutions are not systems build on-site, but rather existing equipment on the market, this should be noted in detail in the appropriate Technical Specifications.

» Design for rainwater collection and use system if the hydrological study concludes that it can be used or if there is no other water source available. If it can't be used, it can be suggested as an auxiliary service.

- Electrical and ICT systems.

» Design of the electrical system from the existing fixed point[37] to the building's interior, substation, and shield systems.

» Designs for a renewable energy system to reduce the electrical burden on the public grid at least for the hot water supply, circulation lighting, and exterior lighting (if requested by the Executing Agency). This will be built if the climatic conditions justify it.

The entire Final Design should be adapted to current regulations and the design criteria specified in the Technical Specifications and best practices for design.

The drawings should be presented at the minimum scale cited in the Technical Specifications. The scale may be increased if needed to make them easier to understand. If the project covers a large area, the floor plan may be divided into zones, using the same groupings for each system.

37 The fixed point is where the power connects, the point where the system much reach. It may be next to the boundary of the land or farther away.

Construction

Architecture and exterior construction

- Design brief
  - » Location, basic description of the property, descriptions of access points, background information (regulations, the physical and social environment), design criteria (functional space, circulation, construction and operational considerations), description of the building (number of units, number of floors, placement levels, possible expansion, etc.), description of outdoor areas, unique features, a short description of the materials and finishes, etc. Include the design criteria that were adopted based on the equipment evaluated during the design, as well as decisions about energy savings and reducing the vulnerability of the infrastructure to natural disasters.
- Drawings
  - » Placement and enclosure of construction (that shows preliminary construction activities such as temporary structures, site office, barriers, enclosures, with relevant details).
  - » Plan of earthwork and demolitions (if applicable) including corrections to the topography, e.g. resurfacing the land.
  - » Plan of construction stages (if applicable).
  - » Plan identifying the locations of outdoor spaces. This can also include the functional diagram and zoning by floor.[38]
  - » General plans by floor (furnished).
  - » Roofing plan
  - » Dimensioned plans by floor
  - » Structural layout plan
  - » Outdoor spaces plan, which can be included in the plan of the first floor.
  - » Exterior and interior facades.
  - » General sections.
  - » Section of the façade.
  - » Floor plan with evacuation routes.
  - » Floor plans and sections at larger scale for special areas, e.g. auditoriums and X-ray rooms, delivery rooms, sterilization systems, etc. in healthcare settings.
  - » Information about finishes, either in a separate drawing or in the floor plans (floors, ceilings, and walls).
  - » Special architectural details: roofs, interiors, or any additional element that requires detail drawings.
  - » General detail.
  - » Details of openings, metal or wood (methods, details, projections).
  - » Stair details (floor plans, elevations, sections, axonometric drawings, railings, steps, etc.).
  - » Details of furnishing and equipment (counters, closets).
  - » Details of bathrooms (methods, details, projections).
  - » Drawings of how the systems, architecture, and structure interface and appropriate details (to resolve issues). Include floor plans and sections.
  - » Drawings of the edges of the structural slab (without finishes) with gaps for mechanical equipment (elevators – hoists – coolers – condensers – heaters - equipment, etc.), openings, expansion joints, technical panels, etc., duly measured and noted with the structural axes.
  - » Provide the drawings with the construction, distribution channels, air conditioning ducts, cable conduits, potable water pipes, sewage pipes, and other necessary systems to make sure they do not interfere with one another.

38 The functional plan and zoning can be included in the design brief.

Structure

- Design brief
    - » Location, design conditions (seismic zone, etc.), foundation conditions, load summary, building description, structural levels and their relationship to architectural levels, materials used, structural system, construction phases, structural analysis method used (software), general information about the structure, typical loads, reference standards for the design, etc.
    - » Design criteria adopted based on the equipment evaluated during the structure design.
- Calculation report
    - » Include the calculation for all structural and non-structural project elements, clearly indicating how the parameters were defined and used.
    - » Assessment method: equivalent horizontal force method or modal analysis.
    - » Structural analysis and definition of structural units.
    - » Load analysis and load combinations.
    - » Design spectrum (if the project is in a seismic zone).
    - » Isometric drawing of each defined structural unit.
    - » Input and output calculations for each planned structural unit.
    - » Equivalent horizontal force of each planned structural unit.
    - » Maximum drift of each planned structural unit.
    - » Foundation, overhead columns, and overhead beam designs for each planned structural unit.
    - » Joist and purlin designs for each planned structural unit.
    - » Design of stairs and ramps, elevator shaft, storage tanks, and all system elements.
    - » Roof designs.
    - » Retaining wall designs.
    - » Outbuilding designs (gate houses, etc.).
    - » Non-structural element designs.
    - » Metallic structural designs.
    - » Any necessary attachments.
- Drawings
    - » Foundation.
    - » Axes and columns.
    - » Slabs and roofs.
    - » Foundation reinforcements (exploded view).
    - » Column reinforcements (exploded view).
    - » Slab and beam reinforcements (exploded view).
    - » Roof reinforcements.
    - » Other reinforcements (exploded view): stairs, shafts, walls, tanks, outbuildings.
    - » Details of metal structures.
    - » Details of non-structural elements: windows, fixtures, railings, banisters, joints, supports, beams, benches, pedestals, plinths, etc.
    - »Construction details, layouts with axes and depths; in this specific case, provide the designs for paved structures, containment structures, gradients, and other necessary items.

Systems

Water and sanitary and fire systems

- Design brief
  - » Location, design conditions, assumptions adopted, relevant definitions. General description of systems: describe the external and internal systems, the treatment plants required, the rainwater supply systems (if applicable), and the pump and fire systems. Software used for the calculations (specifically for fire systems). Reference standards.
  - » If the project involves equipment that requires water and sanitation systems, include the design criteria evaluated during the design.
- Calculation report
  - » Water System
  - » Design parameters: residual pressure, materials, allotments, design method, flow rates, connection, water softener, etc.
  - » Critical path analysis: loss assessments, elevation loss, flow accumulations, etc.
  - » Storage volume calculation: tank measurements, fill level, overflows, sump, etc.
  - » Connection and meter calculation.
  - » Pumping equipment: dimensions, operating point, electric parameters, speed control, etc.
  - » Water storage tank calculation.
  - » Calculation tables.
  - » Water purification system (if applicable): water quality, measurements, etc.
  - » Filtration and chlorination system (if applicable) if using rainwater.
  - » Water heating system: flow and temperature, boiler dimensions, tank, solar heaters (if applicable), water recirculation, etc.
  - » Sanitation System
  - » Design parameters: return flow, materials, design method, flow rate, connections, elevations, etc.
  - » Grease traps: measurements, operating brief, etc.
  - » Well pump measurements (if using well water).
  - » Pump equipment (if using well water).
  - » Pressure line calculation - pump discharge (if using well water).
  - » Connection to sewer: diameter, gradient, material, length, tractive force, elevations, auxiliary parts (e.g. manholes), etc. if the sewer runs through the land or the municipality has committed to building the system in the short term. Otherwise, the designer should design the system up to the point where it will meet the existing sewer line or design an alternative system.
  - » Capacity meter: measurements, operating brief, etc.
  - » Waste and/or contaminated water treatment: wastewater treatment plant/ proposed system measurements (septic tank, drain field, etc.).
  - » Calculation tables.
  - » Rainwater system
  - » Design parameters.
  - » Roofs and other areas that conduct water
  - » Flow calculations: justification for the data used to calculate the flows used in the system measurements.
  - » Drain calculations: transverse section, gradient, material.
  - » Calculation tables: drainpipes, drains, etc.
  - » Reclamation: sand trap, storage tank: measurements, etc.
  - » Surface drainage.
  - » Final disposal to a rainwater collection point, to the road, to the waterway, as needed. Include measurements, design, etc.
  - » Perimeter filter system.
  - » Fire System
  - » Design parameters: risk classification, design area, ceiling height, materials, etc.

» System components: sprinklers, enclosures, splitters, tanks, monitoring stations, etc.

» Critical path - design area:

» Hydraulic modeling: input parameters, description of software, flow and pressure results, etc.

» Reserve volume calculation: tank measurements, fill level, overflows, sump, etc.

» Main pump: measurements, operating point, electrical parameters, etc.

» Jockey pump: measurements, operating point, electrical parameters, etc.

» Support calculations, including anti-earthquake support.

- Drawings

  » Water system – supply

  » General plan: site plan with the topography and land boundaries, external system, connection, tanks: on land.

  » Plan by floor: one drawing per floor at a legible scale: include zone diagram if needed.

  » Isometric drawing of critical path at minimum: this should include the figures from the calculation table.

  » Isometric drawing of systems by zone: detail drawings by room of where the systems are located indicating the system's route from its connection to the building through the shut-off valve to its respective destinations.

  » Heating system (hot water), if needed: floor plan and details of equipment, pumps and recirculating systems, valves, storage tank, insulation, etc.

  » Tank and pump room: isometric drawing, floor plan, elevations, detail drawings (nipples, overflows, access panels, etc.), pipes, valves, attachments, controls inside the room.

» Tank and pump room - geometric design.

» Details of connections to fixtures: sinks, toilets, showers, control valves, etc.

» Connections and meters: details, georeferenced location, etc.

» Purification system, if applicable: position, plan and details of the equipment chosen, installation levels, structures needed, etc.

» Sanitation system

» General plan, including details of connections (section with elevations, foundation pipes, etc.).

» Filter system in the foundation: floor plan, details.

» Plan by floor: one drawing per floor at a legible scale: include zone diagram if needed.

» Vertical diagram of systems: detail of drainpipes and interconnection with ventilation systems.

» For health centers or hospitals, differentiate the systems by fluid type.

» Details of connections to fixtures.

» Inspection structures: geometry, elevation, detail drawings, etc.

» Treatment system: geometry, floor plan, sections, etc.

» Flow meter: geometry, floor plan, sections, etc.

» Grease traps: geometry, floor plan, sections, etc.

» Additional structures: rodent trap, anti-reflux valves: geometry, floor plan, sections, structural design, etc.

» Rainwater system

» General floor plan: drawing of position, exterior system, final connections.

» Roof plan: include areas that conduct water, slopes, and channels.

» Plan by floor: one drawing per floor at a legible scale: include zone diagram if needed.

» Inspection structures: location, geometry, heights, details, etc.

» Treatment system (if applicable:) geometry, floor plan, sections, etc.

» Additional structures: rodent trap, anti-reflux valves, odor trap: geometry, floor plan, sections, etc.

» Details: storm drains, connections, etc.

» Fire System

» Plan by floor: one drawing per floor at a legible scale: include zone diagram if needed.

» Vertical diagram of systems.

» Tank and pump room: isometric drawing, floor plan, elevations, detail drawings (nipples, overflows, access panels, etc.), pipes, valves, attachments, controls inside the room.

» Tank and pump room - structural design.

» Details: sprinklers, cabinets, splitters, supports, valves, monitoring stations and drainage, etc.

Natural gas or propane systems

- Design brief

  » Location, design conditions, assumptions adopted, relevant definitions. General description of the system. Describe the exterior and interior natural gas or propane systems. Reference standards.

  » If the project involves equipment that requires a gas system, include the design criteria evaluated during the design.

- Calculation report

  » Design parameters: inventory of appliances and equipment that use natural gas, total installed potential, consumption calculation, etc.

  » Materials and ventilated routes.

  » Calculation of ventilation volume by space and requirement for outside grates.

  » Selection of operating pressure and accumulated losses.

- Drawings

  » General floor plan: site plan with the topography and land boundaries, external system, connection.

  » Plan by floor: one drawing per floor at a legible scale: include zone diagram if needed.

  » Isometric drawing of the critical path at minimum, indicating the length of each section: this should include the figures from the calculation table.

  » Detail drawings of the equipment and gas appliance connections.

  » Connections, regulation point and meters: detail drawings, georeferenced location, etc.

  » Detail drawings, vent grates, ventilation ducts, boiler ventilation system.

Electrical and ICT systems

- Design brief

  » System location and general features. User, purpose, design (from the physical point where the electricity enters the premises from the utility company to the interior installation), energy sources considered (renewable and nonrenewable), etc. Energy availability on the property, assumptions adopted, suggested technical solution, and on-site measurements. Software used for the calculations. Reference standards and rules and regulations of the utility companies providing services to each land.

  » If the project requires high-load non-industrial electrical devices, include the design criteria evaluated during the design.

- Calculation report.

  » Load analysis and voltage level.

  » Transformer calculation.

  » Safety distances.

» Regulation calculations and energy losses.

» Short-circuit study and ground fault.

» Safeguard calculation and coordination.

» Financial calculation of conductors with wiring panel.

» Conduit calculation (cable tray, pipework, channels) with conduit tables.

» Grounding system calculation for this calculation. On-site measurements may be used, or the system may be designed using established criteria based on the soil type.

» Lightening protection system with shielding diagrams.

» Risk analysis and mitigation measures.

» Lighting calculation for each area of the building.

» Drawings with conduit, channel, and cable routes.

» Renewable energy calculations.

» Measurements and calculations for emergency generator (including fuel).

» Any necessary attachments.

• Drawings

» General floor plan with connections and external construction.

» One-line diagram with load table.

» One-line diagrams of partial connections (list each panel).

» Lighting plan (should include facade and emergency lighting). The plans should include furnishings.

» Diagram of outlets (regulated and normal on the same drawing). The plans should include the furnishings the architect decided on for each space.

» Floor plan showing voice, data, signal, intercommunication, and emergency call systems. The plans should include furnishings.

» Vertical sections that show vertical conduit routes.

» Drawings with mechanical dimensions with substation cubicles, low voltage enclosures, distribution panel for each type used, control panels for industrial pumps and motors. (This should be consistent with other fields.)

» Drawing of the shielding system to protect the building against lightning.

» If applicable, drawing of design and installation of emergency generator (with fuel storage and feeding accessories).

» Drawing of renewable energy system. (If applicable)

» Detail drawings of the grounding system, electrode burial, inspection box, and output for plugging in equipment.

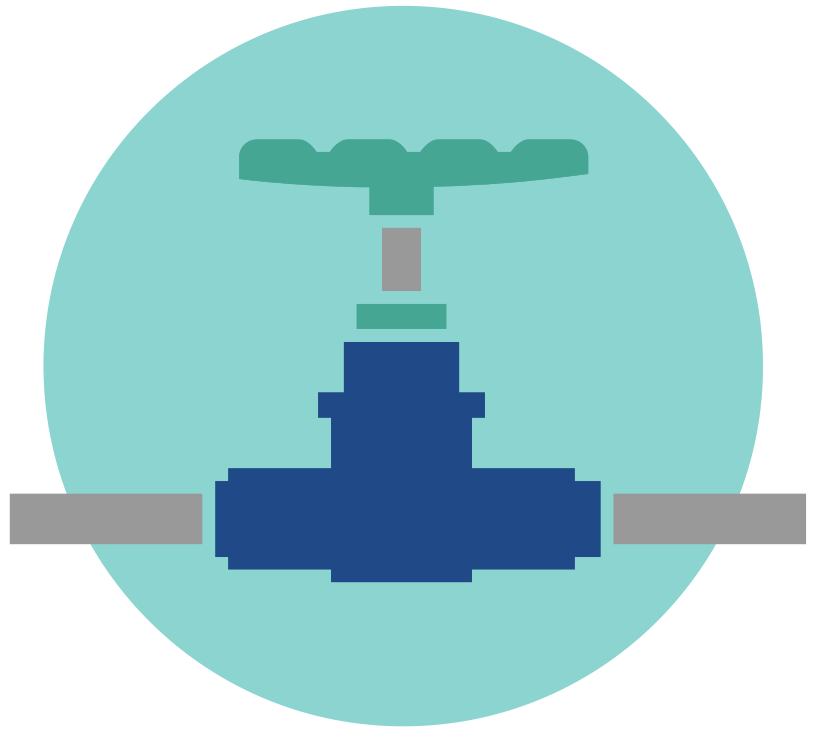
» Detail drawings of mounts that show tray sections, conduit distribution in critical land, detail drawing of the substation door (if needed), anchoring points of cables, pipes, lights, elevations of socket mounts, switches, light fittings, etc.

» Architecture of proposed data transmission system.

» Drawings of the substation with building dimensions, cubicle distribution, sockets, underground wiring and safety distances, if needed. Include the sections with heights needed for correct interpretation.

» Detail drawings of medium tension cubicle mounts and the transformer in the substation (anchors, grounding, fastening of conductors, etc.).

» Diagram showing how special elements are connected (dimmer switches, sensor lights, motor starters, uninterruptible power supply, connection to isolation transformers, etc.) if needed.



Ventilation and climate control systems

- Design brief
  - » Location, design conditions, list of equipment basic features, etc. Design basis: existing environmental conditions and desired conditions. Description of bioclimatic assessment: this should include the technical analysis justifying the decisions. Installation requirements: requirements should be provided to ensure that the equipment is installed, started up, and operated correctly. Software used for the calculations. Reference standards, which should be the same as the standards in the Technical Specifications.
- Calculation report
  - » Thermal loads.
  - » Mechanical extractions.
  - » Ducts.
  - » Electrical and monitoring system.
  - » Modeling (bioclimatic aspects): finite element models (if applicable).
  - » Refrigeration lines.
  - » Any necessary attachments.
- Drawings
  - » Architectural drawing with thermal loads
  - » Architectural drawing with space pressurization.
  - » Air supply and return (equipment, ducts, diffusers, grates).
  - » Electrical system: one-line diagram.
  - » Extraction system and refrigeration lines (equipment, ducts, diffusers, grates).
  - » Roof plan and location of equipment.
  - » Sections of the duct routes to verify their dimensions, junctions, and ceiling accessibility.
  - » Details: equipment, anchors, supports, and mounts for equipment, ducts and lines.
  - » Additional technical and mechanical drawings: include drawings of distribution, copper lines for compressors and insulation for compressed air equipment, temperature distribution and control, and exhaust for installations, motors, and equipmen.

Budgets, quantities and estimates

- The budget[39] will be presented in a single Excel file with the following tabs:
  - » Budget summary: the first tab of the Excel file will be a budget summary that lists all the sections and the value of each.
  - » Detailed budget by category (one sheet per category; architecture and construction work, water and sanitation systems, natural gas and fire systems, electrical and ICT systems, climate control and mechanical ventilation systems, final cleanup).
- For each category, the budget will contain sections, subsections, and items.
  - » Each detailed budget item should have, on separate tabs, a Unit Price Analysis (UPA) and include materials, equipment, and labor at minimum.[40] Labor should have one tab that identifies the kind of workers each field needs.

39 Not all of this will apply for projects completed under a design-build model (D+B).

40 For hard-to-access land, include the costs of transporting materials and labor.

» There will be one section in the budget for overhead, contingency, and profits. There should not be overhead, contingency, and profit listed for each specialty.

» These should not exceed 30% of the budget,[41] including value-added tax (VAT). If overhead, contingency, and profit exceed 30%, there should be an acceptable reason.

» One tab should present the overhead assessment, including provisional installations for construction (electrical, hydraulic, site offices, materials storage, bathrooms).

» Contingency will be set at 3% to 5%[42] depending the evaluation of the project land.

» Profits are set at 5%.[43]

• Quantities for each category, including reports to back them up.

• Prices of main inputs

Technical specifications or construction brief

• Each budget item should have its own Technical Specification, and the figures should match the UPA. One Technical Specification may cover several items, but it should indicate which ones it includes.

• The Technical Specifications format should be unique for each specialty.

• The Technical Specifications, in addition to having the appropriate figures, should include:

» Description.

»Previous activities.

» Process and implementation.

» Tests to be done (list the tests and the standards under which they will be performed).

» Allowance for approval.

» Materials (same as the UPAs).

» Equipment (same as the UPAs).

» Equipment (small tools).

» Method and form of payment (for unit pricing).

» Approval.

» Annexes.

• The UPAs of products created on-site (e.g. concrete) will have their own Technical Specification.

Construction planning

• This will be presented in Microsoft Project.

• The budget will be presented by section. The activities or categories will have unique, consecutive numbers that match the ones in the budget summary.

41 This is a suggested percentage. In some countries, it may be set by national regulations. Use that percentage if applicable. It may also depend on each country's VAT. This 30% is made up of 15% VAT, 5% overhead, 5% contingency, and 5% profit.

42 These are suggested percentages. In some countries, they may be set by national regulations. Use those percentages if applicable.

43 This is a suggested percentage. In some countries, it may be set by national regulations. Use that percentage if applicable.

Design WELL Build Better

A guide for planning, creating, overseeing, and making decisions about social infrastructure designs

IDB

Wilhelm Dalaison - Marcos Camacho

Infrastructures Sociales