

The 'Delivering More' Toolkit

Assessment Tool



The Delivering More project outlines a human-centred process to co-design ideal maternal care from the user perspective - with the aim of developing improved health facility designs that enable safe, respectful Maternal and Newborn Health (MNH) care provision and utilisation in traditionally underserved populations. With support from the Bill & Melinda Gates Foundation and the Elsa & Peter Soderberg Charitable Foundation, the project was led by the Institute for Healthcare Improvement (IHI), a not-for-profit organisation with a mission to improve health and health care worldwide. IHI partnered on the project with MASS Design Group — a nonprofit design, research, and engineering firm with extensive experience designing and implementing impact-driven health care infrastructure.

Based on learnings from the immersions in Ethiopia and Bangladesh, we have developed a globally-applicable toolkit and a set of guiding principles for improving maternal and newborn facility design.

Project Lead

Project Partner



About this Guide

The Engagement and Assessment Tools included within this toolkit provide methodologies for documenting feedback from end users and assessing the condition of existing infrastructure.

The Assessment Tool — what you're reading now — is focused on assessing existing facilities and infrastructure. Together with user feedback from the engagement process, these data will help the design team evaluate whether renovation, expansion, or new construction is the best course forward and identify opportunities for improving or innovating building systems.

This document includes sections dedicated to structural engineering, site topography, site accessibility, stormwater management, solid and medical waste, water supply, wastewater management, and electrical systems in order to build a comprehensive understanding of the facility's current state and potential for modification. Like the Engagement Tool, the Assessment Tool has been compiled with our local contexts in mind, but the tools capture critical information that — with minimal adaptation — would be important to understand in any location where this methodology may be applied.

The design team will need to use their best judgement to determine what level of assessment is required. This document provides a thorough checklist of topics that should be evaluated if improving an existing facility. However, if it is already clear that the project will be new construction, then it may not be necessary to evaluate existing spaces as rigorously.

Approach

The questions in this Tool serve as a prompt for collecting the information which may be helpful in determining a design approach for facility improvement.

It would be advantageous to include professional engineers in your Assessment Team, who, together, have a comprehensive understanding of the engineering systems that are being assessed. In your context, you may come across aspects of the facility that are important but may not be covered in this tool. It is important for the users of this tool to capture all important information, and we advise the Assessment Team to spend time synthesising recommendations following the facility visits to ensure a smooth handover to the Design Team (if the Design Team is different from the Assessment Team).



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SECTION 1

Orientation

The orientation section contains general questions that are necessary to frame the context of the facility design intervention. These questions could be answered by simple desktop research and should ideally be completed before visiting the facility.

1



Introduction

a. Type of health care facility:

(Circle the bubble)

Health Post

Health Centre

Primary Hospital

General Hospital

Tertiary Hospital

b. Facilities included in maternal health care scope:

(Circle all of the bubbles that apply. If the answer is not clear, refer to MoH/local implementing partners and confirm requirements.)

MNH (Maternal & Newborn Health)

OR (Operating Room)

NICU (Neonatal Intensive Care Unit)

c. Survey the relevant buildings:

If plan drawings have not been provided before the site visit, the first exercise will be to survey the relevant buildings and draw the plans in CAD. These CAD drawings should be printed before continuing with the Assessment to facilitate sketching of building services, equipment, and structure. Ensure the following aspects are captured in the survey:

- External dimensions, including heights, roof dimensions, changes in cladding system, etc.
- Internal dimensions, including room layouts, wall thicknesses, etc.
- Opening dimensions, including doors and windows (width and heights), plus swing direction.

2



Climate

Describe the site climate and seasonal variability using anecdotal information and reference online data sources where available. Include the following, where available:

a. Seasonal temperature variation

b. Diurnal temperature variation

c. Seasonal humidity variation

d. Rainfall (amount and seasons)

e. Prevailing wind direction

f. Monthly/seasonal wind variation

3 

Surroundings

a. Describe the site and surrounding amenities and services. Include the following and mark information on site map/plan. Check the boxes once the relevant information has been recorded.

- Adjacent buildings (proximity, height, massing, etc.)
- Surrounding natural features (trees, hills, etc.)
- Local commerce (focus on building materials, hardware, etc.)
- Local businesses, skills, and trades

Open for additional notes & drawings:

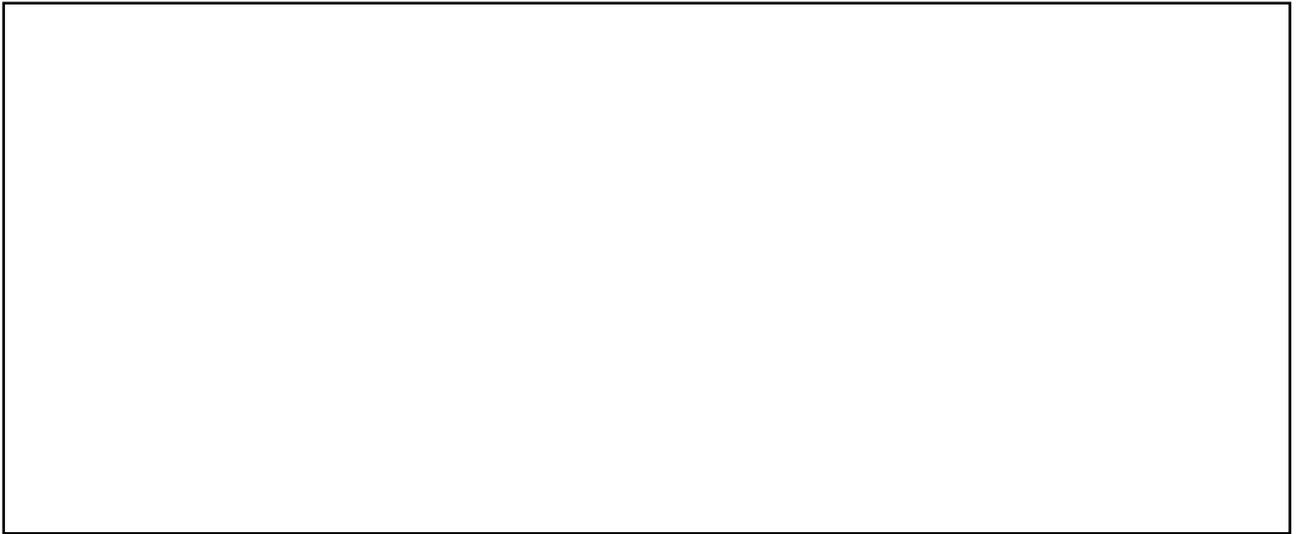
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Site Conditions

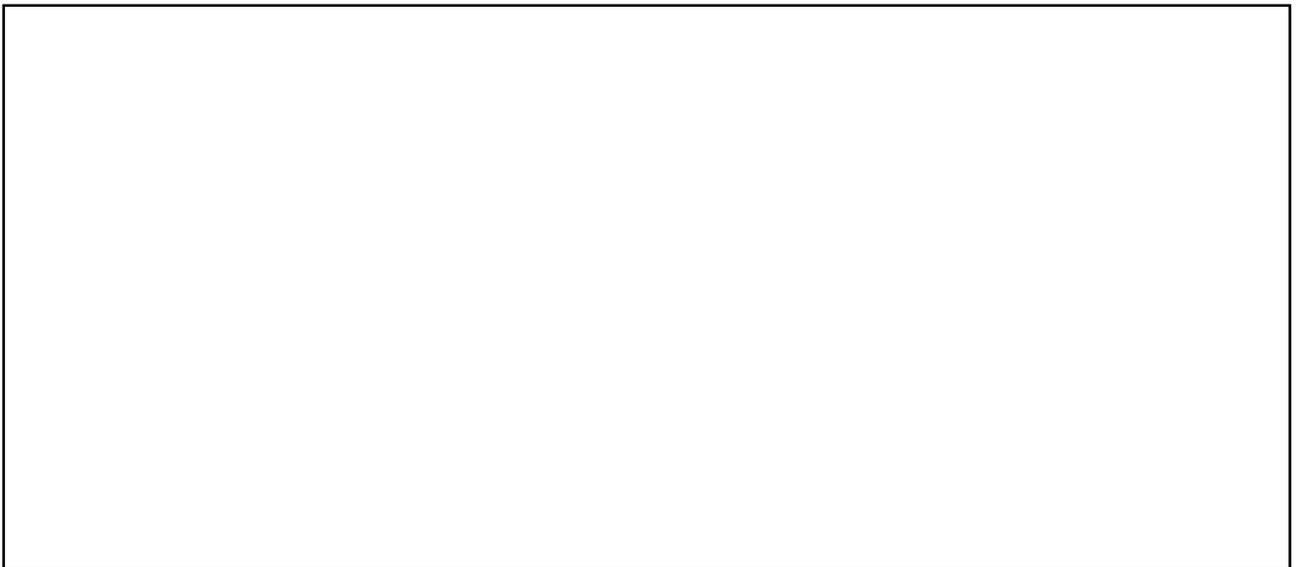
Describe the site conditions below and record the following on the site plan, where applicable. (Capture photographs of the conditions below, if necessary, and record their locations for reference.)

a. Topography

b. Soil conditions

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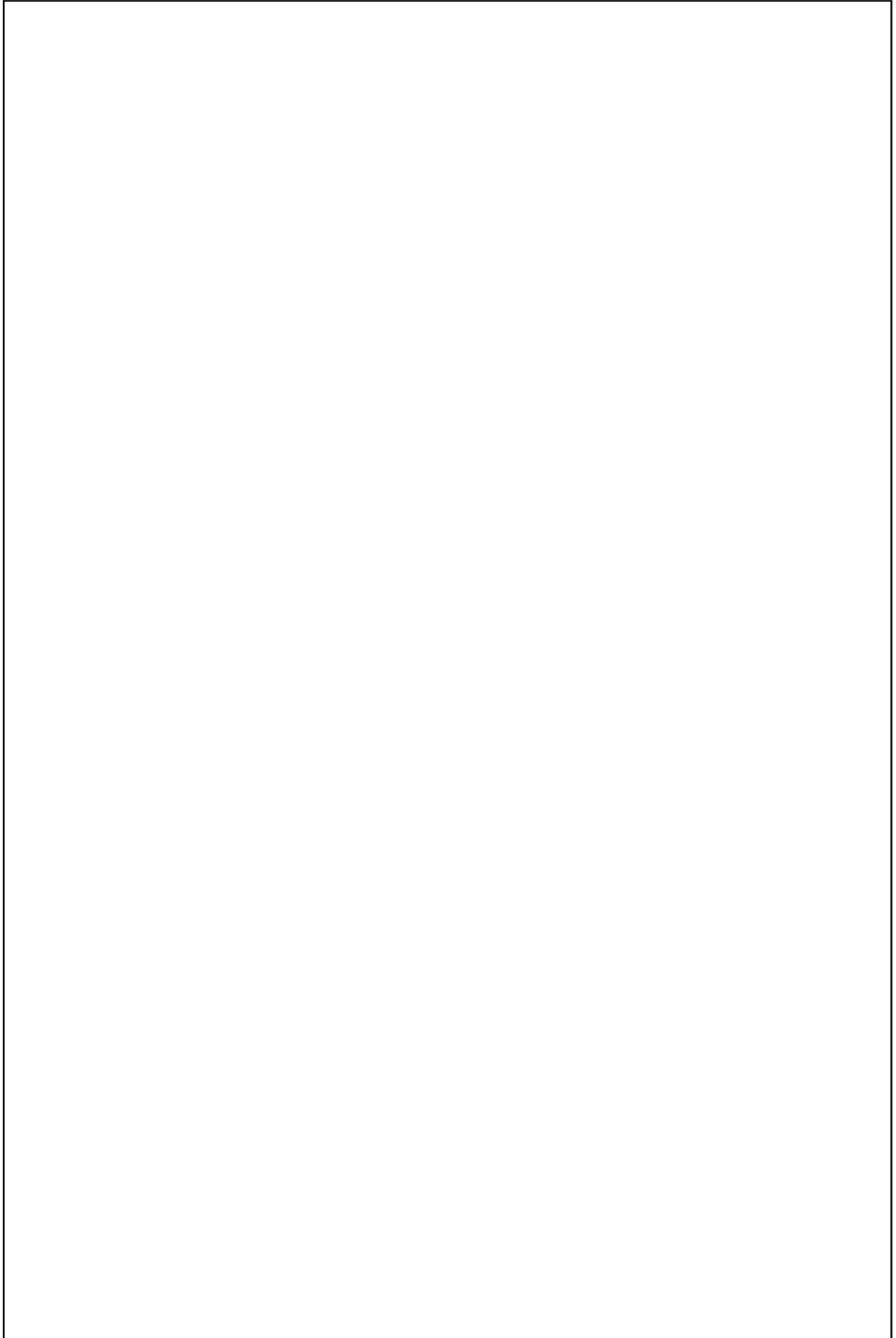
c. Vegetation

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d. Groundwater level (including seasonal variations)

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Additional notes/sketches:

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Additional notes/sketches:

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SECTION 2

Interview

The assessment worksheets in Sections 2 and 3 are designed to give the design team a clearer picture of the current condition of the facility. The interview section includes questions pertaining to: structural engineering, site infrastructure, water supply, wastewater & sanitation, solid waste, air quality & comfort, medical gas, and electrical. These questions are intended to be answered by a facility manager or an individual familiar with the facility's maintenance and operations.

1



Structural

a. Do you know when the buildings were constructed?

b. Do you know what materials have been used for the construction of any hidden parts of the building? (e.g., roof, foundations, columns)

c. Are the materials used in the building construction readily available in the area?

- If so, are these the best choice for the design of any future construction, or is there an alternative material choice that would be more appropriate?

d. Can you describe the typical construction arrangement and sequence used for this type of building in the area?

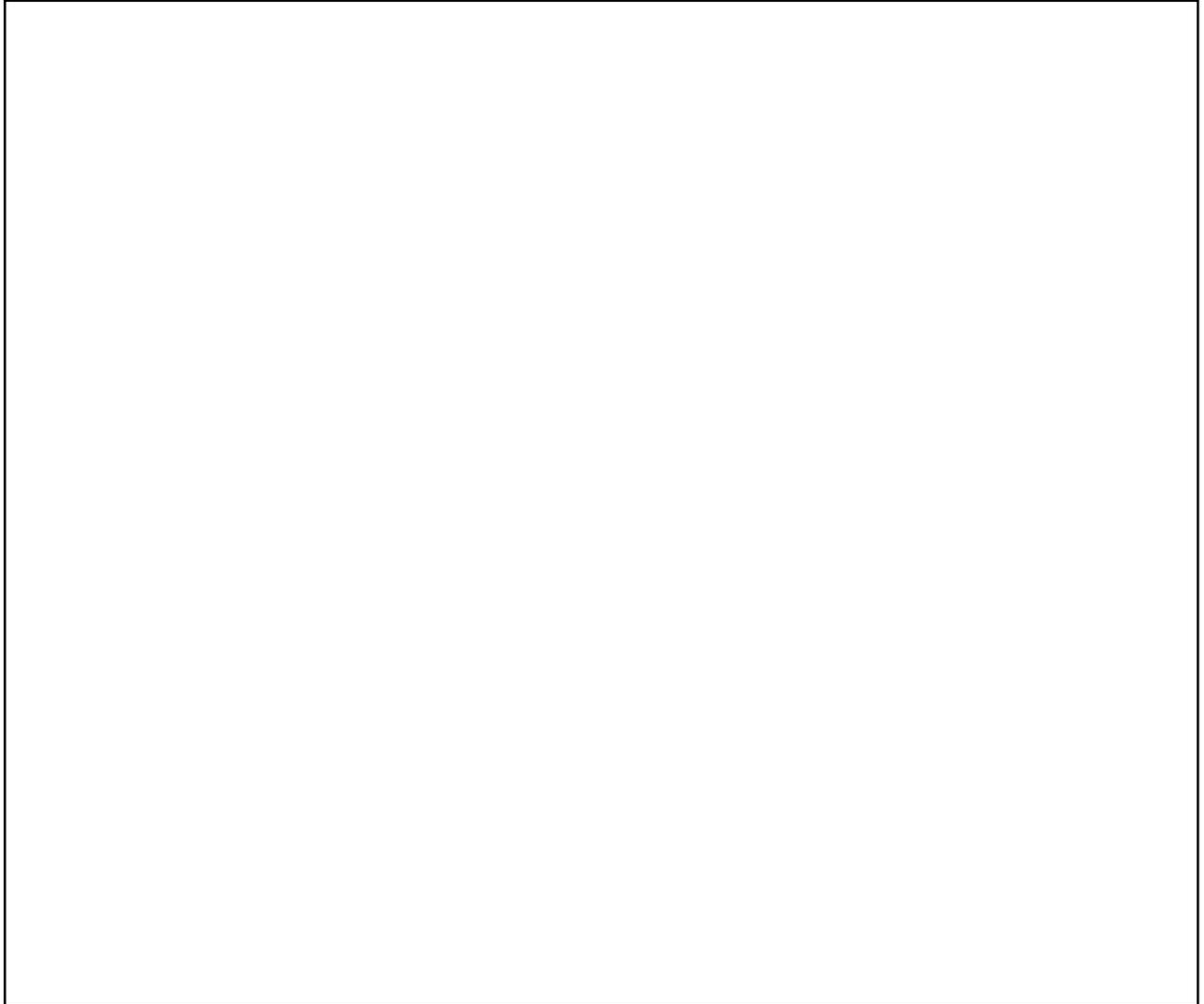
e. Are there any visible structural defects that you are aware of?

f. Have there been any structural repairs implemented on any parts of the building since you have worked here? Or any that you are aware of before you started?

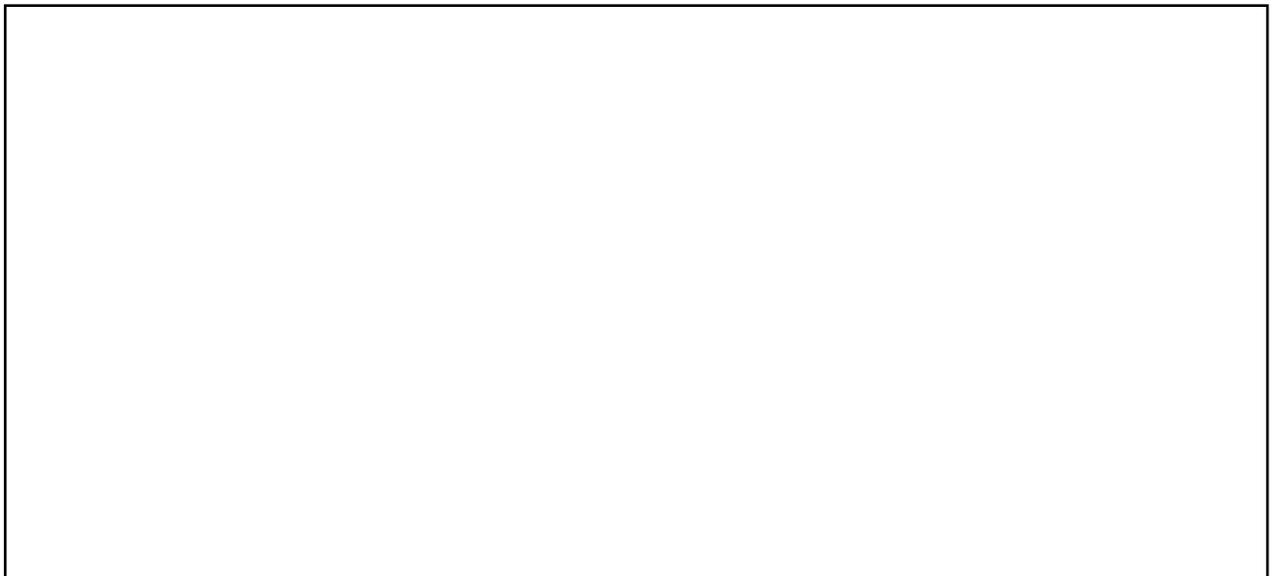
g. Are there any structural defects commonly observed on other buildings of this type in the area? Examples include rust, rot, rising damp, cracking, separation of elements, etc.

h. Do you remember experiencing any seismic activity since you have lived in this area? Are you aware of any earthquakes having occurred in the past 25 years?

- If yes, do you know if these caused any damage to buildings in the area? What was the typical form of damage?



Additional notes/sketches:



a. What types of vehicles use the site?

b. Approximately how many vehicles use the site per day?

Emergency Vehicles

c. Is dedicated access or parking provided for ambulances and other emergency vehicles? (circle) If YES, mark on plan.

 Yes No

d. Is there sufficient capacity for current site needs?

Parking

e. Are there enough bays for current site use?

f. Is there sufficient turning/circulation space?

Flooding & Erosion

g. Do any areas of the site flood in heavy rain events? (Mark locations on plan)

h. Is flooding due to: Surface flow; River level rise; Groundwater rise?

i. Describe effects of flooding (e.g., access cut off, buildings becoming unusable...)

j. Does water flow onto site from beyond the site boundaries?

Roof Drainage

k. Describe any problems with functionality. (E.g., Damaged elements, regular blockages, overflows, etc.)

Water Disposal

l. Do soak pits ever overflow?

m. Note any available information about the soak pits construction. (E.g., Depth, diameter, infill material...)

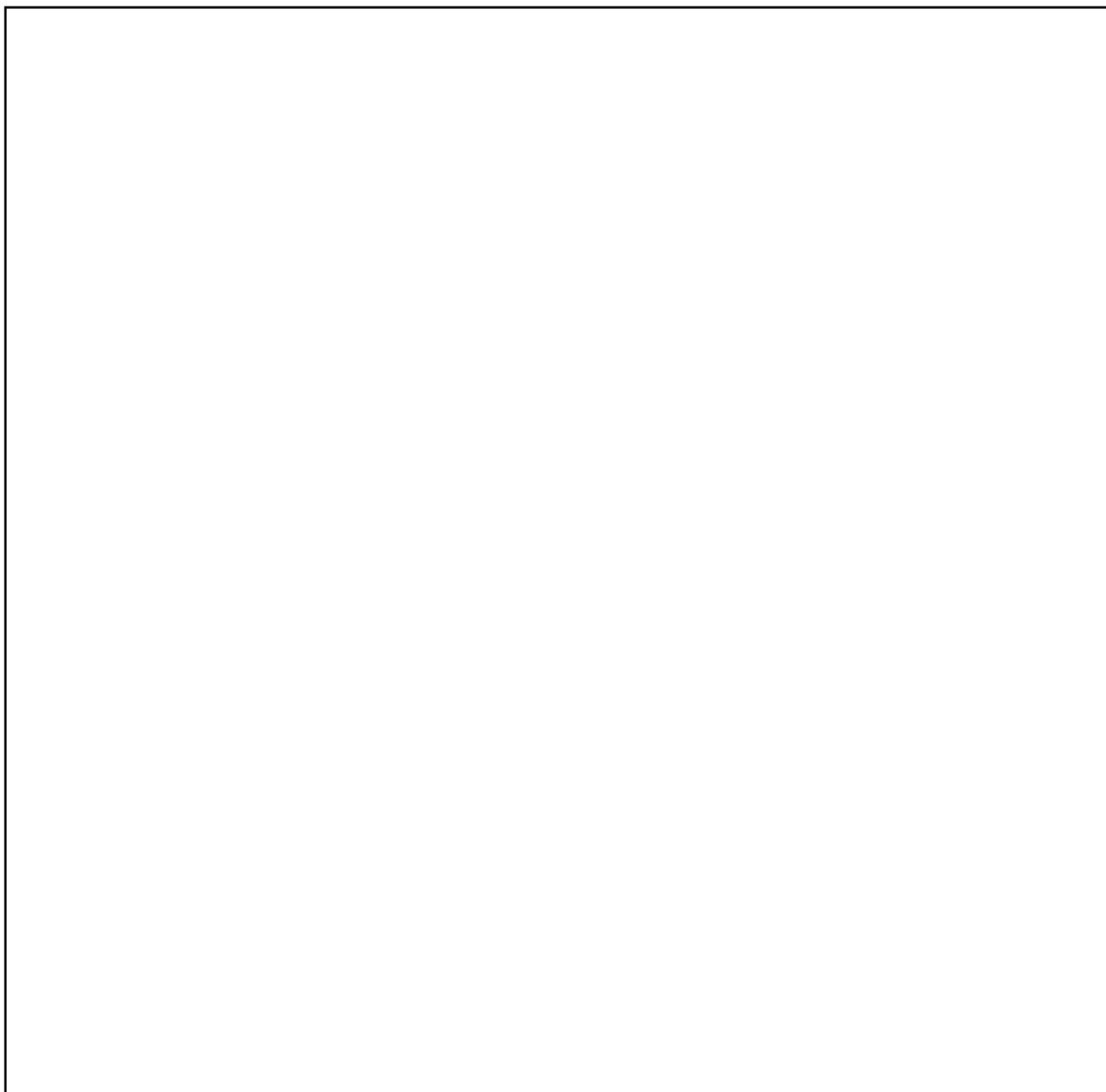
n. What is collected rainwater used for?

o. How is collected rainwater distributed?

p. Is any water treatment provided?



Additional notes/sketches:



Source and Storage

a. What is the water source for the site? (Check the relevant box)

- Piped municipal supply
- Borehole (powered pump)
- Borehole (hand pump)
- Well (bucket collection)
- River
- Other...

b. Is water storage available on site?

c. Note the quantity and size of tanks

d. Describe the tank material & condition

e. Is the quantity enough for current daily needs? Note any seasonal variation.

f. Are there periods of water outages? Note how frequently and for what duration water is unavailable. Note any seasonal variation.

g. Note any information on water quality. (E.g., Color odor, taste...)

h. How is water treated on site? (Check the relevant box)

- No on-site treatment
- Central on-site packaged treatment
- Local UV at point of use
- Local filters at point of use
- Other:

For non-municipal supplies:

i. Does the facility own the water supply system?

j. Is the system shared with any other users?

k. Who installed the system and when?

l. How often does the system break down? What are the common causes?

Distribution

m. Is water metered and submetered?

n. How is water distributed around the site? (Check the relevant box)

- Carried by hand
- Piped (gravity feed)
- Piped (pumped)
- Other:

o. How far do people typically need to carry water?

For piped systems:

p. When were the pipes installed?

q. What is the pipe material?

r. Are there any reported leakage issues?

Hot Water

s. Are there any hot water systems? (Check the relevant box)

- Solar thermal panels and hot water storage
- Gas hot water boilers
- Electric point of use heater
- Electric hot water storage cylinders
- Other (Provide description)

Maintenance

When answering these questions, consider all relevant parts of the water supply system: source, treatment, distribution, water heaters, pumps, etc.

t. Who maintains the water systems?

u. What does routine maintenance involve? How often is it done?

v. Are there any regular tests? (E.g., For water quality)

x. What is the history of breakages and how has broken equipment been fixed or replaced?

Additional notes/sketches:



Water Treatment & Disposal

a. Are blackwater and greywater combined or kept separate?

b. Is wastewater discharged to a municipal sewer?

c. Is untreated wastewater disposed of on site? How? (Circle)

 Soak pits Leachfield Other

d. Is any wastewater treatment provided on site? (Circle)

 Septic tank Anaerobic Baffled Reactor (ABR) Biodigester Other

e. Are any useful byproducts derived from human waste? (Circle)

 Compost Biogas Other

f. Is treated wastewater disposed of on site? How? (Circle)

Soak pits

Leachfield

Other

g. When was the system constructed and by whom?

h. Who maintains the system and what is involved?

i. Is the system shared with any other users?

j. Are there any problems with the existing wastewater system? (E.g., Overloading, breakdowns, odor, worries about groundwater contamination, etc.)

k. Is there any greywater treatment and re-use? Give details: Where does the water come from? What treatment is given? How is it re-used?

Maintenance

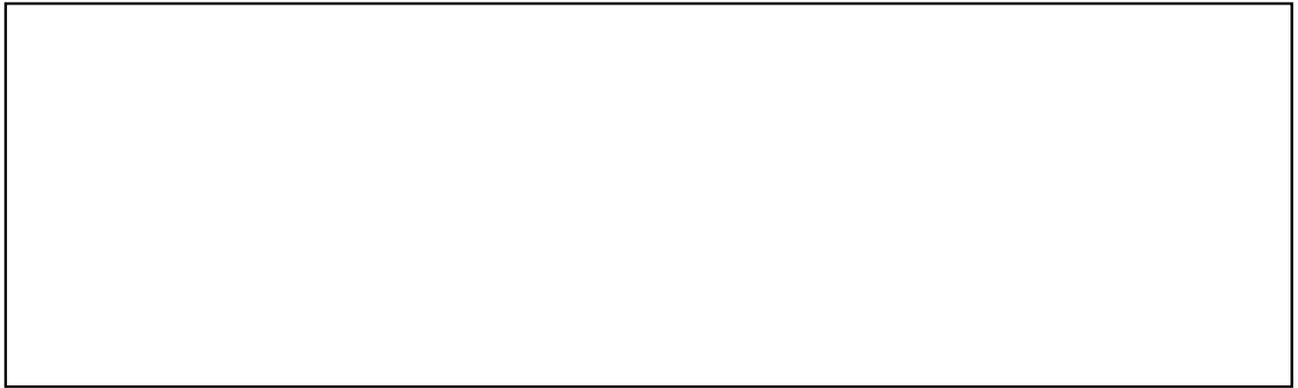
When answering these questions, consider all relevant parts of the wastewater and sanitation systems.

l. Who maintains the wastewater and sanitation systems?

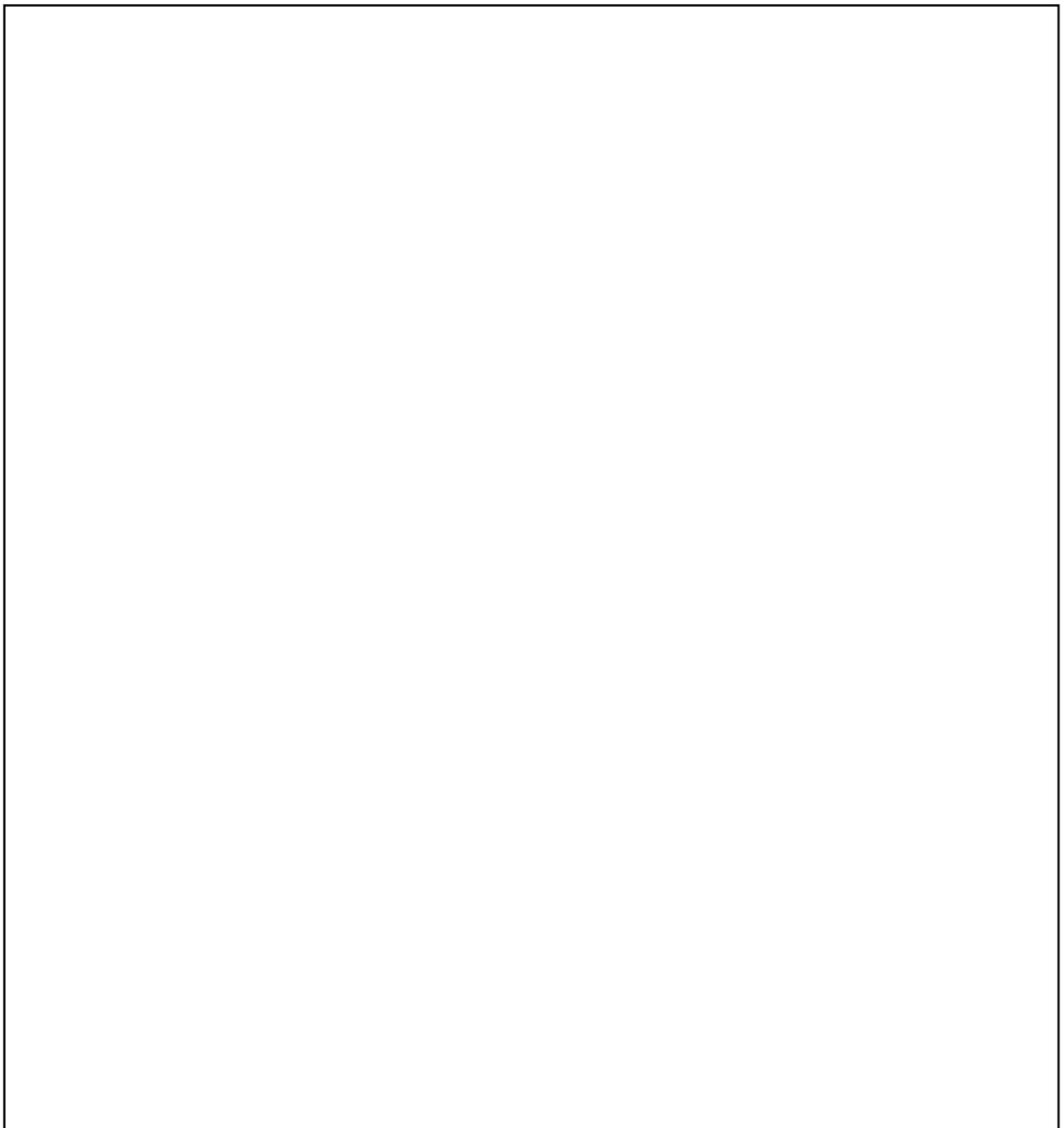
m. What does routine maintenance involve? How often is it done?

n. Do any parts of the system break down or malfunction? How can you tell?

o. How have breakdowns been fixed or dealt with?



Additional notes/sketches:





a. Is solid waste disposed of on or off site?

b. Are solid and medical waste separated?

c. How is medical waste disposed of?

d. How are sharps disposed of?

e. Describe the disposal chain. How is waste transported? Any intermediate storage?

f. Describe the systems (e.g., storage areas, burial pits, incinerators...)

g. What are the problems with the existing system?

h. For any major pieces of infrastructure (e.g., incinerators), note when they were built, by who, and key details, such as capacity and operation.

Maintenance

When answering these questions, consider all relevant parts of the solid waste management system, including collection and transportation methods, storage areas, burial pits, incinerators, etc.

a. Who maintains the solid waste system?

b. What does routine maintenance involve? How often is it done?

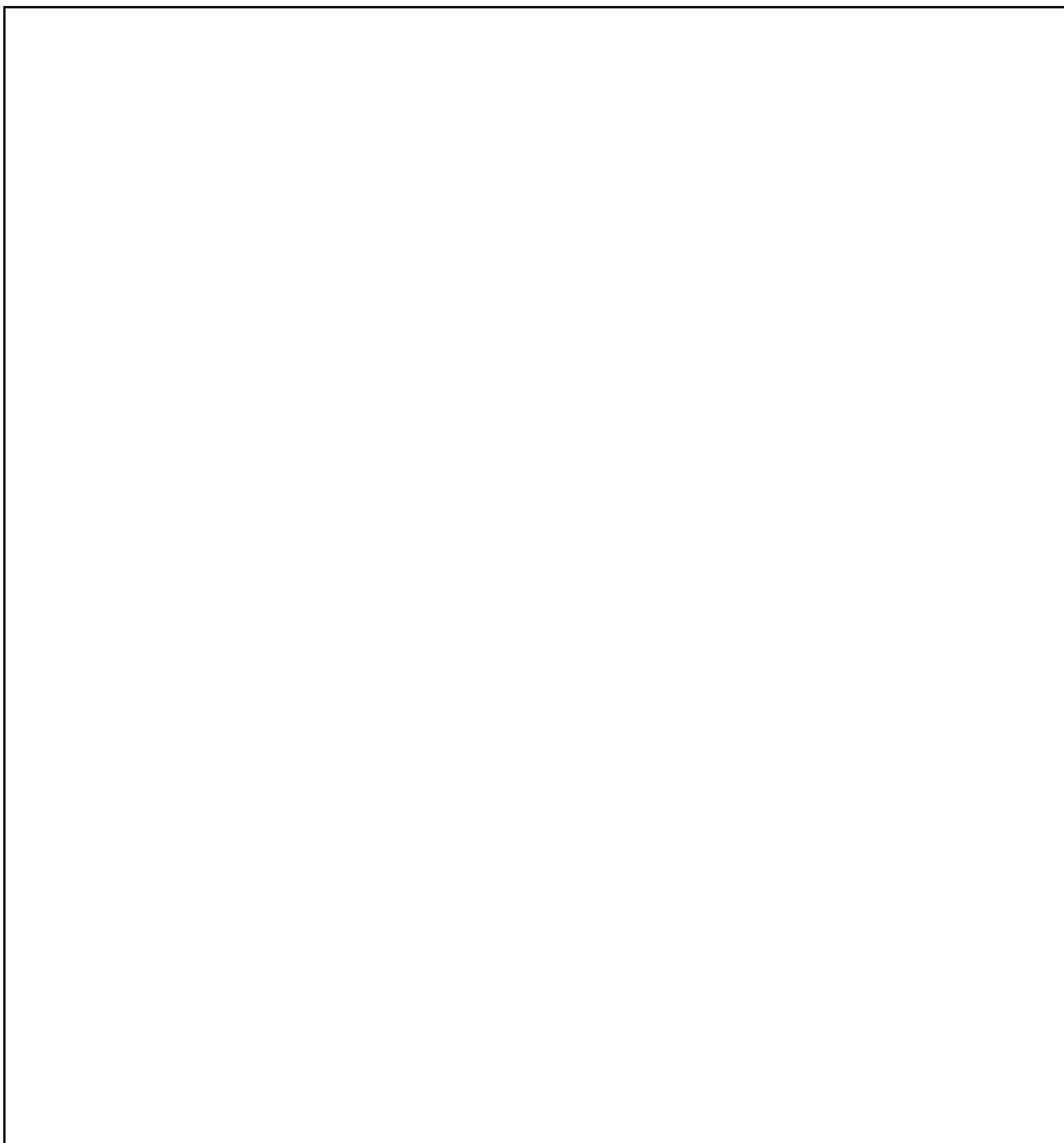
c. Do any parts of the system break down or malfunction? How can you tell?

d. How have breakdowns been fixed or dealt with?

e. What happens when pits become full?



Additional notes/sketches:





Ventilation & Air Quality

a. Are there operable windows?

b. Do occupants use the windows? Are there any preferences to keep windows open or closed?

c. Are any windows/blinds/curtains kept closed for privacy?

d. Are any windows/blinds/curtains kept closed for managing dust/other external pollutants?

e. Do any spaces feel particularly stuffy?

f. Do any spaces feel particularly fresh and breezy?

g. Are there issues with condensation or mold?

Mechanical Heating, Ventilation & Air Conditioning (HVAC)

a. Are there any mechanical ventilation systems in the building/spaces being assessed?
(Check the relevant box)

- None
- In-wall extract/supply fans
- Ducted mechanical ventilation systems
- Central air handling units
- Ceiling/floor standing fans
- Other (Provide description)

b. Are there any mechanical cooling systems in the building/spaces being assessed?
(Check the relevant box)

- Split units
- Multi-split systems
- Variable refrigerant flow systems
- Air handling unit/cooling coil in mechanical ventilation system
- Other (Provide description)

c. Are there any mechanical heating systems in the building/spaces being assessed?
(Check the relevant box)

- Radiant heater panels
- Electric forced air heaters
- Reversible ASHP units (i.e., cooling systems used for heating too)
- Other (Provide description)

d. How are the HVAC systems controlled and who controls them?

Maintenance

Describe the maintenance and operation regimes for the HVAC, if there are any.

a. Who operates the mechanical HVAC systems?

b. How are they maintained and by who?

c. What is the history of breakages and how has broken/equipment been fixed or replaced?

Additional notes/sketches:

Additional notes/sketches:

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Medical Gas

a. What types of medical gas are present? (Check the relevant box)

- Medical Air
- Oxygen
- Carbon Dioxide
- Nitrogen (Medical Liquid Nitrogen)
- Nitrous Oxide

b. Are any medical gases needed but not currently provided or insufficient? (Check the relevant box)

- Medical Air
- Oxygen
- Carbon Dioxide
- Nitrogen (Medical Liquid Nitrogen)
- Nitrous Oxide

Additional notes/sketches:

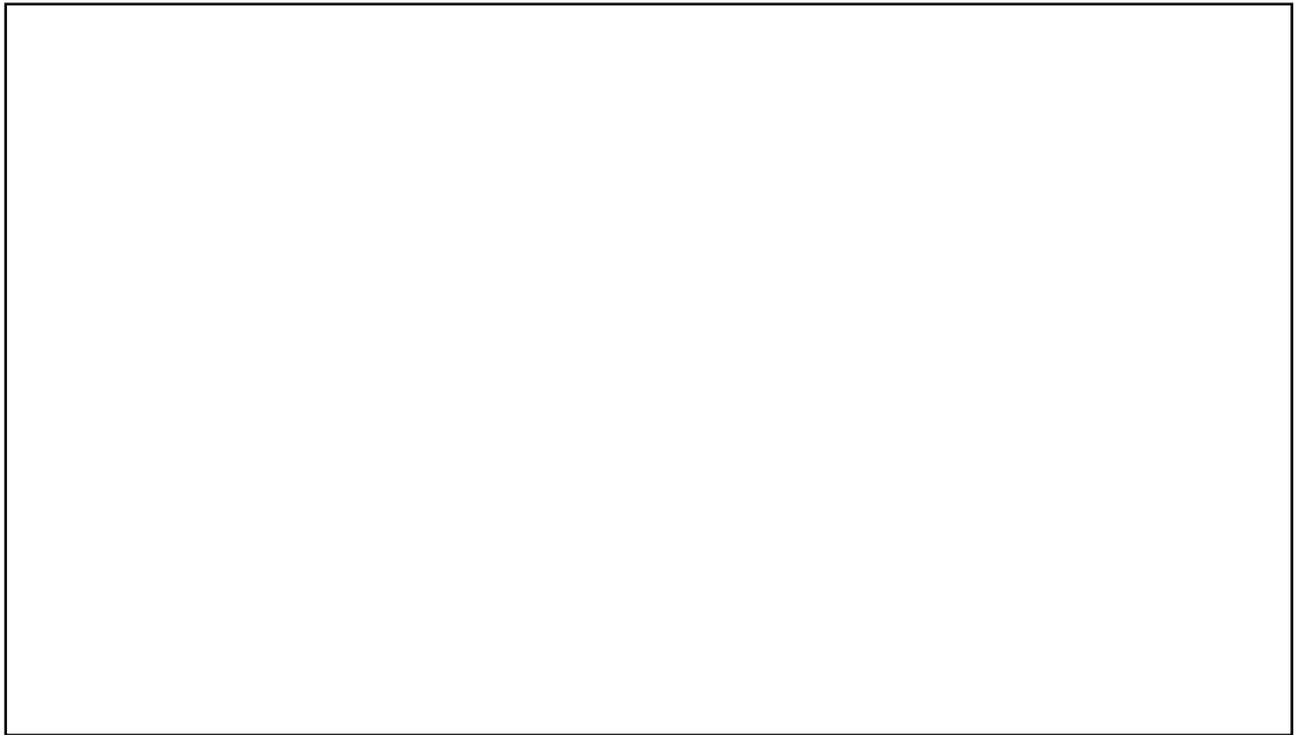
Maintenance

Describe the maintenance and operation regimes for medical gas, if there are any.

a. Who operates the mechanical gas systems?

b. How are they maintained and by who?

c. What is the history of breakages and how has broken equipment been fixed or replaced?



Additional notes/sketches:





- a.** Is the plant room appropriately sized? Is it easy to access all elements and areas?

- b.** Is the building equipped with a fire detection and alarm system? If so, what type of components are included?

- c.** Is the building equipped with a general earthing system? If so, where is it located?

- d.** Is the building equipped with lightning protection? If it exists, where are the air terminal, down conductors, and earthing electrodes located? Is a different system used?

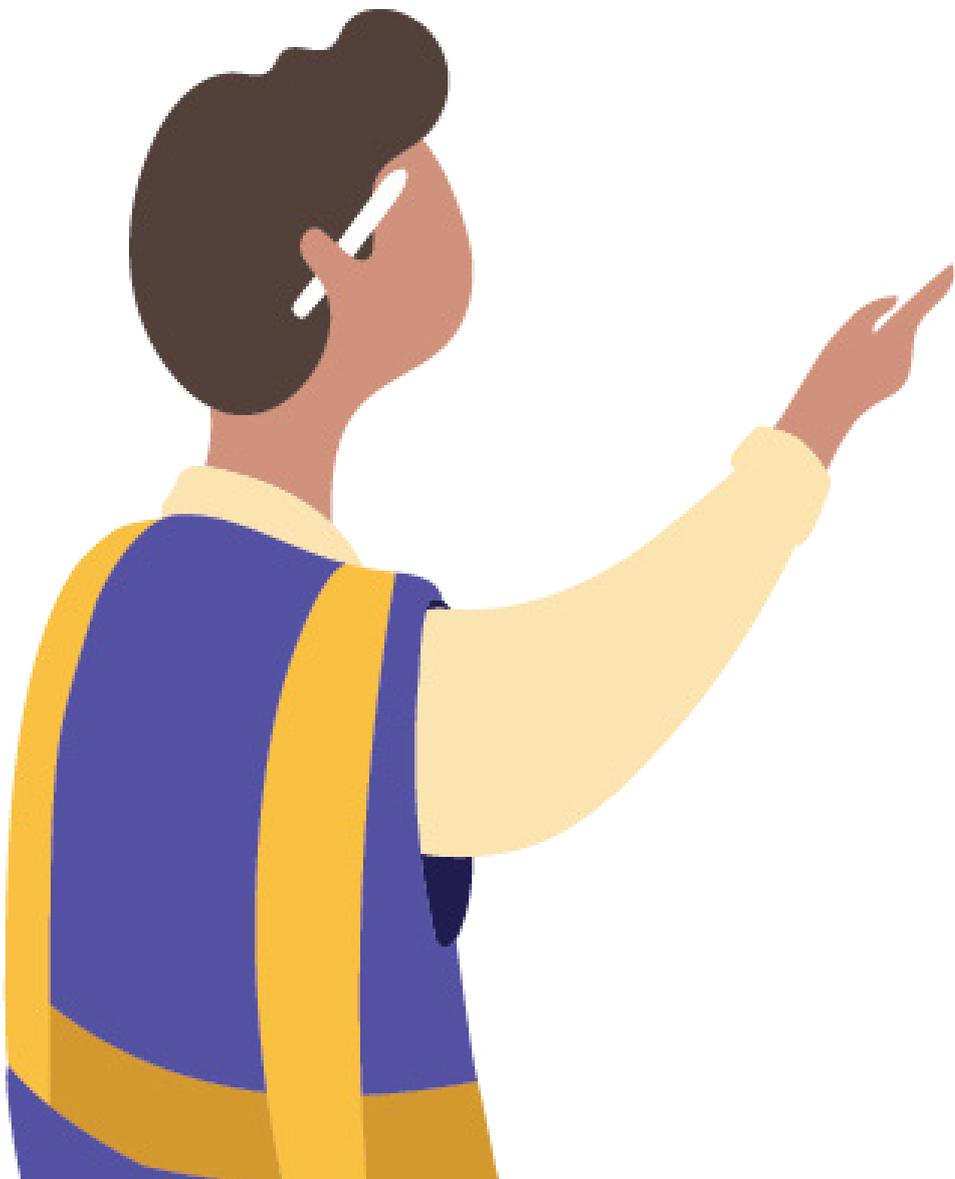
e. Confirm how long the electrical installation for the site has been in place.

f. Have there been any recorded failures, issues, or inefficiencies originating from the electrical installations in recent times?

- For example, equipment failures or excessive voltage drops due to lightning strikes or electrical surges.

g. Have any electricity sources (e.g., public grid, diesel generator, P.V. system, UPS) failed in the past five years and why?

Additional notes/sketches:



SECTION 3

Inspection

Similar to Section 2, the inspection section is organised by topic: structural engineering, site infrastructure, water supply, wastewater & sanitation, solid waste, air quality & comfort, medical gas, and electrical. The questions should be answered by conducting physical inspections of the existing facility. It is important to ensure that all important information is recorded and that the assessment team spends time summarizing their findings and recommendations for next steps.

Structural



Background

This section is intended to guide the user through a preliminary inspection of a building structure. Key goals of this assessment include:

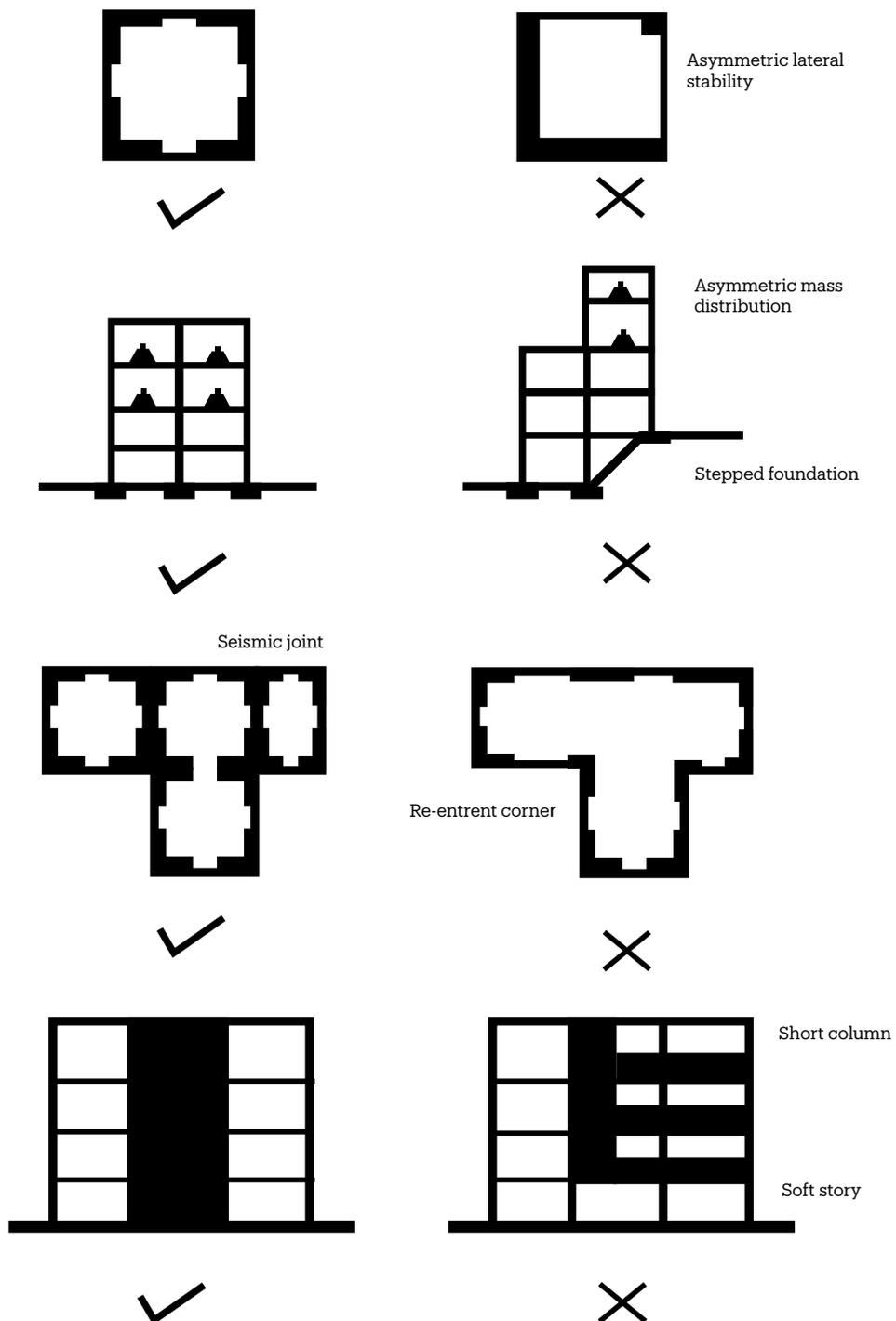
1. Establish the primary structural materials and arrangement of the building
2. Establish the lateral stability system that currently exists
3. Establish the general condition of the building structure
4. Identify any key issues or red flags in any parts of the structure
5. Begin to understand the seismic performance of the building
6. Decide on next steps and recommend further investigations

When working in areas prone to earthquakes, it is also important to begin to understand how the existing structure may perform under seismic conditions. While a structure may appear perfectly adequate to resist the loads it experiences in normal conditions (e.g., dead loads, imposed loads, wind loads), earthquakes can cause the building to respond in unpredictable ways, which may lead to damage or collapse. There are a number of “good practice” rules regarding the layout of the building that can simplify the building’s response to seismic loads and subsequently enhance performance. These include, but are not limited to:

1. Symmetry of lateral stability elements in plan
2. Uniformity of mass distribution across the building
3. Founding the building all at the same level
4. Avoiding large steps in the elevation/section profile
5. Providing seismic joints between rectangular blocks on plan or at steps in floor level
6. Avoiding re-entrant corners in plan
7. Detailing walls and partitions to stop “short column” effects from developing
8. Avoiding “soft stories”
9. Providing a rigid diaphragm at all floor and roof levels, such as a reinforced concrete slab, plan bracing system, or a substantial sheathing material
10. Providing redundancy in the lateral stability system

The penultimate section of this tool includes a checklist for each of these good practice seismic design principles, which should be completed to help summarize the findings for each structure inspected.

It is also important to highlight the limitations of this tool. Different building typologies require different types of assessment; for example, a masonry building with timber roof must be inspected differently than a reinforced concrete frame. The first part of the structural assessment tool states a number of assumed material and element types, which should be validated prior to proceeding with the rest of the inspection.





- a. Identify each of the following parts of the structure and note their typology and material (Fill in table)

Aspect of Buildings	Element Type	Material Type
Vertical Structure		
Foundations		
Ground Floor		
Suspended Floors (if any)		
Roof Primary Structure		
Roof Secondary Structure		
Lateral Stability System		

- b. Approximate plan dimensions of building footprint

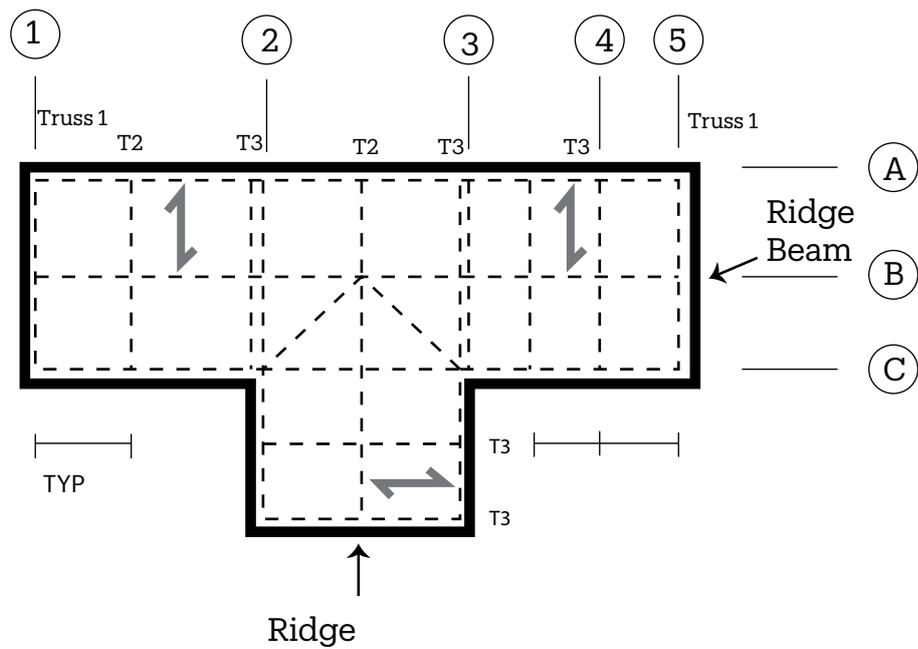
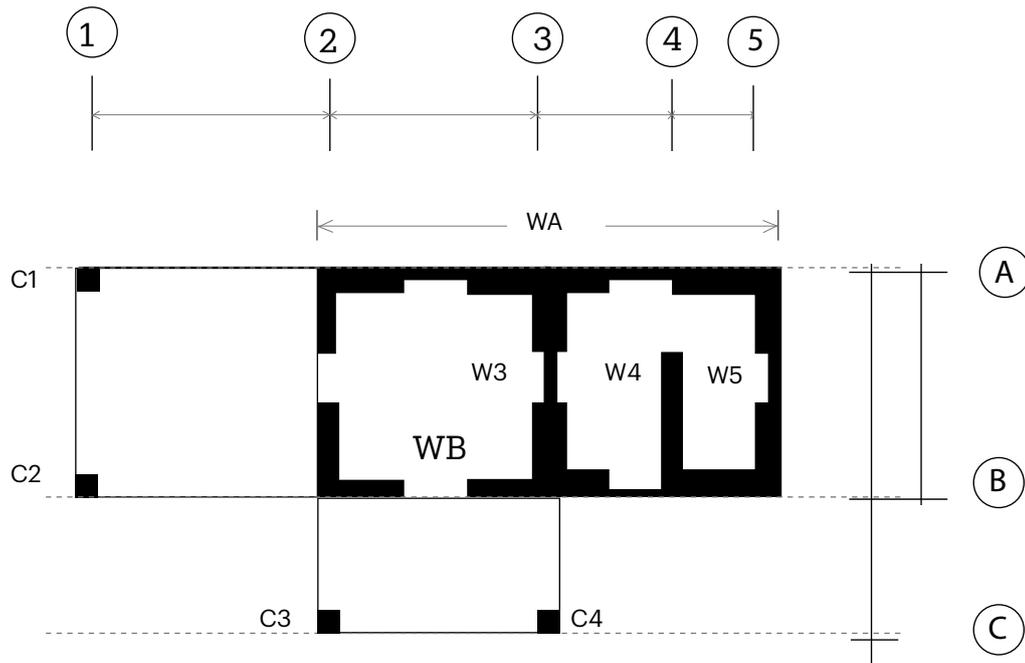
- c. No. of stories

- d. Typical story height (note floor-to-floor or floor-to-ceiling)

- e. Develop a sketch plan of each story. (Check the boxes below once the relevant information has been recorded.)

- Include general plan dimensions.
- Establish an approximate structural grid. This may not pick up every structural wall, but should try to find repeat/rhythm in the structure and identify major structural elements.
- Include all vertical elements of the structure and develop an appropriate numbering system to allow each element to be described individually.
- Include arrangement of any horizontal framing elements (e.g., beams or trusses) and develop an appropriate numbering system to allow individual element to be described individually.
- Include assumed span directions of floors and secondary roof systems.
- It may be necessary to remove small areas of finishes (such as ceiling panels) to gather this information.

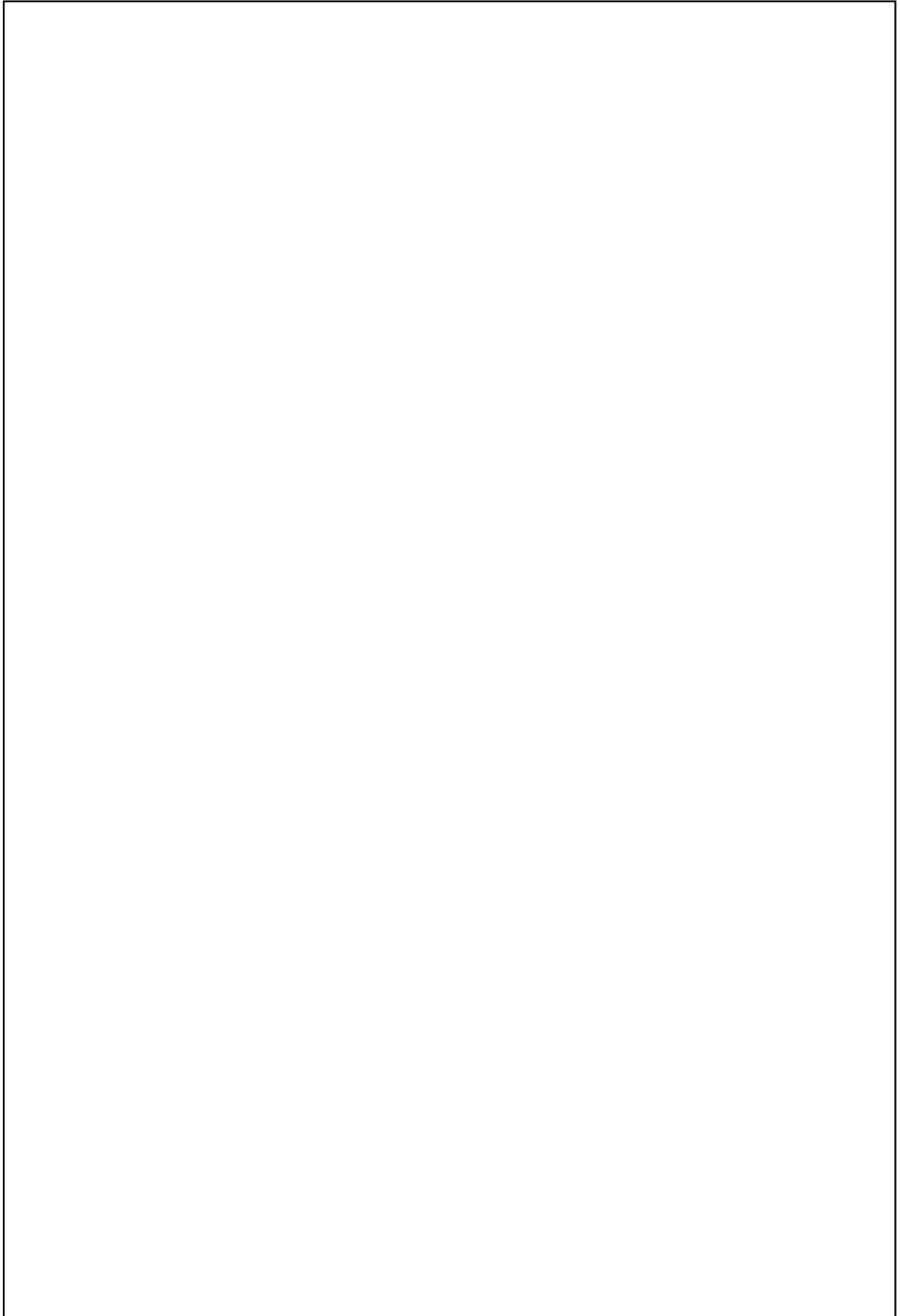
Example of an annotated sketch plan



Additional notes:

Sketches

Plans of each story, including a roof plan(s)



Sketches

Plans of each story, including a roof plan(s)

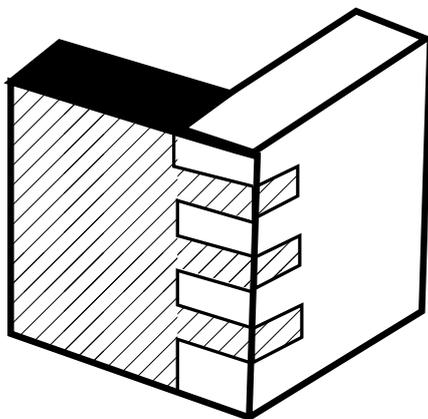
A large, empty rectangular box with a thin black border, intended for drawing architectural plans of each story and the roof plan(s).



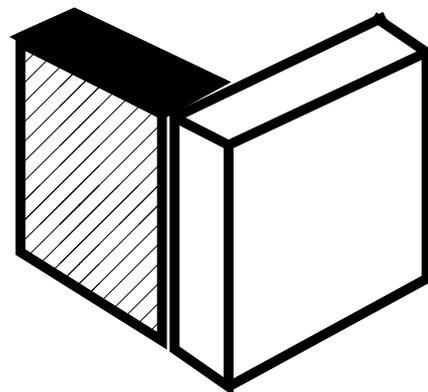
- a. Describe the general condition of the vertical structure throughout the building, in one or two sentences.

- b. **Recording of Individual Elements.** (Check the boxes below once the relevant information has been recorded.)

- Include dimensions and section widths/sizes.
- Provide comment on the condition of specific elements.
- If any elements are showing significant defects (e.g., cracking in walls, spalling of concrete on columns, etc.), sketch an elevation of the element and highlight the location and detail of the defect.
- Include a note on how well vertical elements of structure are tied together (e.g., are wall junctions bonded or unbonded?).
- Note whether there is a ring beam provided at the tops of the walls/columns. If there is, note its materiality, dimensions, any defects, etc.

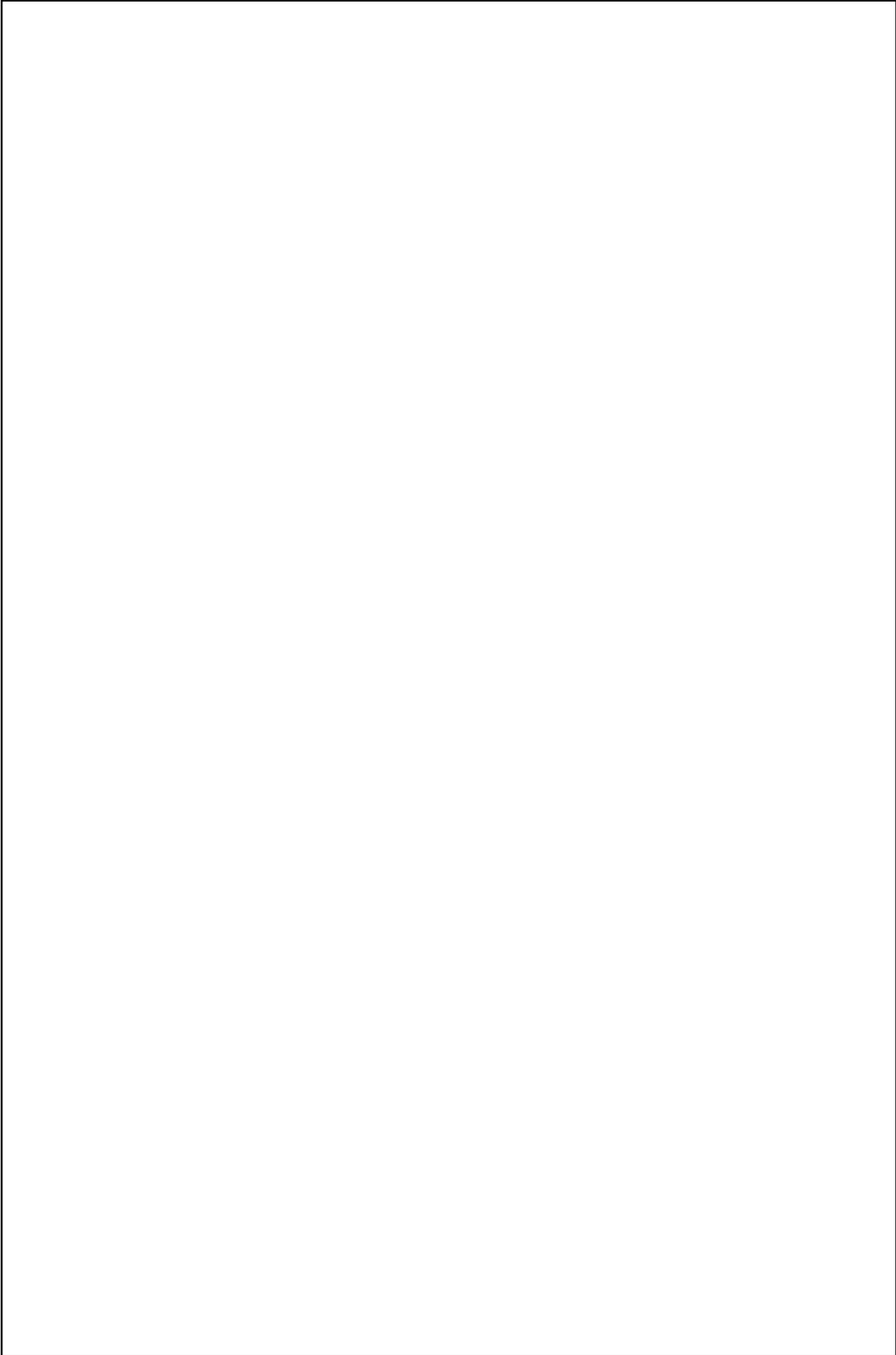


Bonded



Unbonded

Sketches





a. Trial Pitting Investigation

Guidelines:

- Decide on appropriate trial pit locations. External trial pits are preferred to minimize disruption.
- Avoid locating trial pits adjacent to any drains, manholes, or known service routes.
- Try to place trial pits so as to investigate a range of element types.
- If trial pitting against structural walls, placing trial pits on inside corners of two adjoining walls can be an efficient way of investigating both footings.
- If trial pitting against structural columns, excavating back along the gridlines can help to expose any ground beams that may run between pad foundations or footings to non-structural infill walls.

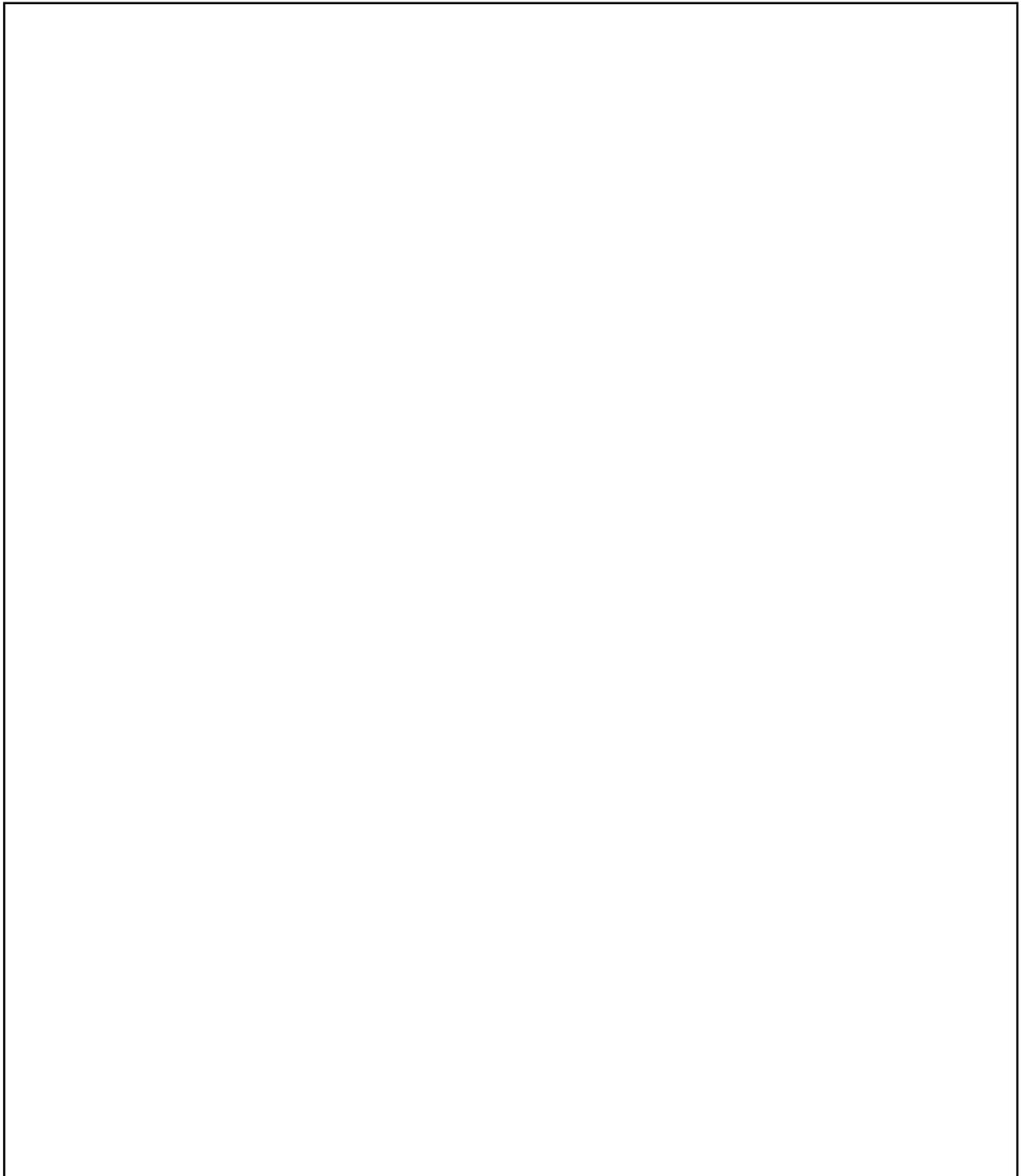
Excavate and log trial pits:

- Excavate trial pits by hand to formation level, taking care not to damage the wall or foundation during excavation. Under no circumstances should the excavation undermine the foundation.
- Once the foundation is fully exposed, clean back the exposed faces to allow accurate measurement.
- After recording the foundation arrangement and ground conditions within the trial pit, the pit shall be backfilled with the excavated soil. This soil should be compacted in layers of 100mm thickness until reaching ground level.
- Any finishes or hardscape shall be reinstated after backfilling.

b. Develop a plan showing location of trial pits.

c. Sketch a section through the foundations uncovered at each trial pit. Include the following. (Refer to Appendix for detailed information on how to record soil conditions found in trial pits)

- Measure the depth from ground level to formation level
- Measure the step from the face of the wall to the edge of the foundation
- Measure the depth from ground level to the top of the foundation/step
- Measure the width and height of any intermediate steps (such as brick corbels)
- Make note of all materials used in the foundation build up
- Describe in detail the type of ground found at the base of the foundation



- d. Inspect all foundations/base of walls to identify signs of erosion. Describe how deep it is and, if possible, the likely cause.**

- e. Identify any signs of services leaking close to the foundations.**

- f. Note the condition of foundation materials exposed in trial pits.**

- g. For the building in general, record any signs that could indicate foundation settlement, such as cracks or windows/doors no longer fitting in frames.**

- a. Describe the general materiality, dimensions, and condition of the ground floor (if possible).

- b. Record how the floor meets the walls. Does it appear to run beneath the walls or stop at the face of the wall.

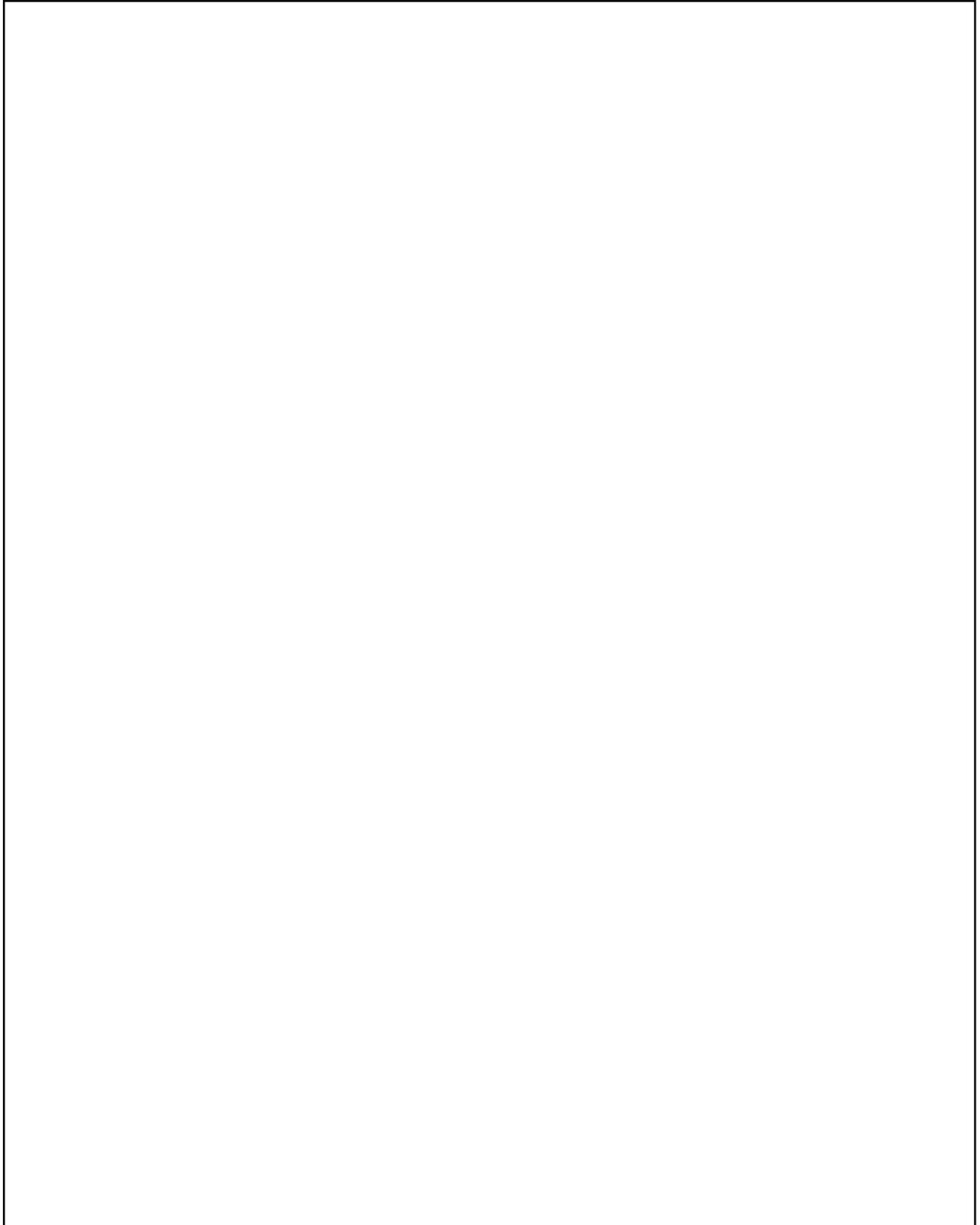
Suspended Floors (if any)

- a. Describe the general materiality, dimensions, and condition of the suspended floor structure.

- b. Try to establish the thickness/structural depth of the suspended floor structure (may require the use of reference points such as windows, etc.).

c. Inspect the underside of the suspended floor structure, if possible. This may require the removal of ceiling panels or looking out for already-removed ceiling panels, at a number of locations.

- Identify any primary structure in the suspended floor, such as beams or trusses. Sketch their general layout, dimensions, note any known reinforcement amounts, and comment on their condition.
- For any elements showing significant defects (such as cracking or spalling of concrete, rusting of steel, rotting of timber), sketch an elevation and identify the location, type, and extent of the defect.



- d. Sketch or photograph how beams meet the supporting walls or columns. Do the beams typically run above the vertical element, or do they sit on a shelf/corbel? Does the arrangement look sufficient for transferring vertical and horizontal loads?**





Roof Primary Structure

- a. Confirm material of primary roof framing.

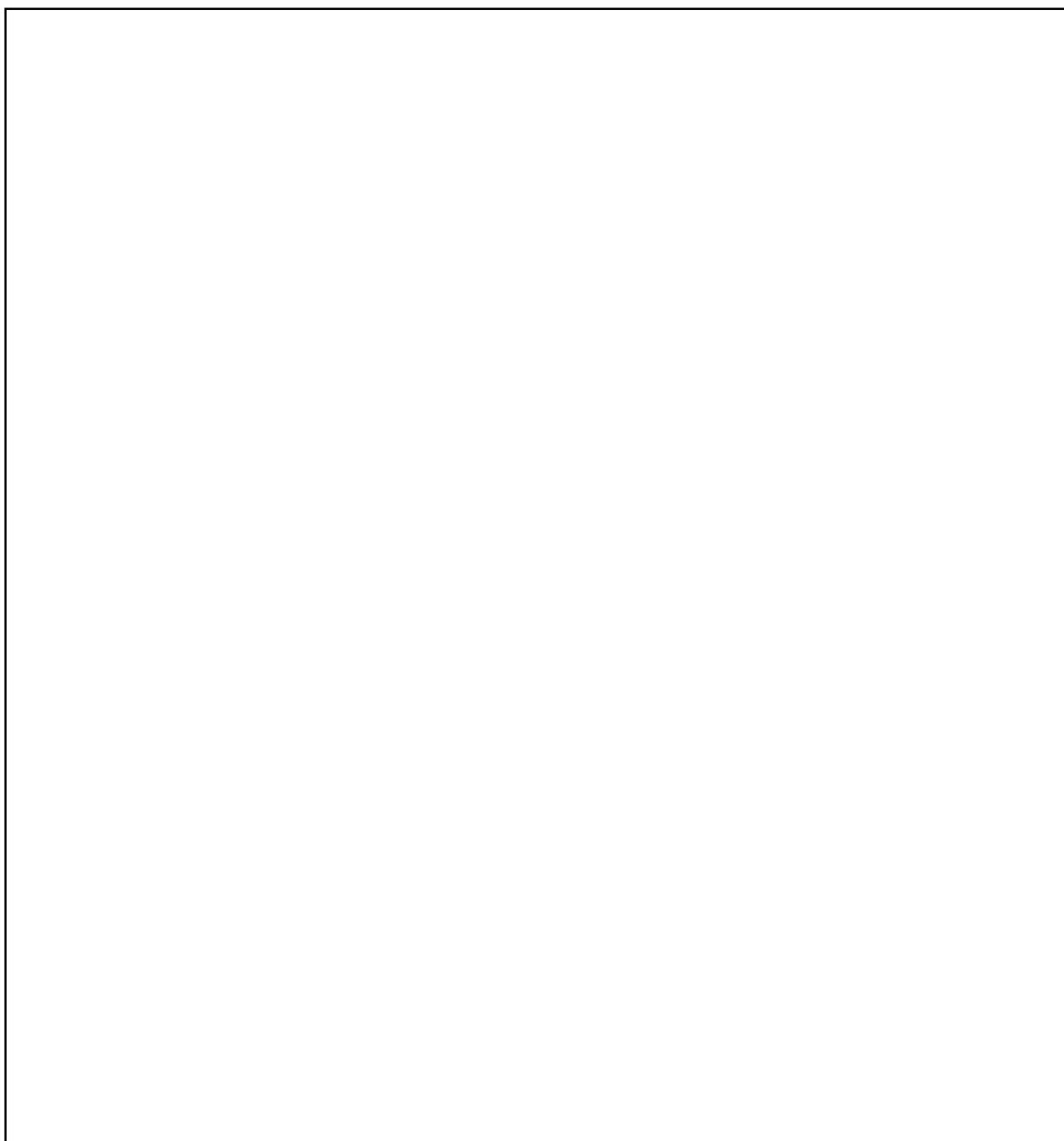
- b. Sketch or photograph how beams meet the supporting walls or columns. Do the beams typically run above the vertical element, or do they sit on a shelf/corbel? Does the arrangement look sufficient for transferring vertical and horizontal loads

- c. Record Defects

- Identify any areas showing excessive deflection (if any) and mark on a plan. (This may be best identified from inside or outside the building)
- Identify any rust, rot, cracking, spalling, or other defects which may be developing in the roof structure and record locations.

d. Sketch an elevation of any visible trusses or roof beams. (Check the boxes below once the relevant information has been recorded.)

- Include overall dimensions including span and height
- Include dimensions of individual elements
- Be sure to sketch the arrangement of trusses accurately (e.g., correct number of internal elements)
- Sketch the typical connections used at junctions between elements
- Mark the location of all connections and where elements are continuous
- Highlight the location of any atypical connections and provide sketches, such as splices half way long a member
- Record any defects such as rot, rust, cracking, spalling, or other signs of deterioration or structural failure



- e. Sketch or photograph how beams/trusses meet the supporting walls or columns. Do the beams typically run above the vertical element, or do they sit on a shelf/corbel? Does the arrangement look sufficient for transferring vertical and horizontal loads?



Roof Secondary Structure (if any)



a. Confirm material of purlins/rafters.

b. Confirm typical dimensions of the purlins/rafters

c. Confirm typical spacing of the purlins/rafters

d. Note the support arrangement onto the primary structure; does it look sufficient?

e. Note any connections at midspan, such as splices. Do these look sufficient?

f. Record Defects.

- Identify any areas showing excessive deflection (if any) and mark on a plan. (This may be best identified from inside or outside the building)
- Identify any rust or rot which may be developing and record locations.



Lateral Stability System and General Seismic Performance

a. Describe the lateral stability system of the building (e.g., masonry shear walls/ reinforced concrete moment frames/steel bracing).

- Note: In many cases, it may be difficult to conclude on a single system. For example, a reinforced concrete frame with tight packed masonry infill may be stabilized both by portalization of the frame and shear wall action of the infill. If this is the case, comment on the likely contribution of each part of the system based on visible sizes/stiffnesses.

b. Rate how well the building follows the following “good practice” seismic design principles. Provide comment or narrative as considered appropriate.

Seismic Design Principle	Poor	Average	Good
Symmetry of lateral stability elements in plan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Uniformity of mass distribution across the building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The building is founded all at the same level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Large steps in the elevation/section profile are avoided	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No re-entrant corners in plan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Walls and partitions are detailed to avoid “short column” effects from developing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There are no “soft stories”	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Floors and roofs appear to form a rigid diaphragm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There appears to be redundancy in the lateral stability system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



a. How would you summarize the general state of the building as a whole, in terms of its resistance to normal loading conditions (dead, imposed, and wind loading). Tick the box that best applies.

- Describe locations on a plan
- Provide a description of each specific area or element and why it is considered to require attention

Location	Description

b. What is the general feeling for next steps in terms of developing the site? Tick the box that best applies.

- Demolish the existing building and build an entirely new structure
- Demolish a portion of the building to make space for new build construction and carry out remediation/strengthening works on the remaining part of the existing building
- Carry out remediation locally and seismic upgrading of the existing structure
 - Implement minor repairs only or leave the building as it is and refurbish

c. If it is considered possible to remediate the existing structure, comment on how extensive the work would need to be to meet safe standards. Comment on the effort/time/cost of remediation compared to building a completely new building instead.

d. If it is considered possible to remediate the existing structure, how much flexibility is there in adjusting the internal layout?

e. If a new building or extension is recommended, where should it be located on the site?

f. What lessons can we learn from the existing building? Are there any aspects of the structural design that we should avoid? Should we use a similar structural system or consider an alternative?

g. Suggested further investigations (List the required locations for each.)

- Measured survey - to establish exact dimensions of building and individual elements (may be due to lack of access to certain areas)
- Collection of concrete core samples - to establish concrete grade/ strength through crushing
- Removal of concrete cover to expose rebar - to establish quantity and layout of reinforcement
- Collection of brick samples - to establish brick strength through crushing
- Collection of mortar samples - to establish mortar strength and mortar mix
- Collection of soil samples - for lab testing of geotechnical properties
- Full geotechnical investigation, including boreholes - to gain a better understanding of underlying ground conditions and properties of soils at depth
- Collection of timber sample - for 4-point bending strength tests and to establish mechanical properties (May require replacement of removed element or propping of surrounding structure)
- Collection of steel sample - for yield strength tests (May require replacement of removed element or propping of surrounding structure)

Site Infrastructure

0



Background

Tools & Equipment

- Printed copies of site plan and colored pens for marking up on site OR a tablet with soft copy site plan for marking up on screen
- GPS device (or phone with GPS mapping app)
- Tape measure

Record Keeping

- Where possible, record x,y coordinates of all site elements using GPS so that they can be plotted onto a site map later on. Note that typical GPS accuracy on plan is around 5-10m, so will not be as accurate as a physical survey using total station
- Take photographs of all civil elements discussed below and note locations of each

1



Grading & Retaining Walls

a. Markup the site plans to show the following. (Check the boxes below once the relevant information has been recorded)

- Overall site grading (e.g., high points, low points, grade directions, and slope estimates)
- Retaining walls (location and height)

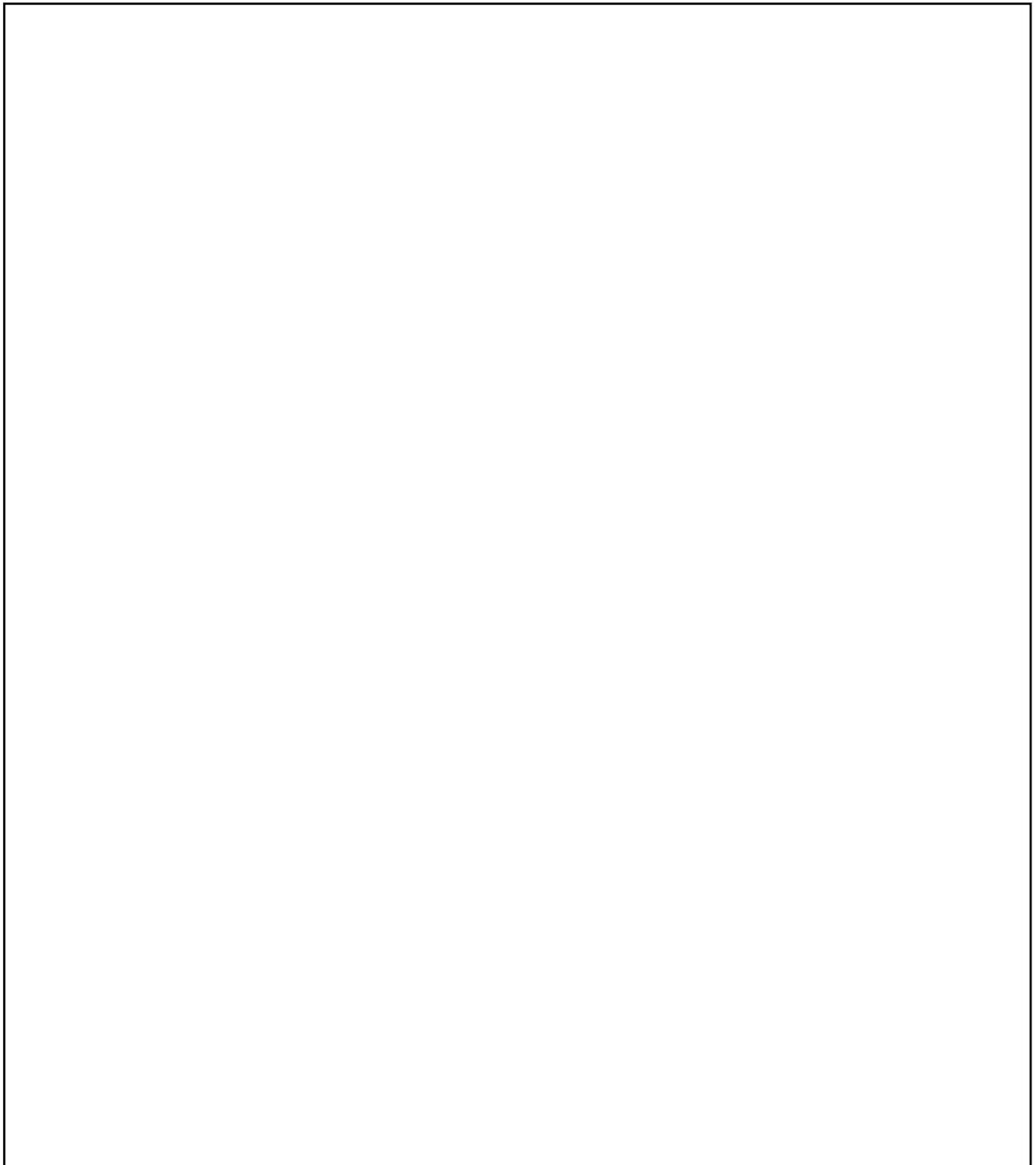
Additional notes/sketches:

Retaining Walls

Include photographs of all retaining walls. Record the following if a topographical survey is unavailable.

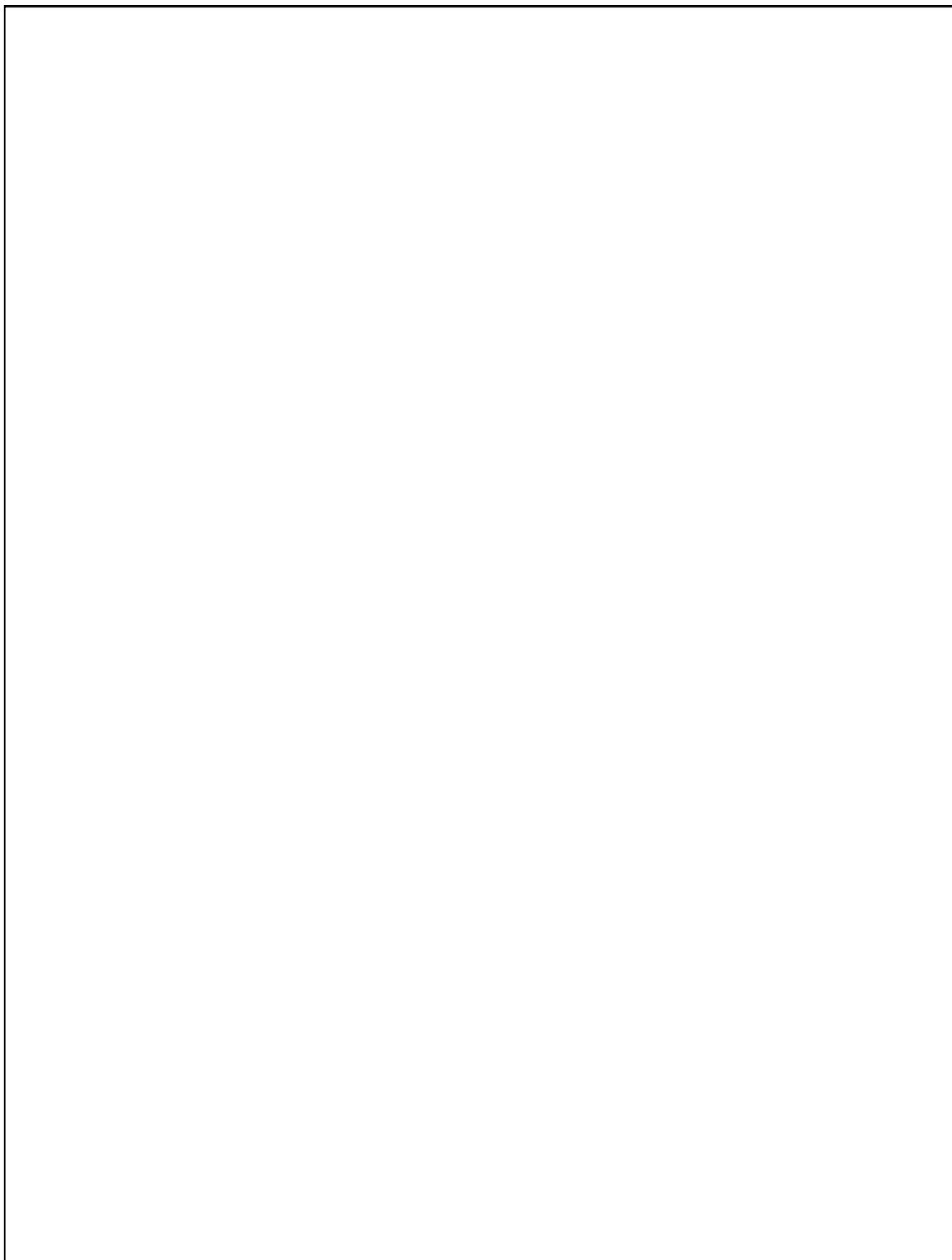
a. For each retaining wall, provide a sketch showing the following:

- Retained height
- Material e.g., dry stone, mortared stone masonry, reinforced concrete
- Slope on front face
- Ground slope behind wall
- Ground slope in front of wall

A large, empty rectangular box with a thin black border, intended for drawing a sketch of a retaining wall. The box is currently blank.

b. Are there any physical defects on the retaining walls? Mark the following on a sketch plan and photograph.

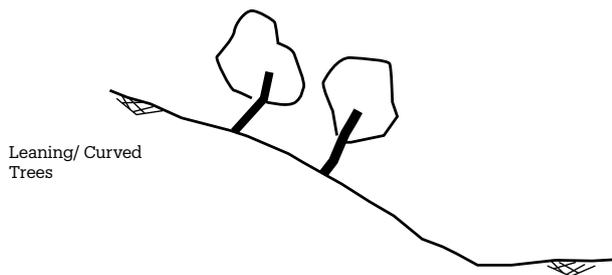
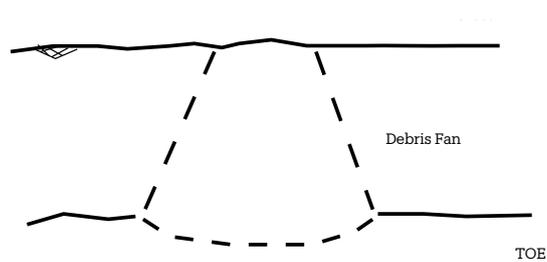
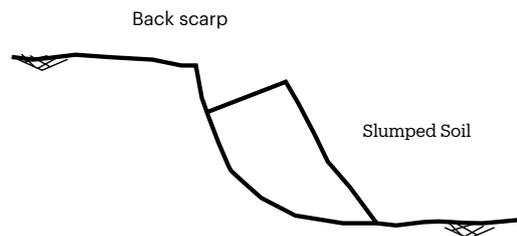
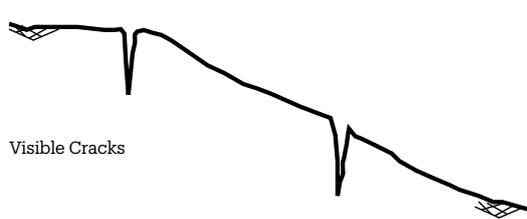
- Cracks
- Settlement behind wall
- Wall tilted/leaning over

A large, empty rectangular box with a thin black border, intended for a sketch plan and photograph of retaining walls. The box is currently blank.

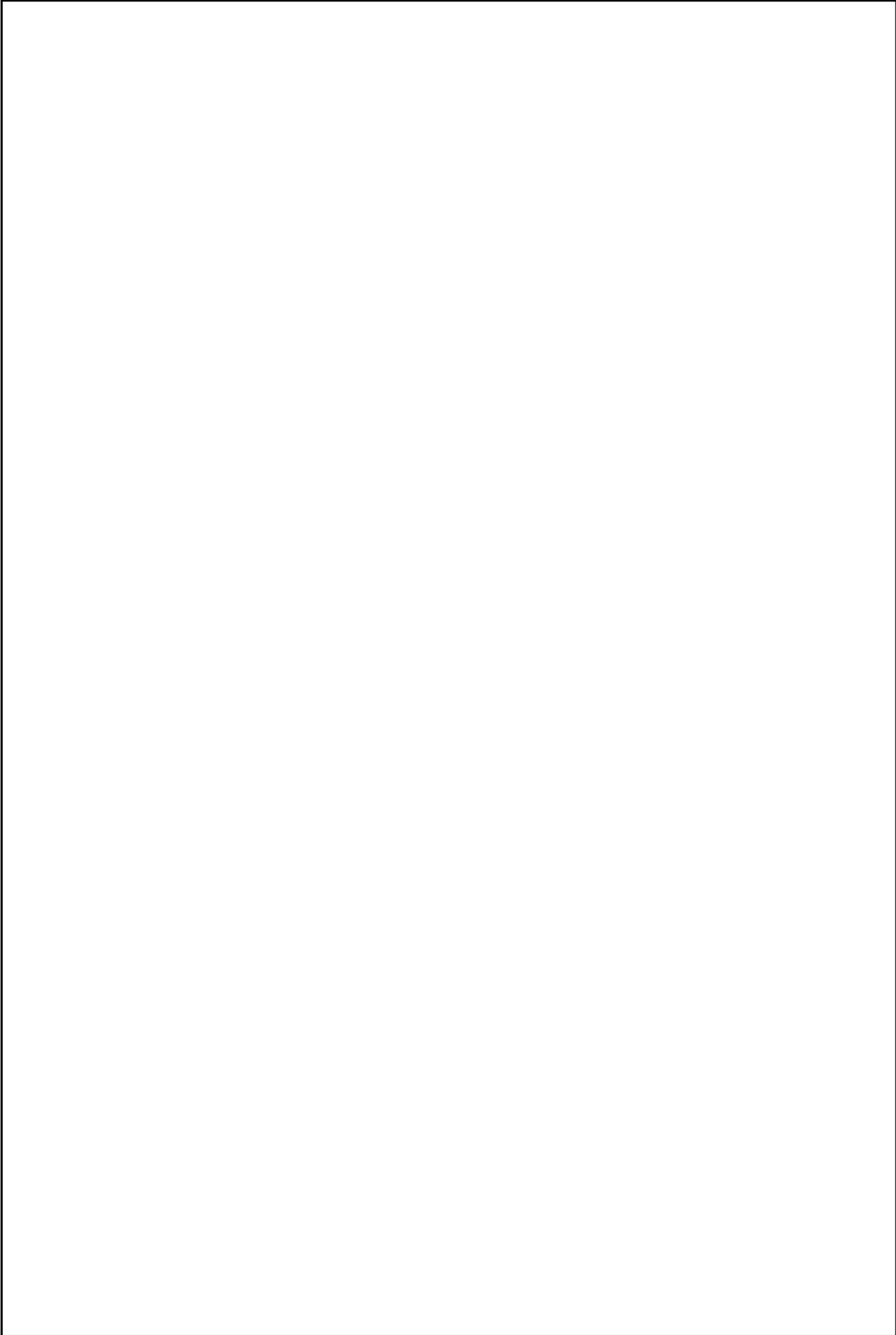
Slopes

a. Do any slopes show signs of instability? Provide photographs, mark on plan, and provide annotated sketches:

- Leaning or curved trees, guardrails, utility poles, etc.
- Debris fans
- Back scarps
- Visible cracks
- Toe erosion



Sketches:



Markup site plan to indicate access roads and parking.

Access Roads

a. Measure the road width.

b. What is the road surfacing material?

c. Is any surface water drainage provided? (circle) If YES, show details on a sketch. (e.g., channel locations, type, and dimensions)

Yes

No

d. Note road condition and any significant defects. e.g., potholes, rutting, erosion, surface cracking)

Parking

a. Number of parking bays (or area in m²).

b. Describe the parking surfacing material.

c. Is any surface water drainage provided? (circle) If YES, show details on a sketch. (e.g., channel locations, type, and dimensions)

Yes

No

d. Note road condition and any significant defects. (E.g., potholes, rutting, erosion, surface cracking)

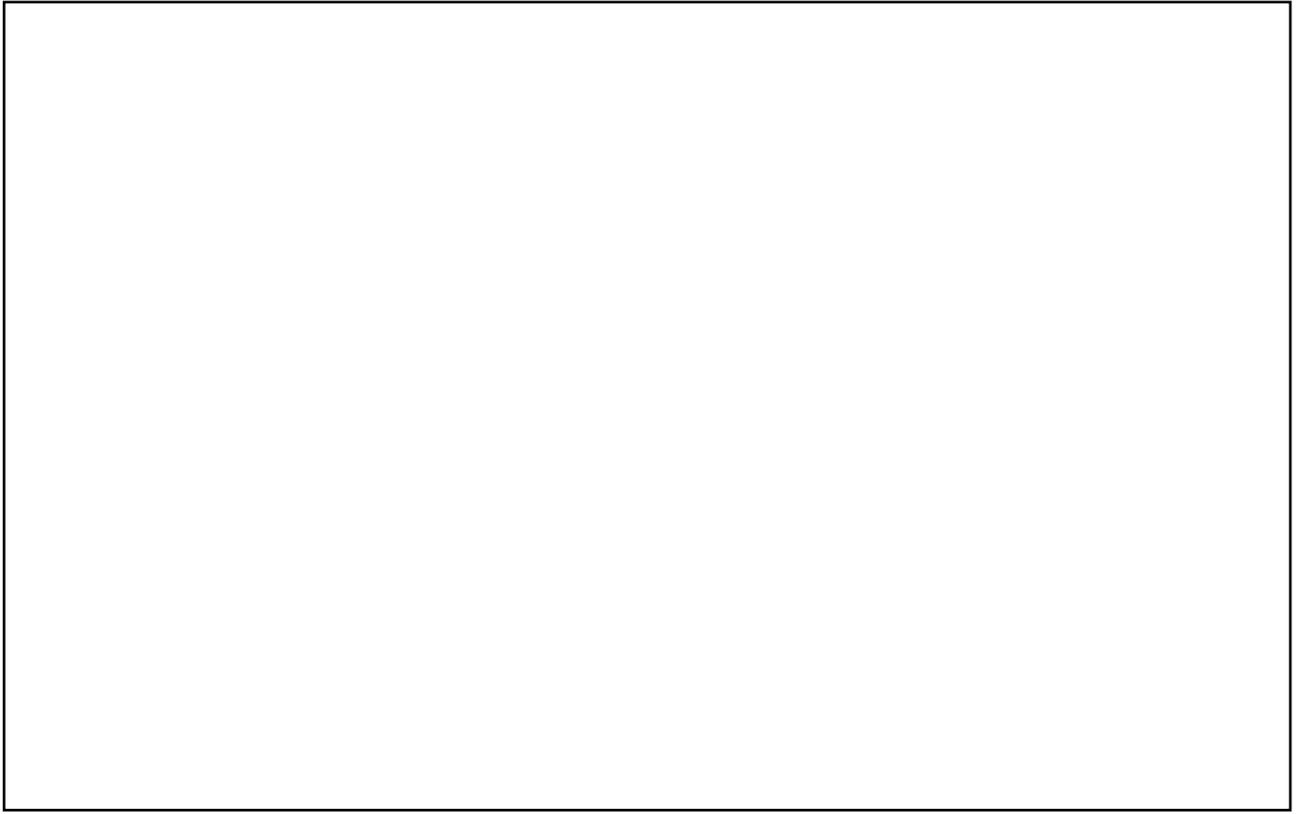


a. Markup the following on the site plan. (Check the boxes below once the relevant information has been recorded.)

- Surface water channels - location, material, dimensions
- Piped surface water drainage - estimate locations based on manholes or facilities
- Manager knowledge
- Manholes/chambers
- Discharge locations (on or off site)
- Soak pits
- Other

Flooding and Erosion

- a. Note and photograph any areas of erosion.



Roof Drainage

- a. Does this building have gutters? Does it have downspouts?



- b. Does roof drainage combine with surface water? Where does the water collected from the roof go?



Surface Channels

a. Fill in the following table and provide description/annotated sketches.

Description	Material	Dimensions	Condition

Piped Drainage

a. Pipe material

b. Typical pipe diameter

c. Typical depth

Water Disposal

a. Check the site disposal method. (Tick all that apply)

- Surface discharge (on site)
- Surface discharge (off site)
- Soak pit
- Other

b. Photograph surface discharge (on site or off site) and describe. (e.g., Structure type)

c. Does the discharge cause any problems downstream? (e.g., Erosion or flooding)

d. Provide description, photographs, and annotated sketches for other water disposal methods.



a. Do buildings have rainwater collection?

b. Number and size of tanks.



a. Markup a site plan with the following. (Check the boxes below once the relevant information has been recorded)

- Generator
- Fuel store
- Solar PV panels

Additional notes/sketches:

Water Supply



Background

This section is intended to guide the user through a preliminary investigation of the water supply. The aim is to understand:

1. How water is supplied, stored and distributed
2. What the quality of water is
3. How reliable the water supply is
4. What plumbing fixtures and hygiene facilities exist
5. Who maintains the systems and their expertise
6. The current challenges and priorities



Water Supply

During site & facility inspection, verify information obtained from facility manager interview. Note any discrepancy/confusion for further discussion. Take photographs of all key elements.

a. Markup the site plans to show the following. (Check the boxes below once the relevant information has been recorded)

- Location of source/point where water is brought onto site
- Storage tanks (above and below ground)
- Booster pumps
- External taps

Additional notes/sketches:

Cold Water Services



2

a. Prepare a mark-up or sketch of the water services in the building or area under assessment. Include the following, if possible:

- Location of incoming water and valve arrangement
- Pipework distribution and pipe sizes (if they can be determined)
- Location of water appliances
- Location of meters
- Locations of water treatment
- Details of appliances and equipment, including manufacturer, model, serial number
- Location of damage, leaks, aging, etc.

Hot Water Services



3

a. Prepare a mark-up or sketch of the water services in the building or area under assessment. Include the following, if possible:

- Location of hot water appliances
- Location of hot water generators
- Details of appliances and equipment, including manufacturer, model, serial number, if this information can be seen
- Location of damage, leaks, aging, etc.

Wastewater & Sanitation



Background

This section is intended to guide the user through a preliminary investigation of the wastewater and sanitation system. The aim is to understand:

1. The sanitary standard of toilets and shower facilities
2. How foul waste is separated, conveyed, stored, and treated
3. Who maintains the systems and their expertise
4. The current challenges and priorities



Sanitation, Wastewater Treatment & Disposal

During site & facility inspection, verify information obtained from facility manager interview. Note any discrepancy/confusion for further discussion. Take photographs of all key elements.

a. Markup the site plans to show the following. (Check the boxes below once the relevant information has been recorded)

- Pit latrines
- Wastewater treatment
- Wastewater disposal

Additional notes/sketches:



a. What kind of toilets are used, and what is their sanitary condition?

- Pit latrines
- Pour flush pit latrines
- Composting toilets
- Flushing toilets (WC)
- Other

Describe their condition:

b. Describe any problems: (e.g., overloading, blockages)

c. What type of showers are used, and what is their condition?

- Bucket showers (external bathroom)
- Bucket showers (internal bathroom)
- Plumbed shower
- Other

Describe their condition:

d. What provision is made for hand-washing?

e. Describe provision for menstrual hygiene.

3



Water Treatment & Disposal

a. For any treatment system, sketch and give details. (e.g., Size, materials, construction)

b. For any disposal system, sketch and give details. (e.g., Size, materials, construction)



g. Prepare a mark-up or sketch of the water services in the building or area under assessment. Include the following, if possible:

- Location of building level collection and treatment
- Drainage pipework distribution and pipe sizes
- Location of sinks, basins, toilets, showers, etc.
- Vent locations
- Clean out/rodding eye locations
- Details of equipment, including manufacturer, model, serial number
- Types of traps
- Condition of systems and location of areas of damage, disrepair, significant aging, etc.

Solid Waste



Background

This section is intended to guide the user through a preliminary investigation of the site solid waste management. The aim is to understand:

1. How medical waste is separated, transported, and disposed
2. Who maintains the systems and their expertise
3. The current challenges and priorities



Solid Waste Management

During site & facility inspection, verify information obtained from facility manager interview. Note any discrepancy/confusion for further discussion. Take photographs of all key elements.

a. Markup the site plans to show the following. (Check the boxes below once the relevant information has been recorded)

- Waste sorting/storage areas
- Waste disposal (burning, burial, etc.)
- Placenta pits
- Sharps pit

Additional notes/sketches:

Additional notes/sketches:

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Air Quality & Comfort



Background

This section is intended to guide the user through a preliminary investigation of the air quality, comfort, and HVAC systems in the buildings. The aim is to understand:

1. Air quality and ventilation in terms of basic ventilation needs, comfort, and airborne disease infection control.
2. Thermal comfort across the spaces (e.g., Do some area overheat or get too cold regularly?)
3. What user and cultural preferences need to be considered
4. What spaces have mechanical HVAC systems, and how are they operated and maintained
5. The challenges and priorities for improvement



Solid Waste Management

During site & facility inspection, verify information obtained from facility manager interview. Note any discrepancy/confusion for further discussion. Take photographs of all key elements. Obtain the latest architectural information for the building including floor plans, sections, elevations, and typical details, where available, and use these to mark-up and sketch observations.

- a. Describe or sketch the main/typical assemblies. Include details of thermal characteristics, if known. (e.g., Thermal conductivity, density, specific heat capacity)

i. Walls	
Material?	

Build up?	
Insulation?	

ii. Floors	
Material?	
Build up?	
Floor finish?	
Insulation?	

iii. Roof	
Material?	
Build up?	
Roof finish/ material?	
Insulation?	

iii. Roof	
Framing material?	
Glazing type? (single/double)	
Opening type?	
Mosquito net?	
Louvers?	

iv. Doors	
Material?	
Presence of glazing?	

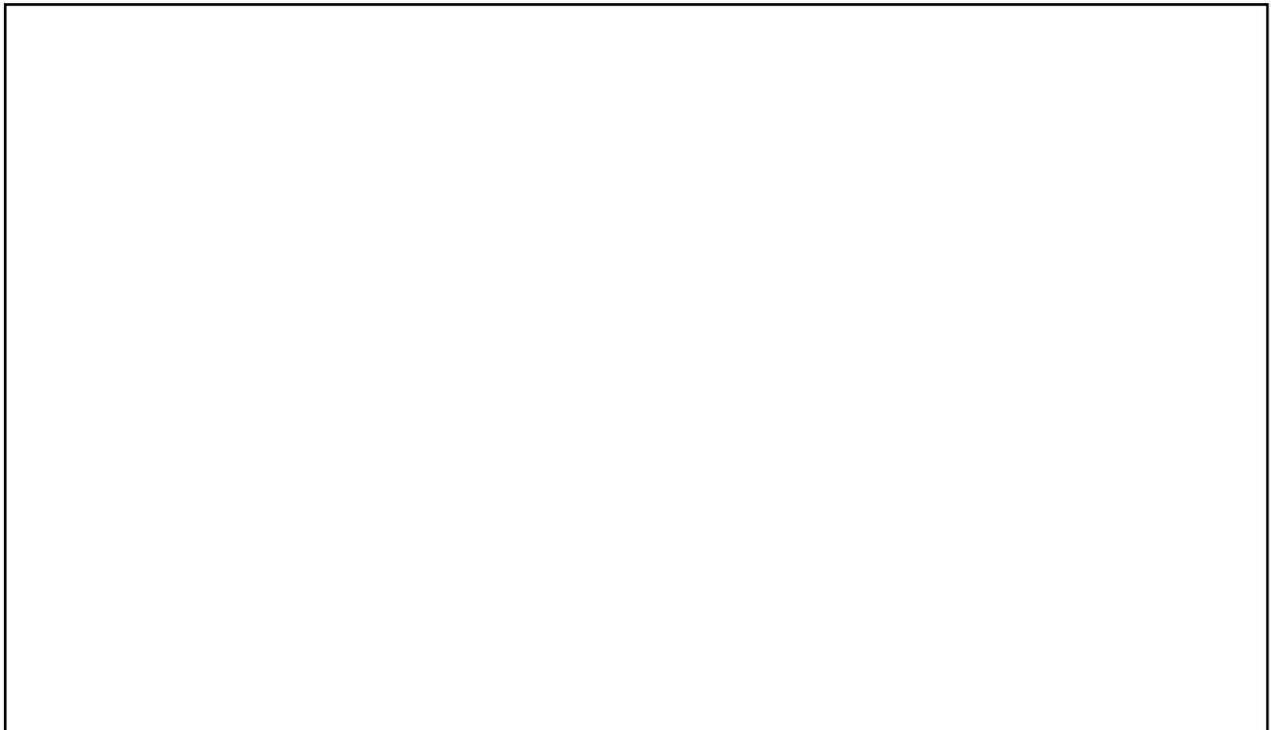
b. Identify and describe any solar shading (locate them on the architectural plans and include photos). Check the boxes below if the following features have been identified.

- Internal blinds or curtains
- External fixed overhangs or fins
- External operable shutters
- Others



a. Using the architectural plans (if available) mark-up the location, size, and characteristics of facade openings (windows, vents, louvers, doors). Include the following:

- Photos of openings
- Descriptions/sketches/photos of opening type and characteristics (e.g., top hung 30-degree opening angle)
- Orientation and dimensions
- Details of any internal or external obstructions to air flow (e.g., mosquito nets, adjacent structures)
- General quality and condition
- Main natural ventilation type in each space (e.g., single sided, cross ventilation, stack ventilation)



Heating, Ventilation & Air Conditioning (HVAC)



a. If present, mark-up or sketch document and prepare sketches of the heating, ventilation, and air conditioning systems, including the following, wherever present and available:

- Equipment locations and details, including manufacture, model, and serial numbers
- Ductwork and pipework material, routes, and sizes
- Locations and size of supply and extract grille, intake, and exhaust
- Age and condition of the system
- System controls, such as local switches/speed controllers, sensors (motion, temp, CO2), time clocks, BMS
- Functionality of grilles/louvers, their air flow direction, and air velocity, if possible*

*Use a thin piece of paper against any ventilation grilles to determine the direction of the air flow. An anemometer can also be used to take the air velocity. Ensure the size and type of grille is documented, too.

4



Other Systems

a. Document and provide details of any other systems not captured above. Check the boxes below if the following features have been identified.

- Dehumidification systems
- Humidifications systems
- Liquid Petroleum Gas
- Other

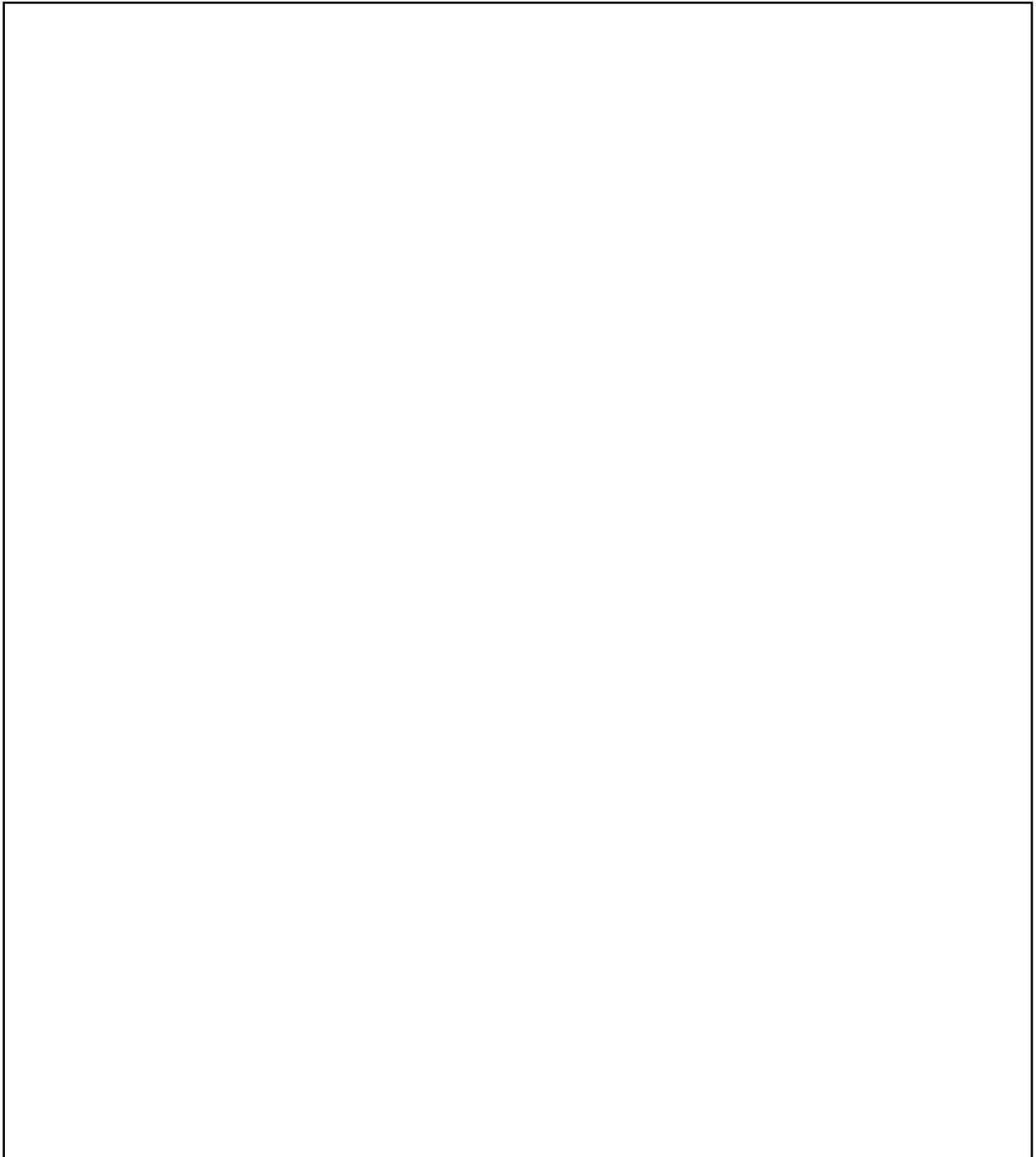
Notes/sketches:

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Medical Gas

a. Describe and sketch the following. Check the boxes below if the following features have been identified.

- Freestanding canisters
- Pipework
- Central tanks
- Control units
- Equipment, materials, manufacturers, model, etc.





This section is intended to guide the user through a preliminary inspection of the electrical engineering strategy and infrastructure on site. Key goals of this assessment include:

Electrical Systems

- 1. Understanding how the electrical system in the maternity unit relates or ties into the electrical provision across the entire facility.**
 - Identifying the location of Medium Voltage (MV) and Low Voltage (LV) lines.
 - Understanding the Low Voltage (LV) reticulation strategy for the maternity unit and for other buildings within the same compound.
- 2. Understanding how the power is supplied and at what capacity. (Main power supply, any supplemental, like solar)**
 - Evaluating peak load and the available capacity from the grid.
 - Investigating meter type and reading.
 - Evaluating the state of backup systems.
- 3. Evaluating electrical needs in the facility and listing types of equipment that the facility requires.**
 - Understanding equipment power demand.
 - Identifying equipment and establishing a list of current and future equipment needs.
- 4. Investigating the reliability of the power systems.**
 - Understanding how frequent network outages are and the assumed reasoning for outages.
 - Identifying whether power failure is a local, district, or national issue.
 - Evaluating if backup power systems are sufficient.
- 5. Understanding if loads are balanced appropriately.**
- 6. Evaluating if the current electrical systems are inefficient or unsafe.**
 - Investigating if there have been issues relating to excessive voltage drop.
 - Understanding maintenance routines and potential shortfalls.
- 7. Understanding the facility's electricity costs.**

Lighting

- 1. Evaluating the effectiveness of the lighting system.**
 - Quantifying the number and quality of lighting fixtures both inside and outside of the facility.
 - Evaluating if the lighting performance is affected by electrical supply/distribution.
- 2. Mapping the required light levels for each space within the maternal health facility.**
- 3. Investigating if natural daylighting is sufficient for any of these spaces during the day (take into account lighting needs and building orientation).**
 - Measuring the current natural and electrical light levels using a light meter.
- 4. Understanding the ability to control local and global lighting for the comfort of patients and work lighting for clinicians.**
- 5. Concluding if the facility's lighting is being maintained/up-kept.**



Source of Electricity

Obtain the latest architectural information for the building, including floor plans, sections, elevations, and typical details, where available. Reference the site plan included in this Assessment booklet, where necessary.

a. What power sources exist on site? Tick all that apply, and then fill out the relevant tables:

- Direct connection on low voltage
- Connection on an MV Line through distribution transformer
- Solar PV system
- Diesel generator
- UPS

b. Fill in the following table pertaining to grid supply. (Direct connection on the low voltage network in the site vicinity)

Grid Supply No. Of Phases Supply Voltage Supply frequency

E.g. 3 phases supply		E.g. Live to live: 400 volts Live to neutral: 230 volts	E.g. 50 Hz

Locate the point of interconnection to grid on the site plan.

c. Fill in the following table pertaining to grid supply. (Connection on an MV line through a distribution transformer)

Capacity (kVA)	No. of Phases	Primary voltage (V)	Secondary voltage (V)
E.g. 200kVA	E.g. 3 phases supply	15 000 V	E.g. Live to live: 400 volts Live to neutral: 230 volts

Locate the transformer on the site plan.

d. Fill in the following tables pertaining to Solar P.V. System.

Solar P.V	P.V. Array size (kWp)	Inverters	Batteries
	E.g. 200 kWp	E.g. YES	E.g. 300Ah

Maintenance and service records	Condition (in use/faulty)	Spare capacity, if known (to accommodate future load)
E.g. Available (refer to pictures)	E.g. in use	E.g. 20%

Locate the P.V. System on the site map.

Diesel Generator

e. If the site is equipped with a diesel generator, identify the following:

Diesel Generator	Set capacity (kVA)	No. of Phases	Supply voltage
	E.g. 200 kWp	E.g. 3 phases supply	E.g. Live to live: 400 volts Live to neutral: 230 volts

Fuel storage	Maintenance and service records	Condition (in use/faulty)	Spare capacity
E.g. 500 litres, 2 days autonomy	E.g. Available (refer to pictures)	E.g. in use	E.g. 20%

Locate the diesel generator on the site plan.

f. Note the intended use of the diesel generator. (e.g., Grid backup at 100%)

Uninterruptible Power Supply (UPS)

g. If the facility is equipped with a centralized UPS, identify the following.

UPS	Capacity (kVA)	No. of Phases	Supply voltage
	E.g. 50 kVA	E.g. 3 phases supply	E.g. Live to live: 400 volts Live to neutral: 230 volts

Intended use	Condition	Maintenance records
E.g. power backup for life supporting equipment	E.g. in use	E.g. Available (refer to copies of maintenance report)

Locate the UPS on the site plan.

Site Wide Power Reticulation



2

Site Main Distribution Board (SMDB)

Location of the SMDB on the site plan. Take a clear photo of the SMDB and any visible labels on the various components. Access the SMDB to identify the following:

- a. The main circuit breaker type and ratings.** (This should be written on the circuit breaker itself)

E.g. 300 Amps, TPN

- b. The surge protective device type and its rating, if installed.** (This should be written on the circuit breaker itself)

E.g. Type 1 SPD

- c. Identify the circuit breaker supplying the Maternity Unit block and record its ratings.** (This should be written on the circuit breaker itself)

- d. Note organisation of the components: neatness of the cabling, sufficient space to accommodate new components, etc.**

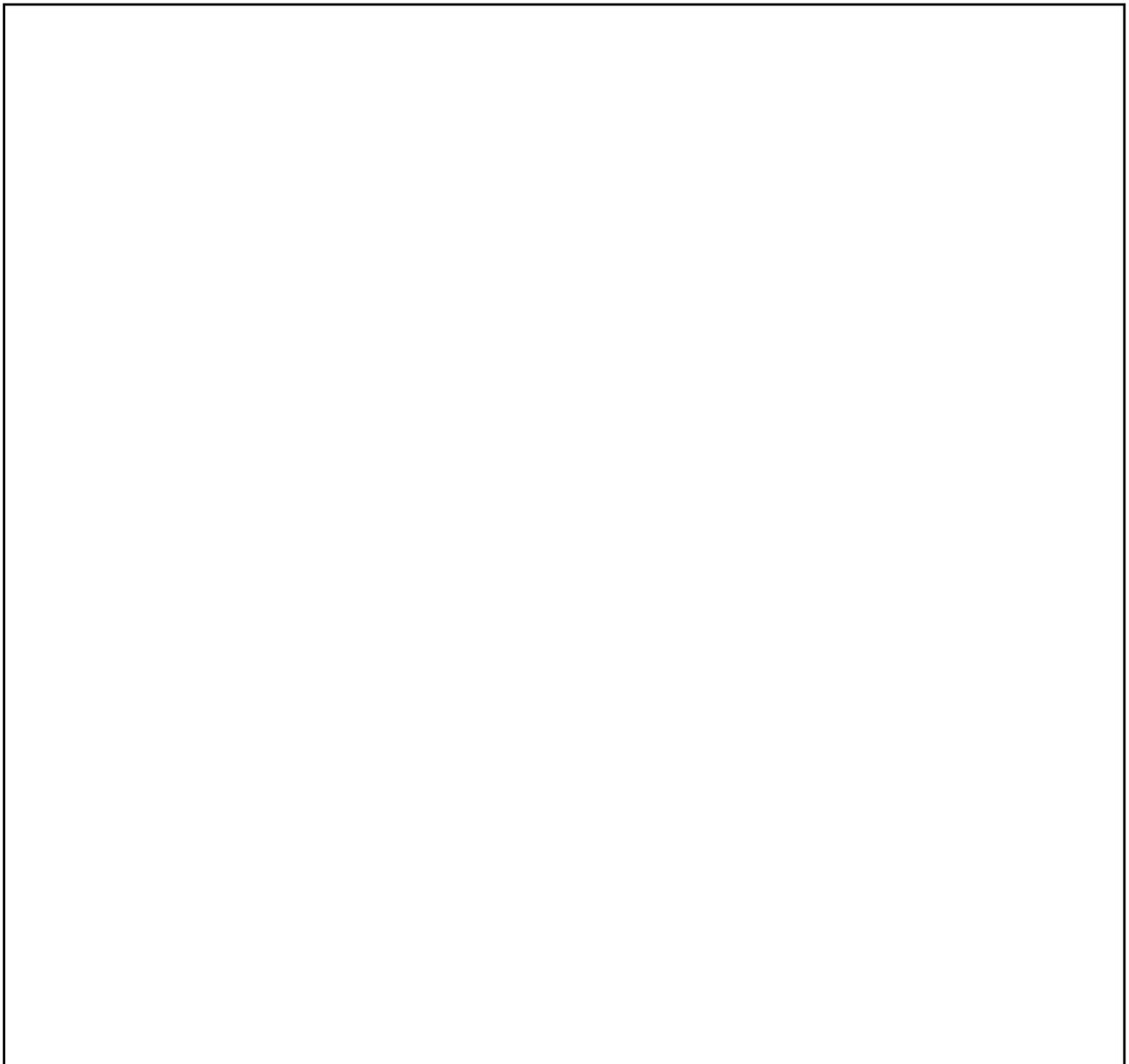
E.g. DB full of components, no spare space for new components

Cable Reticulation

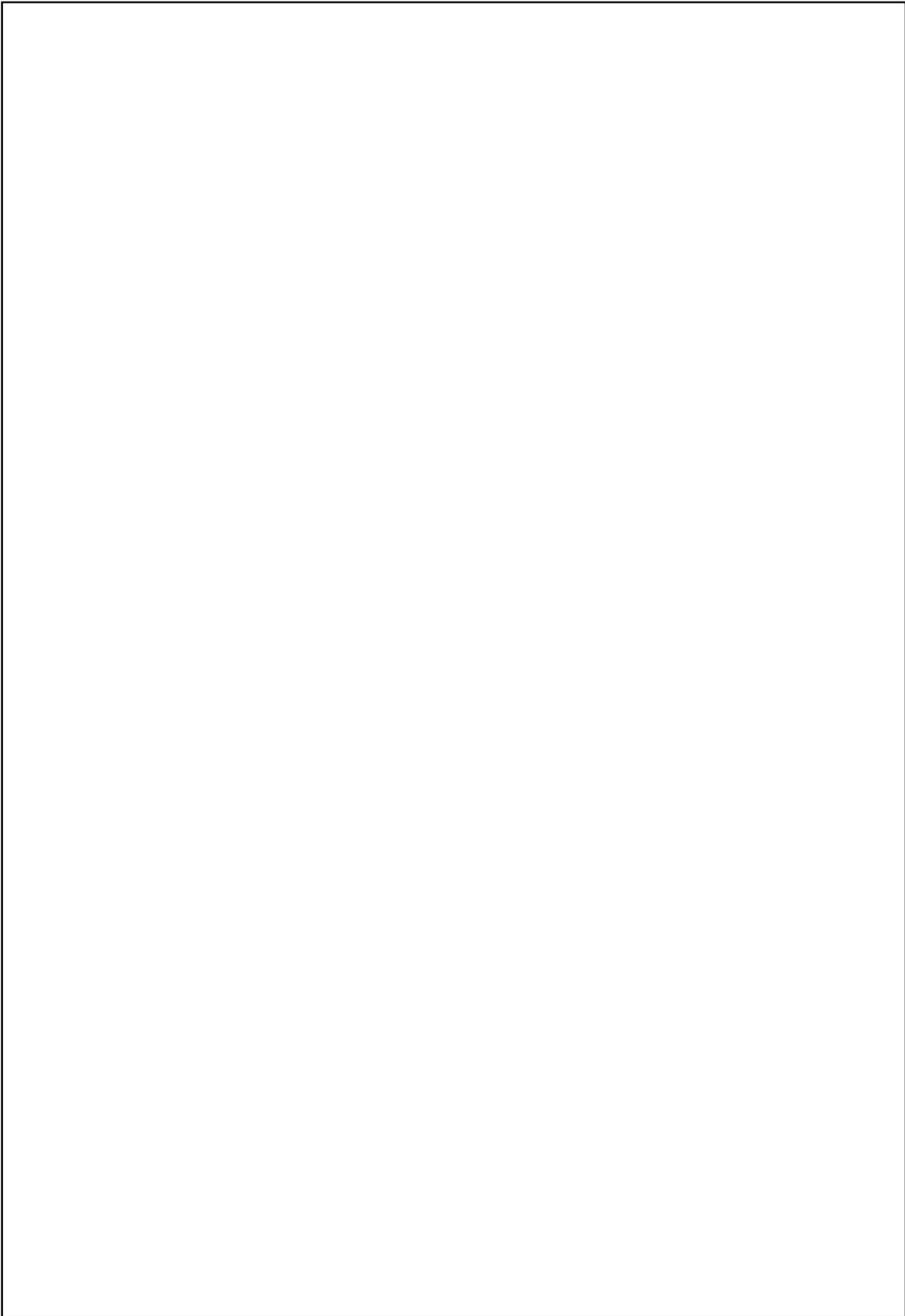
How to determine the method of cable installation:

- On the accessible section/length of the cable, identify the type of cable used.
 - This cable may be visible below the site main distribution board or at the point of connection to the grid, or in any overhead cables approaching the site”
- Take a clear photograph of the cables where they are accessible, be sure to include any information written on the cable:
 - a. Number of conductors: single core vs multi-core cables
 - b. Estimate the diameter if the cross section is not written down
 - c. Cross section area of the conductor: mm²
 - d. Type of conductor: copper vs aluminum
 - e. Type insulation: PVC vs XLPE vs none (non-insulated)
 - f. Is the cable armored: Yes or No (cable buried directly must have an armor in a form of steel wire as a mechanical protection)

e. From the grid to the SMDB, ask/confirm the method of cable installation.



f. From the SMDB to the Maternity block DB, ask/confirm the method of cable installation.



**Main Distribution Board (MDB)**

a. For each building of interest, access the MDB and identify the following:

- Repeat the above for all Distribution Boards in the building of interest
- Take a picture of the DB when closed and opened
- Locate the MDB on the building layout

b. Note the location of the MDB.

c. The main circuit breaker type and ratings.

(This should be written on the circuit breaker itself)

E.g. 125 Amps, TPN

d. The surge protective device type and rating (if installed).

(This should be written on the circuit breaker itself)

E.g. Type 2 SPD

e. Note the organisation of the components: neat cabling, sufficient space to accommodate new components, etc.

E.g. Spare capacity available

- f. Identify if the protection against electric shock is provided in the MDB. This is achieved through Residual Current Devices (RCD) or equivalent.**

E.g. RCD or RCBO in use

- g. Report any other findings (as applicable).**

E.g. The DB is located in a confined space and is in good shape. Consider reusing it.

Cable Reticulation

Identify the cable reticulation strategy, as follows. (Take pictures where possible to illustrate the condition of the system)

- h. Recessed conduits**

E.g. conduits carrying services to sockets and switches are recessed generally.

- i. Surface mount conduits**

E.g. conduits carrying services to sockets and switches are recessed generally.

j. Cable tray/baskets

E.g. None

k. Cable/wires directly clipped on the walls

E.g. Observed in a few instances

l. Report any other finding (as applicable)

E.g. Observed in a few instances

Electric Lighting

Identify the following:

m. The types of the lamps in use (incandescent, fluorescent, LED, etc.)

E.g. fluorescent lamps are mainly used, even though a few incandescent bulbs exist

n. The form (linear, bulbs, etc.)

E.g. Mainly linear

o. Identify the lighting control system (manual switch on/off or other)

E.g. Manual switching mainly

p. If possible, find the product description for a few lamp samples

q. Report any other findings (as applicable):

- Electric lamps flickering and accelerated aging as a result of excessive voltage drop in the circuits
- Intensive use of electric lighting during the day in some spaces due to closing the blinds to limit the glare from daylight
- Electric lighting maintenance: frequency for replacing the faulty lamps and for cleaning the lamps (for example, once a year)

Small Power

Where possible, identify the following: (Take pictures where possible to illustrate the condition of the system)

s. The types of general purpose sockets in use (BS plugs, universal plug, etc.)

E.g. Sockets of BS plugs are used but the end user would appreciate using multi standard plugs

t. Report any other findings (as applicable)

General Earthing

u. Confirm if the electrical installation in the building is provided with an earthing system, as follows:

- Access the general earthing electrode, if possible, and take its picture.
- Find where the general earthing electrode connects to the MDB. Normally this happens on the main equipotential bar. Take a picture.
- Locate the general earthing electrode on the building layout.

v. Report any other findings (as applicable)

Lightning Protection System

w. Confirm if the building or the site is equipped with a lightning protection system (LPS). The LPS is comprised of the following:

- Take a picture for any provision accessible, where possible
- Locate different provisions on the building layout sketch
- The above is only necessary if there is a potential to reuse existing components

x. An air terminal

E.g. There is a mesh system on the roof (as reported)

y. The down-conductors

E.g. A few down conductors are located randomly

z. The earthing electrodes

E.g. No inspection chamber for the LPS earthing is observed.

aa. Report any other findings (as applicable)

E.g. Consider designing a new earthing system

Fire Detection and Alarm System (FAS)

ab. Check if the existing facility has any FAS in place that can be reused. Determine if any of the provisions listed below are in place and in a good condition.

- Take a picture of any provision accessible, where possible
- Locate different provisions on the building layout sketch
- The above is only necessary if there is a potential to reuse existing components

Item	Condition
Smoke detectors	
Heat detectors	
Manual Call Points	
Fire Alarm Panel	

General

Further inquiries should be conducted regarding the following:

ac. What is the general feeling for next steps in terms of developing the site?

(Recommendation on electrical installation renovation)

Replace the entire electrical installation of the maternity block	<input type="radio"/> YES / <input type="radio"/> NO
Replace only a portion(s) of the installation that is defective (e.g., the lamps, the sockets and switches, the wires. etc.). This may be the best option if the full electrical system was renovated recently.	<input type="radio"/> YES / <input type="radio"/> NO

ad. Preliminary/preparation works

- The rehabilitation of the facility more generally, and electrical installations particularly, requires temporary cessation of facility use. Discuss with facility managers whether and how services in the portion of the building that is being renovated could be halted or relocated for the duration of the renovation.
 - Here we want to understand if there is some preliminary work required to allow/support the continuity of the services to the public during the rehabilitation of the maternity block.

ae. Power supply alternative

- Given the operation of the facility and its maintenance cost management, would a dedicated power supply to the maternity unit, including also a dedicated power backup, be a good option? If yes, what power backup source would be more suitable (diesel generator, PV system)?

af. Lessons learned

- Report the lessons learned from the existing facility related to the observed deficiency in the existing system, from the end user experience.

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ag. Further investigation to suggest:

- Any existing LV infrastructure within the site dedicated to the reticulation of the power to the maternity unit, and expected to remain in use after the renovation, should formally be inspected according to the building code/standards from an authority having jurisdiction in the location of the project.
- Ask/confirm if the facility underwent a formal inspection of the electrical installations in the past, and report the general recommendations.

--

ah. Voltage drop and load balancing assessment

- If the facility is equipped with an energy meter feature to allow the reading of current intensity, voltage and power factor on each phase, ask when the facility runs at a peak and do spot readings of the intensity, the voltage and the power factor. Note that load balancing exists in multi-phase voltage supply. If the facility is supplied in single phase voltage, one reading of the voltage and another for the current will suffice.

I1 (A)	<input type="radio"/>
I2 (A)	<input type="radio"/>
I3 (A)	<input type="radio"/>

V12 (volts)	<input type="radio"/>
V13 (volts)	<input type="radio"/>
V23 (volts)	<input type="radio"/>

ai. Note Power Factor (%)

Notes/sketches:

Appendix

1



Guidance on Trial Pit Logging

a. Recording/reporting

- Photograph side walls of pit and the foundation (with a tape measure for scale)
- Photographs of the soil in your hand
- Short videos of the excavation, if possible
- Annotated sketches for each pit showing how the soil changes with depth
- Annotated sketches showing the foundation (dimensions, depth, materials, notes on condition)
- Record what tool is used for digging and the effort required (e.g., easy digging with hoe; hard digging with pick; etc.)

b. Soil Description

- Describe the type, consistency, color, moisture content of soil at each depth.
- *(All these tables taken from NZ Geotechnical Society, Field Description of Soil and Rock. <https://ir.canterbury.ac.nz/bitstream/handle/10092/4287/Appendix%20B%20NZ%20Geotechnical%20Society%20Field%20Description%20of%20Rock%20and%20Soil?sequence=5&isAllowed=y>)*

c. Type (e.g., Gravel, sand, silt, clay)

- Coarse/Granular soils - particles will be easily visible by eye. Soil does not roll to a ball when wet (no cohesion).
- Fine/Cohesive soils - particles not visible by eye. Soil rolls to a ball when wet. Soil sticks to hands.
- Note any signs of organic content - (e.g., roots, visible organic matter, or an organic/marshy smell).
- Record any larger cobbles/boulders you find.
- Soil may be a combination - (e.g., clay with sand or gravel).
- Carry out simple hand tests and record results (see Appendix A).
- If you encounter rock, note the depth and color. Also useful to know if it is possible to chip it with a pick or to break pieces off with your fingers.

TYPE	COARSE									FINE		ORGANIC
	Boulders	Cobbles	Gravel			Sand			Silt	Clay	Organic Soil	
			coarse	medium	fine	coarse	medium	fine				
Size Range (mm)	200	60	20	6	2	0.6	0.2	0.06	0.002	Refer to Section 2.3.5		
Graphic Symbol												

d. Consistency

- This is an attempt to describe the strength or density of the soil in the ground/in situ (i.e., in the walls or base of the pit)
- Cohesive soils (silts/clays): Use your hands to check against the “diagnostic features”
- Granular soils (sands/gravel)

Table 2.9 Consistency Terms for Cohesive Soils

Descriptive Term	Undrained Shear Strength (kPa)	Diagnostic Features
Very soft	< 12	Easily exudes between fingers when squeezed
Soft	12 – 25	Easily indented by fingers
Firm	25 – 50	Indented by strong finger pressure and can be indented by thumb pressure
Stiff	50 – 100	Cannot be indented by thumb pressure
Very stiff	100 – 200	Can be indented by thumb nail
Hard	200 – 500	Difficult to indent by thumb nail

Loosely packed: Can be removed from exposures by hand or removed easily by shovel.

Tightly packed: Requires a pick for removal, either as lumps or as disaggregated material.

e. Color

Table 2.5 Colour Terms

1	2	3
light dark	pinkish reddish yellowish brownish greenish bluish greyish	pink red orange yellow brown green blue white grey black



Soil hand tests

a. Ball test

- Take a small handful of soil and slowly add water while mixing in your hand. You are aiming for the consistency of mashed potato/ugali, not soup!
 - * Try to roll the soil to a ball in your hands.
 - * Record whether it's possible to roll to a ball.
- If it will roll to a ball:
 - * Is the surface of the ball shiny or matte/dull?
- Then squeeze the ball in your fingers.
 - * Does it feel smooth or crunchy?
 - * Can you feel soil particles moving over each other?

b. Thread test

- Take a small handful of soil and slowly add water while mixing in your hand.
- Try to roll the soil into a long, thin thread between the palms of your hands.
 - * Can you roll to a thread about 6mm diameter?
 - * How long can you make the thread before it breaks?

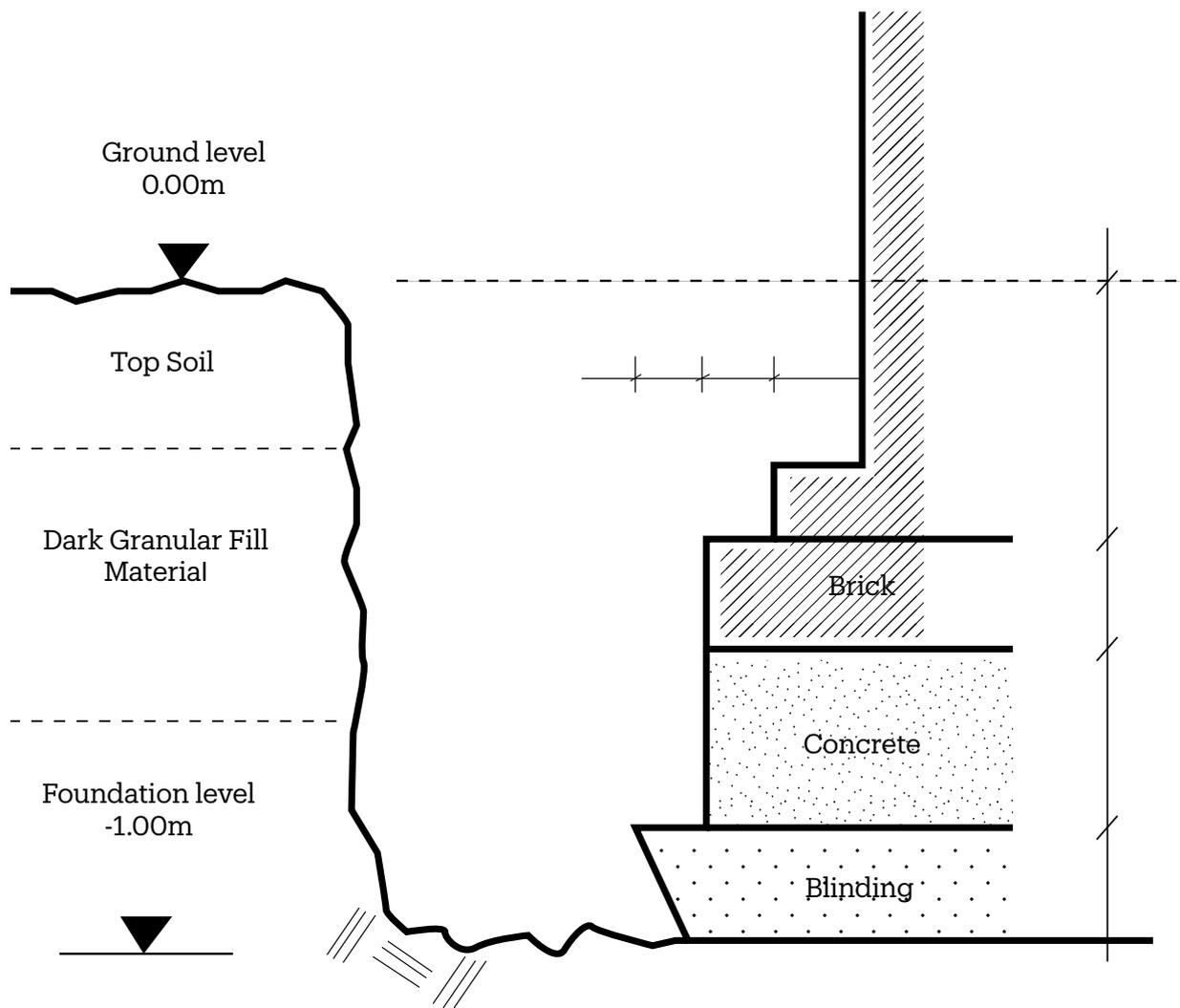
c. Pat test

- * Take a small handful of soil and slowly add water while mixing in your hand. Now you are aiming for the consistency of porridge!
- * Hold the wet soil in the palm of one hand. Use the other hand to repeatedly hit from underneath the hand which holds the soil. Observe whether water rises to the surface of the soil.

d. Drying test

- * Take a small amount of soil, mix it with a small amount of water, and form into a cube (around 25mm each side). Leave it to dry in the sun.
- * Can you easily crush it between your fingers?

Notes/sketches:



Dark Red Slightly Sandy Clay
 Can push thumb into side wall by 5mm

Notes/sketches:

Notes/sketches:

A large, empty rectangular box with a thin black border, occupying most of the page below the 'Notes/sketches:' label. It is intended for the user to write notes or draw sketches.

