

# **PROJECT SPECIFICATION**

For  
Landscaping in new HNEC HQ



UNDP Libya

2018

## Environmental Impacts and Recommended Mitigation Measures

### 3.1.1 General

Project works are to be assessed by UNDP to identify any significant impacts on environmental or social characteristics of the project area. This notwithstanding, some impact can be expected to occur during the course of construction activities. These impacts can be appropriately managed or mitigate by the measures contained in the following environmental mitigation list.

### 3.1.2 Climate and Air Quality

Impacts to local air quality during construction can be anticipated due to fugitive dust generation in and around the construction area. Mitigation measures shall be implemented to avoid any significant impact.

Construction activities will also result in the generation of diesel exhaust from heavy equipment and generators.

Following mitigation measures shall be implemented to avoid any significant impact:

#### 3.1.2.1 Mitigation 1

The generation of dust during construction shall be mitigated through avoidance strategies as follow:

- Subcontractor shall be required to spray water during windy conditions.
- Trucks carrying earth, sand or stone shall be covered to avoid spilling.
- Open burning shall be prohibited on the construction sites.
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#### 3.1.2.2 Mitigation 2

The generation of diesel exhaust emissions during construction shall be mitigated through avoidance strategies as follows:

- All equipment shall be in good operating condition.
- Machinery shall not be left idling unless necessary during winter operations.
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### 3.1.3 Surface water

Construction activities can result in increased turbidity of runoff water due to soil erosion. Mitigation measures shall be implemented to avoid any significant impact.

Construction activities can also result in contamination of runoff due to leaking fuel or lubricants from construction equipment. Mitigation measures shall be implemented to avoid any significant impact.

Construction of the facilities will result in an increase in hardscaping, with a resulting incremental increase in surface water runoff. If minor paving is planned, then little runoff will leave the construction site and may not impact on surrounding drainages.

To avoid significant impacts following mitigations shall be implemented:

#### 3.1.3.1 Mitigation 1

Impacts due to soil erosion shall be mitigated by careful grading of the construction site such that significant amounts of water is not allowed run off of the construction site into adjacent drainages.

Where excavated soils are stored on site, adequate measures shall be implemented to control runoff, including covering exposed soils, construction of settling basins, or erection of physical barriers.

#### 3.1.3.2 Mitigation 2

Machinery and equipment shall be maintained in good working condition and shall be regularly inspected for leaks.

Any maintenance of equipment or machinery onsite could only occur over non-permeable areas with adequate containment measures to capture spills.

Fuel storage shall be provided with adequate containment measures to capture spills.

### 3.1.4 Groundwater

Construction activities can result in contamination of runoff due to leaking fuel or lubricants from construction equipment. *1.5.3.2 Mitigation 2* will also prevent groundwater contamination.

Construction of the facilities will result in an increase in hardscaping resulting in a incremental decrease in groundwater percolation. If minor paving is planned, it may not decrease and will not impact on groundwater supplies. In most cases *1.5.3.1 Mitigation 1* will prevent groundwater contamination.

### 3.1.5 Terrestrial Ecology

If the project site is urban site and is with no natural habitats or significant natural flora or fauna, then no impacts are anticipated and no mitigation measures will be required. Otherwise the subcontractor shall contact UNDP for mitigation measures requirement policy and guidance prior to commencing site works.

### **3.1.6 Socioeconomics**

Construction of projects, depending to the type of the project, will result in a significant number of construction jobs. Employment will result in multiplier effects by generating commerce with benefits provided throughout the local economy.

If the program includes capacity building component, which will promote on-the-job skills training in construction methods, quality control, and/or construction safety, the skill transfer will result in improved capacity of local contractors to successfully undertake future construction projects.

Improved and expanded educational facilities will result in improved learning opportunities and provide long-term benefits to the local economy.

In such cases, the following mitigations shall be implemented:

#### **3.1.6.1 Mitigation 1**

The program shall include capacity building, including classroom and on-the-job training, in construction methods, quality control, and construction safety.

#### **3.1.6.2 Mitigation 2**

The use of local subcontractors shall be encouraged wherever possible.

### **3.1.7 Traffic and Transportation**

Construction activities will result in additional truck traffic and potential traffic congestion on local streets, depending on the site location. The truck traffic will also result in potential threats to pedestrian safety. Following mitigation measures shall be implemented to avoid any significant impact if the project site is in urban:

Note: Operational impacts may need to be assessed should construction activities alter the current usage of the sites or traffic flow patterns.

#### **3.1.7.1 Mitigation 1**

Delivery of materials and equipment to the site shall be scheduled during periods of light traffic (e.g. early morning or late afternoon).

#### **3.1.7.2 Mitigation 2**

Where necessary, pedestrian access-way improvements shall be provided prior to commencing construction activities. These improvements could include sidewalks, fencing, or alternate routes.

#### **3.1.7.3 Mitigation 3**

The construction contractor shall provide flag men and other traffic control measures to avoid conflicts between construction traffic and other vehicles and /or pedestrians.

### **3.1.8 Visual quality**

Construction activities may result in a short-term impact to the visual quality of buildings. In particular, buildings in progress are generally stark in appearance. Additionally, construction material and wastes may result in a cluttered site. Following mitigation measures shall be implemented to avoid any significant impact on this issue:

#### **3.1.8.1 Mitigation 1**

The subcontractor shall be required to maintain a site free from rubbish. The contractor shall be required to conduct regular housekeeping to include removal of rubbish, construction waste, and proper storage of construction material.

### **3.1.9 Recreation**

As per architectural principles, new buildings are usually sited to minimize the impact on available recreational fields. Although no mitigation is practically required, sufficient space shall be maintained for the existing recreational fields.

### **3.1.10 Cultural**

Depending to the location of the project, if buried cultural or archaeological resources may be uncovered during construction activities, following mitigation measures shall be implemented to avoid any significant impact:

#### **3.1.10.1 Mitigation 1**

If potential cultural or archaeological resources are unearthed during construction, activities in that area shall immediately cease. The appropriate government office shall be contacted until such time as the government office provides authorization.

### **3.1.11 Noise**

Construction activities will result in noise impacts resulting from the use of heavy equipment and machinery. Noise levels will be typical for construction sites and no significantly loud equipment should be avoided if possible (i.e., pile drivers, crushers, etc.). Following mitigation measures shall be implemented to avoid significant impact:

#### **3.1.11.1 Mitigation 1**

The contractor shall as far as practicable, ensure that all processes, machines and equipment used implement one or more of the following measures:

- Engineering noise control, e.g., modifying noisy processes, machines and equipment, relocating noisy processes or isolating them within enclosures, erecting sound barriers, reducing kinetic or potential energy and regularly maintain machines and equipment.
- Using quiet machines and equipment when such machines and equipment are available in the market. Examples are generators, compressors and concrete breakers. The contractor shall provide hearing protectors for workers who are exposed to excessive noise and ensure that they are worn at all times. Warning signs to remind workers that hearing protectors must be worn shall be put at areas with excessive noise.

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#### **3.1.11.2 Mitigation 2**

To the extent practicable, construction activities shall occur during normal working times. Where necessary to conduct operations in late evening or early morning, these operations shall be short in duration and shall be coordinated in advance with the project team and nearby inhabitants.

#### **3.1.11.3 Mitigation 3**

A community outreach program shall be implemented to ensure that local residents are aware of the purpose of the construction activities and have the opportunity to report any impacts.

### **3.1.12 Solid, Hazardous and Special Wastes**

Construction activities, including demolition and excavation, will result in solid wastes requiring disposal. There could also be evidence of hazardous or special wastes on the project sites that may result in contamination through spillage or unearthing.

Construction activities may result in the generation of hazardous wastes, including oils and lubricants. Accidental release of these wastes may result in impacts. To avoid such impact following mitigation measures shall be considered:

#### **3.1.12.1 Mitigation 1**

Solid wastes shall be transported off the site and disposed of in a disposal site previously approved by the relevant authority and/ or Ministry of Urban Development.

#### **3.1.12.2 Mitigation 2**

In the event buried hazardous wastes are uncovered during excavation, all construction activities shall cease.

### **3.1.13 Geologic and Seismic Hazards**

In areas considered as high seismic risk zones, infrastructure will be designed in accordance with approved seismic codes. Therefore, impacts related to geologic and seismic hazards are considered unlikely and no mitigation measure seems required.

### **3.1.14 Unexploded Ordinance**

Construction sites have mostly been surface survey and cleared of UXO in urban areas. However, heavy rains, frost heaves, or other factors in urban areas and at any case in rural areas can result in UXOs being uncovered. Disturbance or handling of UXOs can result in loss of life or limb.

To avoid significant impacts on this issue following mitigation measures shall be considered:

#### **3.1.14.1 Mitigation 1**

If a potential UXO is identified, the area shall be immediately vacated and secured. UNMACA or other qualified and authorized disposal organization shall be immediately notified and arrangements made to dispose of the potential UXO.

#### **3.1.14.2 Mitigation 2**

If excavation is required below the depth which has already been cleared, or if excavation is required outside the area that is not known as a clear zone, a certified demining organization shall be employed to survey and clear the area prior to any works.

### **3.1.14.3 Mitigation 3**

UXO safety training shall be provided onsite to all workers. Training shall incorporate how to identify potential UXO and the appropriate response as described in 1.5.14.1 *Mitigation 1*.

## **3.5 Service trenching**

### **3.5.1 General**

#### **3.5.1.1 Inspection**

##### Notice

Give sufficient notice so that inspection may be made at the following stages:

Service trenches excavated before laying the service.

Services laid in trenches and ready for backfilling.

#### **3.5.2 Execution**

##### **3.5.2.1 Excavating**

###### Excavation

Excavate for underground services, to required levels and grades. Generally make the trenches straight between inspection points and junctions, with vertical sides and uniform grades.

###### Trench Widths

General: Keep trench widths to the minimum required for laying and bedding of the relevant service and construction of pits.

###### Trench Depths

If excavation is necessary below the zone of influence of the underside of adjacent footings, give notice, and provide support for the footings as instructed.

###### Obstructions

Clear trenches of sharp projections. Cut back roots encountered in trenches to at least 600 mm clear of services.

Remove other obstructions including stumps and boulders which may interfere with services or bedding.

###### Dewatering

Keep trenches free of water. Place bedding material, services and backfilling on firm ground free of surface water.

###### Excess Excavation

If trench excavation exceeds the correct depth, reinstate to the correct depth and bearing value using compacted bedding material or sand stabilised with 1 part of cement to 20 parts of sand by weight.

##### **3.5.2.2 Backfilling**

###### General

Do not install backfill until required inspections and testing are completed.

Backfill service trenches as soon as possible after the service has been laid and bedded, if possible on the same working day.

###### Backfill Material

Install backfill materials in layers not exceeding 15 centimeters in thickness and compact to 95 percent of the maximum density. Install and compact sand bedding to provide a uniform full length bearing under piping and conduits.

Where portions of existing structures, walks, paving, or other improvements are removed or cut for piping or conduit installation, replace the material with equal quality, finished to match adjoining existing improvements.

General fill with no stones greater than 25 mm occurring within 150 mm of the service, or other materials as required for particular services or locations.

Under roads and paved areas and within 4 m of building: Coarse sand, controlled low strength material or fine crushed rock.

In topsoil areas: Complete the backfilling with topsoil for at least the top 100 mm.

Use appropriate marking tape to identify services.

##### **3.5.2.3 Reinstatement of Surfaces**

###### General

Reinstate existing surfaces removed or disturbed by trench excavations to match existing and adjacent work.

### **3.6 Landscape – soils AND PLANTING**

#### **3.6.1 General**

##### **3.6.1.1 Submissions**

###### Suppliers

Obtain statements from suppliers of plant materials, giving the following:

Particulars of the supplier's experience in the required type of work.

Lead times for delivery of the material to the site.

##### **3.6.1.2 Inspection**

###### Notice

Give sufficient notice so that inspection may be made of the following:

lawns prepared before seeding

plant holes excavated and prepared for planting

setout of gravel paths prepared for filling

#### **3.6.2 Products**

##### **3.6.2.1 Topsoil**

###### Source

Import topsoil unless the topsoil type can be provided from material recovered from the site.

###### Additives

Use additives to raise topsoil to the required standard approved by the Engineer.

##### **3.6.2.2 Compost and Fertiliser**

###### Compost

Provide well rotted vegetative material or animal manure, free from harmful chemicals, grass and weed growth.

###### Fertiliser

Provide proprietary fertilisers, delivered to the site in sealed bags marked to show manufacturer or vendor, weight, fertiliser type, recommended uses and application rates.

##### **3.6.2.3 Gravel Paths**

Provide paths constructed with consolidated small gravel chippings and concrete edging pavers where shown on plans.

#### **3.6.3 Execution**

##### **3.6.3.1 Preparation**

###### Vegetative Spoil

Remove vegetative spoil from site. Do not burn.

##### **3.6.3.2 Rockwork**

###### Rock Work

General: Place rocks while ground formation work is being carried out. Provide site rock, otherwise provide imported rock. Bury rock two thirds by volume, with weathered faces exposed. Protect the weathered faces from damage.

Site rock: Stockpile for future placement and accessibility for lifting. Dispose of other rock off site.

Imported rock: Provide rock which has been selected before delivery.

##### **3.6.3.3 Subsoil**

###### Ripping

Rip parallel to the final contours wherever possible. Do not rip when the subsoil is wet or plastic. Do not rip within the dripline of trees and shrubs to be retained.

Ripping depths: Rip the subsoil to the following typical depths:

Compacted subsoil: 300 mm.

Heavily compacted clay subsoil: 450 mm.

###### Planting Beds

Excavated: Excavate to bring the subsoil to at least 300 mm below finished design levels. Shape the subsoil to fall to subsoil drains where applicable. Break up the subsoil to a further depth of 100 mm.

Unexcavated: Remove weeds, roots, builder's rubbish and other debris. Bring the planting bed to 75 mm below finished design levels.

###### Cultivation

Minimum depth: 100 mm.

Services and roots: Do not disturb services or tree roots; if necessary cultivate these areas by hand.

Cultivation: Thoroughly mix in materials required to be incorporated into the subsoil. Cultivate manually within 300 mm of paths or structures. Remove stones exceeding 50 mm, and weeds, rubbish or other deleterious material brought to the surface during cultivation. Trim the surface to design levels after cultivation.

#### Additives

Apply additives after ripping or cultivation and incorporate into the upper 100 mm layer of the subsoil. Refer to the **Soil additives schedule**.

### **3.6.3.4 Topsoil**

#### Placing Topsoil

Spread the topsoil on the prepared subsoil and grade evenly. Ensure that grassed areas may be finished flush with adjacent hard surfaces such as kerbs, paths and mowing strips.

Contamination: Where diesel oil, cement or other toxic material has been spilt on the subsoil or topsoil, excavate the contaminated soil, dispose of it off the site, and replace it with site soil or imported topsoil.

Finishing: Feather edges into adjoining undisturbed ground.

#### Consolidation

Compact lightly and uniformly in 150 mm layers. Produce a finished topsoil surface which has the following characteristics:

Smooth and free from stones or lumps of soil.

Graded evenly into adjoining ground surfaces.

Ready for planting.

#### Topsoil Depths

Spread topsoil to the following typical depths:

Excavated planting areas: If using organic mulch, 200 mm.

Irrigated grassed areas generally: 150 mm.

Non-irrigated grass areas: 100 mm.

#### Surplus Topsoil

Spread surplus topsoil on designated areas on site, if any; otherwise, dispose off site.

Designated areas to be determined by the Engineer.

### **3.6.3.5 Grass Seeding**

#### Preparation

Prepare the areas to be sown. Spread the fertiliser evenly over the cultivated bed within 48 hours before sowing, and rake lightly into the surface. If a prepared area becomes compacted from any cause before sowing can begin, rework the ground surface before sowing.

#### Sowing

Do not sow if frost is likely before the plant has reached an established state, or in periods of extreme heat, cold or wet, or when wind velocities exceed 8 km/h. Provide even distribution. Lightly rake the surface to cover the seed.

#### Rolling

Roll the seed bed immediately after sowing.

Roller weight (maximum):

Clay and packing (heavy) soils: 90 kg/m width.

Sandy and light soils: 300 kg/m width.

#### Watering

Before germination: Water the seeded area with a fine spray until the topsoil is moistened to its full depth. Continue watering until germination to keep the surface damp and the topsoil moist but not waterlogged.

After germination: Water to maintain a healthy condition, progressively hardened off to the natural climatic conditions.

#### Germination

Maintain sown areas until healthy grass covers the whole of the seeded area.

Reseeding: If germination has not been attained within one month, reseed the sown areas.

#### Weeding

Remove weeds that occur in sown areas. Where necessary spray with a selective weedkiller for broad leaved weeds. Do not spray grass seeded areas within 3 months of germination.

#### Protection

Protect the newly sown areas against traffic until well established. Protection method to be approved by the Engineer.

#### Mowing

Mow to maintain the grass height within the required range. Do not remove more than one third of the grass height at any one time. Carry out the last mowing within 7 days before the end of the planting establishment period. Remove grass clippings from the site after each mowing.

### **3.6.3.6 Plants**

#### Plants

Characteristics: Provide plants with the following characteristics:

Large healthy root systems.

Vigorous, well established, free from disease and pests.

Suitable for planting in the natural climatic conditions prevailing at the site.

Replacement: Replace damaged or failed plants with plants of the same type and size.

#### Plant Containers

Supply plants in weed-free containers of the required size.

Open rooted stock: If trees are to be supplied as open rooted stock, ensure this is appropriate to the species, variety, size, and time of year for planting.

Refer to the **Plant Schedule**.

#### Labelling

Label at least one plant of each species or variety in a batch with a durable, readable tag.

#### Storage

Deliver plant material to the site on a day to day basis, and plant immediately after delivery.

### **3.6.3.7 Planting**

#### Individual Plantings in Grassed Areas

Excavate a hole to twice the diameter of the root ball and at least 100 mm deeper than the root ball. Break up the base of the hole to a further depth of 100 mm, and loosen compacted sides of the hole to prevent confinement of root growth.

#### Locations

If it appears necessary to vary plant locations and spacings to avoid service lines, or to cover the area uniformly, or for other reasons, obtain directions from the Engineer.

#### Planting Conditions

Do not plant in unsuitable weather conditions such as extreme heat, cold, wind or rain. In other than sandy soils, suspend excavation when the soil is wet, or during frost periods.

#### Watering

Thoroughly water the plants before planting, immediately after planting, and as required to maintain growth rates free of stress.

#### Placing

Remove the plant from the container with minimum disturbance to the root ball, ensure that the root ball is moist and place it in its final position, in the centre of the hole.

#### Fertilising

In planting beds and individual plantings, place fertiliser pellets around the plants at the time of planting.

#### Watering Basins for Plants in Grass

Except in irrigated grassed areas and normally moist areas, construct a watering basin around the base of each individual plant, consisting of a raised ring of soil capable of holding at least 10 L.

### **3.6.3.8 Stakes and Ties**

#### Stakes

Use Hardwood stakes, straight, free from knots or twists, pointed at one end.

Drive stakes into the ground at least one third of their length, avoiding damage to the root system.

Stake sizes:

For plants < 2.5 m high: Three 50 x 50 x 2400 mm stakes per plant.

For plants 1 – 2.5 m high: Two 50 x 50 x 1800 mm stakes per plant.

#### Ties

Provide ties fixed securely to the stakes, one tie at half the height of the main stem, others as necessary to stabilise the plant.

Tie types for plants < 2.5 m high: 50 mm sack webbing stapled to the stake.

### **3.6.3.9 Gravel Paths**

#### Pavement

Use small size gravel in layers not exceeding 150mm thick to form paths where shown on drawings. Colour and type of gravel to approval of Engineer. Retain sides of path with either:

Precast decorative concrete paving edge strips, colour to approval of Engineer.

Concrete kerbs



### **3.6.3.10 Planting Establishment**

#### Period

The planting establishment period commences at the date of practical completion and finishes at the date of final certificate.

#### Existing Planting and Grass

Where existing grass or planting is within the landscape contract area, maintain it as for the corresponding classifications of new grass or planting.

#### Recurrent Works

Throughout the planting establishment period, carry out maintenance work including, watering, mowing, weeding, rubbish removal, reseeding, staking and tying, replanting, cultivating, and keeping the site neat and tidy.

### **3.7 Pavement kerb, channel and linemarking**

#### **3.7.1 General**

##### **3.7.1.1 Inspection**

#### Notice

Give sufficient notice so that inspection may be made of the following:

Set out of kerbs and channels.

Set out of line marking prior to painting.

##### **3.7.1.2 Tolerances**

Kerbs and channels conform to the following:

Absolute level tolerance:  $\pm 10$  mm.

Maximum deviation from design alignment: 50 mm.

Maximum deviation from a 3 m straightedge placed on horizontal, vertical, or sloping surfaces required to be straight: 5 mm.

Line marking to conform to the following:

The location of markings shall not vary from the locations shown on the drawings by more than 50 mm.

##### **3.7.1.3 Interpretation**

#### Definitions

General: For the purposes of this worksection the definitions given below apply.

Absolute level tolerance: Maximum deviation from design levels.

Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface

Channels and kerbs: Includes all forms of concrete gutters, dish drains, grated drains and mountable barrier kerbing.

#### **3.7.2 Products**

##### **3.7.2.1 Materials**

#### Concrete

Ready-mixed concrete shall comply with M-150 (1:2:4) for non-reinforced mass concrete and M-200 (1:1.5:3) for reinforced concrete and the requirements of these standards.

On site batch mixed concrete shall have characteristics and proportions of concrete ingredients which conform to those specified in M-150 (1:2:4) and M-200 (1:1.5:3).

#### Pavement Marking Paint

Provide samples of pavement marking paint and technical specifications for approval by the Engineer prior to use on site.

#### **3.7.3 Execution**

##### **3.7.3.1 Linemarking**

#### Setting out

Set out the work to ensure that all markings are placed in accordance with the drawings.

#### Surface Preparation

Clean dry surface: Pavement markings shall only be applied to clean dry surfaces. Clean the surface to ensure a satisfactory bond between the markings and wearing surface of the pavement.

Wet weather: Pavement marking shall not be carried out during wet weather or if rain is likely to fall during the process.

Provision for traffic: Provide for traffic while undertaking the work and protect the pavement markings until the material has hardened sufficiently so that traffic will not cause damage.

Mixing of paint: All paint shall be thoroughly mixed in its original container before use to produce a smooth uniform product.

#### Application of Paint

Pavement markings shall be straight or with smooth, even curves where intended. All edges shall have a clean, sharp cut off. Any marking material applied beyond the defined edge of the marking shall be removed leaving a neat and smooth marking on the wearing surface of the pavement.

#### Removal of Pavement Markings

General: Remove pavement markings, no longer required, from the wearing surface of pavements without significant damage to the surface.

### **3.7.3.2 Channels and Kerbs**

#### General

Before placing any kerb and/or gutter, the foundation material shall be shaped and compacted to form a firm base.

Where placed on pavement courses, the foundation shall be compacted to the requirements of the *Pavement base and subbase* work section.

Kerb and/or gutters may be constructed in fixed forms, by extrusion or by slip forming in accordance with the drawings. The foundation, concrete quality, curing and testing details shall be in accordance with the *Concrete Paving* work section.

#### Tolerances

The level at any point on the surface of the gutters shall be within  $\pm 10$  mm of design levels. When a straight edge 3 m long is laid on top of or along the face of the kerb or on the surface of gutters, the surface shall not vary more than 5 mm from the edge of the straight edge.

#### Joints

Contraction joints: Formed every 3 m of gutter length for a minimum of 50% of cross sectional area. The joint shall be tooled 20 mm in depth to form a neat groove of 5 mm minimum width.

Expansion joints: 15 mm in width for the full depth of the kerb and gutter. Joints shall be constructed at intervals not exceeding 15 m and where the gutter is attached to pits and retaining walls. Expansion joints shall consist of approved preformed jointing material.

Concrete pavement: Where kerbs and/or gutters are cast adjacent with a concrete pavement the same type of contraction, construction and expansion joints specified in the concrete base shall be continued across the kerb and/or gutter.

#### Backfill

Timing: After the new kerb and gutter has been constructed and not earlier than three days after placing, the spaces on both sides of the kerb and/or gutters shall be backfilled and reinstated in accordance with the drawings.

Material: Backfill material behind the kerb shall consist of granular material, free of organic material, clay and rock in excess of 50 mm diameter.

Compaction: Backfill material behind the kerb shall be compacted in layers not greater than 150 mm thick.

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## **2.1 water services**

### **2.1.1 General**

#### **2.1.1.1 Aims**

##### Responsibilities

Provide water services systems subject to the site and other constraints below:

Cold water services: Connect the cold water supply system to the water source with a stop valve at the connection point.

Provide the water source if required to suit the particular conditions as defined on the drawings. Provide the cold water installation to the draw-off points or connections to other services.

This is typical text. Edit to suit the project.

Hot water services: Provide the hot water installation from the cold water connection points to the draw-off points or connections to other services.

This is typical text. Edit to suit the project.

Hose reel system: Provide the hose reel system where defined on the drawings and in the BOQ.

Describe the required system. Delete if not applicable.

Sanitary plumbing and drainage: Provide the plumbing and drainage system where defined on the drawings and in the BOQ.

Describe the required system.

Stormwater: Provide the stormwater system where defined on the drawings and in the BOQ.

Describe the required system.

Subsoil drainage: Provide the subsoil drainage system where defined on the drawings and in the BOQ.

#### **2.1.1.2 Inspection**

##### Notice

Give sufficient notice so that inspection may be made of the following:

Underground pipework prior to concealment.

Above ground pipework prior to concealment.

### **2.1.1.3 Submissions**

#### Execution Details

Before starting the respective portions of the installation, submit the following for approval from the Engineer:

Embedded services: Proposed method for embedding services in concrete walls or floors or chasing into concrete or masonry walls.

Fixing of services: Typical details of locations, types and methods of fixing of services to structure.

Inaccessible services: If services will be enclosed and not accessible after completion, submit proposals for location of service runs and fittings.

Proposals for location of exposed piping.

#### Samples

Provide samples listed in the **Water Services Samples** schedule.

## **2.2 Execution**

Refer to the **Water system piping** schedule for details of all pipe types.

### **2.2.1.1 Installation generally**

#### Accessories

Provide the accessories and fittings necessary for the proper functioning of the systems, including taps, valves, outlets, pressure and temperature control devices, strainers, gauges and pumps.

Isolating valves: provide valves so that isolation of parts of the system in the event of leaks or maintenance causes a minimum of inconvenience to building occupants.

#### Arrangement

Services and equipment: Locate and arrange so that:

Failure of plant and equipment (including leaks) does not create a hazard for the building occupants and causes a minimum or no damage to the building, its finishes and contents.

maintenance operations can be carried out in a safe and efficient manner, with a minimum of inconvenience and disruption to building occupants and without damaging adjacent structures, fixtures or finishes.

#### Embedded Pipes

Do not embed pipes that operate under pressure in concrete or surfacing material of a building without prior written approval. If embedding is approved:

Install in continuous lengths without fittings wherever possible.

Do not lay across joints between adjoining sections of concrete through which reinforcement does not extend.

Pressure test and rectify leaks before the concrete is poured.

#### Penetrations and Fixing

Limitations: Do not penetrate or fix to the following without prior approval:

Structural building elements including external walls, fire walls, fire doors and access panels, other tested and rated assemblies or elements, floor slabs and beams.

Membrane elements including damp-proof courses, waterproofing membranes and roof coverings.

Fire rated building elements: Seal penetrations with a system that maintains the fire rating of the element.

Membranes: If approval is given to penetrate membranes, provide a waterproof seal to the approval of the Engineer between the membrane and the penetrating component.

#### Piping

Install piping in straight lines, plumb and to uniform grades. Arrange and support the piping so that it remains free from vibration and water hammer, while permitting movement in both structure and services. Keep the number of joints to a minimum. Prevent direct contact between incompatible metals.

Concealment: If practicable, conceal piping and fittings requiring maintenance or servicing so that they are accessible within non-habitable enclosed spaces such as roof spaces, subfloor spaces and ducts. Provide at least 25 mm clearance between adjacent pipelines (measured from the piping insulation where applicable).

Cover plates: Where exposed piping emerges from wall, floor or ceiling finishes, provide cover plates of stainless steel or non-ferrous metal finished to match the piping.

Pipe support materials: To be the same as the piping or galvanized or non-ferrous metals, with bonded PVC or glass fibre woven tape sleeves where needed to separate dissimilar metals.

#### Pits

Location: Install below-ground water meters, control valves and gas regulators in concrete access pits with removable pit covers.

Internal dimensions: To give 300 mm clear space all around the fittings in the pit.

Concrete: Grade M-200, 100 mm thick, with reinforcement fabric.

Pit covers: To be minimum of 5mm thick steel covers with finger holes for easy removal.

Installation: Grade floor to a point on one side and drain to the stormwater drainage system. Carry the pit walls up to 50 mm above finished ground level. Cast in the pit cover frame flush with the top. Trowel the top smooth.

#### Valve boxes

Location: Install underground isolating valves in concrete access pits with removable pit covers.

Identification: Mark the box covers with the name of the service.

### **2.2.1.2 Installation of Fixtures**

#### General

Accessories: Use manufacturer's brackets and accessories where these are available and suitable for the mounting substrate.

Protection: Deliver fixtures to site protected from damage under site conditions by coatings, coverings and packaging.

Remove only sufficient protection to permit installation.

#### Installation

Connections: Connect to each fixture supply and waste services. Install plumb and level.

Cutting and fitting: If it is necessary to cut and/or fit substrate to install an item carry out this before the surface is finished or painted. Remove items when required for painting and protect until re-installed. Reinstall when painting and finishing is complete. Cap or plug the open ends of pipes.

Substrate and fixings: Before installation make sure that the substrate to which the fixtures are to be installed is adequate. In solid walls confirm adequacy of the material at fixing locations.

### **2.2.1.3 Painting, finishes and marking**

#### Exceptions

Do not paint chromium or nickel plating, anodised aluminium, glass reinforced plastic, stainless steel, non-metallic flexible materials and normally lubricated machined surfaces.

#### Finishes

Finish exposed piping, including fittings and supports, as follows:

In internal locations such as toilet and kitchen areas: Chrome plate copper piping with bright finish.

Externally and steel piping and iron fittings internally: Paint.

In concealed but accessible spaces (including cupboards and non-habitable enclosed spaces): Leave copper and plastic unpainted except for identification marking. Prime steel piping and iron fittings.

Valves: Finish valves to match connected piping.

#### Marking and Labelling

Mark services and equipment to provide a ready means of identification.

Locations exposed to weather: Provide durable materials.

Pipes, conduits and ducts: Identify and label.

Consistency: Label and mark equipment using a consistent scheme across all services elements of the project.

### **2.2.1.4 Hot and Cold Water Services**

#### Fittings and Accessories

Provide the fittings necessary for the proper functioning of the water supply system, including taps, valves, backflow prevention devices, temperature control devices, strainers.

#### Line Strainers

Type: Low resistance, Y-form bronze bodied type, with screen of dezincification resistant brass, stainless steel or monel.

Screen perforations: 0.8 mm maximum.

#### Piping Insulation

Application: Fit insulation tightly to piping surfaces without gaps. Minimise number of joints. Insulate fittings for the same thermal resistance as the piping insulation. Install the insulation on unions and other items requiring service so that it is readily removable. Provide supports formed to fit around the insulation so the insulation thickness is reduced by < 10%.

Material: Select from the following:

Polyester in moulded tubular sections faced with factory bonded aluminium foil laminate or integral polyester scrim.

Polyolefin foam: Cross linked closed cell polyolefin foam faced with factory bonded aluminium foil laminate.

#### Tapware

Provide the tapware in accordance with the **Sanitary fixtures** schedule.

Metal heads and handles: Provide brass fittings or suitably bush to prevent electrolysis and growth.

Plastic heads and handles: Provide break-resistant fittings of a compact nature, to prevent fracture and exposure of jagged or rough edges.

Tap positions: Locate hot tap to the left of or above, the cold tap.

#### Thermostatic Mixing Valves

Water temperature regulated by a single hand control, capable of delivering water at the temperature of either of the supply systems and at any temperature in between and suitable for controlling single or multiple outlets, as appropriate. Refer to the **Sanitary fixtures schedule**.

Controls: Incorporate the following:

A temperature sensitive automatic control which maintains temperature at the pre-selected setting and rapidly shuts down the flow if either supply system fails or if the normal discharge water temperature is exceeded.

#### **2.2.1.5 Water Heaters**

##### Standard Electric Systems

Provide standard electrical water boilers as identified in the BOQ to locations identified on the drawings. Refer to the **Water heater** schedule.

##### Solar Water Systems

Provide a proprietary automatic water heater comprising solar collector and storage container, with or without supplementary heating unit and including connections, controls and necessary fittings.

#### **2.2.1.6 Hose Reels**

##### General

Provide hose reels with swivel hose guides in accordance with the **Fire hose reels** schedule.

#### **2.2.1.7 Stormwater**

##### Cleaning

During construction, use temporary covers to openings and keep the system free of debris.

##### Downpipe Connections

Turn up underground drainage pipelines to finish 50 mm above finished ground or pavement level.

##### Access Pits

Cover levels: Locate the top of covers or gratings, including frames as follows:

In paved areas: Flush with the paving surface.

In landscaped areas: 25 mm above finished surface.

##### Stormwater Drains

Provide stormwater drains to connect downpipes, surface drains, subsoil drains and drainage pits to the outlet point or discharge point.

Downpipe connections: Turn up underground drainage pipelines with bends to meet the downpipe, finishing 50 mm (nominal) above finished ground or pavement level. Seal joints between downpipes and drains. Alternatively, terminate downpipe minimum of 100mm above adjacent ground level and discharge water to surface run off area. Allow for scour protection to bottom of downpipe.

##### Lined Surface Drains-Grated Trenches

Provide precast or cast in situ concrete lined trenches with painted or galvanized steel gratings.

#### **2.2.1.8 Subsoil Drains**

##### General

Provide subsoil drains to intercept groundwater seepage and prevent water build-up behind walls and under floors and pavements. Connect subsoil drains to surface drains or to the stormwater drainage system as applicable.

Connection: Connect subsoil drains to the stormwater drainage system.

Filters: UV resistant geotextile material with a permeability  $\geq 10$  times that of the native soil and capable of retaining particles of 0.25 mm size. Securely fit or join the sock at each joint.

Subsoil drains: Provide proprietary perforated plastic pipe.

#### **2.2.1.9 Sanitary Plumbing and Drainage**

##### Vent pipes

Staying to roof: If fixings for stays penetrate the roof covering, seal the penetrations and make watertight.

Terminations: Provide bird-proof vent cowls of the same material and colour as the vent pipe.

##### Sanitary Fixtures

Provide sanitary fixtures in the **Sanitary fixtures schedule** complete with all accessories necessary for correct installation and use.

#### **2.2.1.10 Completion**

##### Testing

Hydrostatic tests: Do not install insulation until the piping has been tested. Pressure test cold and hot water services to ensure that all pipework is free from leaks. Include pipe joints, valve seats, tap washers and strainers. Repair as necessary, replace if damaged and retest.

#### Completion

Hot and cold water services: On completion, flush pipelines using water and leave them clean.

Stormwater and wastewater services: On completion, flush the system using water and leave clean.

#### Charging

On completion of installation, commissioning, and testing, fill the hot and cold water systems with water, turn on control and isolating valves and the energy supply and leave the water supply system in full operational condition.

#### Operation and Maintenance Manuals

Provide written operating and maintenance instructions containing:

Contractor's contact details for service calls.

Manufacturer's maintenance and operation literature.

Description of day-to-day operation.

#### Record Drawings

Provide a drawing of the system as installed. Show dimensions, types and location of the services in relation to permanent site features and other underground services. Include all changes made during commissioning and the maintenance period.

Diagrams: Include diagrammatic drawings of each system.

Services below ground: Where pipes and fittings are below ground show the depth and dimensioned references that will allow the future location of the service for maintenance or expansion.