UNDP
INDONESIA

TECHNICAL SPESIFICATION

CONSULTING SERVICE FOR THE DESIGN AND CONSTRUCTION SUPERVISION FOR TWO PUSKESMAS AND TWENTY ONE SCHOOLS IN CENTRAL SULAWESI

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CBC
General Consultants

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I. PUBLIC WORKS

1.1. GENERAL TECHNICAL REQUIREMENTS

1.1.1 Scope

Works mentioned in this project is referring to the Consulting service for the design and construction supervision for two Puskesmas and twenty-one Schools in Central Sulawesi which located in 4 (four) Municipal/Districts, those are:

- Palu Municipality
- Sigi District
- Donggala District
- Parigi Moutong District

General Technical Requirements are requirements from a technical perspective, which in general applied for the entire work parts where the requirements can be applied.

These Technical Requirements form a unity with Special Technical Requirements and collectively constitute technical requirements for all part of the work as disclosed in one or more of the following documents:

- Invitation to Bid (ITB)
- Drawings
- General Condition
- Bill of Quantities / Price Schedule
- Special Technical Requirements
- Other Bidding / Implementation documents

In the case of parts of these technical requirements that cannot be applied to any of the documents above, those parts of the General Technical Requirements mentioned will automatically be invalid.

1.1.2 Reference

For all parts of the work in this work agreement, unless specifically stated otherwise in one or more documents from the tender/implementation document, applies:

- Law/Presidential Decree
- Regulations/Decree from Authorized Department/Agency
- Local Regulation
- Standard/Norma/Guidance

Which applicable in Indonesia for parts of work that related but not limited to:

Subject		Reference
Portland Cement	:	SNI 15-249-1994
Portland White Cement	:	SNI 15-0129-2004
Masonry Cement	:	SNI 15-3758-2004
Mixed Portland Cement	:	SNI 15-3500-2004
Portland Composite Cement	:	SNI 15-7064-2004
Brick	:	SNI 15-2094-1991
Light-weight Brick	:	SNI 03-2156-1991
Angle Steel Beam	:	SNI 07-2054-2006
U channel steel beam	:	SNI 07-0052-2006
Steel sheet and Rolled Steel	:	SNI 07-3567-2006
Steel Wire-Rope	:	SNI 0076: 2008
Low Carbon Steel Wire	:	SNI 07-0040-2006
Steel WF-beam	:	SNI 07-7178-2006
Steel I-beam	:	SNI 07-0329-2005
Low Carbon Steel Cut Wire	:	SNI 7680:2011
Heat Resistant Casting Steel	:	SNI 07-1855-1990
Steel Nails	:	SNI 0323:2014
Concrete Reinforced Steel	:	SNI 07-0954-2005
Steel Sheet, Steel Plate Steel Coil	:	SNI 07-061-2006
Fence Wire Mesh	:	SNI 07-6503-2001
Steel Stirrup	:	SNI 07-0065-2002
Steel Stirrup for general use	:	SNI 7614-1990
Copper Rod	:	SNI 07-1814-1990
Cast Steel	:	SNI 07-1812-1990
Zinc-coated Steel Sheet	:	SNI 07-2053-2006
Concrete Reinforced Steel	:	SNI 2052:2014
Concrete Reinforced Steel	:	SNI 07-2052-2002
Welding Low Carbon Steel Wire Rods	:	SNI 07-0075-1987
Welding Low Carbon Steel Wire Rods	:	JIS G 3503-1980
How To Test Metal Tensile	:	SNI 07-0408-1989
Zinc Coating	:	SNI 07-0311-1989
Low Carbon Steel Wire Rods	:	SNI 07-0053-2006
High Carbon Steel Wire Rods	:	SNI 07-0375-1989
High Carbon Steel Wire	:	SNI 07-0376-1989
Low Carbon Steel Wire	:	SNI 07-0040-2006
Stainless steel wires	:	JIS G 4309:1999
Stainless Steel	:	SNI 7840:2012
Steel Pipes for General Construction	:	SNI 0068:2013
Aluminium Foil	:	SNI 07-0957-1989
Aluminium Sheet and Aluminium Plate	:	SNI 07-0956-1989
Extruded Aluminium Profiles for General Construction	:	SNI 07-2122-1991
Screws, Bolts, Nuts of Steel or Iron	:	SNI HS 7318
Metric Trapezoidal Thread	:	SNI 05-1607-1989
Hexagon Head Bolt	:	SNI 05-0661-1989
Hexagon Nut Shape 1 class A and A	:	SNI 05-3068-1992
Hexagon Nut Shape 2 class A and B	:	SNI 05-3069-1992

Hexagon Nut Shape class C	:	SNI 05-3070-1992
Metric Coarse Screw Threads	:	JIS B 0205
Retaining Rings	:	JIS B 2804
Handwheels	:	JIS B 2601
Rolled Steel for General Structural	:	JIS G 3101-1987
Carbon Steel Pipes for Pressure Service	:	JIS G 3454-1988
Hexagon Head Bolts Product grades B	:	ISO 4015 : 1979
Hexagon Head Bolts Product grades C	:	ISO 4016 : 1999
Mechanical of fastener-bolts, screws, stud and nut	:	ISO 8839 : 1986
Iso general-purpose metric screw threads	:	ISO 965-1 : 1998
Hexagon head bolts	:	ISO 4014 : 1999
Hexagon head screws	:	ISO 4017 : 1999
Hexagon head screws	:	ISO 4018 : 1999
Fasteners-hexagon	:	ISO 272 : 1982
Hexagon nuts, style 1	:	ISO 4032 : 1999
Hexagon nuts, style 2	:	ISO 4033 : 1999
Hexagon nuts product grades A dan B	:	ISO 4035 : 1999
Hexagon nuts product grades C	:	ISO 4034 : 1999
Emulsion Paint	:	SNI 06-3564-1994
Emulsion Paint	:	SNI 3564:2009
Emulsion Paint	:	SNI 3564:2014
Paint and Varnish	:	SNI 12944-5:2012
Paint and Varnish	:	SNI 12944-6:2012
Epoxy Primer	:	SNI 8162:2015
Organic Decorative Paint	:	SNI 8011:2014
Flat-shaped Paint Brush	:	SNI 03-1829-1990
Wood Painting	:	SNI 03-2407-1991
Wood Painting	:	SNI 03-2407-2002
Metal Painting	:	SNI 03-2408-1991
Concrete Tiles Painting	:	SNI 03-2409-1991
Concrete Tiles Painting	:	SNI 03-2409-2002
Emulsion Wall Painting	:	SNI 03-2410-2002
Roof Tile Painting	:	SNI 03-34-33-1994
Roof Tile Painting	:	SNI 03-34-33-2002
Primer and Steel Base Paint Quality and Test	:	SNI 06-0063-1987
Primer and Steel Base Paint Quality and Test	:	SNI 06-0087-1987
Primer and Steel Base Paint Quality and Test	:	SNI 06-0088-1987
Putty Quality	:	SNI 06-0105-1987

In the case where the part of work whose technical requirements are not regulated in general/special technical requirements or one of the provisions mentioned in article 2.1. above, then for this part of the work, the Contractor must submit one of the following conditions to be agreed upon by the Consultant to be used as a guideline for technical requirements:

- Standards/Norms/Codes/Guidelines that can be applied to the part of the work concerned, issued by the Agency/Institution/Professional Association/Producers Association/Testing Agency or international or national agencies from other countries, to the extent that agreement is obtained from UNDP and the Consultant.
- Technical brochures from producers that are supported by certificates from testing agencies that are recognized nationally and internationally.

1.1.3 Material

1. **New /Used**

   Unless otherwise specifically applied, all materials used in/for this work must be new material. The use of used materials can only be allowed with written permission from the Consultant with the approval of UNDP.

2. **Tag**

   In this case where the material factory/producer issues a tag for the product/material it produces, or as an identifier of quality/class/capacity, then all material from the factory/manufacturer used in this work must contain the tag unless otherwise specified by the Consultant. Similar materials with different functions must be tagged to distinguish one material from another material. This tag can be in the form of a color or other markings which must be in accordance with reference to Article 2 of this General Technical Requirement if there is regulation there, or in cases where there is no clear regulation on it, this must be carried out according to the instructions from the Consultant.

3. **Trademarks and equality**

   The mention of trademarks for a material/product in the technical requirements must be understood as a requirement of equal quality of the performance of the material/product, which is stated in words: "or equivalent."

   Unless specifically stated otherwise, the use of other material/products which can be proven to have a quality of appearance equivalent or better to the material/product that uses the trademarks mentioned is acceptable to the extent that prior written approval has been obtained from UNDP and the Consultant for the equality.

   The usage of the material/product that has been agreed as "equivalent" will not be considered as an alteration of work, and hence the difference in price with the material/product mentioned trademarks be ignored.

4. **Substitution**

   With the approval from the Consultant, the Contractor may submit the proposal for the substitution of a material/product with another material/product with a different appearance than required, but at the same level. In the approval of a substitution, the difference in price with the required material/product will be calculated as alteration of work, with provisions that the Contractor is innocent / not negligent, then in the case where the substitution is caused by the failure of the Contractor to obtain the material/product as required, thus the additional work will be considered as non-existent.

5. **Material Approval**

   To avoid material rejection in the site, it is strongly recommended that any material/product be purchased/ordered/produced in advance for inspection and approval by the Consultant so that no material rejection occurs in the site due to the neglect of the product above, it is entirely the responsibility of the Contractor for which no consideration can be given.

   With the approval along with sample/brochure as mentioned above along with the requirements are present, does not necessarily guarantee that all materials/products will be accepted/approved in the site, as long as it cannot be proven that all the materials/products are in accordance with the approved sample/brochure.

6. **Sample**

   When requesting approval for material/product from the Consultant, samples of the material/product must be submitted with the following conditions;

a. Number of samples

For materials/products from which no test certificate can be given, a number of material/product must be submitted in accordance with the requirements specified in the test manufacturer's standards to be used as test object to be submitted to the testing agencies appointed by the Consultant and UNDP.
For materials/products on which a test certificate can be shown which can be approved/accepted by UNDP and Consultant, 2 (two) samples must be submitted, each accompanied by a copy of the test certificate concerned.

b. Approved Sample

Regarding the samples that have obtained approval by UNDP and Consultant, a written statement must be made as evidence of the approval. Besides, an approval tag must be attached to 2 (two) samples, all of which will be held by UNDP. If desired, the Contractor can request several material from the sample, the approval tag, and the approval statement for the benefit of its documentation. In such a case, the number of samples that must be submitted to the Consultant and UNDP must be added as necessary in accordance with the material requirements.

c. Sample Approval Time

It is the responsibility of the Contractor to submit samples on time so that approval of the samples will not cause delays in the material procurement schedule. For materials/products whose requirements are not related to equality in a particular trademark, the decision on the sample will be given by the Consultant within not more than 10 (ten) working days. In the case where the agreement will involve a material decision outside the technical requirements (such as the determination of the model, color, etc.), then the entire decision will be given in no more than 21 (twenty-one) working days.

For material/products that are substitute, the approval decision will be given by the Consultant and UNDP within 30 (thirty) days of receiving the entire consideration materials. For material/products that are tools/equipment or other products that due to the nature/number of/procurement price is not possible to be given samples in the form of materials / finished products, requests for approval can be submitted based on the brochure of the product, which must be completed with:

- Complete technical specifications issued by the manufacturer.
- Letters as needed from the agent/importer, according to the instructions of the Consultant and UNDP, such as letters of Spare Parts Assurance and After Sales Service, etc.
- Catalogs for color, finishing work, etc.
- Test certificates/classification assignments etc. and, other documents in accordance with the instructions of UNDP and Consultant.

In the arrangement/stack and with environmental conditioning, by observation, and with good accessibility in accordance with the provisions for each material/product in these requirements is not clear, following the instructions of the Consultant and UNDP.

The Contractor who will use the material/product is responsible that while in storage, the material/product is still in a proper condition to be used at work, the Consultant and UNDP has the right to order that:

- The material/product is immediately repaired so that it returns to being qualified to be used or
- In the case where repairs are no longer possible, the material/product must be immediately removed from the site to be replaced by meeting the requirements within 7 (seven) days, including coordination with and approval of the Owner.

For materials/products that have a certain usage life, storage must be classified according to the age of use, which must be stated with a tag with the following conditions:

- Made from cans or paper that will not be damaged during this usage period
- The minimum size of 40 cm x 60 cm
- Letters with minimum size can be read from a distance

1.1.4 Implementation

1. **Implementation Plan**

   Within 7 (seven) days since the two parties signed the Contract, the Contractor must submit it to UNDP and the Consultant. Work program consists of:

   a. Detailed Implementation Schedule (Network Planning & bar chart)
   b. Material Procure Schedule
   c. Labour Schedule
   d. Equipment Schedule
   e. Detailed Implementation Methods
   f. Sub Package and Milestone Tables (if any)
   g. Tables or Lists per Item

   Other administrative requirements that will be determined later by the Consultant who will examine the Contractor's work plan above to provide a response to the maximum within 2 (two) weeks.

   The Contractor must re-submit the work plan if the Consultant and UNDP ask for the revision/improvement of the work plan in the last 4 (four) days before the start of implementation time. The Contractor is not permitted to start the implementation of work before the approval of UNDP on this work plan, unless it is proven that UNDP has neglected the obligation to check the work plan of the Contractor on time. The failure of the Contractor to start work due to the absence of the work plan approved by the Consultant and UNDP is entirely the responsibility of the Contractor.

2. **Working Drawing**

   Working drawings must be submitted to the Consultant and subsequently distributed to UNDP and Consultant to obtain approval and the drawings must be submitted in 2 (two) copies.

3. **Daily, Weekly, Monthly Plans**

   a. At least every afternoon, the Contractor must submit a daily work plan that contains the implementation plan of various types of work to be carried out the next day.
   b. At least every Saturday during the period when the implementation takes place, the Contractor is obliged to submit a weekly plan containing the implementation plan of the various works to be carried out in the following week to the Consultant and UNDP.
   c. At least in the last week of each month, the Contractor is obliged to submit a monthly plan that outlines the various implementation plans of the various works planned in the following month to the Consultant and UNDP.

   The negligence of the Contractor to prepare and submit a daily, weekly, monthly plan is considered as negligence in carrying out the orders of UNDP and the Consultant in general administrative requirements. To start a new part of the job, the Contractor is obliged to notify UNDP and the Consultant regarding the matter no later than 2 X 24 hours in advance with the permit format specified by the Consultant.

4. **Daily, Weekly, Monthly Reports**

   The Contractor is required to make a Daily Report, Weekly Report, and Monthly Report that provides a clear description of the activities carried out in the site. The report is made in 3 (three) copies, including:

   a. Physical Activities
   b. Notes and Instructions of UNDP, Consultant submitted both verbally and in writing.
   c. Matters relating to the problem:

- Material (approved/disapproved)
- Number of Labour
- Weather Condition
- Variation Order

Based on daily reports, weekly reports are made, where the report contains an overview and a record of achievements for last week's work and next week's work plan. This report must be signed by the Project Manager and submitted to UNDP and the Consultant to be acknowledged / approved.

Testing Report

The Contractor must submit to UNDP and the Consultant in 5 (five) copies regarding the following matters:

- The testing results of all installation operation requirements
- Cable test results (mergers and voltage)
- Test results of installation equipment
- Measurement results, etc.

All of these tests and / or measurements must be witnessed by UNDP and the Consultant.

5. **Testing of Work Results**

If all materials / products that comply with these specifications have been sent and installed, they must meet the conditions of the test requirements. The Contractor must carry out a test of the overall work output of the material / product installed, if it has been tested, it turns out to fulfill its function in accordance with the provisions of the contract, then all complete units of the material / product with the equipment can be submitted to UNDP, Consultant.

6. **Completion and Submission**

Submission of keys. All original keys are accompanied by a construction key, if any. At least 1 set of duplicate keys. Official documents (such as tax payment letter, tax fiscal, etc.). All kinds of guarantees in the form of a warranty in accordance with the requirements. The repayment requirements are following the instructions given by UNDP and the Consultant.

1.2. SPECIAL TECHNICAL REQUIREMENTS

1.2.1. Applicable Standard

All work must be carried out by meeting the technical requirements in the requirements of the Indonesian Normalization (NI), the Indonesian Industrial Standards (SII) and other national and local regulations that apply to the types concerned, among others:

- NI – 2 (1971) PBBI
- NI – 3 (1970) General Regulations for Building Materials in Indonesia
- NI – 8 (1974) Indonesia Portland Cement Regulations
- NI – 5 (1961) Indonesian Wood Construction Regulations

For work not included in the above standards, national or international standards apply to those jobs, or at least the technical requirements of the country of origin of the material / work apply.

1.2.2. Trademarks

Unless otherwise specified, the names / trademarks of the material mentioned in the technical requirements are designated for comparison purposes, especially in terms of quality, model, shape, and type.

Contractor may propose other brands whose quality, model, shape, and type are on par after obtaining approval from the Consultant and UNDP. If it is proposed with other brands, the brand proposed should be equivalent or better through material testing technical data from material testing agencies approved by the Consultant and UNDP.

In cases where 3 (three) trademarks or more are mentioned for the same material work, the Contractor must be able to provide one of them in accordance with the approval of UNDP and the Consultant.

1.2.3. General Data of the Work Site

1. Measurement Points

a. The worker must re-measure existing conditions and report to the Consultant.
b. Benchmark size and the size specified in the drawings become the site reference.
c. If there are dimension differences between the main drawing and the detailed drawing, the main drawing should be used as the reference. However, this must be reported immediately to the Consultant.
d. Taking and using the false measurements during the implementation of the work will be the full responsibility and the risk of the Contractor.
e. Any discrepancies that may exist between the drawings and reality must be reported immediately to the Consultant, and the decision will be processed by UNDP.
f. The benchmark of approximately 0.00 (the estimated point = zero) will be determined by markings on the site using permanent concrete stakes.
g. These permanent markings must be maintained during construction by The Contractor.
h. Determining the dimension and the right angle must be executed with as much accuracy as possible, by using the water pass and theodolite, for example.
i. Grid (axles) and height mounted by the Duty officer should not be smaller than 10 x 10 cm made from class 1 quality woodblocks.
j. Implementation of measurements should pay attention to the following matters:
    - Building setback and marking stakes are mounted by the Contractor and legalized by the Local Government Urban Planning Office stated in a Minutes.
    - If there is a delay in this implementation, it will not be used as an excuse to delay the construction period; all costs are the responsibility of the Contractor.
    - The ground floor level of this building is about + 0,600 m from the surface of the planned site. It is then considered as more or less ± 0,000 m floor elevation. Thus this floor elevation will be used as a reference during the implementation period.
    - The right angle measurements are only done with a water pass or Theodolite.
    - Measurement of the right angle by the principle of the Pythagorean triangle is not permitted.
    - The accuracy of the horizontal and vertical measurements is the Contractor's responsibility.
    - The inaccuracy of measurements must be corrected immediately, and the consequences (ex: demolition) will be the Contractor's responsibility.

1.2.4. Site measurements and Benchmarking

The project location is determined by the Consultant on the site and the Contractor must start the work from the baseline and marking stakes that have been approved by the Consultant and take full responsibility for the measurements conducted.

The Contractor reports to the Consultant on reviewing the measurements of the main marking stakes.

1.2.5. Preparation work

Notice

Before initiating the Preparation work, the Worker must notify the Consultant for the initial inspection and permission to carry out the work, in 2 X 24 hours notice before starting the Work.

Barrack

The placement of Barrack must be located in a strategic place to ease the Supervision of construction workers. The 36 m2 Barrack consists of workspace for Contractor / sub-Contractor, Consultant and meeting room with a capacity of 20 people.

The room should be equipped with:

- Meeting table and chair
- Whiteboard with stationaries
- Working table for the Consultant
- Storage Cabinet and material sample
- Electricity
- AC for each room
- Toilet

1.2.6. Safety tools and equipment on the site

The Barrack consists of:

- Floor : Tiles 30x30cm
- Wall : Wooden structure and 6mm of double Multiplex (outdoor paint & indoor paint)
- Door : Wooden mullion & wooden frame finished with the plywood door panel
- Ceiling : Plywood finished with paint
- Roof : Metal roofing sheet/ Asbestos

If it is a two-story barrack, the Consultant is located on the second floor. All materials for barrack are approved by the Consultant.

Storage and Boarding house

Locating storage and boarding house should not interfere with the construction work and the pieces of equipment inside the storage, and the boarding house is protected from damage caused by sunlight, rain, and other exposures. The storage and boarding house's dimension can be adjusted per usage and needs in accordance with UNDP and Consultant's guidelines using material such as:

- Floor : Plaster
- Wall : Wooden structure and 6 mm Multiplex
- Door : Wooden mullion & wooden frame finished with the plywood door panel
- Ceiling : Expose, without Ceiling
- Roof : Metal roofing sheet/ Asbestos

Project's Signage

Project's Signage should be placed on the front of the site so it's visible and readable from outside of the site. Material and the form of signage should be in accordance with the aplicable regulations, and the placement of the entire material should be approved by UNDP and the Consultant.

Project's Fence

Project's Fence should be placed on the side of the road around the construction site to protect work activities on the site from the outside environment with sturdy material such as boards, multiplex, or zinc. The foundation and columns should be strong enough to support the load above and from the side, with the height of the project fence planned to be 2 meters from the ground or road, the material used must be clean and made of homogeneous material.

Water and Electricity

Workers must provide clean water and electricity for work implementation, electricity power provided by the generator, or clean water from well with the capacity and dimension adjusted with the needs and workers should be approved by the Consultant.

Mobilization and Demobilization

Workers may adjust Mobilization and Demobilization activity per procedure and schedule made by the worker. The worker should be responsible for the damage that occurs during the activity.

1.2.7. Site Work

1. Contractor's work and cleaning

The Worker must ensure the readiness of the site and any consequences that may arise in the process of carrying out in the cleaning work. Permission approval to start the implementation of the Work derived after inspection of site conditions together with the Consultant and the Worker.

Installation Termination

a. Secure the plumbing installation, electrical power lane, or other installation on the site before the cleaning work initiate. The method of terminating should be approved by UNDP, the Consultant, the Stakeholder of the area, and other relevant parties.
b. Installing or replacing the electrical installation and plumbing which broken off caused by the cleaning work with the new one directly to the existing lane around the site.

2. Cut and Fill

Cut

a. All cut must be conducted in accordance with the drawings and terms determined according to the requirements, such as Straus Pile excavations, Foundation and Beams excavations, Infiltration Wells, drainage channels, septic tanks, etc.
b. The foundation pit excavations must refer to the water pass. If there are still roots of the tree, the remains of the body or loose parts at the base of each excavation, then these must be dug out, and the holes are filled back with sand filled with water and compacted to fulfilled the referred water pass.
c. All excavations must be inspected and approved by the Consultant. The Contractor is required to report the results of the completed cut to UNDP and the Consultant before starting with foundation work.
d. Deviations from this provision will be the Contractor's responsibility and risk.
e. For the possibility of the water collected at the base of the excavation hole, both when digging and when working on the foundation, a water pump or mud pump must be provided which, if necessary, can work continuously to avoid the water being collected.
f. The Contractor must pay attention to securing the edge wall of the excavation hole so that it does not collapse by providing a safety wall or temporary support.
g. The soil originating from excavation works must be removed immediately after reaching a certain amount from the site on every Consultant's instructions period.
h. Parts that are filled must be filled with soil that is clean from all impurities. Implementation in layers with hoarding.

Re-hoarding

a. Under the installation of Local foundation and Sloof and sheet piles are 10 cm thick with sand.
b. Regarding the construction of foundations or other parts of the Sub-Structure and site elevation cutting, the cutting work must meet the following conditions:
   - Common layers of native soil (approximately 30 cm deep) must be removed.
   - Decomposed material should be discarded.
   - Debris removed
   - The backfill material used is the landfill soil
   - Filling done layer by layer (max.40 cm) slightly wet / moistened and solidified using Vibro Stamper.
c. Beneath the work floor must be filled with 10 cm of solid sand.
d. If the basic floor plan is considered to be inadequate according to the consideration of the Consultant and UNDP, and if repair is taken, then the sand design method (zandpaaltjes) or with a layer of lime mortar or other ways according to the consideration of the Consultant is the most appropriate.
e. Layers of sand are also needed beneath the flat slab / retaining wall, drainage channel, base course, etc. according to the drawings and instructions of the Consultant.

3. Anti-Termite Work (Pre- and post-construction termite control)

a. Scope of Implementation

   The scope of work in this article includes:
   - Site soil investigation towards termite condition.
   - Investigation of anti-termite chemical materials and equipment for the coating work.
   - Implementation of coating or spraying chemical termites resistant on the Wall and the bottom of the foundation excavation pit and the foundation, basic course beneath the floor, the surface parts of the building according to the implementation instructions of the factory that producing the termite resistant material.
   - The Contractor must request the Consultant instructions regarding the parts to be given the anti-termite material.

b. Termiticide material requirements using chlorpyrifos (soil water base)

   - The material is a chemical material to prevent the rise of termites to get to the building and secure the building land that is likely to be a place of termite nesting through the soil and the bottom of the building that has been given a coating layer of anti-termite before.
   - The material used must have the concentration/formulation required by the Indonesian Ministry of Health or other authorized agencies or Bayer, Latrex, and Lentra brands.
   - Before the Contractor/Sub-Contractor provides materials for this work, it is necessary to show the sample to the Consultant to get their approval.
   - All termite materials imported into the site must be sealed. If the quality of the material to be used is not in accordance with the sample, it can result in a substitution/exchange of the mentioned material at the Contractor's expense.
   - Anti-termite work must be conducted by Contractors/businesses engaged in pest control.

c. Implementation Requirements

- Material mixing should be done on the site so that the usage formulation can be acknowledged by the Consultant/expert appointed for such matters.
- The coating is conducted in stages as follows:
  - On excavated soil before foundation is installed.
  - On the part of the of construction work type that will contact the land fill such as: foundation surface, subsurface of the floor plate, the bottom surface of the stairs and others after sub-structural work is completed.
  - On the soil part before the containment of sand backfill.
  - At the top of the sand fill before being covered with floor cover layer material.
- Before conducting work, the Contractor must ask the Consultant in advance. The number of materials used (volume per unit area) for each stage of coating and the building part must be as required and obtain the approval from the Consultant.

d. Guarantee

The Contractor must provide guarantees regarding 2 (two) things:

- The material used has the required concentration, formulation and comparison.
- At least 5 (five) years after the coating of this material, the Contractor must guarantee the effectiveness of the anti-termites coating material.

1.3. CONSTRUCTION WORK SAFETY AND HEALTH PLAN (RK3K)

1.3.1. Scope

The guidelines for the implementation of the Construction Work Safety and Health Plan (RK3K) specifically describe the implementation of Health, Safety, and Environment (HSE) for building construction. This guideline is intended as a reference and provision for building contractors related to the implementation of the Construction Work Safety and Health Plan (RK3K).

These HSE implementation guidelines are arranged in the order of work in accordance with the general specifications of road and bridge construction works, namely: general, drainage works, soil works, widening of pavement and road shoulder, grained pavement works, asphalt pavement works, structural work, condition restoration work, work daily, routine maintenance work and road and utility equipment work.

1.3.2. Normative Guidelines

This guideline uses reference documents that have been published both nationally and internationally, including:

- Law No. 14 of 1969, about Protection of Workers and Guiding Work Safety Norms.
- Law No. 1 of 1970, about Occupational Safety.
- Minister of Manpower Regulation No. Per. 01/Men/1980 about Occupational Health and Safety in Building Construction.
- Minister of Manpower Joint Decision No. Kep.174/Men/1986 and Ministry of Public Works and Housing No. Kep/104/Men/1986 about Occupational Health and Safety on Building Construction Works.
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- SNI 19-0229-1987 : Work in Enclosed Space.
- SNI 19-0230-1987 : HSE for Wood logging and transportation works.
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- SNI 19-3994-1995 : Guidelines for Occupational Safety and Health at First aid.
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- SNI 05-0572-1989 : Wood Hand Saws.
- SNI 06-0652-1989 : Heavy Work Gloves from Cow Leather.
- SNI 05-0738-1989 : General Requirements and Test Methods for Hand Tractor Work.
- SNI 03-0963-1989 : Test Methods of Hydraulic Land Excavators.
- SNI 09-0964-1989 : Test Methods for Centipede Chain Tractors.
- SNI 03-0965-1989 : How to Test Loader Work.
- SNI 09-0966-1989 : How to Test Motor Grader Work.
- SNI 19-1717-1989 : Occupational Safety of Circular Sawing Machines for Woodwork.
- SNI 19-1721-1989 : Noise assessment and control at Work.
- SNI 19-1957-1990 : Guidelines for Occupational Health Monitoring.
- SNI 19-1961-1990 : Special Regulations for Occupational Safety and Health.
- SNI 18-2036-1990 : Radiation Work Safety Requirements.
- SNI 19-3996-1995 : Guidelines on Occupational Safety and Health about Explosive Storage and Security.

1.3.3. Definition and Term

1. Occupational Safety
   Work safety where worker individual side will be considered as a subject.
2. Construction Safety
   Occupational safety in a construction project which can be seen from the individual side of the worker and organization where the worker works.
3. Safety Engineering
   Accident prevention efforts or efforts to increase occupational safety by using engineering.
4. Safety Management
   Accident prevention efforts or efforts to increase occupational safety with a management system.
5. Accident
   Unexpected events that results in loss of personnel and property.
6. Work accident
   Unexpected events occur during work and result in loss of personnel, property or both.

1.3.4. Provisions for the implementation of HSE

1. Administration Provision

a. General Obligation

General obligation mentioned means general obligation for construction Contractor, i.e.:

- Contractors are obliged to make sure that the workplace, equipment, work environment, and work procedures are arranged so that workers are protected from the risk of accidents.
- The Contractor guarantees that the equipment machinery, vehicles or other equipment that will be used or needed in accordance with occupational safety regulations, then these items must be used safely.
- Contractor also conducts supervision of the workforce so that the workforce can carry out work in a safe and healthy condition.

- The Contractor appoints occupational safety officers who, because of their position within the Contractor organization, are responsible for overseeing the coordination of work carried out to avoid the risk of accident hazard.
- Contractor provides jobs suitable for workers according to their expertise, age, gender and physical/health condition.
- Before the work begins, the Contractor guarantees that all workers have been given instructions on the hazard of their respective work and prevention efforts, for that Contractor can install generators, warning boards and prevention facilities that are deemed necessary.
- The person is also responsible for periodic inspections of all workplaces, equipment, means of accident prevention, work environment and safe work practices.
- Matters relating to costs incurred in the implementation of occupational safety and health are the responsibility of the Contractor.

b. Occupational safety and health organization

Construction Contractor must specifically assign RK3K Experts and HSE personnel for each project implemented. The HSE personnel must be included in the organizational structure of the construction of each project, with the following provisions:

- Occupational safety and health officers must work full-time to administer and organize occupational safety and health.
- The Contractor who manages work by employing workers with a number of at least 100 people or the conditions of the nature of the project is considered as necessary to form an HSE unit, is required to form an HSE supervisory unit.
- The occupational safety and health advisory committee is a structural unit of the service provider organization that is managed by the management or service provider.
- The occupational safety and health officer, together with the occupational safety supervisor committee work as well as possible, under the coordination of the Contractor, and is responsible for the project leader.
- The Contractor must do the following things:
  - Provide a committee to guide the occupational safety and health of the facilities in carrying out their duties.
  - Consult with the committee for the guidance of occupational safety and health in all matters relating to occupational safety and health in the project.
  - Take practical steps to give effect to the recommendations of the occupational safety and health committee.
- If 2 (two) or more Contractors join a project, they must work together to form occupational safety and health activities.

c. Accident Report

One of the duties of the HSE officer is to record events related to HSE, where:

- Every work accident or dangerous event must be reported to the relevant Agency.
- The report must include statistics that will indicate the following matters:
  - Shows a record of accidents from each work activity, each employee.
  - Shows a description of accidents and their causes.

d. Occupational safety and first aid

Organizations for emergencies and first aid in accidents must be made in advance for each project which includes all employees / first aid workers in accidents and equipment, communication equipment and other equipment as well as transportation routes, where:

- Workers must have their health checked.
  - Before or sometime after entering the first period of work (health check before entering work with emphasis on physical health and individual health),
  - Periodically, in accordance with the risks that exist in the job.
- Workers under the age of 18 years must receive special health supervision, including regular health checks.
- Data obtained from health checks must be recorded and archived for Reference.
- First aid if a sudden accident or illness has to be done by a doctor, nurse or trained person in first aid accident.
- Adequate first aid kits or medical kits must be provided at the workplace and maintained so as not to be contaminated by dust, humidity and so on.
- First aid kits or medical kits must contain at least medicine for compresses, bandages, antiseptics, plasters, scissors and snakebite kits.
- First aid kits and medical kits must not contain anything other than first aid kits needed in an emergency.
- First aid kits and drug boxes must contain information that is easy and clear so that it is easy to understand.
- The contents of medicines and first aid kits must be checked regularly and kept contained (not empty)).
- Carriages to lift the sick (stretchers) must always be available.
- If workers are working underground or in other circumstances, rescue equipment must always be available near where they work.
- If workers are working in places where there is a risk of drowning or poisoning, rescue equipment must always be available near where they work.
- Preparations must be made to enable rapid transportation to the hospital or other places of treatment, if needed, for officers who are sick or have an accident.
- Instructions/information should be announced/posted in a good and strategic location which informs, among others :
  - Closest spot/location to medicine boxes, first aid kits, ambulances, stretchers for the sick, and places where HSE officers can be searched for.
  - The nearest telephone to make a call / call an ambulance, telephone number and name of the person in charge, etc.
  - Name, address, phone number of doctors, hospitals, and rescue centers that can be contacted immediately in an emergency.

e. Occupational Health and Safety Financing

The operational costs of occupational safety and health activities must be anticipated early on, when the Service User prepares the design and estimated cost of a project so that in the bidding period, it became one of the work items that need to be part of the evaluation in determining the bidding winner. Furthermore, the Contractor must implement the principles of occupational health and safety activities, including the provision of infrastructure, human resources, and financing for these activities at a reasonable cost. Therefore both Contractor and Service Users need to understand these occupational health and safety principles in order to carry out the preparation, implementation and supervision steps.

2. **Technical Provision**

a. Environmental Aspect

In line with planning and implementing RK3K for building construction, the Contractor must refer to the Environmental Management Plan Document (RKL) and Environmental Monitoring Plan (RPL) or Environmental Management Efforts (UKL) and Environmental Monitoring Efforts (UPL). If such documents are not available, then HSE planning and implementation, especially related to environmental aspects, must obtain approval from the board of directors.

b. Workplace and Equipment

Technical provisions of the workplace and equipment on a project related to Occupational Health and Safety are as follows:

1) Entrance and Exit

- Entrance and emergency exit should be placed in the workplace.
- Those spots and equipment should be well maintained.

2) Lighting

- If the natural lighting is not suitable to prevent danger, suitable artificial lighting devices must be installed in all workplaces, including on along the aisles.
- Lighting must be safe and fairly bright.
- Lighting should be secured by officers if necessary to prevent hazards if the lights off / burst.

3) Ventilation

- In an enclosed workplace, adequate ventilation should be made to get fresh air.
- If necessary, to prevent hazards caused by air polluted by dust, gases, or other causes, ventilation must be made to waste gas disposal.
- If removing dust and harmful gases are technically impossible, workers must be provided with personal protective equipment to prevent the hazards mentioned above.

4) Cleanliness

- Materials that are not used and no longer needed must be moved to a safe place.
- All protruding nails must be removed or bent to prevent accidents.
- Equipment and small objects should not be left scattered because they can cause accidents, such as falling or stumbling).
- The remnants of items of equipment and rubbish must not be left piled up at work.
- Workplace and aisles that are slippery due to oil or other causes must be cleaned or doused with sand, ash, or such.
- Mobile devices must be returned to their original placement for storage after being used.

c. Prevention of fire and fire extinguishers

To be able to prevent fires at a place or project, prevention can be carried out as follows:

1) in the workplace should be provided:
   - Fire extinguisher.
   - Appropriate water supply.
2) Supervisors and several workers must be trained to use fire extinguishers.
3) People who are trained to use a fire extinguisher must always be available on-site during working hours.
4) Fire extinguishers should be checked periodically and properly maintained by the authorized person.

5) Fire extinguishers such as water pipes, Lightweight fire extinguishers and the pathway to the fire extinguisher must always be maintained.
6) Fire extinguisher equipment must be placed in a visible place and easy to be reached.
7) At least one fire extinguisher must be available in the following places:
   - in every building where flammable items are stored.
   - in places where tools for welding are stored.
   - at each level/floor of a building under construction where flammable items and tools are present.
8) Some extinguishers from dry chemical must be provided:
   - in a place where flammable liquid goods/objects are stored.
   - where oil, and gas fuel heating devices are present.
   - where asphalt and asphalt boiler are present.
   - places where potential electrical hazard/fire hazard caused by electricity will occur.
9) Fire extinguishers must be maintained to prevent technical damage.
10) Fire extinguishers containing chlorinated hydrocarbons or carbon
11) Tetrocloride should not be used indoors or in confined spaces (confined, narrow spaces).
12) If a water storage pipe (reservoir, standpipe) is installed in a building, the pipe must be:
   - installed in a strategic place due to convenience disposal.
   - a valve is made at each end.
   - each drain hole will be made a pipe with a valve that produces high-pressure water jets.
   - has a channel/connector that can be used by the Fire Department.

d. Heating Appliances

Placement of materials and heating appliance must be in a suitable place and safe from flammable materials as follows:
1) Heaters such as charcoal stoves should only be used in areas with adequate ventilation.
2) Heaters with an open flame should not be placed near the exit.
3) Equipment that easily flammable should not be placed on wooden floors or flammable materials.
4) Tarpaulins, canvas materials, and other materials must not be placed near heaters that use fire and must be secured so that they do not burn.
5) Charcoal stoves must not use coal fuel material containing bitumen.

e. Flammable Materials

Placement of flammable materials must be safe as described below:
1) Flammable materials such as dust/sawdust, oily rags, and unused pieces of wood must not be buried or piled at work.
2) Chemical materials that can be mixed and break with water down must be kept dry.
3) In buildings, oil residues must be stored in cans with lid.
4) No smoking, lighting a fire, or/and close to flammable material.
5) Flammable liquids must be stored, transported and used in such a way that fire burst can be avoided.
6) Fuel/gasoline for heating should not be stored in a building or any place except in cans or fire-resistant appliances made for the purpose.
7) Fuel should not be stored near doors.

f. Inspection and Supervision

Inspection and supervision must be carried out regularly and continuously as long as work takes place in places where has fire risk, where:

1) Places where fire risk is present for example spots close to heaters, electrical installations and electrical conduits where flammable liquids and flammable materials are stored, electric or carbide welding sites.
2) The person authorized to prevent the fire hazard must always be on standby, even outside working hours.

g. Equipment and warnings

The main equipment and warnings that must be available at the project or work site are as follows:

1) Warning signs, installed in spots that attract attention, a strategic place that visible.
2) Fire alarm, must be placed in the most reachable place.
3) Phone number and equipment of the nearest Fire Department must be available and easy to read.

h. High-leveled workplaces

Equipment and protection in high workplaces are as follows:

1) Workplaces with elevation more than 2m above the floor or the ground, all exposed sides must be protected with safety bars and safety edges.
2) High elevation workplaces must be equipped with entrance and exit pathways, for example, stairs.
3) If necessary, to avoid hazards working in high places or other places where workers have risk of falling more than 2m in height, the site workplace must be equipped with a net (mesh) trap, the platform, or by using a belt (seat belt) that is mounted firmly.

i. Prevention of the risk of falling into the water

If workers are in danger of falling into water and drowning, they must wear lifebuoys/safety clothing and / or other equipment manned boats and ring buoys.

j. General Utility

General utilities such as electricity lanes, gas pipes, water, telephones and others that will be disrupted related to road and bridge construction plans must be coordinated with the relevant agencies beforehand and for certainty about the location and position of these utilities, checks and field reviews must be conducted along with the relevant agency.

k. Noise and Vibration

Noise and vibration that are harmful to workers must be reduced to below the threshold value. If noise cannot be overcome then workers must wear ear protectors.

l. Avoiding unauthorized people

Unauthorized people are not permitted to enter the construction area, unless accompanied by an authorized person and equipped with personal protective equipment. In the area of construction that is being conducted and sides of the highway must be fenced off.

m. Equipment of occupational safety

Various types of standard work equipment to protect workers in carrying out their duties include the following:

1) Safety hat, which is useful for protecting the head from collisions with hard objects while operating or maintaining AMP.
2) Safety shoes, which will be useful to avoid slipping because of slippery or protect feet from falling hard objects, etc.
3) Safety goggles, especially needed to protect the eyes on the worksite that metal powders or other hard material powder are present.
4) Masks, needed in a dusty environment even though the operator's room has been tightly closed, still, it is recommended to mask.
5) Gloves are needed when doing hard material work-related, for example, opening or tightening bolts, etc.

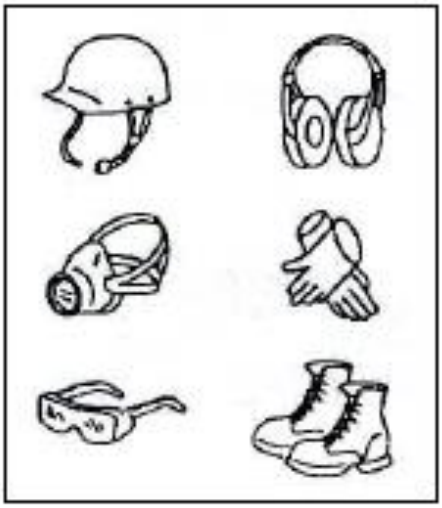

Figure 1 Occupational safety equipment

3. **Guidelines For The Main Workers Of Construction**

a. Guidelines for board of directors

Some things that need to be considered by board of directors to reduce costs due to work accidents, such as:

- Keeping the notes about occupational safety from all site managers. This information is used to evaluate the occupational safety program that has been implemented.
- Site visits to communicate occupational safety in the same way as the monitoring and control of costs and scheduling work plans.
- Allocate occupational safety costs on Contractor budgets and allocate work accident costs on the projects implemented.
- Requires a detailed work plan so that it can guarantee that the equipment or material used to conduct the work is safe.
- Newly hired workers undergo training on occupational safety and effectively utilize the available skill in each division (section) for occupational safety programs.

b. Guidelines for managers and supervisors

For managers and supervisors, the following can be applied to reduce accidents and health problems in the implementation of construction work:

- The manager is obliged to protect the safety and health of construction workers by applying various rules, and standards to improve HSE, and also encourage work personnel to improve their attitudes and awareness of HSE through good

communication, good organization, persuasion and education, respecting workers for safe actions, as well as setting realistic targets for HSE.

- Actively supporting policies for safety at work, such as including occupational safety issues as part of work planning and providing positive support.
- Managers need to pay special attention and establish close relationships with the foremen and workers to avoid accidents and problems in construction projects. The manager can do it by:
  - Guiding new workers to their jobs and make sure they get acquainted with personnel from other jobs; and pay special attention, especially to the first days.
  - Intervene in disputes between workers and foremen. By doing so, we will be able to understand the point of view of workers. This method is not intended to damage ("overstep") the authority of the foreman, but rather to ensure that the workers have been treated fairly (fairly).
  - Show respect towards the foremen's skill and acknowledge them as a human being who has a possibility of making mistakes. This can be done by allowing the foremen to choose their workers (but not giving up a single power to lay off the workers).

c. Guidelines for foremen

Foreman can reduce accidents and health problems in the implementation of construction work by:

- Treating new workers in different ways, for example by not letting new workers to work unsupervised or not putting them together with old workers.
- Reducing pressure on workers, for example by not providing high productivity targets and disregarding to the safety and health of workers. Furthermore board of directors can help the foremen to reduce work accidents in the following way:
  - Personally emphasizing the importance of occupational safety through their informal and formal meeting communication with foremen in the field.
  - Emphasize occupational safety in meetings within the Contractor structure.

d. Guidelines for workers

Guidelines that can be used by workers to reduce accidents and health problems in the implementation of construction work include:

- Personal problems are omitted when entering the work environment.
- Not working on the site if the health conditions are less favorable.
- Obey the rules that have been issued.
- Understanding Occupational Health and Safety Program.
- Understanding the given scope of work.

1.3.5. Technical Implementation Of RK3K On Building Construction

The RK3K technical implementation of building construction work is carried out on activities such as:

1. General Division

a. **Preparation work**

1) Site overlook

Site Inspection Work has potential hazards to workers, i.e.:

- Health problems due to workers not using standard work tools and equipment.
- Anticipating the prevention of hazards caused by the Supervision works.

- On the site using standard work protection equipment such as helmets, shoes, goggles, masks and gloves.

2) Mobilization and demobilization

Mobilization and Demobilization works have potential hazards to the workforce, ie:

- Workplace accidents and health problems due to inadequate workplace.
- Accidents and health problems of workers due to storage of materials & equipment and unfeasible materials.
- Accidents and health problems of workers due to the storage of materials and equipment or materials do not meet the requirements of accidents or health problems due to demolition of workplaces, electrical installations, equipment and supplies, cleaning and return of unfavorable conditions. Anticipating the hazard prevention by the Mobilization and Demobilization Work such as:
  - Provide site offices and qualified employee residences,
  - Provide land, storage and workshops that meet the requirements,
  - Implementation of the demolition of buildings, installation and cleaning of workplaces and restoration of conditions must meet the requirements.

3) Site Office and its facilities

The work of the Field Office and its Facilities have potential hazards to the workforce, ie:

- Hazards due to pollution generated by work implementation,
- Hazard due to office buildings and other facilities collapsed,
- Hazard due to stagnant water and theft in office buildings and supporting facilities,
- Fire hazard in office or storage or other buildings. Anticipating the prevention of hazards caused by site office work and its facilities are:
  - Buildings for office and its facilities must be placed in such a way to be free from pollution generated by implementation activities,
  - Office buildings and other facilities must be constructed with a structural strength that meets the requirements,
  - Office buildings and facilities must be made at a higher elevation than the surrounding area, enclosed with a fence, equipped with gravel access roads and a parking lot.

4) Logistics testing facilities and services

Logistic Testing Facility and Service Work has a potential hazard to workers, such as:

- Hazard due to material and equipment used does not meet the requirements,
- Hazard due to the method of transportation of the material that does not meet the requirements,
- Danger due to storage does not meet requirements,
- Hazards due to the disposal of materials and unused materials that do not meet the requirements.

Anticipating the prevention of hazards caused by Logistics Testing Facilities and Services work such as:

- Fire extinguisher must be available and sufficient first aid supply in all barracks, offices, warehouses and workshops,
- Materials and equipment used should meet the requirements,
- Material transportation must be in accordance with the road-load,
- Hazardous materials must be stored separately and secured properly,
- Disposal of materials must be in a designated place, safe and does not interfere with road traffic.

b. **Traffic control work**

1) Temporary traffic control road work

Road and Temporary Traffic Control Work has potential hazards to workers, such as:

- Danger due to temporary road damage / collapse,
- The danger of traffic due to entrance to the job site is unavailable or available but less qualified.

Anticipation of prevention of hazards caused by temporary road work:

- Buildings must be made with structures and strengths that meet the requirements,
- Temporary traffic control management with adequate signage.

2) Temporary traffic control management

Temporary traffic control management works have potential hazards to the workers for example:

- Hazard due to no access available for residents located along with the site work and adjacent to the work location.
- Anticipating the prevention of hazards caused by Temporary traffic control management, which is by providing temporary access that is safe and convenient to the residents.

3) Maintenance for traffic safety

Maintenance work for traffic safety has potential hazards to the workers such as:

- Accidents due to temporary buildings and damaged and not functioning signs,
- Hazards due to unsafe traffic caused by unused material and dirt scattered.

Anticipating the prevention of hazards caused by the Maintenance Work for Traffic Safety such as:

- Temporary buildings and signs must be kept safe and in conditions of service that meet the requirements,
- Cleaning of unused materials.

c. **Utility relocation and cleaning work**

1) Utility Relocation

Utilities Relocation Work has potential hazards to the workers such as:

- Accidents due to workers being electrically shocked or exposed to dangerous gases. Anticipating the prevention of hazards caused by the Utility Relocation Work such as:
  - Utility Data and Location information for relocation should be precise
  - Implementation should be done with proper procedures and methods.

2) Cleaning

Cleaning work has potential hazards to workers such as:

- Hazard due to cleaning up the accumulation of the remaining building materials, dirt and rubbish post-work operations.
- Anticipating the prevention of the dangers arising from Cleaning Work by:
- Cleaning all exposed surfaces must be done properly so that the project finished will be ready to use.

2. Drainage

a. **Sewer and drainage works**

1) Measurement and Benchmarking

Measuring and Benchmarking on Sewers and Drains has a potential hazard to workers such as:

- Health problems due to general work conditions,
  - Injured due to the condition and the misuse of building meter,
  - Accidents due to poor traffic management,
  - Accidents due to the wrong type and method of using the equipment,
  - Accident due to benchmarking method.

Anticipating the prevention of hazards caused by the Measurement and Benchmarking in Sewers and Drains such as:

- Must use work equipment that met the standard,
- Measurements must be made using a building meter that conforms to the standard,
- Traffic control managing must be in accordance with the standards,
- Tools and how to use must be correct and in accordance with the standards,
- Installation of benchmarking must be correct and in accordance with the provisions.

2) Cutting/Excavation

Excavation work on sewer and waterways works has potential hazards to workers, such as:

- Accidents affected by digging tools (hoes, blencong, etc.) due to the distance between diggers is too close,
- Danger due to excavation slopes landslide.

Anticipating the prevention of hazards caused by Excavation Work on Sewers and Drains such as:

- The distance between diggers must be kept at a safe distance,
- If the excavation is done at night, sufficient amount of lighting should be used,
- Maintain a stable slope.

b. **Work of masonry with mortars for gutters and drains**

1) Measurement and benchmarking

Measurement and benchmarking work in work of masonry with mortars for gutters and drainage network has the potential hazard to workers such as:

- Health problems due to general work conditions,
- Injured due to the condition and use of the wrong building meter,
- Accidents due to poor traffic management,
- Accidents due to the type and misuse of the equipment,
- Accident due to benchmarking method.

Anticipating the prevention of hazards caused by the Work Measurement and benchmarking in the Work of Masonry with mortars for gutters and drainage networks such as:

- Must use standard work equipment,
- Measurements must use a building meter that conforms to the standard,
- Traffic control must be in accordance with the standards,
- Tools and how to use it must be in accordance with the standards,
- Benchmarking must be precise and in accordance with the requirements.

2) Excavation

Excavation work in Work of masonry with mortars for gutters and drainage network has the potential hazard to workers such as:

- Accidents affected by digging tools (hoes, blencong, etc.) due to the distance between diggers is too close,
- Landslide hazard on excavation slopes.

Anticipating the prevention of the hazard due to the Excavation work in Work of masonry with mortars for gutters and drainage network such as:

- Diggers should work in a safe distance,
- If excavation is done at night, a sufficient number of lighting should be used,

- Cut and maintain a stable slope,
- Draining the used excavation submerged in water.

3) Mounting

Mounting works in Work of masonry with mortars for gutters and drainage network has the potential hazard to workers such as:

- Injured caused by mortar and falling masonry,
- Injured caused by rock fragments,
- Accidents due to improper placement of material stocks, especially the masonry.

Anticipating the prevention of the hazard due to the work of masonry with mortars for gutters and drainage network such as:

- The method of implementation must be in accordance with the requirements,
- Accidentally making direct contact with a mortar,
- Locating the masonry in a safe distance for site work,
- The method of splitting and forming the masonry surface following the requirements,
- Material stock must be placed in a safe place and distance from the site work.

3. Soil Works

a. General excavation work

1) Measurement and benchmarking

Measurement and benchmarking works in General excavation work have the potential hazard to workers such as:

- Health problems due to general work conditions,
- Injured due to the condition and use of the wrong building meter,
- Accidents due to poor traffic management,
- Accidents due to the type and misuse of the wrong equipment,
- Accident due to benchmarking method.

Anticipating the prevention of the hazard due to the Measurement and benchmarking on the General excavation work such as:

- Must use standard work equipment,
- Measurements must use a building meter that conforms to the standard,
- Traffic control must be in accordance with the standards,
- Tools and how to use must be correct and in accordance with the standards,
- Benchmarking must be precise and in accordance with the provisions.

2) Excavation

Excavation work in General excavation work has the potential hazard to workers such as:

- The accident caused by a digging equipment (hoe, blencong, etc.) due to the distance between the excavators is too close,
- Landslide hazard on excavation slopes ,
- Accidents due to heavy equipment operations both at the excavation location, transportation and at the disposal site.

Anticipating the prevention of the hazard due to the Excavation work in General excavation work such as:

- the diggers must be working adjacent to each other at a safe distance.
- If excavation is done at night, sufficient lighting must be used.
- Cut and maintain a stable slope.

3) Disposal of excavated material

Disposal of excavated material work in General excavation work has a potential hazard to workers, such as:

- Accidents due to a pile of excavated material that will be used for filling.

Anticipating the prevention of the hazard due to the work of disposal of excavated material on the General excavation work such as:

- Heavy equipment should be operated according to standards,
- The pile of excavated material that will be used for fillings should not be kept for too long.

b. Masonry work

1) Measurement and benchmarking

Measurement and benchmarking work in Masonry work have the potential hazard to workers such as:

- Health problems due to general work conditions,
- Injured due to the condition and use of the wrong building meter,
- Accidents due to poor traffic management,
- Accidents due to the type and misuse of the equipment,
- Accident due to benchmarking method.

Anticipating the prevention of the hazard due to the work of Measurement and benchmarking on Masonry work such as:

- Must use standard work equipment,
- Measurements must use a building meter that conforms to the standard,
- Traffic control must be in accordance with the standards,
- Tools and how to use it must be in accordance with the standards,
- Benchmarking must be precise and following the requirements.

2) Excavation

Excavation work in Masonry work has the potential hazard to workers such as:

- Accidents affected by digging tools (hoes, blencong, etc.) due to the distance between diggers is too close,
- Injured caused by rubble stones,
- Accidents due to heavy equipment operations at the excavation location, transportation, and at the disposal site.

Anticipating the prevention of the hazard due to the Excavation work in Masonry work such as:

- Diggers should work in a safe distance,
- If excavation is done in dark conditions or at night, sufficient lighting must be used,
- Excavation must be done by experts with the proper method,
- Heavy equipment must be operated according to standards.

3) Disposal of excavated material

Disposal of excavated material work in Masonry work has the potential hazard to workers, such as:

- Accidents due to a pile of excavated material that will be used for fillings.

Anticipating the prevention of the hazard due to the Disposal of excavated material work in Masonry work such as:

- The pile of excavated material that will be used for fillings should not be kept for too long.

c. Structural Excavation works in the depth of 0-2 meter

1) Measurement and benchmarking

Measurement and benchmarking works in Structural Excavation work in the depth of 0-2 meter has the potential hazard to workers such as:

- Health problems due to general work conditions,

- Injured due to the condition and use of the wrong building meter,
- Accidents due to poor traffic management,
- Accidents due to the type and misuse of the equipment,
- Accident due to benchmarking method.

Anticipating the prevention of the hazard due to the Measurement and benchmarking work in Structural Excavation works in the depth of 0-2 meter such as:

- Must use standard work equipment,
- Measurements must use a building meter that conforms to the standard,
- Traffic control must be in accordance with the standards,
- Tools and how to use it must be in accordance with the standards,
- Benchmarking must be precise and in accordance with the requirements.

2) Excavation

Excavation work in Structural Excavation works in depth of 0-2 meter has the potential hazard to workers such as:

- Accidents affected by digging tools (hoes, blencong, etc.) due to the distance between diggers is too close,
- Injured caused by the riprap,
- Accidents due to heavy equipment operations at the excavation location, transportation and at the disposal site.

Anticipating the prevention of the hazard due to the Excavation work in Structural Excavation works in depth of 0-2 meter such as:

- Diggers should work in a safe distance,
- If excavation is done in dark conditions or at night, sufficient lighting must be used,
- Excavation must be done by experts with the proper method,
- Heavy equipment must be operated according to standards.

3) Disposal of excavated material

Disposal of excavated material works in Structural Excavation works in depth of 0-2 meter has the potential hazard to workers such as:

- Accidents due to a pile of excavated material that will be used for fillings.

Anticipating the prevention of the hazard due to the Disposal of excavated material works in Structural Excavation works in depth of 0-2 meter such as:

- The pile of excavated material that will be used for fillings should not be kept for too long.

d. Structural Excavation works in depth of 2-4 meter

1) Measurement and benchmarking

Measurement and benchmarking works in Structural Excavation works in depth of 2-4 meter has the potential hazard to workers such as:

- Health problems due to general work conditions,
- Injured due to the condition and use of the wrong building meter,
- Accidents due to poor traffic management,
- Accidents due to the type and misuse of the equipment,
- Accident due to benchmarking method.

Anticipating the prevention of the hazard due to the Maintenance work for traffic safety such as:

- Must use standard work equipment,
- Measurements must use a building meter that conforms to the standard,
- Traffic control must be in accordance with the standards,
- Tools and how to use it must be in accordance with the standards,
- Benchmarking must be precise and in accordance with the requirements.

2) Excavation

Excavation work in Structural Excavation works in depth of 2-4 meter has the potential hazard to workers such as:

- Accidents affected by digging tools (hoes, blencong, etc.) due to the distance between diggers is too close,
- Injured caused by the riprap,
- Accidents due to heavy equipment operations at the excavation location, transportation and at the disposal site.

Anticipating the prevention of the hazard due to the Excavation work in Structural Excavation works in depth of 2-4 meter such as:

- Diggers should work in a safe distance,
- If excavation is done in dark conditions or at night, sufficient lighting must be used,
- Excavation must be done by experts with the proper method,
- Heavy equipment must be operated according to standards.

3) Disposal of excavated material

Disposal of excavated material works in Structural Excavation works in depth of 2-4 meter has the potential hazard to workers such as:

- Accidents due to a pile of excavated material that will be used for fillings.

Anticipating the prevention of the hazard due to the Disposal of excavated material works in Structural Excavation works in depth of 2-4 meter such as:

- The pile of excavated material that will be used for fillings should not be kept for too long.

e. Structural Excavation works in depth of 4-6 meter

1) Measurement and benchmarking

Measurement and benchmarking works in Structural Excavation works in depth of 4-6 meter has the potential hazard to workers such as:

- Health problems due to general work conditions,
- Injured due to the condition and use of the wrong building meter,
- Accidents due to poor traffic management,
- Accidents due to the type and misuse of the equipment,
- Accident due to benchmarking method.

Anticipating the prevention of the hazard due to the Measurement and benchmarking works in Structural Excavation works in depth of 4-6 meter such as:

- Must use standard work equipment,
- Measurements must use a building meter that conforms to the standard,
- Traffic control must be in accordance with the standards,
- Tools and how to use it must be in accordance with the standards,
- Benchmarking must be precise and in accordance with the requirements.

2) Excavation

Excavation work in Structural Excavation works in the depth of 4-6 meter has the potential hazard to workers such as:

- Accidents affected by digging tools (hoes, blencong, etc.) due to the distance between diggers is too close,
- Injured caused by the riprap,
- Accidents due to heavy equipment operations at the excavation location, transportation and at the disposal site.

Anticipating the prevention of the hazard due to the Excavation work in Structural Excavation works in depth of 4-6 meter such as:

- The pile of excavated material that will be used for fillings should not be kept for too long.

3) Disposal of excavated material

Disposal of excavated material works in Structural Excavation works in depth of 4-6 meter has the potential hazard to workers such as:

- Accidents due to a pile of excavated material that will be used for fillings.

Anticipating the prevention of the hazard due to the Disposal of excavated material works in Structural Excavation works in depth of 4-6 meter such as:

- The pile of excavated material that will be used for fillings should not be kept for too long.

f. Filling works

1) Measurement and benchmarking

Measurement and benchmarking working in Filling works has the potential hazard to workers such as:

- Health problems due to general work conditions,
- Injured due to the condition and use of the wrong building meter,
- Accidents due to poor traffic management,
- Accidents due to the type and misuse of the equipment,
- Accident due to benchmarking method.

Anticipating the prevention of the hazard due to the work of Measurement and benchmarking on Filling works such as:

- Must use standard work equipment,
- Measurements must use a building meter that conforms to the standard,
- Traffic control must be in accordance with the standards,
- Tools and how to use it must be in accordance with the standards,
- Benchmarking must be precise and in accordance with the requirements.

2) Compacting

Compacting works in Filling works has the potential hazard to workers such as:

- Accidents due to poor traffic management,
- Accidents due to heavy equipment operations at the compacting location,
- Accidents due to landfill methods on the slope.

Anticipating the prevention of the hazard due to the work of Compacting on Filling works such as:

- Traffic control must be in accordance with the standards,
- Excavation must be done by experts with the proper method,
- Implementation of landfill on the slope must be properly done.

3) Watering

Watering works in Filling works has the potential hazard to workers such as:

- Health problems due to dust arising during watering.

Anticipating the prevention of the hazard due to the Watering works on Filling works such as:

- Workers must always wear masks and standard work equipment.

4. Structure compacting

a. Concrete works

1) Measurement and benchmarking

Measurement and benchmarking in Concrete works has the potential hazard to workers such as:

- An accident or injury by a measuring instrument or equipment due to the improper method of work implementation,
- Health or physical problems caused by inadequate equipment used by workers,
- Road accident or being hit by a vehicle when taking measurements on the highway.

Anticipating the prevention of the hazard due to the Measurement and benchmarking on Concrete works such as:

- Implementation of measurement and benchmarking must be done by skilled and experienced workers in their fields,
- Workers must wear appropriate clothing and work equipment (gloves, boots and helmets) which fulfill the requirement,
- Place signposts on the job site to protect the personnel working from the vehicle crossing the project and place the flag officers in all the activities of the implementation.

2) **Preparation**

Preparation of Concrete works has the potential hazard to workers such as:

- Health disorders or physical disorders caused by improper equipment used by workers,
- Pulmonary disease due to dust from material in warehouse/storage areas,
- Fire Hazard in material storage/warehouse,
- The hazard caused by a concrete mixer,
- Accidents caused by insufficient and ineligible safeguards in temporary traffic signs installation.

Anticipating the prevention of the hazard due to the Preparation works in Concrete works such as:

- Workers must wear appropriate clothing and equipment that meet the requirements,
- Cover the material with plastic to prevent the dust from scattering,
- Provide fire extinguishers in warehouses or material storage areas,
- Checking concrete mixer tools before use including the boosters, and should be operated by experts in their fields,
- Place signposts on the job site to protect the personnel working from the vehicle crossing the project and place the flag officers in all the activities of the implementation.

3) **Formwork installation**

Formwork installation works in Concrete works has the potential hazard to workers such as:

- The danger of accident on formwork installation in the soil of the land include: crushed soil, buried soil, crushed falling objects and slip falling,
- Accidents caused by the collapse of excavation due to loading,
- an accident or injury occurs caused by protruding nails, crushed / squashed by wood / formwork.

Anticipating the prevention of the hazard due to the work of Formwork installation on Concrete works such as:

- Formwork installation must be carried out by skilled workers who are experienced in their fields, formwork installation in excavated areas must pay attention to the following provisions:
  - Wearing work clothes and equipment, especially helmets that comply with standards,
  - Excavation wall should be given adequate retaining wall,

- Adequate lighting must be given. In the formwork installation area, it is forbidden to store/place the soil in the construction of the *bekisting*. The soil must be disposed of in a safe place that has been determined,
- Provide an emergency exit,
- Installed appropriate ladders and meet the requirements in terms of strength,
- It is forbidden to place or move the machinery load or other equipment near the formwork installation / excavation side which can cause the collapse of the excavation and endanger everyone in it.

- The nails that protrude out need to be immersed or bent.

4) **Reinforcement**

Reinforcement works in Concrete works has the potential hazard to workers such as:

- Injury due to the reinforcement implemented by inexperienced personnel or non-experts in their fields, such as: hit by reinforcing steel, in direct contact with reinforcing wire, etc.,
- Falling objects such as formwork, steel reinforcement and other work equipment.

Anticipating the prevention of the hazard due to the Reinforcement works on Concrete works such as:

- Implementation of reinforcement must be conducted by workers who are skilled and experienced in their fields, equipped with helmets, gloves, boots that meet the requirements and pay attention to the following provisions:
  - The remnants of iron/steel wire are placed in such a way that they do not cause a hazard,
  - Reinforcing steel protruding from the floor or wall must be protected,
  - When connecting reinforcing bars the protruding ends outward should not cause any hazard,
  - Reinforcing bars should not be stored in scaffolding or formwork that could jeopardize their stability.
- For the installation of reinforcement below ground level/excavation area, the following provisions must be considered:
  - Wearing work clothes and equipment, especially helmets that comply with standards,
  - Excavation wall should be given adequate retaining wall,
  - Adequate lighting must be given In the formwork installation area,
  - It is forbidden to store/place the soil in the construction of the *bekisting*, the soil must be disposed of in a safe place that has been determined,
  - Provide an emergency exit,
  - nstalled appropriate ladders and meet the requirements in terms of strength.

5) **Casting**

Casting works in Concrete works has the potential hazard to workers such as:

- Health or physical problems due to improper equipment used by workers,
- Accidents caused by concrete mixers (direct contact with chains, rotating wheels etc.),
- Concrete mixer hit when the tool is being lifted,
- Fell from the casting site,
- Injured from cleaning the concrete mixer tube,
- Injured due to contact with concrete splashing when pouring concrete from a concrete mixer,
- Visual impairment and hearing loss due to vibrator vibrations and dust when mixing cement, aggregate and water,
- Injured due to short circuit or electric shock when using an electric vibrator,
- Accidents due to the distribution of uetori to the vibrator,
- Injury due caused by using vibrator,

- Health problems by dust due to mixing concrete,
- Accident due to collapse of concrete cast,
- An accident occurred due to the process of shedding concrete mix, concrete stirring, vibrator and water tanker,
- Accidents incurred in the area of employment by unauthorized person,
- Occupational accidents occur when working in the dark or at night due to insufficient lighting,
- Accidents due to temporary site floor collapsed.

Anticipating the prevention of the hazard due to the Casting works on Concrete works such as:

- The casting must be conducted by skilled personnel who are experienced and wearing proper clothing and work equipment that meet the standard,
- All gears, chains and rotating wheels of the concrete mixer must be protected so that they are safe,
- The concrete mixer must be protected by a safety fence to prevent workers from passing underneath while the relevant equipment is being lifted,
- Concrete mixer operators are not allowed to lower the support before all workers are in a safe place,
- At the time of clearing the stirring tubes, the precautions should be taken to protect the workers in it, for example by locking the button in an open position to release the fuses or by turning off the power source,
- When concrete is being poured from the cargo box, workers must be at a safe distance from each concrete splash,
- During the implementation of mixing aggregate, cement and water must not cause scattered dust, workers must wear masks,
- Workers who use electric vibrators must only be experts and experienced in their fields,
- Uetori channel pipes to vibrators must meet the following provisions:
  - The pipe connection must be tied to a safety chain or other effective means,
  - The mouth of the discharge pipe must be tightly bound so that it can prevent shifting movement,
- When using an electric vibrator, then:
  - Connected to the ground (earthed),
  - Important parts must be sufficiently insulated,
  - The electricity must be turned off when not in use,
  - If the concrete starts to harden then it must be protected against the flow of water that flows chemical materials, and vibrations as well as workers,
  - Is not allowed to place weights on hardened concrete,
- Dry materials from concrete must be mixed in an enclosed room:
  - Dust must be channeled/disposed outside,
  - If dust cannot be disposed of, workers must use a respirator,
- During casting the formwork and its leverage must be prevented from damage,
- Operation of mixer, vibrator and water tanker must be done by a skilled and experienced person and must always be maintained so that no outside people or other workers who are unauthorized are in the place of concrete casting,
- Limiting the area of casting works with informative fences or signage,
- Prepare sufficient lighting if the work has to be done at night,
- Temporary site floors that hold concrete pumping pipes must be strong to support pipes that are filled and have a safety factor of at least 4.

b. Precast unit installation work

1) Measurement and Pegging

Measuring and Stamping Work on Precast Unit Installation Work has potential hazards to the workforce, namely:

- Health or physical disorders due to workers not using work equipment that meets the requirements,
- Accident or hit by a vehicle when taking measurements on the highway,
- Injury to the foot or hand due to a nail or hammer.

The anticipation of the prevention of hazards arising from the Measurement and Pegging Works on Preprinted Unit Installation Work, namely:

- The measurement and pegging must be carried out by skilled and experienced workers in their field,
- Install signs at the worksite to protect personnel working from vehicles that cross the project and place flag officers at all locations of implementation activities,
- Workers must wear appropriate clothing and work equipment (gloves, boots, and helmets) and be eligible.

2) Setup

Preparation Work on Precast Unit Installation Work has potential hazards to the workforce, namely:

- Accidents due to mobilization of materials and equipment,
- Accidents due to material storage,
- Accidents due to equipment.

Anticipating the prevention of hazards caused by the Preparation Work on Preprinted Unit Installation Work:

- Mobilization and installation of equipment from a place of origin to the place of work must take into account the provisions in force and in the supervision of people skilled in their fields,
- A safety officer must be appointed who is responsible for overseeing the coordination of work performed. While working, the operator must not be careless and prohibited from leaving his/her place while the machine is still running,
- The equipment to be used needs to be checked first whether all the equipment is functioning properly, such as brakes, towing ropes, equipment/crane loaders, etc.

3) Installation or placement

Installation Work or Placement in Precast Unit Installation Work has potential hazards to the workforce, namely:

- Accidents resulting from lifting/placing precast units,
- b. Accidents due to lifting equipment,
- c. Workers falling from a height,
- d. Accidents resulting from falling objects/scaffolding collapsed.

Anticipating the prevention of hazards arising from the Installation Work or Placement in Preprint Unit Installation Work, namely:

- Installation of equipment for lifting must meet the following conditions:
  - Must be done by skilled people,
  - Installation must be stable, cannot be displaced from its position by the amount, vibration or other cracks,
  - In such a way that the operator avoids danger due to the load, ropes, or reel,
  - The driver can see part of the area he is working on clearly or can be in contact with the telephone, signs and so on to workers who lift or lower loads,
- Drivers who operate equipment for lifting in the open must be protected by a kind of tent or driver's room which must meet the following conditions:
  - Made of fire-resistant material,

- Adequate seating and footing and must be protected from vibrations,
- Has a large visual space for the part being worked on,
- Can reach the tools used in the driver's room,
- Can protect the driver from the influence of the weather,
- Has enough vents,
- Having appropriate fire extinguishers as well as controlling equipment, Equipment controlling equipment for lifting must:
- Made in such a way that the driver who stands or sits has enough space and unobstructed vision, can see clearly the rope and the load, and the load must not cross over it,
- Equipped with a locking device to prevent accidental movements that can be harmful, the crane/tower lift crane that has a rotating axis must be driven in accordance with the regulations issued by the manufacturer. Instructions for use issued by the manufacturer must be in the crane/lift faucet.
- Lift cranes/turrets must not be used in places with a lot of wind or wind and, if necessary anemometer (measuring device for wind direction) should be given.
- The monorail hoist must have a brake (power-operated brake).
- The monorail hoist must be installed so that if the main bolt on the hanging gear is broken, the winch is not rolled.
- Jack construction must be constructed so that the load:
- Stay focused on each position,
- Cannot be unloaded without supervision,
- Will not slip from its position,
- Hydraulic jacks and jacks driven by wind pressure (pneumatic) must be provided with a safety device to prevent the load from a sudden fall when a cylinder filled with liquid or air is damaged.
- When lifting with a jack, the jack must:
- Mounted on a firm base,
- Having the right position to lift,
- Placed in places where there are no obstructions when the jack works.

All chains, ropes, hanging rings, or gears used to lift or lower loads or as a hanging device must be checked periodically and regularly by an authorized person, and what he/she encounters in his/her inspection must be included in a certificate or certificate in a special register.

Steel wire cables for lifting equipment must:

- Made of strong steel wire,
- Have a safety factor related to the method of use, but at least 3.5 times the maximum load,
- Consisting of one length (one length),
- There is no part that stands out, is bent, and has a stake.
- Fiber ropes for lifting equipment must be made of high-quality manila fibers or from natural or synthetic fibers which have the same characteristics and qualities.
- The chains used for lifting equipment must be replaced if:
- The chain becomes insecure because the load exceeds the maximum or due to inappropriate heating,
- One chain extends, more than 5% in total length,
- There were other damages encountered,

All hangers must be made of chains, steel wire or fiber straps and must have sufficient strength on the chain used to lift rings, hooks, swivels, and ends of the chain must be made of the same material.

The hoist/drive wheel must be made of metal, which is resistant to pounding (soft steel or other material of the same nature.

Hooks for lifting must be made of heated and compacted wrought steel or equally strong material. The hook must be equipped with a security key that is so simple as to avoid slipping the load.
All parts of the engine/motor that moves must be protected safely, except when the installation and placement have been taken into account its safety.

Before starting the engine, safety must be checked to ensure a safe work and in particular, must be checked:

- That everything is fine,
- The parts that work are given a good lubricant,
- The bolts and nuts are tightly bound,
- All protective devices are in place and can guarantee safety,

- Worked out in such a way that workers who make adjustments above a certain height use a strap/safety belt, gloves, boots, and helmets in accordance with the provisions or underneath installed safety nets,
- At the time of installation, it is prohibited if there are people underneath.

c. Reinforcement work

1) Measurement and cutting

Measuring and Cutting Work on Reinforcement Works has potential hazards to the workforce, namely:

- At the time of measurement, care must be taken to avoid disturbing road users/fellow workers (risk of getting hit by a vehicle),
- Pinched iron/steel cutting tool,
- Injury due to remnants of iron/steel reinforcement.

Anticipating the prevention of hazards caused by Measuring and Cutting Work on Reinforcement Work, namely:

- Measurements are made using a meter that is in accordance with the standard. At the time of measurement must be considered so as not to interfere with road users. Cutting reinforcement is done in a safe place. Workers who do cutting steel must have sufficient distance between each other,
- The workers use suitable gloves,
- The remnants of reinforcing steel and stainless steel wire are placed so that they do not interfere/endanger.

2) Installation

Installation Work on Reinforcement Works has potential hazards to the workforce, namely:

- Squeezed when lifting the reinforcement. Injuries due to bending steel reinforcement/steel,
- Wounds due to the distance between fellow reinforcement makers,
- The wound on the hand due to steel wire when binding reinforcement,
- Accidents due to landslides / falling objects If the installation of reinforcement under the ground surface,
- Accidents due to reinforcement collapse if the reinforcement is done at a certain height,
- Injuries due to remnants (pieces) of reinforcement and steel wire,
- Injured due to workers and tools.

Anticipating the prevention of hazards caused by the Installation Work on Reinforcement Work, namely:

- Bending the bar using equipment that meets the requirements,
- Worked out in such a way that workers who do the work of bending the reinforcement have sufficient distance between fellow workers,
- Try in such a way when binding steel reinforcement using appropriate gloves,
- If the installation of reinforcement is below the surface of the soil, the soil needs to use an appropriate retaining wall. Prepare appropriate and safe stairs,
- If reinforcement is set at a certain height, then the scaffold used must be appropriate and safe,
- This is done in such a way that the remnants of steel reinforcement and steel wire are placed in an appropriate place,
- Workers use helmets, gloves, and boots accordingly. Given protection or signs/signs that indicate there is reinforcement work.

d. Structural Steelwork

1) Measurement and cutting

Measuring and Cutting Work on Steel Structural Work has potential hazards to labour, namely:

- Accidents resulting from cutting steel by using an electric cutting or welding machine (burns, cuts, abrasions, crushed pieces of steel),
- Hit by a vehicle during measurement.

Anticipating the prevention of hazards caused by the Measurement and Cutting Work on Structural Steel Work, namely:

- Workers are provided with protection to wear boots, gloves, appropriate eyeglasses,
- Signs are needed to protect working personnel from vehicles passing through the project site. Required include, one-lane traffic control signs, cars that are running, stop/go signage, Lightweight traffic lights, traffic cones.

2) Fabrication

Fabrication Work on Structural Steel Work has potential hazards to labour, namely:

- Risk of accidents due to manufacturing, connecting, moving steel, welding, etc.,
- Accidents caused by fellow workers,
- Accidents during steel removal/removal with taking or other tools,

Anticipating the prevention of hazards caused by Manufacturing Works on Structural Steel Work, namely:

- The manufacturing process is carried out separately and accurately placed. A bridge manufacturer can do fabrication (install it). Attempted in the connection process carried out carefully and carefully,
- The manufacturing process must avoid accidents caused by fellow workers or those caused by tools or materials,
- Arranged in such a way the process of transferring steel / lifting with taking or other devices carried out carefully and by people who are experts in their fields.

3) Welding

Welding Work on Structural Steel Work has potential hazards to labour, namely:

- Potential accident to the eye from a welding machine,
- Burns,
- Fire,
- Accidents due to cutting tools/welding machines,
- Accidents due to fellow workers,
- Sparks on other workers,

- Short circuit.

Anticipating the prevention of hazards caused by Welding Work on Structural Steel Work, namely:

- Welding workers must wear fire-resistant protective clothing and equipment such as fire-resistant gloves and welding clothes/aprons, helmets and protective eyewear with suitable filter lenses,
- Welding workers must wear clothing that is free of grease/polish, oil and other materials which are flammable,
- Welding and cutting work should not carry out near storage areas of combustible materials, or near explosive materials or combustible powders, gas or evaporation that may occur, unless adequate safety measures have taken. A suitable fire extinguisher must be prepared for use at any time in the place where welding carries out,
- To avoid the risk of accidents before welding, carefully examine the tools used for welding, gas cylinders, hoses, etc. Welding is carried out by people who are experts in their fields. If welding or cutting carry out on materials that contain poisons or hazardous materials, then strong precautions are taken to protect workers from smoke/vapour:
- Exiting the exhaust vent, or (exhaust ventilation) or,
- With respiratory protective equipment.

Precautions must take so that the igniting vapour does not enter the work area.

- Workers who clean up remnants of metal and crust attached to the body and so on must:
  - Wear protective gloves and goggles or face covers,
  - Clean the pieces/fragments from the body.
  - Ensuring that particles,
- do not touch other people. Preventive measures must take to protect people who pass near welding, not from the danger of sparks and radiation,
- Welding machines must equip with a switch on the engine frame. Or installed nearby, which when opened immediately cuts off all electric current from the power source with the following conditions:
  - The electric welding current must design in such a way as to prevent the transmission of high voltage from the power source to the welding electrode.
  - The conductor electrodes or cables do not leak too long or too short of what is needed to work.
  - Electric current conductors must directly connect to their workpieces, and mechanically connected securely to them or workbenches and so on and adjacent metal objects.
  - Cables must be supported so as not to cause danger or obstruction.
  - In arc-welding machines (hand-operated arc-welding machines), cables and connecting cables used in the electricity network in the Supply section must effectively insulate.
  - The outer surface of the arc welding electrode holder which is operated on by the stairs, including the clamp (jaw) must be competent in isolation.
  - Only heavy-duty cables with unbroken insulation can use.
  - The connecting electrical current must be waterproof.
  - Arc welding and cutting welding work carried out in a place where in addition to the welder, there are also people who work or walk through it must cover with a permanent protective veil or removable protective veil.
  - A permanent or temporary wall or protective curtain must be able to absorb harmful rays from the welding equipment and prevent it.
  - Light reflection, if necessary, painted or in other similar ways.

4) Erection

Erection Work on Structural Steel Work has potential hazards to labour, namely:

- Accidents due to lifting equipment / crane / taken,
- Potential accidents of workers who tighten bolts and nuts in the erection process,
- Falling objects/detachment of structures / overwritten erection process,
- Accidents when shipping materials,
- Accident by the collapse of the scaffolding,
- Potential accidents due to jack use.

Anticipating the prevention of hazards caused by Erection Work on Structural Steel Work, namely:

- Efforts must make in such a way that the safety of the workers, steel construction is guaranteed in the following ways:
- providing ladders, aisles, fixed work platforms, transport platforms, safety chairs and other equipment which suspends from lifting equipment (Lifting Applications), ropes and seat belts, safety nets
- The steel erection process should not carry out when there are hurricanes, strong winds or slippery conditions. Their appearance must not weaken the construction parts which hold the forces by cutting, punching or other such methods. Before carrying out an erection process, all equipment and equipment are scrutinized by people skilled in their fields. Workers who tighten bolts and nuts in the erection process equipped with helmets, boots, and when working at a certain height fitted with seat belts. When the erection process is running the area under the workplace must be fenced off or guarded,
- Steel construction parts must be equipt with equipment for hanging scaffolding, safety straps or seat belts and other safety measures. Before the steel construction parts are lifted, safety precautions must take against falling elements, which must be secured by binding or removing the pieces. Steel construction parts may not forcibly pull when lifted if this could cause danger. The steel bar frame installed must be supported and adequately coupled,
- Instructions must prepare regarding how to lift, transport, install and store parts of steel construction must be qualified, and these instructions must always be available at work,
- The use of scaffolding for erection must calculate with a safety factor (factor safety) of 4 times the maximum load. It must be given a safety ladder for a walk and other safety facilities. Workers may not work near scaffolding buildings during high winds,
- Lifting equipment must not have used before being inspected and given a certificate and tested by an authorized person.

5) **Painting**

Painting Work on Structural Steel Work has potential hazards to labour, namely:

- Wounds on the hands due to the heat dipping system in the galvanizing process,
- Fall when painting at a certain height.

Anticipating the prevention of hazards caused by Painting Work on Structural Steel Work, namely:

- The process of painting / galvanizing process with a hot dyeing system must be carried out by people skilled in their fields and carried out carefully. Workers who do painting use gloves to protect the skin and use cream,
- If the dismissal has carried out at a high place, then the worker is given a seat belt.

1.3.6. First Aid For Accidents (First Aid)

1. General

A work accident can happen to the operator or the people around him when operating the equipment, and the first step is to provide help as soon as possible before the patient gets further medical treatment from an expert (hospital, polyclinic).

In terms of work safety regulations, it is the right of every worker to get first aid in the event of a work accident, and therefore the Contractor is required to provide medicines for first aid in a first aid kit on each device.

Besides that, there needs to be specialised training in dealing with work accidents, so that when an accident occurs, first aid can do adequately and adequately.

2. Purpose and Objectives

First Aid for Accidents (PPPK) is held to provide the initial help needed before the patient takes to the nearest hospital/polyclinic. This first aid plays an important role, because, without excellent first aid, victims may not help if they have to wait for transport to the hospital. The aims and objectives include:

a. Reducing possibility danger of death, if the threat already exists, such as in victims who are in shock, there is extraordinary bleeding or in victims who are fainting,
b. Prevent the danger of disability, both spiritual and physical disabilities,
c. Preventing infection, which means trying to keep the disease from getting worse due to wrong actions or help,
d. Relieve pain.

3. General guidelines for helpers

a. Assess The Situation
   1) Watch what happens quickly and calmly:
      - Did the victim faint, stop the heart or stop breathing?
      - Did the victim experience bleeding or injury?
      - Does the victim have a broken bone?
      - Does the victim experience extreme pain?
      - Does the victim have burns?
   2) Look for additional hazards that threaten victims or rescuers.
   3) Must always remember not to be too brave to take risks, pay attention to personal safety helper.
b. 2. Securing the scene by:
   1) Protect victims from danger,
   2) If necessary, ask someone else to help or report to the relevant department (e.g., 118 or the Contractor's Rescue Team).
c. 3. Give help
   1) Plan and do advice based on the P3K objectives as follows:
      - Creating a safe environment,
      - Prevent the victim's condition from getting worse,
      - Speed healing,
      - Protecting victims who are not aware,
      - Calm the injured victim/sufferer,
      - Maintaining the immune system of the victim waiting for more appropriate assistance can be given
   2) If first aid did, then immediately transport the victim but don't rush or hand over the next aid to the more skilled or the person in charge of handling the accident or send it to the nearest doctor or hospital.

4. Covid-19 Prevention Protocol Scheme in Providing Construction Services

a. Establishment of COVID-19 Prevention Task Force

1) The Contractor is required to form a COVID-19 Prevention Task Force that is part of the Construction Safety Unit;
2) The COVID-19 Prevention Task Force as referred to in a letter created by the Project Committing Officer (PPK);
3) The COVID-19 Prevention Task Force as referred to in letter a amounts to at least 5 (five) people consisting of:
   - (one) Chairperson concurrently member; and
   - 4 (four) Members representing the Contractor.
4) The COVID-19 Prevention Task Force has the duties, responsibilities, and authority to carry out:
   - Socialization;
   - Learning (education);
   - Promotion of techniques;
   - Method of implementing COVID-19 prevention in the field;
   - Coordinate with the COVID-19 Task Force for the Ministry of PUPR to identify Potential Dangerous COVID ¬19 in the area;
   - Health checks related to the potential for being infected with COVID-19 to all workers and project guests;
   - Monitoring the health conditions of workers and controlling the mobilization/demobilization of workers;
   - Provision of vitamins and additional nutrients to improve worker immunity;
   - Procurement of Health Facilities in field;
   - Report to the Consultant and UNDP if a positive worker and Patient Under Supervision (PDP) status has been found and recommends temporary suspension of activities.

b. Identification of COVID-19 Hazard Potential in the field.

1) The COVID-19 Prevention Task Force coordinates with the Task Force
2) Countermeasure for COVID-19 Ministry of PUPR to determine
   - Identification of potential project location risks to the distribution center of COVID-19 distribution in the area concerned;
   - Conformity of health facilities in the Field with COVID-19 treatment protocol issued by the Government;
   - Follow-up on the Implementation of Construction Services.
3) If the Implementation of Construction Services identified:
   - Has a high risk due to the location of the project at the center of the distribution;
   - Positive workers and Patient Under Supervision (PDP) found; or
   - The Head of the Ministry / Institution / Agency / Regional Head has issued a regulation to stop the activity due to force majeure temporarily;

   Then the Contractor may be suspended temporarily due to Force Majeure;
4) Termination of Construction Services, as referred to in letter b above, is carried out under the provisions in Appendix II, which are an integral part of this Ministerial Instruction.
5) In the case of the Implementation of Construction Services because of nature and urgency, it must be carried out as part of the handling of the social and economic impacts of COVID-19, the Construction Services continued with the following provisions:
   - Obtain approval from the Minister of Public Works and Public Housing;

- Implement the COVID-19 prevention protocol with high discipline and regularly reported by the Prevention Task Force. COVID-19;
- Temporarily stop when there is a number 2.b.2) above to handle according to the Government protocol.

c. Provision of Health Facilities in the Field
   1) The Contractor is required to provide health clinic rooms in the field equipped with adequate health facilities, including oxygen cylinders, non-touch body temperature sensors (therrnoscan), blood pressure gauges, medicines, and medical workers;
   2) The Contractor must have operational cooperation on health protection and prevention of COVID-19 with the nearest hospital or community health center for emergency action (emergency);
   3) The Contractor are required to provide additional facilities, including handwashing (water, soap and hand sanitizers), tissues, masks at the office, and field for all workers and guests; and
   4) The Contractor is required to provide vaccines, vitamins, and additional nutrients to increase worker immunity.

d. Implementation of COVID-19 Prevention in the field
   1) The COVID-19 Prevention Task Force installed posters (flyers) both digital and physical about the appeal/recommendations for COVID-19 prevention to be disseminated or installed in strategic places at the project site;
   2) The COVID-19 Prevention Task Force and medical staff must submit explanations, suggestions, campaigns, and promotion of COVID-19 prevention techniques in each morning safety event (safety morning talk);
   3) Medical personnel with the colors of the Security Unit (Security Staff) carry out measurements of body temperature to all workers, and employees every morning, afternoon and evening;
   4) The COVID-19 Prevention Task Force prohibits people (all workers and trans) who indicated to have a body temperature of 38 degrees Celsius from coming to the job site;
   5) If a worker finds in the field as a COVID-19 Patient Under Supervision (PDP), the work must be stopped temporarily by the Service User or Service Provider for at least 14 working days.
   6) Medical Officers are assisted by the Security Unit to evacuate and spray disinfectants on all worksites, facilities, and equipment; and
   7) Temporary termination carried out until the evacuation and disinfectant spraying process, as well as the implementation of health checks and isolation of workers who have made physical contact with workers exposed, have finished.

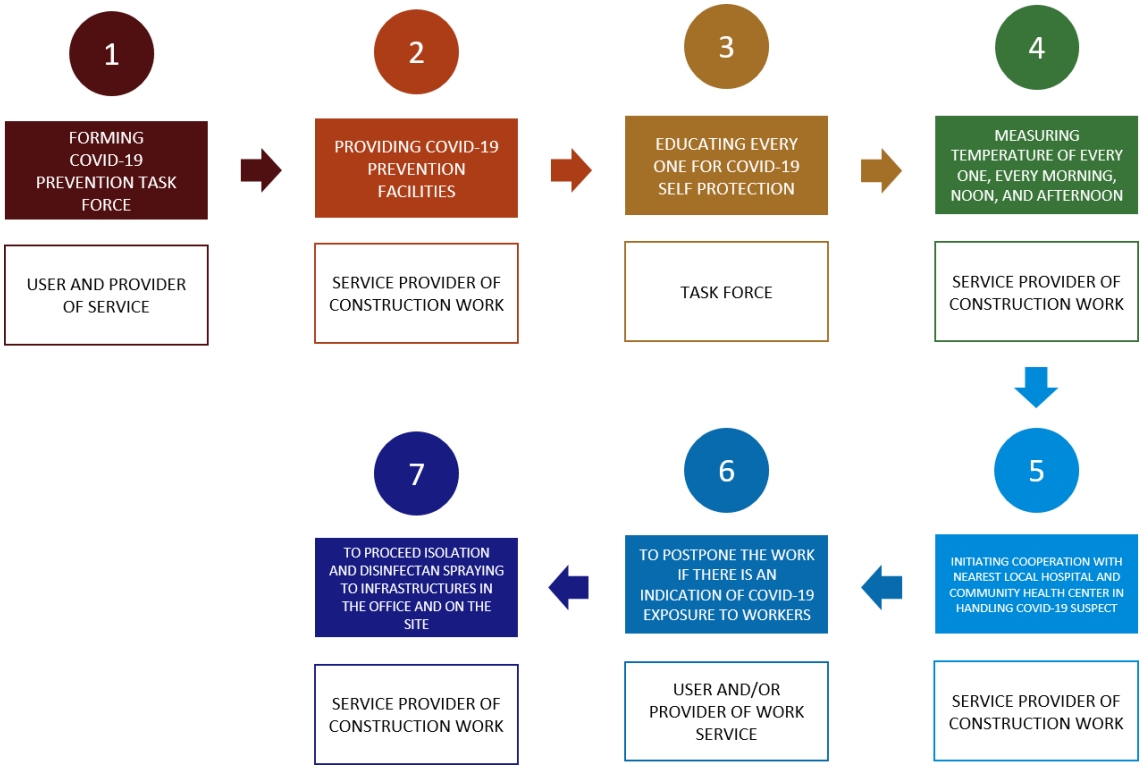

Figure 2 Corona Virus Spread Protocol Protection Mechanism

II ARCHITECTURAL WORKS

2.1. MATERIAL TECHNICAL REQUIREMENTS

2.1.1. Water

It is required that the work implementation should use water that does not contain oil, alkaline acid, salt mineral, organic matter or material which could harm the building, compliance with requirements stated in *PUBI*-1970 / NI-3. To be considered as valid, this should be tested from a competent laboratory.

Specifically for concrete, the amount of water used to make mortar is adjusted to the type of concrete work, which can be determined by the amount of the contents or the size of the weight and must be done properly.

2.1.2. Sand for Filling

Sand for landfill, adding ground level and other purposes, must be filtered and dense. Sea sand for purpose mentioned can be used on a condition that the sand should be washed beforehand and filtering should be done to remove the organic material in the sand with the consent of the Site Director and the UNDP or in accordance with requirements determined in *PUBI*-1970/NI-3.

2.1.3. Sand for Concrete Aggregate

Sand for concrete aggregate mix, plaster mix and bitumen concrete, should fulfil requirements which determined in *PBI*-1971/NI-2 such as:

- Granules must be sharp and hard, cannot be crushed with fingers.
- Mud level must not exceed 5%.
- The granules must be able to pass through a 3 mm mesh.
- Sea sand should not be used.

2.1.4. Sand for Concrete Works

Sand for concrete works should fulfill requirements which determined in *PBI*-1971/NI-3, which some of them should be prioritized such as:

- Granules should be sharp, hard cannot be crushed with fingers and weather effect.
- Mud level must not exceed 5%.
- Sand should consist of granules which vary in grain size, which if being sifted with mesh 150, the remaining of granules present would be above 4 mm, minimum 2 % of the weight of the remaining granules on mesh 1 mm, minimum 10 % of the weight of the remaining granules on the mesh 0,25 mm, ranging between 80 % to 90 % of the weight.
- Sea sand should not be used.
- Those requirements compliance should be proven with a laboratory test.

2.1.5. Crushed Stone

Crushed stone should be hard, dense and should not contain rocks or soil. Crushed stones for the purpose of elevation work (masonry or dry-stacked) form or the stone's appearance should be selected and must not show the signs of weathering and porous.

2.1.6. Pebble and Crushed stones

a. Pebble stones are fine mineral grains that can be sifted through mesh 76 mm will remain on mesh 5 mm.
b. Crushed stones are mineral grains derived from fragments of natural stones that can be sifted through mesh 76 mm and remain on mesh 2 mm.

c. Pebble Stones and crushed stones for concrete must fulfill requirements determined in *PBI*-1971/NI-2 or *PUBI*-1970 NI-3 which among them must consist of hard grains, non-porous, not shatter/disintegrate by the weather.

d. Pebble Stones and crushed stones should be hard, filtered and the adjustment of the grain size and the gradation depends on the usage. Pebble Stones and crushed stones must not contain mud more than 1 % and the color must be greyish jet black.

2.1.7. Split Stone

Split stone is crushed stone which must be able to sift through mesh 25 mm and remain on mesh 2 mm.

Split stone for concrete must fulfill requirement needed in PBI-1971/NI-2 which among them are:

- Must consist of hard grains non-porous, not shatter/ disintegrate by the weather.
- Split stone must be filtered and must not contain mud more than 1 %.
- The size of Split stone for this work is determined 2 x 3 cm.
- The above requirements must be determined by a lab test.

2.1.8. Portland Cement

- Portland Cement (PC) used must PC, a type of (NI-8) and still in a whole sack or new and fulfill requirements determined in PBI-71/NI-2.
- If using PC which being kept quiet long must be tested beforehand by a competent laboratory.
- In transporting PC to the worksite must be kept in a such a way so as not to become damp and should be placed in a dry place.
- PC which solidified (hardened) and “Sweeping” must not be used.

2.1.9. Wood

Generally, the wood must be adequate and healthy with provisions that all the characteristics of deficiencies related to their use will not damage or reduce the value of construction, fulfill the requirements determined in *PKKI* -1961.

There are 2 (two) types of wood quality: Quality A and Quality B.

What is meant by Quality A is wood which fulfill requirements as follows:

- The air-dried lumber (moisture level 5 %).
- The size of the knot should not exceed 1/6 part of the beam width and should not be more than 3,5 cm.
- Beam must not consists of bigger knot 1/10 of the beam height.
- Cracks in the radial direction must not exceed 1/4 of the wood thickness, and cracks according to the circle must not exceed 1/5 of the wood thickness.
- Angled direction (tangential) of fiber should not be more than 1/10.
- What is meant by quality wood B is wood that is not included in quality A, but fulfill requirements as follows:
- Moisture level of the wood is 30 %.
- The size of the knot should not exceed 1/3 of the beam width and should not be more than 5 %.
- Beam should not have wane more than 1/10 of the beam height.
- Cracks in the radial direction must not exceed 1/3 of the wood thickness, and cracks according to the circle must not exceed 1/4 of the wood thickness.
- Angled direction (tangential) of fiber should not be more than 1/7.
- Layering wood material.
- Teakwood should be in good quality; in terms of pattern and fiber should be selected and the color is spread evenly, which is derived from the best-selected wood.

- Plywood/triplek must be in good quality; in terms of pattern and fiber should be selected and the color is spread evenly, with dense layer texture.

2.1.10. Reinforced Concrete and Tie-wire

- The type of iron reinforced steel must be produced from the known steel mills and the form of plain rod or stem-profile (threaded steel) must fulfill requirements that have been determined in PUBI-1970/NI-3.
- The quality of iron reinforced steel used for example U.39, U.24 etc. must be tested by a competent laboratory and the cost is on The Contractor.
- Tie-wire must be made of iron steel with minimum diameter 1 mm which has been filamented beforehand and not zinc coated.

2.1.11. Concrete

Aside from the quality of concrete Bo and B1, in other concrete qualities, the concrete mixture chosen must be such that it produces the compressive strength characteristics recommended for the concrete concerned. What is meant by the characteristic compressive strength is the compressive strength of a large number of test specimens, the possibility of a compressive strength less than that is limited to 5%.

Mix Design
Mix design uses a weight ratio.
Concrete Bo quality for the site work can be used for every mix commonly used for structural work.
Concrete K225 quality or adjusted to the structural work for this work in general may use mix 1 PC : 2 sand : 3 split stone.
Viscosity of the concrete mix
Viscosity of the concrete mix must be checked with a slump test using Abram cone.
Slump values for various concrete work must be in accordance with table PBI-1971/NI-2

2.1.12. Brick

Requirements of brick must fulfill requirements as written in NI-10 or with requirements as follows:
- Brick must be from one factory, in one size, one color, with one evenly quality.
- Size will be using :
  Length 24 cm, width 11.5 cm, thickness 5.2 cm or
  Length 20 cm, width 10 cm, thickness 5 cm.

The biggest deviation from the size as mentioned above, is as follows:
For a maximum length of 3 %, the maximum width of 4 %, the maximum thickness of 5 % with the maximum difference in size between the smallest brick and the largest brick:
- 1 cm of a length are allowed
- 0.5 cm of width are allowed
- 0.4 cm thick is allowed

Color
Each other must be similar, and when being snapped, the cross-section must be in the reddish color spread evenly.

Form
The sides must be flat and the ribs should be 90 ° angled or angled. The sides must not be cracked. The weight of each brick must be the same, which means the size, combustion and stirring are the same and perfect. When hit with a hard object, the sound is loud.

2.2. BRICK WORK

2.2.1. Scope of work

This work includes provisions of workers, materials and equipment needed in this work implementation to achieve good results.

This brickwork includes building walls, inside and outside, stairs, and all the detail mentioned/showed in drawing or in accordance with the guidance of UNDP and the Consultant.

2.2.2. Requirements of Material

Bricks used are bricks with the best quality, angled and the size are 5 x 11 x 23 cm or adjusted to the local products approved by Consultant.

2.2.3. Requirements of Implementation

- Brickworks/brick, using 1 PC : 4 sand mortar or in accordance with the drawing.
- For all outer walls including *bataco* material, all ground floor walls start from the surface of the sloof to a height of 30 cm above the ground floor surface, walls in the wet area as high as 160 cm from the floor surface, as well as all the walls in the drawing that use the trasram/ waterproof mix symbol will use mortar with dense water with mortar ratio 1 pc: 3 tide sand.
- Before using bricks, they must be soaked in a basin or drum full of water until they are saturated.
- After the brickworks with mortar are done, the seam should be scraped for 1 cm deep and clean it with a broomstick then drenched with water.
- Pair of brick walls must be drenched with water first and the remaining have been scraped and cleaned before plastering.
- Brickworks is done incrementally. Each stage stands a maximum of 24 layers per day, followed by a practical column placement
- A 1/2 brick wall area that is larger than 9 m2 and related to the opening for the Aluminium frame will be added columns and reinforcing beams (columns & beams) with a minimum size of 10 x 10 cm or according to the drawing, with a base reinforcement 4 diameters 8 mm, stirrups diameter 6 mm, spacing 20-25 cm. If it is not visible in the drawing, this condition must be obeyed.
- Making a Mount Hole for scaffolding / *steiger* is not permitted at all.
- Making holes in the masonry associated with each part of concrete work (column) must be given 8 mm diameter of concrete steel cuttings reinforcement with the space of 50 cm, which should be well planted beforehand in the concrete work section and parts planted in masonry at least 30 cm unless specified otherwise.
- It is not allowed to install bricks that cracked into 2 that has more than 5% of cracked part or more than 2 parts of the brick.
- Brickworks for a wall with 1/2 bricks must be resulting a 15 cm thick of finished wall, and for a full brick wall, the finish thickness is 25 cm. The implementation must be precise, neat, and completely upright.
- Newly installed brick walls must be watered for at least 7 days and must not be exposed to direct sunlight.
- Between the connection of the wall with the column, the foundation and the beam must be installed concrete steel anchor with a diameter of 8 mm long by 50 cm and concrete that is directly connected to the brick wall must be scraped or made rough first so that the wall pair can adhere properly.
- The remnants of masonry must be scraped and cleaned before the space becomes dry so that it forms a curve so that the plaster can adhere properly.

2.2.4. Material Sample

- Before the Contractor implements the masonry work, the Contractor must provide material samples: brick and sand to get approval from the UNDP.
- Samples that have been approved by the Consultant will be used as a standard/guideline for checking / receiving material sent by the Contractor to the site.
- The Contractor is obliged to make storage to store samples of materials that have been approved by the Consultant and UNDP.

2.2.5. Requirements of Material Delivering and Storaging

Aside from brick, sand, and water, materials delivered on the site are in enclosed packages or in bags that are still sealed and factory labelled, the type and level are written on it, in a complete condition, and not defective. The material must be placed in a dry, well-ventilated, protected, clean place.

The Contractor is responsible for the damage of materials stored both before and during the implementation. If there are things that are not in the proper place, the Contractor must replace the damaged material.

2.2.6. Work Quality Testing

- The Contractor must test all work according to technical requirements as well as from the factory or from the description above.
- Equipment for testing is provided by the Contractor. UNDP and the Consultant have the right to request repeat testing if this is deemed necessary.
- In case the test is properly done or is unsatisfactory, then the cost of testing/repetition of the test is the responsibility of the Contractor.
- Job Security Requirements.
- The Contractor is required to protect the work from damage caused by other jobs.
- The Contractor is required to repair the damage by not reducing the quality of work in case of damage occurs. All costs of repair are the responsibility of the Contractor.

2.3. NON-STRUCTURAL WOOD WORK

2.3.1. Scope of work

This work includes provisions of workers, materials and equipment needed in this work implementation to achieve good results.

2.3.2. Types of Wood Used

Wood Camphor Samarinda, preserved, strong class II-III. This wood type is used for all woodwork mentioned above, except for other wood types as stated in the drawing.

2.3.3. Material Requirements

Woods picked for this project should be the best in terms of quality. Avoid wood defects (See technical requirements for materials). All wood installed/used is approved by UNDP and the Consultant.

2.3.4. Requirements of Implementation

- All sizes of wood shown in the drawing are final sizes (after being shaved and finished, and must be straight without defects, not warping, etc. which can reduce the quality of wood and the quality of work).
- For all woods as described above, cut shaved with a machine without exception, checking of the type, shape, size, and quality must be done carefully.
- Filling at the site must be done as well as possible in a dry area and guarded against direct weather and collision damage.
- After being installed, the Contractor is obliged to give full attention and provide protection against the collisions of other objects, including the use on the visible side, especially leaving an imprint.
- Wood frame for the ceiling is made according to the ceiling pattern that has been planned in the drawing by taking into account the location and shape of the armature that will be mounted on the ceiling and other materials that will be installed.

2.3.5. Requirements of Material Delivering and Storaging

- The material must be delivered to the worksite in a complete and flawless condition.
- The material must be placed in a dry, well-ventilated, protected, clean place according to the instructions of UNDP and the Consultant.
- The storage of material must be sufficient for this project. The material is stacked and protected according to its type.
- Contractors are responsible for damage during shipping, storage, and implementation. If there is damage, the Contractor is obliged to reimburse the costs of the Site Implementation.

2.3.6. Material Protection

Wood materials are avoided/protected from rain, sun and work effects, wood that has been installed is protected from possible defects/damage caused by other jobs.

If there is damage occurs, the Contractor is required to repair and not reducing the quality of work. All costs of repairs are the responsibility of the Contractor.

2.4. NON-STRUCTURAL CONCRETE WORK

2.4.1. Scope of work

Provide workers, materials, equipment, and other tools to implement the work, as stated in the drawing, with excellent and neat results. Procurement and installation of concrete tables covered with marble/granite.

The procurement and installation of practical columns for masonry walls and other components shown in the drawing include concrete, sink, and concrete flower beds.

2.4.2. Materials for Concrete Mix

Provisions

- Portland Cement (Look up material technical at requirements; Article 1.1.8)
- Concrete Sand (Look up material technical at requirements; Article 1.1.4)
- Split/ Coral Concrete (Look up material technical at requirements; Article 1.1.7)
- Heaps of sand and landfill must be separated from one another so that the two materials cannot be mixed together to get the right concrete mix. (Look up material technical at requirements ;Article 1.1.11).
- Concrete Steel (Look up material technical at requirements; Article 1.1.10).

2.4.3. Requirements of Implementation

- Work Quality
  The concrete quality used is a minimum of K.225 and must fulfill other conditions in accordance with the 1971 Reinforced Concrete Regulation (PBI.17971).
- Reinforcement
  Making reinforcement for straight or bent rods, joints and hooks and making stirrups must comply with the requirements listed in PBI.1971.
  The installation of concrete reinforcement must be in accordance with the construction drawings. Concrete bars must be bound with concrete wire to ensure that the iron does not change its place during casting and must be free of reference boards or work floors by installing concrete covers in accordance with the provisions in PBI.1971.

  Concrete steel that does not fulfill the requirements must be immediately removed from the work site within 24 hours after there is a written order from UNDP and the Consultant.

2.4.4. Placing of Concrete

- The method of mixing must use concrete mill measurements for cement, sand and split must be approved in advance by UNDP and the Consultant.
- Casting must be done as well as possible by using a vibrator to ensure the concrete is sufficiently dense and must avoid the occurrence of defects in concrete, such as corrosion and split that can weaken the construction.
- If the placing of concrete will be stopped and continued on the following day, the place of stopping must be approved by the UNDP and the Consultant.

2.4.5. Marking Work/Formwork

- Marking should be installed adjusted to the form and sizes which has been appointed/needed in the drawing.
- Marking should be installed in such a way with sturdy reinforcement and will be guaranteed that it would not deform and remain in position during casting.
- The marking must be tight and does not leak, the surface is flat, free of dirt, such as sawdust, pieces of wood, soil, etc., before casting is done, the formwork must be examined and must be easily dismantled without damaging the concrete surface.
- With regards to marking poles on board or steel for easy transfer of placement, poles should not be connected more than one. Poles of dolken are Ø 8-10 cm.
- Poles must be bound to one another with crossbeams. The new marking is opened after the fulfillment of requirements specified in PBI.1971.

2.4.6. Marking/Formwork Dismantling Work

Dismantling of formwork may only be carried out with written permission from UNDP and the Consultant.

After the formwork is opened, it is not permitted to make any changes to the concrete surface without written approval from UNDP and the Consultant.

2.5. FLOOR WORK

2.5.1. Sub Floor Work

1. Scope of work

- This work includes the provision of workers, materials and tools needed for the implementation of this work to get excellent results.
- The lean concrete sub-floor works include all the details mentioned/shown in the drawing as the basis for finishing the floor.

2. **Material Requirements**

- Lean concrete sub floor: with a mixture of 1 PC: 3 Sand: 5 split. Control of all work must be in accordance with the requirements: PBI.17971 (NI-2) PUBB.1956 and (NI-8).
- Examples of materials used must be submitted before installation, to obtain approval from UNDP and the Consultant.
- The Contractor must provide 2 (two) requirements and operational technical requirements from the factory as information for UNDP, and the Consultant. Other materials not listed above but needed to complete / replacement purpose of this work has to be new, the best quality of its type and must be approved by UNDP and the Consultant.

3. **Requirements for Work Instructions**

- For masonry that is directly on the ground, the ground where the floor will be installed must be compacted so that there is a flat surface and to obtain the maximum bearing capacity of the soil, a stamper machine is used.
- The backfill sand under the floor required must be hard, clean and free of alkaline, acids and other organic materials. The thickness that is required is 10 cm or according to the drawing and should be watered and stamped to obtain maximum density.
- Above the sand is given a 5 cm thick floor or concrete rebate with a mixture of 1: 3: 5 (see the drawing).
- For masonry on lean concrete slabs (levelled floors), concrete slabs are given a layer of plaster (screed) with mix 1 pc: 3 of 2 cm of thick sand with paying attention to the slope of the floor.
- Some sub-floors of lean concrete are done so that they are completely on the level with the slope of the floor.

4. **Sample material**

- Before the work is implemented, workers must provide material samples to obtain approval from UNDP and the Consultant.
- Samples that have been approved by the Consultant will be used as a standard/guideline for checking / receiving material sent by the Contractor to the site.
- Workers are required to make storage areas that have been approved by UNDP and the Consultant.

5. **Requirements Of Material Delivering and Storaging**

- Materials that must be delivered to the site must be in good quality and without defects. Certain materials are still in the original sack/package which is still sealed and labeled by the manufacturer.
- The material must be stored in a protected and closed, dry, not humid and clean place in accordance with the specified requirements.
- The storage of materials must be sufficient for this project, the materials are stacked and protected according to the type.

6. **Requirements of Work Security**

Within 7 (days), the site location must be protected from the traffic of people and materials. The Contractor is required to protect work from damage caused by other work. In the event of damage, the Contractor is required to repair it by not reducing the quality of work.

2.5.2. Screed Layer Floor Work

1. **Scope of work**

- Included in this work is the provision of workers, materials, work equipment and other tools needed in implementation to obtain excellent results.
- Unless specified otherwise in this specification, all work and material materials related to this work are the responsibility of the Contractor.
- The screed layer is done on concrete slabs, including under the floor finishing for all details, as shown in the drawing document, with a mixture of 1 pc: 3 sand + hardener with a thickness of 5 cm.
- The screed layer is done on the floor area set forth in the drawing.
- The screed layer 1 pc: 3 sand + hardener, h = 4 cm, done in the area set forth in the drawing.
- Work instructions, shape, volume and other size details in accordance with those set forth in the drawing document, bill of quantity, and in accordance with an instruction by UNDP and Consultant.
- Other provisions and requirements apply all conditions and requirements for finishing/plastering work or follow the terms and requirements for other similar work in this specification.

2. **Material Requirements**

- Portland cement used must be of the highest quality type I, from an approved product and compliance with requirements determined in NI-8, SII 0013-81 and ASTM C 150-78A.
- The concrete sand used must fulfill the requirements determined in PUBI 1982 Article 11 and SII 0404-80.
- Water must fulfill requirements determined in PUBI 1982 Article 9, AFNOR P18-303 and NZS-3121/1974.
- Management of all work must be in accordance with the requirements listed in PBI 1971 (NI-2) PUBI 1982 and (NI-8).

3. **Requirements of Implementation**

- Before the work is implemented, workers must provide material samples to obtain approval from UNDP and the Consultant.
- Floor screeds are done if the floor which is lean concrete or concrete slabs, has been cleaned of all dust from the influence of other work.
- Floor screed material is a mixture of Portland cement (PC) material and sand that meets the specified requirements
- The finished upper layer of the screed floor is PC rendering without a mixture of other materials, which is superimposed on the entire surface of the floor and is leveled. The minimum rendering thickness is 2 mm after leveling.
- The thickness of the screed floor mix with rendering included is 3 cm in minimum, made of a mixture of 1 PC : 3 sand. The surface of the screed floor must be completely flat unless required otherwise, free of defects (cracks).

- As preparation before the screed floor is done, the screed floor base must be cleaned with a wire brush and water so that aggregates appear and bond well with the screed. Another way is to make the concrete surface rough in an approved way. After cleaning, the base layer is watered (one night) and after being dried, it is covered with liquid cement (cement water) for a maximum of 20 minutes, then the screed is cast.
- For screeding large areas above 25 m2 mixing must follow the mixing requirements for concrete (Mechanical mixing and weigh batcher must be used).
- Casting is done at once, for large areas casting follows a 3 m wide lane and casting a lane should only be done 24 hours after the next lane has been cast. The surface of the end of the previous screed lane must be moistened with cement water before the next lane is cast.

4. **Flattening and Compaction**

The screed must be compacted with a beam vibrator and special attention must be paid to the ends that are often left behind. When leveling is needed (for finishing that needs it) leveling with screed boards must wait min. 1.5 hours and maximum 2.5 hours to avoid screed surface dusting. The tolerance difference between 2 lines is maximum of 1 mm. Screed must be watered for 7 days:
The installation of floor finishing materials can be conducted in a minimum of 4 (four) weeks.

2.5.3. Floor Hardener

1. **Scope of work**

This work includes the provisions of workers, materials and equipment needed for the implementation of this work, to achieve excellent results. This floor work includes all the details mentioned / shown in the drawing / shown in the finishing material list or in accordance with the instructions of UNDP and the Consultant.

This works implemented include parts of the floor surface as shown in the detail drawing. This includes preparatory work on the floor surface that will be coated with Metallic Floor Hardener, provisions of workers, materials, tools, equipment and maintenance until final work submission.

2. **Material Requirements**

Floor hardener, material used is produced by Frosroc, Sika or equivalent and approved by UNDP and the Consultant.

The color of the Floor Hardener finishing is then determined by the approval of the UNDP and the Consultant.

Floor Hardener Material is Metallic Aggregates without a mixture of other materials, from the process of materials according to the provisions that are required from the factory.

Work is conducted layer by layer, the color must be constant and uniform, resistant to heavy loads, resistant to vibrations and light scratches, can prevent the presence/occurrence of cracks on the surface of the floor, not easy to get dirty, easy to be taken care of and not slippery surface.

3. **Work Implementation**

- The surface area of the floor must be flat, there are no cracks, no holes and crevices open on the floor surface.

- The work of the Floor Hardener layer is conducted after the approval of the UNDP and the Consultant.
- The work must be in accordance with the requirements of the factory concerned and in the supervision of UNDP and the Consultant.
- Before the material is made, it must be selected for size and measurement according to the installation procedure.
- Floor hardener work that has been installed must be avoided from damage due to the work implementation (other work). The Worker must be responsible for the perfection in the results of the work performed.
- The Worker is required to repair damages that may occur on the surface of the Floor Hardener so as to achieve the quality of work that has been required without additional costs.

Expected Final Result:

- The Floor Hardener masonry installed must comply with the drawing documents that have been approved by UNDP and the Consultant. The surface of the floor must be flat, not bumpy, and not bulging.
- Floor Hardener surfaces must have a uniform color.

4. **Work Quality Testing**

- Before the installation is conducted, the Worker is required to provide the Consultant and UNDP a "Certificate Test" of the Floor Hardener material from the manufacturer or factory.
- If there is no Certificate Test, the Contractor must test the material in the Laboratory, which will be appointed later.
- Test results from the laboratory are submitted to UNDP and the Consultant as soon as possible.
- All costs associated with testing the material are the responsibility of the Contractor.

5. **Requirements of Work Security**

Material that has been installed is avoided from stepping on for 3 x 24 hours after installation. In the event of damage, the Contractor is required to repair it by not reducing the quality of work.

The Worker must submit 2 (two) copies of the operational requirements and technical requirements of the factory as information for UNDP and Consultant.

Other materials not listed above but needed for completion / replacement of work in this section must be standard, the best quality of its type and must be approved by UNDP and the Consultant.

6. **Requirements Work Instructions**

- Surface Preparation; Concrete plate thickness of at least 15 cm, Flatten the new concrete using a vibrating rod. To simplify the casting process & maintain concrete quality additive plasticizer (Concrete Mix) by reducing water usage will be added.
- Surface smoothing; Concrete leveled with Straightedge (straight steel bar) according to the desired level, after enough plasticity, smooth the concrete surface by using a wood trowel and finish trowel machine.
- Sprinkling; Concrete plates are ready to be sprinkled with floor hardener powder if the surface is pressed with the thumb, leaving only 3-5 mm of marks, sprinkle 4-5 kg / m2 floor hardener powder evenly by hands or the appropriate tool. Floor hardener is sprinkled incrementally at a dose of 2/3 first, and when the material becomes dark in color evenly

due to absorption of water from the ground floor, it can be immediately rubbed (by trowel). After that, the remaining 1/3 parts are spread evenly on the concrete surface. If the material starts to seep in and become evenly dark due to absorption of water from the ground floor, it can be immediately rubbed (by trowel).

- Compaction; Wait until the floor hardener powder has been moistened by the water content of the cement on the concrete surface, use a trowel finish machine with a low spin and a really flat bottom.
- Initial Refining; As soon as the concrete starts to harden (Initial setting) a smoothing with a trowel finish machine with a finer metal propeller rotation with a low angle position should be done.
- Final Refining; The final finishing process that is needed can be done later with a trowel machine with high speed. Furthermore, to protect concrete surfaces from the evaporation of water that is too fast & cracks, spray with transparent curing material should be done.
- The finishing must use a trowel machine when the concrete has hardened and strong withstanding the load of the machine without damage in order to obtain a denser surface.
- After the hardener work is finished, it must be coated with Concur (Curing Compound) to reduce the occurrence of evaporation of concrete water. In an open area, it should be protected again after curing with a wet sack to reduce shrinkage cracks.
- Floor that has been worked on should not be exposed to rainwater for 48 hours and should not be used for 1 week. If it is immediately burdened with heavy traffic in the first 2 weeks it should be protected with multiplex or plywood.

7. **Material Sample**

- The Contractor must provide examples of all materials, to obtain approval from the Consultant and UNDP. Examples that have been approved by the Consultant and UNDP will be used as a standard/guideline for checking / receiving material delivered by the Contractor to the site.
- The Contractor is required to make a storage area for samples that have been approved by the Consultant.

8. **Requirements of Material Delivery and Storage**

- Aside from sand and water, material that is delivered to the site must be in a closed condition or bags that are still sealed and labeled from the factory, tagged with the type and grade, in intact condition and without defects.
- Materials are placed in a dry, well-ventilated, protected, and clean place. Floor hardener material that has been installed is prevented from being stamped on for 3x24 hours after installation
- In case of damage, the Contractor is required to repair it by not reducing the quality of work.

2.5.4. Tiles

1. **Scope of work**
   This work includes the provisions of workers, materials, and equipment needed to implement this work to achieve excellent results. This floor work includes all the details mentioned/shown in the drawing / shown in the finishing material list or in accordance with the instructions from UNDP and the Consultant. The thickness of the mortar layer on the floor in spaces is 5 cm.

2. **Material Requirements**
   Tiles Products of Roman, Platinum, Mulia or equivalent:
   - Polish type with size 40cm x 40cm.
   - Unpolish type (anti-slip) with size 40cm x 40cm.

3. **Work implementation**
   - Installation using paste/cement AM / MU is equivalent and must be conducted according to factory instructions with the approval from the UNDP and the Consultant.
   - The use of AM / MU paste/cement should not be mixed with ordinary cement.
   - Before material masonry, the material must be selected for the same color size and bind only a little water.
   - Cutting floor material is not permitted in the form of serrations, must be leveled and sharpened to get a flat, smooth and neat side.
   - Installing floor must be perpendicular to each other, the remaining must be a straight line and as small as possible (with the approval of the Site Supervisor) to be filled with special cement equivalent to AM.
   - The seam must be straight, not curved, not cracked, resistant to water, chloride, and mildew.
   - The material used must be approved by UNDP and the Site Supervisor and installation must be conducted by experts in their field with the approval of UNDP and the Consultant. The Contractor must provide reserves material to UNDP as much as 2% from the total material.

Expected final result:
- Floor installed must be in accordance with the example approved by the Consultant and UNDP. The surface of the wall must be flat, not bumpy and not protruding.
- Aside from sand and water, materials that are delivered to the site must be in a closed condition, or bags that are still sealed and labeled from the factory, tagged with type and grade, in the whole condition and without defects.
- The materials are placed in a dry, well-ventilated area protected and clean. The Contractor is responsible for the damage of materials that are stored both before and during implementation.
- If there are things that are not in place, or if the material is damaged and lost, the Contractor must replace it with the approval of UNDP at the cost of the Contractor.

4. **Work Quality Testing**
   - Before the installation is conducted, the Contractor is required to provide a "Certificate Test" of homogenous tile material from the manufacturer or factory.
   - If there is no Certificate Test, the Contractor must test the material in the Laboratory, which will be appointed later.
   - Test results from the laboratory are submitted to the UNDP as soon as possible.
   - All costs associated with testing the material are the responsibility of the Contractor.

5. **Requirements of Work Security**

   Material that has been installed is avoided from stepping on for 3 x 24 hours after installation. In the event of damage, the Contractor is required to repair it by not reducing the quality of work.

   Managing of all work must be in accordance with ASTM regulations, Indonesian Ceramics regulations (NI-19) and PUBI-1982. Portland Cement (see material technical requirements) Sand and Water (See material technical requirements).

   The Contractor must submit 2 (two) copies of the operational requirements and technical requirements of the factory as information for UNDP.

   Other materials not listed above but needed for completion/replacement of work in this section must be in standard, the best quality of its type and must be approved by UNDP.

6. **Requirements of Work Implementation**
   - Before lean concrete is installed, spreading sand underneath it in 3 cm thick should be done.
   - The base of the tile is lean concrete with a thickness of 5 (five) cm according to the drawing (ground floor)
   - The binding mixture with a mixture of 1 pc: 3 sand plus adhesive material, or PC neat plaster can be added plus adhesive material.
   - The installed floor area must be completely flat with attention to the slope of the floor to facilitate drainage.
   - Ceramic installation patterns must be in accordance with detailed drawings or in accordance with the instructions of UNDP.
   - The width of the remnants must be the same and maximum depth of 3 mm in a straight line or in accordance with the drawing/instructions of UNDP. The remnants are filled with colored cement grout fillers, colored according to instructions from the UNDP and the Consultant.
   - Cutting floor material must use special cutting tools in accordance with the instructions of the Site Supervision. Material that has been installed must be cleaned of all kinds of stains attached so that it is really clean. Before Tile is installed, it must first be soaked in water until it is saturated.
   - Installation with an area of more than 20m2 using flexible joint or according to the drawing planner.

7. **Sample material**
   - The Contractor must provide examples of all materials, to obtain approval from UNDP. Examples that have been approved by the UNDP will be used as a standard / guideline for checking / receiving material sent by the Contractor to the site.
   - The Contractor is required to make storage of samples that have been approved by UNDP.

8. **Requirements of Material Delivering and Storaging**
   - Aside from sand and water, which is delivered to the site in a closed condition or bags that are still sealed and labeled from the factory, tagged with the type and grade, in intact condition and without defects.
   - Materials are placed in a dry, well-ventilated, protected and clean place. Floor hardener material that has been installed is prevented from being stamped on for 3x24 hours after installation
   - In case of damage, the Contractor is required to repair it by not reducing the quality of work.

2.6. WALL WORK

2.6.1. Wall Plaster

1. **Scope of work**

   Included in this wall plastering work is the provisions of workers, materials needed, equipment needed including tools and equipment needed to implement this work according to determine in drawings, description according to the location determined.

2. **Material Requirements**

- Brick that is used is the best quality, angled, and uniform with the size 5 x 11 x 23 cm, precision, smooth surface and not porous and not cracked.
- In general, the bricks used must fulfill DIN and SNI requirements.
- Job location is as stated in the drawing.

3. **Requirements of Implementation**

- On the surface of the wall to be plastered, the previous remnants must be scraped by 1 cm to give the plaster a handle.
- Then the walls are brushed clean and soaked with water, then the first layer of plastering can be done. The second plaster is in the form of instant cement.
- Wall plastering thickness must not be less than 1 cm or more than 2 cm unless specified otherwise.
- The final plastering work must be straight, even, flat or perpendicular, basically the first plastering is the same as the masonry mix, where it is done. Provisions regarding plastering mortar for various purposes can then be seen in every description and every job.
- For waterproof areas, the wall installment that is connected to the outside air and all wall installment 30 cm from the floor surface and 180 cm from the floor surface for bathrooms, toilet and other wet areas use a water-resistant mix.
- For flat surfaces, it must have a field curve / convex tolerance not exceeding 5 mm for a distance of every 2 m2., If it exceeds, the Contractor must repair at the expense of the Contractor.
- If the results of the plastering show an unsatisfactory, uneven, not perpendicular, bent, broken or cracked, porous, then the part must be dismantled for repair by the Contractor.

4. **Preparation of Plastering Works**

- Clean the base surface until it is completely ready to receive instant cement. Get rid of all the things that can damage / disrupt the work.
- Form a temporary screed if possible (for permanent base formation) to ensure the same thickness, all flat surfaces, accurate contours and profiles.
- Wet the surface, if needed, for preparation. Don't saturate the surface, and don't install plaster on until the visible water surface disappears.
- Place / paste the plaster mixture for 2.5 hours (maximum) after the mixing process, except when the air is hot / dry, reduce the placement time as needed to prevent the temporary stiffness of the plaster. Don't add more water to wet the stiff plaster.

2.6.2. Interior Plaster

1. **Scope of work**

Installment:

- Install the first and second base layers with a thickness of approximately 7 mm. The thickness of the finishing layer must be added on top. Measure the tape/thickness of the plaster from the flat bottom.
- Apply the first layer with sufficient materials, press to guarantee the basic unity. After the first layer is attached to the brush in one direction, to form a mechanical bond for the second layer, on the surface of the vertical surface, brush horizontally.
- Apply the second base layer with sufficient materials, press to ensure that this layer is closely attached to the first base layer.

- Apply the finishing layer over the base layer 2 mm thick. Mount the base layer with a thickness of approximately 10 mm. The thickness of the finishing layer must be added on top.
- Check/measure the thickness of the plaster from a flat base on the back. Apply the first base layer with enough material, press to ensure the binding with the bottom. After the first base layer is attached, brush it in one direction to form a mechanical bond for the finishing layer.
- Water a layer of plaster that has dried to receive a further application. Wet with water as needed to get even absorption.
- For flat surfaces, the tolerances are no more than 5 mm in the 2 m² areas are given.
- The Contractor is responsible for determining the procedures/instruction to repair and other things that occur during the implementation, as long as it is not the owner's fault, such as plastering cracks, breaks during implementation time and repairs that are not acceptable or approved by UNDP and the Consultant.
- Cut, patch, repair and point up the plaster as needed with new plaster. For patching, solid with surface must be enclosed/joined. The Contractor is responsible for all repairs carried out after consultation with UNDP and the Consultant until such repairs are acceptable, at the expense of the Contractor.

2. **Sample material**

- Before the work is implemented, workers must provide material samples to obtain approval from UNDP and the Consultant.
- Samples that have been approved by the Consultant will be used as a standard/guideline for checking / receiving material sent by the Contractor to the site.
- The Contractors are required to make storage of material samples that have been approved by UNDP and the Consultant.

3. **Requirements of Material Delivering and Storaging**

- The material must be delivered to the worksite in a complete and flawless condition, not cracked or broken.
- Material must be placed in a dry, well-ventilated, protected, clean place according to the instructions from UNDP and the Consultant.
- The storage of materials must be sufficient for this project. The materials are stacked and protected according to the type.
- Contractors are responsible for damage during shipping, storage, and implementation. If there is damage, the Contractor is obliged to reimburse the costs of the Site Implementation.

4. **Work Quality Testing**

The Contractor must test all work according to the technical requirements of the factory or according to the description above. UNDP has the right to request retesting if deemed necessary. Equipment for testing is provided by The Contractor. In the case of tests that are not performed properly or are unsatisfactory, the cost of retesting is the responsibility of the Contractor.

5. **Requirements of Work Security**

For 3 (three) days, the site must be protected from direct contact by people/hard impact/collision.

The Worker is required to protect the work from damage caused by other workers. In the event of damage, the Contractor is obliged to repair it by not reducing the quality of the work, all costs of repairs are the responsibility of the Contractor.

2.6.3. Plaster and Concrete Neat Plaster

1. **Scope of work**

Concrete is part of the structural work that demands the results of good casting, neat (not porous), smooth, ready to be finished either by painting or other media and precision per the planned form, if there is an untidy result of the work then the implementing party must tidy it up without demanding additional costs.

Plastering and concrete neat plaster works are applied if the concrete produced is not neat according to the planning drawings and there is a difference between structural drawings with architectural drawings and interior drawings that require different shapes and dimensions.

This work includes the provision of worker, materials, tools and transport equipment required. The Contractor in this plastering work are in accordance with the drawings and descriptions of the specified locations, including concrete plates, beams, stairs and others which is not protected (product pose) either exterior/interior.

2. **Material Requirements**

This plaster material is Portland Cement, sand and water with a ratio of 1 pc: 2 sand plus neat plaster.

- Portland Cement (Please see material technical requirements)
- Cement (Please see material technical requirements)
- Water (Please see material technical requirements)

3. **Work Instructions**

- All concrete surfaces to be plastered must be made rough and cleaned of all kinds of dirt, then in the first stage it has to be soaked, then plastered with a mixture of 1 pc: 2 sand through a fine sieve and added neat plaster.
- Plastering thickness must not be less than 1 cm or more than 1.5 cm, unless specified otherwise. Plastering work must be straight, even and perpendicular. If the results of plastering show unsatisfactory results such as uneven, not perpendicular, wavy, broken or cracked, porous, then the parts must be dismantled for repair by the Contractor.

2.6.4. Finishing Tile Work

1. **Scope of work**

- This work includes the procurement of materials, workers, work equipment, and other tools needed in this work implementation so that the work of plywood, homogenous tiles and ceramic tiles can achieve good quality and perfect results.
- The material used is granite, homogenous tile and ceramics installed in places as stated in the drawing document, or following the instructions of UNDP and Consultant.
- Placing instruction, shape, volume and other size details in accordance with what is stated in the drawing document and bill of quantity. Other requirements apply to all conditions and requirements for the finishing work of granite and ceramic wall coatings, or follow the terms and requirements for other similar work in this specification.

2. **Standard applies:**

- SII – 0023 – BI
- Indonesian Industrial Standard – Quality and Test Method for Floor Tiles.
- PUBI – 1982
- General Requirements of Indonesia Building Material.

3. **Material Requirements**

- Types of ceramics used are stoneware, solid ceramic bodies (denser than porcelain), brightly colored from a single ceramic material or a mixture of ceramic products equivalent to Roman, Platinum, Mulia.
- Wall surfaces should not reveal flaws, warped cracks, detached glaze parts, pinholes or dirty defects of glaze material.
- The sides must be angled with deviation tolerance not more than 0.50 cm, resistant to friction with hardness not less than 5 Mohs scale (weight loss due to friction test should not be more than 0.10 gr/tile weight.

4. **Requirements of Implementation**

- Ceramic tile with quality I installed on toilets, pantry or places as stated in the drawing document or following the instructions of the Consultant and UNDP.
- Before implementing the work the Contractor is required to submit sample materials that will be used to the UNDP and Consultants to obtain their approval.
- Installation of ceramic tiles must be conducted by people / craftsmen who are truly experts to obtain good and satisfying results.
- For the purpose of cutting / connection / welds must use a good quality cutting machine, in order to obtain good and satisfactory cutting results.
- Ceramic before being installed soaked in water (saturated with water).

2.6.5. Finishing Work with Natural Stone

1. **Scope of work**

- This work includes the procurement of materials, worker, work equipment, and other tools needed in this work implementation so that the finishing work of this natural stone can achieve good quality and perfect results.
- Natural stone that is used is a two-faced black natural stone installed in places as stated in the drawing document, or following the instructions of the Consultant and UNDP.
- The placement instruction, shape, volume and other size details in accordance with what is stated in the drawing document and bill of quantity. Other requirements apply to all conditions and requirements for the finishing work of wall covering materials or follow the requirements for other similar work in this specification.

2. **Material Requirements**

- The type of natural stone used is Andesite Stone, which is abstraction / irregular stone.
- The surface of the stone must not show any flaws, cracks, loose surfaces, holes or dirty defects.
- The size used will be determined later, the side must be right-angled.
- For the finishing result must be done with a two-layer clear coating.

3. **Requirements of Implementation**

- Natural stones that are used in the size and location of the installation, as stated in the drawing document or follow the instructions of the Consultant and UNDP.

- Before carrying out the work, the Contractor is required to submit a sample of natural stone material that will be used to the UNDP to obtain approval.
- Installation of natural stone must be conducted by people / craftsmen who are truly experts to obtain good and satisfying results.
- For the purpose of cutting / connection / welds must use a good quality cutting machine, in order to obtain good and satisfactory cutting results.
- Other terms and conditions apply to all conditions and requirements for work, other wall covering materials or follow the requirements for other similar work in this specification.

2.7. GLASS WORK

2.7.1. Scope of Work

- This work includes the supply of workers, materials/equipment, work equipment, and other assistive devices needed in the implementation, to obtain excellent and perfect work results.
- This work includes the installation glass windows, and for all details as mentioned/required in the drawing documents and following the instructions of the Consultant, UNDP.
- How they work, placement, shape, volume, and other size details under those listed in the drawing document and bill of quantity.
- Other terms and conditions apply all the terms and conditions for woodwork, or follow the terms and conditions for other similar work in this specification and the instructions of UNDP.

2.7.2. Applicable Standards

Flat glass types, classes, requirements, standards for testing must comply with the provisions in:

- SII - 0189 - 78

Indonesian Industrial Standard - Quality and Test Method of Sheet Glass.

- PUBI - 1982

General Requirements for Building Materials in Indonesia, namely:

Sheet glass used is a type of clear glass with a thickness including:

- 5 mm thick clear glass for door and window application in flat glass quality requirements:

Table 1.Sheet glass quality requirements

Type of MM	Thickness in MM (Tolerance)	Length & Wide Tolerance in MM	Angle Tolerance M/M
19	6,00 (± 0,30)	± 2	12
12	6,00 (± 0,30)	± 2	12
8	6,00 (± 0,30)	± 2	12
5	6,00 (± 0,30)	± 2	12

Table Description:
Sheet glass must not exceed the allowable tolerance.

Rectangular shaped sheet glass must have a right angle and a flat, straight edge. The maximum permissible tolerance is 12 mm / m.

Permitted clear glass sheet defects must comply with the conditions below:

2.7.3. Material Requirements

1. Float glass is for doors and windows (exterior and interior), domestic products of the Asahi Mas brand, or from other equivalent products approved by the UNDP. Glass type, Glass thickness, installation, and size as needed or as indicated in the drawing document.

2. The glass used is of AA quality and must meet the requirements in 1982 PUBI article 63 and SII 0189-78.
3. The size of the cut glass at the mounting location, as shown in the drawing document.
   a. Tolerance
   b. Length and width
   c. For length and width with permissible tolerances of approximately is 2.0 mm.
   d. Angles
4. Cutting of rectangular sheet glass must have angled angles and flat and straight edge edges, maximum tolerance of 1.5 mm per meter in length. The tolerance of the thickness of sheet glass should not be more than 0.3 mm.
5. The glass must be free of bubbles (spaces containing gas in the glass), free from chemical compositions that can interfere with vision, free from cracks (broken lines on the glass either partially or entirely thick of the glass), free of edge bumps (protrusions on the long and wide sides towards in / out), free of string and waves. Thread is a defect of an embossed line that is transparent; waves are a glass surface that changes and interferes with vision, free from spots, clouds, and scratches. Free of clouds (glass surfaces that experience abnormalities), free of scratches (line cuts on the glass surface), free of arches (bent glass sheets).

2.8. CEILING WORK

2.8.1. Scope of work

Covers the procurement of materials and the supply of all workers, equipment, materials, and installation of all ceilings following the drawings and requirements.

2.8.2. Terms of implementation

- Before the Ceiling Installation Work begins, the Contractor must first pay attention to the areas installed according to the planning drawings. Before being installed, the materials used must first submit examples to obtain approval from the UNDP and the Consultant.
- Installation can only do after the work and equipment that is inside the ceiling (such as piping, wiring, tray, ceiling hanging devices, and other installation work) are ready and finished working and have been tested.
- Contractors must submit shop drawings for approval and get approval from UNDP and the Consultant.

2.8.3. Material requirements

1. Calcium Silicate /GRC

   a. The area that is gypsum ceiling mounted is all of the ceilings that fits in the planning drawing.
   b. Material: calcium board shera board products
      Size: Standard 120 x 240 cm
      Thickness: 6 mm
      Color: Will be determined later
      Order: Hollow 40x40x0.75

2.9. DOORS AND WINDOWS

2.9.1. Works of Solid Wooden Door Frames

1. **Scoop of work**

- This work includes the provision of workers, materials, equipment, and other supporting tools to implement the work so excellent results can be achieved.
- The work of solid wood door frames includes all the details stated/shown in the drawings and approved by UNDP and the Consultant.

2. **Material Requirements**

Wood Panel Doors and Doors

- Product: look up on the architectural material specifications
- Material: Camphor Wood Samarinda Oven or local equivalent
- Shape: look up on the door and window frame scheme
- Specifications: 30mm solid wood
- Finishing: veneer
- Steel mongery: look up on the steel mongery table / architectural material specifications

All wood material must have a certificate issued by an Independent body that supports anti-illegal logging programs. Accessories:

All complementary equipment (screws, anchors) must galvanize or as required of the relevant plant.

3. **Implementation provisions**

- Before carrying out work, the Contractor requires examining the existing drawings and conditions in the field (size and holes), including studying the shapes, patterns, layouts, placement, installation methods, mechanisms, and details of each drawing.
- Before the implementation begins, the piling up of door materials at the worksite must place in a room with good air circulation, not exposed to direct weather and protected from damage and humidity.
- All elbow joints for door frames and other reinforcement must be taken into account so that their strength guarantee by taking care / maintaining tidiness, no holes, or defects in the tuning.
- If needed, should use a galvanized top screw, without leaving blisters on the surface of the frame that looks. After the installation, doors and windows must be flat, not corrugated, not bent, and all equipment can function correctly.

2.9.2. Work of Glass Window Wooden Frame

1. **Scope of Work**

- This work includes the provision of workers, materials, equipment, and other supporting tools for the implementation of the work, so that excellent and perfect work results achieved.
- The work of solid wood glass window panes includes all the details stated/shown in the drawings approved by UNDP and the Consultant.

2. **Material Requirements**

- The wood processed must take into account the dimensions shown in the drawing or according to the required specifications

- The dimensions of the frame/frame shown in the drawings are the final/finished dimensions.
- All frames, casings, and doors must be free of termites and free of knot

3. **Requirements of Implementation**
   - Before carrying out the work, the Contractor must examine the existing drawing and conditions on the site (size and holes), including evaluating the shape, pattern, layout, placement, installation mechanism, and details according to the drawing.
   - Before the implementation begins, the piling up of door materials at the worksite is placed in a place with good air circulation, not exposed to direct weather, and protected from damage and humidity.

   All elbow joints for door frames and other reinforcements must be taken care of to ensure their strength by taking care of tidiness, no holes, or defects in the tuning.

2.9.3. Working and Locking Tools

1. **Scope of work**
   a. Included in this work consists of the procurement of workers, materials, equipment, and other assistive devices needed to implement the work so that good quality and perfect work results are achieved.
   b. Included the procurement, installation, security, and maintenance of all tools installed on the door and window shades as well as all the details mentioned/specified in the drawing.
2. **Material Requirements**
   a. All the hardware in this work, from right quality products, variations in color selection, and from materials, have been approved by UNDP and the Consultant.
   b. The working mechanism of all equipment must be following factory regulations.
   c. All keys are accompanied by a sign made of Aluminium plates bearing their identification numbers.
   d. This plate connects with a key with a nickel ring. For children, the key provides a locked cabinet with a bracket enamel finish complete with hooks for the key complete with identification numbers. This cabinet must use a piano hinge and have a floor plan.

   Door leaf fixture:

   a. Hinges (butt hinges) with the installation of 3 pieces for a single door and 2 x 3 parts for a double door, the minimum shutters install two pieces each leaf. Use the Calfis brand hinges or equivalent or other specified and approved by UNDP and the Consultant.
   b. Material from stainless steel with the same screw flower nails as hinges, Satin stainless steel or Satin Chromium finish.
   c. Equipment from all doors specified/specified in the drawing installed equipment - material from the Calfis brand, which is equivalent, namely:
      1) Sliding doors using accessories:
         - Hinges Brand Calfis or equivalent
         - Pull Plate Brand Calfis or equivalent
         - Mortise Lock Brand Calfis or equivalent
         - Cylinder Brand Calfis or equivalent
         - Sliding Rail Brand Calfis or equivalent
      2) One-leaf door using accessories:
         - Hinges Brand Calfis or equivalent
         - Lever Brand Calfis or equivalent
         - Mortise Lock Brand Calfis or equivalent
         - Cylinder Brand Calfis or equivalent
         - Escutcheon Brand Calfis or equivalent
         - Door Closer Brand Calfis or equivalent

3) The two-leaf door uses accessories:
   - Hinges Brand Calfis or equivalent
   - Lever Handle Brand Calfis or equivalent
   - Mortise Lock Brand Calfis or equivalent
   - Cylinder Brand Calfis or equivalent
   - Escutcheon Brand Calfis or equivalent
   - Accessories Brand Calfis or equivalent
   - Door Closer Brand Calfis or equivalent
4) Doors for public toilets use accessories:
   - Sign Plate Brand Calfis or equivalent
   - Mortise Lock Brand Calfis or equivalent
   - Cylinder Brand Calfis or equivalent
   - Door Closer Brand Calfis or equivalent

3. **Requirements of Implementation**
   - All equipment that will be used in this work, before being installed, examples are given to the UNDP for approval.
   - Submission must be accompanied by brochures / specifications from the relevant factory.
   - If deemed necessary, the Site Supervisor may request to conduct laboratory tests on samples of material submitted as a basis for approval.
   - All laboratory test costs are the full responsibility of the Contractor.
   - The top hinges are installed no more than 28 cm (as) from the top side of the door down. The lower hinges are installed no more than 32 cm (as) from the floor surface to the top. The middle hinge is installed in the middle of the top between the two hinges.
   - The key to planting must be firmly attached to the door frame.
   - After the key is attached, marks used for paint or other finish material attached to the key must be cleaned and removed completely.
   - Installation of door closer on the trunk and door leaf, arranged in such a way that the door always closes tightly on the door frame, and can function properly.
   - For all doors that can hit the wall when opened, given a door stop of the brand and type as required, installed properly on the floor using screws and nylon plug.
   - For toilet doors, the distance is taken from the top and bottom sides of the door.
   - The door handle is mounted 100 cm (as) from the local floor surface or according to the drawing and approved by the UNDP and the Consultant.
   - 'Lock' and 'latch' positions must be submitted by the UNDP for approval.

2.10. PAINTING WORK

2.10.1. Painting Work

1. **Scope of work**

   a. This paint job includes supply workers, paint material, equipment of work, tools assistance and transport when needed to the workplace as listed in these drawings, descriptions, conditions, and the employment agreement.

   b. A paint job definition is all surface coating on various materials for protection, giving color, giving texture, and giving the ability to be washed from the material.
   The details of this paintwork include the following types:

      1) Basic or primary painting and putty work.
      2) Wall paintwork (concrete or stone walls).
      3) Gypsum ceiling paint, concrete work
      4) Wood paintwork that is visible and invisible.
      5) Metal painting work.

c. And all the paintings as described in this specification or what needs in the drawing.

2. **Material Requirements**

a. Paint for the outside of the building, including painting the perimeter wall (exterior weather shield) using Dulux or Mowilex Weathershield products or equivalent.
b. Paint for gypsum ceilings and concrete using Dulux or Mowilex products or equivalent.
c. Paint for the inside of the building (interior) using Dulux or Mowilex products or equivalent.

3. **Material Standard / Quality Requirements**

Painting all works must be following NI-3 and NI-4 or by the specifications of the paint, factory used.

The paint manufacturer determines the standards of paint materials and procedures, and the Contractor is not permitted to change the standard by mixing and melting, which is not by the manufacturer's instructions or without permission from UNDP and the Consultant.

Testing
Contractors are required to prove the authenticity of paint from the factory above regarding the purity of the colors that are being used.

Proof in the form of:
- Canned Seal.
- Laboratory Test.
- The final result of the painting.

The results of this purity test must obtain written recommendations from the manufacturer to be acknowledged by UNDP and the Consultant.

4. **Material Delivery and Storage**

a. Material import from the worksite should be intact and not defective. Certain ingredients must still be in the original box, which is sealed and labeled by the manufacturer.
b. The material must be stored in a protected and closed, dry, non-humid, and clean place, as required.
c. Material storage must be sufficient for this project, material placed and protected according to its type.
d. The Contractor must be responsible for damage to the material during shipping, storage, and implementation.
e. Besides the general safety measures in the storage of building materials, for some types of paint and other kinds of materials below must be given special protection against the danger of fire and poisoning, among others as follows:

1) Sprites Petroleum.
2) Cellulose Thinner.
3) Cellulose paint.
4) White Sprites.
5) Polyurethane.
6) Sprites Methylate.
7) Chlorinated Rubber Thinner.
8) Paraffin.
9) Oil paint.
10) Creosote.

f. In using the material in the room, you must follow the instructions as follows:

1) A suitable Lightweight fire extinguisher and a first aid kit must be available within a short distance. The roo mis ventilated adequately.
2) Do not close to a fire or electric motor that emits fireworks.
3) Remove goods from the warehouse only in quantities that are immediately needed.
4) Don't leave the can open for too long.
5) Not allowed to leave used cans at work.

g. In the amount of material exceeding 50 liters, the following instructions should take into account:

1) If being outside, needs to protect against direct sunlight.
2) If being in a room, then the place has the following requirements:
3) It has a slope of at least 2% and has a drainage along with a spilled liquid reservoir.
4) The warehouse should be made of fire-resistant materials.
5) The roof of the warehouse should be built in such a way that it destroys quickly during fire hazards to avoid the effects of an explosion.
6) The door must be at least 5 cm thick and must open outward.
7) Towards Poisoning.
8) In this category, tin paint includes colors whose lead content exceeds 5% in wet conditions and 1% in dry conditions.
9) Must be kept separately and identified.
10) It is not permissible to use this paint in a closed warehouse and for children's premises.
11) Peel should be removed before it dries.
12) The use of the following solvents must be indoors, and adequate ventilation should be done to compensate for oxygen reduction.
13) Polyurethane alkalic oil, epoxy paint, bitumen cellulose paint, methylated varnish oil, and methylated paint removal.

5. **Requirements of Implementation.**

a. All materials before work presented to the UNDP and the Consultant, along with the factory terms/conditions/guarantees for approval. Rejected material replaced at no additional cost.
b. If it deems necessary to exchange/replace replacement materials, it is approved by UNDP and the Consultant based on the examples submitted by the Contractor.
c. For paintwork in open areas, do not do paintwork in gusty wind conditions, which will reduce the painting's quality.
d. When time is urgent, please do this painting in a state-protected from wet and humidity or dusty.
e. The painted material's surface thoroughly prepares for painting according to the paint factory requirements and the material concerned. The surface to be painted must be spotless of dust, grease/oil and smudges attached.
f. Every requirement to be started in a field must get approval from UNDP and the Consultant. Before painting, the Contractor requires to conduct an experiment to be approved by UNDP and the Consultant.
g. Contractors are not allowed to start work if there are abnormalities/differences on the site before the defect resolves.
h. If there are abnormalities in any case between the drawings and others, the Contractor must immediately report to UNDP and the Consultant.
i. The Contractor is obliged to repair/redo/replace the damage that occurred during the implementation period and the guarantee period at the expense of the Contractor, as long as the actions of UNDP do not cause the damage.

Implementation of Detail Drawing.
If necessary, the Contractor must make painting implementation work drawing (for parts deemed necessary).

6. **Implementation Instruction**

   a. Do the painting in the best way, which is commonly done except for other specifications. The method of painting, the use of base layers, and the thickness of the cover layer are at least the same as those issued by the factory.
   b. The painting should be flat, not piled up, run-down, or traces that show signs of spray and roller strokes. Brush all the bases with original paint using a brush; spraying is only allowed to if approved by UNDP and the Consultant.

7. **Repainting**

   a. Will do if there is a base coat or a final coat that doesn't cover or is loose. Repetition of painting is carried out as indicated by UNDP and the Consultant. And must follow the instructions and specifications issued by the relevant factory.
   b. Surface cleaning must be approved; work includes fees, washing with water, or cleaning with a dry cloth.
   c. The neatness of this paint job is required not to soiling and interfere with other finishing work or other work that is already installed. Imperfect work is repeated and improved upon the responsibility of the Contractor.

8. **Work Quality Testing**

   a. Before carrying out work, the Contractor requires to experiment on all work carried out at their own expense.
   b. The painting which is not approved by UNDP and the Consultant must be repeated/replaced at the expense of the Contractor. At the time of submission, the factory with a Contractor must provide a guarantee for 2 years for all painting work against possible defects due to weather, color, and other paint damage.
   c. Contractors must test all results based on the conditions that have been given by and the instructions of UNDP and the Consultant. Contractors provide equipment for testing.
   d. UNDP and the Consultant have the right to ask for repeat testing if deemed necessary.
   e. In the case of tests that have been performed well or are unsatisfactory, the cost of testing/repetition of testing is the responsibility of the Contractor.

9. **Job Security Requirements**

   a. The areas painted are prohibited from other jobs, as well as other activities, and also, the area is protected from dust and other dirt until the paint is dry.
   b. Protect work or other materials close to this work, such as fittings, frames, etc., cover/protect the building during painting work. The Contractor is responsible for repairing or replacing material damaged by the painting work.

2.10.2. Painting Wall with Emulsion Paint

1. **Scope of Work**

   Included in the scope of this work is painting the entire building and other parts listed in the drawing.

2. **Job Requirements**

   Before painting above the masonry/brick wall, the plaster should pay attention to whether:

The profile requested in the drawing has been implemented, in accordance with the levelling required in the drawing.

- Is the plastering already perfect/flat / water passed.
- Has the plaster gave a layer of neat-plaster so that the entire surface is smooth.
- All surface surfaces are clean of the required stains.

3. **Material**

Used Mowilex or Dulux products or equivalent approved.

The first layer as a sealer layer is Acrylic Alkalic Resistant Sealant 440 - 2934 or similar for all surfaces by painting 1 (one) layer and plamir 550-1967.

Final Paint

- For interior walls mowilex or equivalent, a minimum of 2 layers of color determine later.
- For exterior walls, use mowilex weathershield or equivalent with a minimum of 2 layers.

4. **Workmanship**

- The wall is ready to be painted must be sealed first. The sealer used is a Dulux product or equivalent. Before the walls seal, the plaster must be completely dry, there are no cracks, and the Contractor must seek the approval of the UNDP.
- The sealer layer is made as thin as possible until it forms a flat plane, after 1 (one) week the sealer installed and the Site Supervisor has approved the color test, the plamur side should be smoothen with fine sanding paper No. 00, then cleaned with chicken feathers until clean. Next, the walls paint using a roller. For surfaces where the use of rollers does not allow a good/smooth brush.
- Each time the final coat is applied, avoid being exposed to touch for ½ hour. Repainting does at least 2 hours later for every column, Beam, and Concrete Plate Paintwork that appears.

5. Job Requirements

- Before starting work, the Contractor must examine whether the profiles and size requested in the drawings are fulfilled in the plastering/concrete work. All surfaces must be even.
- The surface must be dry, clean of grease/oil stains and other stains attached.
- All defects, corrosion should be cleaned first, then plastered with mortar 1 pc: 3 sand, after the plastering is dry, the entire surface is flat and smooth after the rendering are completely dry, the painting work is done.
- The surface of the rendering must be dry, clean of grease/oil stains and other stains attached.

2.10.3. Painting of The Ceiling And Other Fields

1. **Scope of Work**

Included in the work scope is painting the entire ceiling of concrete plates, clipboard, wood, and metal, as shown in the drawings and according to the UNDP's instructions, and Site Supervisor.

2. **Job Requirement**

The new requirements implement after the UNDP has approved the ceiling installation with the Site Supervisor installed according to the pattern in the drawing. There are no cracked or broken units installed, and the connections with other materials are perfect.
The surface must be dry, clean of grease stains, and clean of other stains that stick.

3. **Material**

Ceiling
Material for the basis: mowilex or equivalent, then do the final painting using Dulux or mowilex paint, or the equivalent with works using a paint roller, the color will be determined later.

Management of materials and other tools in this work must meet the provisions of the relevant factory.

4. **Requirements of Implementation**
   - All painting areas must be completely flat, with no defects (cracks, holes, etc.).
   - Painting cannot be done as long as there are still improvements in the painting field. The painting field must be free from dust, grease, oil, and other impurities, which can damage or reduce the painting's quality.
   - Painting carries out after obtaining approval from UNDP and the Consultant.
   - Examples of materials that have been approved by the UNDP use as a standard of inspection/receiving materials sent by the Contractor to the workplace.
   - Material and color experiments must be carried out by the Contractor to obtain the UNDP's approval before the work is started/carried out, and the quality is under the requirements required by the relevant factory.
   - The work must be done well. The colors should be uniform, and there are no stains on the painting surface. Damage caused by other jobs should be avoided.
   - Contractors must be responsible for perfection in the work and maintenance/cleanliness of the work until the handover of work.
   - If there are imperfections in works or damage, the Contractor must repair/replace it with the same quality material without additional costs.
   - Contractors must provide skilled/experienced workforce as required from the factory so that that good quality work can be achieved.

2.10.4. Metal Painting

1. **Scope of Work**
Includes all metal painting work as listed in this specification drawing at a specified location but not limited to painting stair railings and roof trusses.

2. **Material**
   - Approved Danapaints products or equivalent. For visible metal.
     Cat Primer : Quick Drying Metal Primer Chromate A 540-49020 or the equivalent.
     Primer : Undercoat A 543-101.
     Final paint : Synthetic super gloss or equivalent
     each 2 to 3 layers and covered well.
   - Aluminium paint A 338-2212 or equivalent uses for Aluminium.
   - For other metals: DANAPAINTS super gloss A 365 or equivalent 2 to 3 layers each and well covered.
   - For metals that are not visible
     Cat Primer : Quick Drying Metal Primer Chromate A 540-49020 or
     equivalent, as much as a minimum of 2 layers (until covered with good).

3. **Implementation Method**
   - The surface of iron/steel/Aluminium must be clean and free of rust, cracks, and other impurities.
   - Cleaning with Blat Cleaning is the best way. If the mill scales are left a while on the surface, they may use clean with a steel brush or mechanically.
   - Scrubbing with a steel brush conducted when the situation is urgent and approved by the UNDP.

4. **Material Delivery and Storage**
   - The material must be brought to the workplace intact and without defects. Some specific materials must still be in the original box/packaging that sealed and labeled the manufacturer.
   - Material is stored in a protected and covered, dry, not moist, and clean place, according to factory requirements.
   - Material storage must be sufficient for this project; the material is placed and protected according to its type.
   - Contractors are responsible for damage during shipping and storage. If there is damage, the Contractor is obliged to reimburse the costs of the Contractor.

5. **Job Security Requirements**
   - Profile steel materials are avoided/protected from rain and others. Steel installed is protected from possible defects/damage resulting from other jobs.
   - In the event of damage, Contractors require to repair it by not reducing the quality of work. All repair costs are the responsibility of the Contractor.
   - Painting of Road Markings and Parking Limits With Roadline Paint.

   Scope of work.
   Surface Preparation.
   - The surfaces are cleaned from dust, oil, and other impurities.
   - Paint Preparation
   - Before use, it should be stirred perfectly. If needed, it should be diluted with Roadline Paint Thinner to 5%.
   - Usage
   - It recommends using a brush.
   - Special Warning
   - This paint consists of a volatile and flammable liquid, so try to get adequate ventilation and avoid using the paint close to the fire.

   Material requirements.

Type	: Chlorination Rubber + Alcyd Resin
Pattern	: Semi-gloss.
Warning	: Dust does not stick: 10 minutes
Retailer	: Roadline Paint Thinner.
Thickness	: 40 -50 Microns.
Color	: White, Yellow (yellow taxi), determined later

2.10.5. Wood Painting

1. **Scope of Work**
   Works included in this work are the provision of workers, materials, equipment and tools needed including adequate material transportation to the worksite/location.

Will be done including door panel painting.

Work Requirements.

Material	: Woodstain Mowilex or Danapaint or equivalent.
Chemical Resistance	: Consistent in NI-4, not fade, dry quickly, anti-mildew, resistant to weather, the gloss is not sharp and fulfilling the requirements of the factory concerned.

2. **Terms and Conditions of implementation**
   - Before painting on a wooden surface, special attention should be paid for:
   - The requested profile, according to the drawing, has been done based on the specified leveling.
   - The surface of the wood must be flat and perfect following a predetermined pattern.
   - The surface of the wood does not occur pits or other defects. All areas of painting must be clean of any stains or dirt/dust.
   - Furthermore, wood painting using a spray tool adjusted to the state of its location.
   - UNDP and the Consultant approved the use of tools of the highest quality of its kind
   - A coat of paint complete on the finished color must avoid the occurrence of touches for half an hour to 2 hours every time.
   - The final painting in should be repeated at least 2 hours later. The final painting works at least 2 (two) layers so that excellent flat color painting results will be obtained.

3. **Example of Material**
   - Before the work carries out, the Contractor must be able to provide examples of the material to be carried out to obtain approval from the UNDP and the Site Supervisor.
   - The Contractor must submit 2 (two) copies of the factory's operational, technical requirements as information for the Site Supervisor.
   - Other materials not contained in the above provisions, but are needed for completion/replacement of work in this section, must be of new material, good quality of its type, and approved by UNDP.
   - Samples of materials approved will be used as a standard/guideline for checking / receiving material sent by the Contractor to the site.
   - Contractors are required to make storage for samples of materials that have been approved by UNDP.

4. **Quality Testing Work**
   - Before the paint job is conducted, Contractors are required to submit a "Certificate test" from the manufacturer/factory to UNDP and the Consultant.
   - If there is no Test certificate, the Contractor must carry out testing of paint material in the laboratory specified by UNDP and the Consultant.
   - Test results from the laboratory immediately submitted to UNDP and the Consultant.
   - All costs related to the testing of these materials are the full responsibility of the Contractor without additional charges.

5. **Job Security Requirements**
   - Painting work that is done must avoid direct touch for 3 x 24 hours after processing.
   - The painting field is protected from possible defects resulting from other work.
   - All costs for repairing and replacing these materials are the full responsibilities of the Contractor without additional charge to UNDP.

2.11. TOOLS - SANITAIR TOOLS

2.11.1. Scope of Work

- This work includes the procurement of workers, materials, equipment, and other tools needed in the implementation, so that good quality and can achieve perfect work results.
- This sanitary work is installed in toilets and other spaces stated/shown in the drawing and approved.

2.11.2. Material Requirements

- On Public Toilets using the product TOTO or equivalent with specification:
  Sitting closet in the same class as CW914J
  Squatting closet type CE 7
  Washlet shower spray class TB19CSMCR
  Showerhead type wall TX465SE classmate
  Shower stop class TX443SE faucet
  S11N class Soap Holder
  TX703AC class paper holder
  Floor drain class TX1BV1
- All materials must meet size, standard, and be found on the market unless otherwise specified.
- All equipment in a complete state with all its equipment must be in accordance with factory standards.
- The material used are products required in the description and the requirements of this Technical Specification

2.11.3. Implementation Conditions

- Before installation, all materials are shown to UNDP and the Consultant, along with the requirements of the manufacturer's specifications for approval. Unapproved material should be replaced at no additional cost.
- If it deems necessary to make a replacement, The UNDP and the Consultant approved the replacement of replacement materials based on the examples submitted by the Contractor.
- Before installation begins, the Contractor must examine the existing drawings and field conditions, including studying the shape, pattern, placement, method of installation, and details according to the image.
- If there are abnormalities in any case between Architectural drawings with specification drawings and so on, the Contractor must immediately report them to the Consultant to clarify the specifications.
- Contractors are not allowed to start work in a site if there is a discrepancy/difference on the site before the discrepancy is resolved.
- During the implementation, testing/checking must always be conducted to the perfection of the work results.
- The Contractor is obliged to repair, redo, replace if there is damage during the implementation period and the warranty period, at the expense of the Contractor, as long as the damage is not caused by UNDP.
- Implementation of the installation must produce a perfect, neat, and facile result.

2.12. ROOF FINISHING WORK

2.12.1. Scope of Work

Includes the preparation of roof covering material to work on, installation in places in accordance with the plan drawings, and completion, including the provision of workers and auxiliary equipment.

2.12.2. Material Requirements

The roof covering material is Spandex with roof insulation using glass wool layer and Aluminium Foil with the following conditions:

Roof Cover

- Specifications : Zincalume steel base material consists of 43.5% Zinc, 55% of Aluminium and 1.5% of Silicon
- Color : Will be determined later
- Brand : Lysaght or equivalent
- Thickness : BMT 0.4mm

Glasswool

- Size : 2.5 cm x 1.2 m x 30 m
- Type : Unicell or equivalent
- Thickness : 2.5 cm
- Weight : 3.92 kg / m2

Aluminium foil

- Size : + 100 x 2500 cm^2
- Brand : Unicell or equivalent
- Thickness : 0.25 mm
- Weight : 2000 gr / m2

Flash / Corner Flashing

- Specifications : Zincalume ZINCALUME steel base material consumer of 43.5% Zinc, 55% of Aluminium and 1.5% of Silicon
- Color : Will be determined later
- Brand : Lysaght or equivalent
- Thickness : BMT 0.4mm

2.12.3. Material Sample

Before starting the roof covering work, the Contractor must submit samples of materials and colors that will be used complete with a certificate/statement from the producer explaining that the quality of the material complies with the requirements above to the UNDP and the Consultant for approval.

2.12.4. Power and Equipment

- Installation is carried out by skilled and experienced personnel with complete equipment.
- Before starting the work, the Contractor must first study the plan's drawings for the Spandex roofing work along with the roof insulation and check the site condition which will be installed on.
- Contractors are required to make shop drawings that show installation details, screw strength, and joints that are visible and complete with measurements. This work drawing must first obtain approval from UNDP and the Consultant.

2.12.5. Implementation

- For roof coverings (Truss), girder, etc., Contractors are required to carry out measurements according to the site conditions.
- Installation must be done by personnel who are specialized and skilled in this job. The installation does in such a way so that it obtains a neat, sturdy, tight, and not bumpy roof installation.
- Cutting spandex (if any) must be done mechanically with the approval of UNDP and the Consultant.

2.12.6. Acceptance Conditions

- Every roof cover job installed must be in a precise position and in contact with one another and guarantee for neatness.
- The results of roofing work must be flat, not bumpy, and not leaking.

2.12.7. Maintenance Requirements

Repair

Any damage on roof coverings works repaired in the manner recommended by the manufacturer. Repairs carried out in such a way that it does not damage other finishing work.
If there is a damage finishing job due to the repair of this roof covering work, the damage must be repaired immediately.

Security

- After finishing the roof covering, the surface should be protected with adequate protective materials at the Contractor's expense.
- After the cover is installed, the surface must be protected against the possibility of being exposed to chemicals and other objects that might cause defects, stains, etc.
- If this happens, the Contractor must repair the defects until it is recovered.

2.13. SANITAIR CHANNEL SYSTEM

This section covers the procurement of sanitary channel networks, including excavation and backfilling structures concerned with this network.

2.13.1. Materials

- The mixture used is a mixture of 1 pc: 2 sand with enough water to produce the right mixture density for this connection.
- The concrete used is under the particular requirements in this specification and from a mixture of waterproof concrete (1 pc: 1.5 sand: 2.5 splits).
- Sealers, for pipe connections, are rubber gaskets unless stated or indicated in the drawings/requirements.
- Sanitary pipes, unless stated otherwise, all sanitary pipes used are PVC pipes. Class VU, which has a minimum size in accordance to standards in Indonesia.
- For this sanitary pipe, which is used for drainage from the minimum toilet pipe PVC in 4" diameter and from the washbasin / urinal minimum PVC pipe in 2" diameter and the kitchen sink at least PVC pipe 3 "and the floor drain minimal pipe PVC in 2" diameter.
- For the whole system, only one type of class V.U pipe can be used, such as Pralon / Rucika or equivalent products, which are first approved by the UNDP.

2.13.2. Implementation

- Where the "Gravity Flow Sewer" crosses over the water pipe, then the "Sewer" pipe is wrapped in watertight concrete at a distance of 3 m each side of the water pipe.
- The thickness of this concrete, including the concrete in the connection of the pipes, must not be less than 10 cm.
- All connections must be tightly sealed with rubber gaskets.
- Concrete Cradle, these pipes must be supported by a concrete Cradle in the place according to the drawing or the places shown. This concrete consists of a mixture of 1 pc: 3 sand: 5 splits.
- For "T" connections, a factory-made connection must be used. Pipe cutting to be used as a connection is not allowed except for special cases with the approval of the Consultant, UNDP and Construction Management Consultant.
- Man holes (control tub) must be made of brick / stone with a frame and cover of reinforced concrete and in accordance with the drawing.
- For sections that cross with the road above, the hole is made of watertight masonry with a frame and cover made of reinforced concrete, according to the drawing and follows the instructions of the Consultant, UNDP, and Constitutional Court Consultant.
- Frames and covers must be given tag and must be installed so that the top surface and cover will be flat or higher than the ground surface.

2.14. DRAINAGE WORKS

2.14.1. Scope of work

Drainage works include the construction and installation of open sewers, sewers and other drainage structures according to direction, slope and dimensions, as stated in the plan drawings. In principle, all drainage works must be finished before the road / subgrade work begins.

- Open Sewerage
- Open channel brick / stone masonry

On top of the channel, a solid layer of compacted sand is installed. For masonry, masonry sand and Portland cement are used. The results of the excavation must be neat and the basic inclination of the channel must be able to drain the water in as the planned speed. At the edge of the side road which is a boundary with a channel must be made slope of 1: 4 to prevent landslides from the side road, unused canal excavation must be disposed somewhere else.

On the bottom of the channel before being given any pair must be coated with 5 cm thick sandbag. Open channel of mortar stone 1 pc: 2 ps, plastering 1 pc: 3ps.

Open Channel Cast Concrete

The channel is made of concrete cast with a mixture of 1 Pc: 2 Ps: 3 Cr for the walls of the channel and a semi-circular concrete for the bottom of the channel. Underneath the channel is a compacted layer of sand. Concrete used with quality K.225. The channel must have a good slope. The size and installation of the channel are adjusted to the working drawing. The excavation for installing the channel is made to taste.

Channels consist of several sizes such as the width of 200 cm, 300 cm, 400 cm, 600 cm and 800 cm with channel cover / Grates / Grille made of iron with quality light duty and heavy duty with sizes ranging from 200 cm, 300 cm and 400 cm.

2.14.2. Material Requirements

1. Sand

For sand under hardening layers can be used sea sand that is clean from dirt and mud.

2. **Crushed Stone**

   Broken Stones must be hard, must not be porous, and have at least three halves.

3. **Concrete Sand**

   Concrete sand must be sharp, rough and must not contain more than 5% clay, the color of sand must be black.

4. **Checking**

   Materials are inspected at the worksite.
   Quality and material quality must be approved.
   Rejected materials must be transported in no later than 2x24 hours.

5. **Closed Channel**

   The closed channel is made of concrete as drainage for rainwater and greywater from the building which is connected to the control tub at the places listed in the drawing plan.
   The concrete pipe is installed according to the size listed in the plan drawings and placed on compressed sandstone. The quality of concrete pipe must meet the requirements of AASHO Standard M 86 with K-350 concrete quality and after approval by UNDP.

6. **Culvert**

   Culverts are made from masonry works which is conducted by following the instructions of the Consultant, and UNDP. Type and size and location as listed in the drawing plan. The cover is made of reinforced concrete whose size and construction are as stated in the drawing plan. K-350 concrete quality as well as in accordance with concrete work requirements and follow the instructions of UNDP.

7. **Control Tube**

   There are two types of control tub work, namely control tub without cover and control tub with cover (iron grill). The control tub is made of masonry work with sizes and placement locations as listed in the drawing plan. Grill made of high-grade iron that has been approved by UNDP. The sizes are as stated in the plan drawings.

8. **Tunnels**

   A tunnel to flow rainwater into the open road on the roadside. Tunnels are made for the road that has an open channel beside it according to the plan and according to the instructions of UNDP. The distance between each tunnel is 5-8 meters.

9. **Excavation work:**

   Excavation work meant here is excavation work for the building of canals and buildings for drainage. This work includes work to refill the previous dug pits with good material, remove excess drying material that is necessary, pumping, protecting make the edges of construction and related demolition if necessary. There is no distinction between excavation in ordinary soil material and quarrying rock. In stone quarrying, the equipment used must first obtain approval from UNDP.

   The Contractor must notify the Consultant and UNDP before starting the excavation so that the cross-section, elevation level, and measurement can be conducted on undisturbed soil conditions.

   There is no additional cost / payment for this excavation work but it must include the unit price of each construction building that requires the excavation as stated in the offer.

III STRUCTURAL WORK

3.1. JOB PREPARATION AND MEASUREMENT

3.1.1. Scope of Work

This work includes the supply of workers, materials, measuring instruments, and other things needed to complete. Including measurements, project fencing, keet directors, bouwplank, project land clearing, environmental permits, insurance, electricity and working water, project documentation, and other work as stated in the Bill of Quantity (BoQ). Also included the scope work is a re-measurement of land boundaries and the position of the building following the plan. In principle, the Contractor must prepare everything related to this project, so that the work can go according to plan.

3.1.2. Project land preparation.

1. **Demolition of Damaged Buildings**

   Before the work is carried out, the Contractor must perform the demolition and rubble/land clearing of the old buildings. Thus the work can be carried out smoothly and according to schedule.

2. **Measuring Instrument / Theodolite**

   Measurements are taken during the work, starting from the beginning before the work is carried out to the end to make As-Built Drawings. Measurements must be carried out with the building axis as the reference in the two main directions of the building. For this reason, the Contractor must have a full calibration and calibration certificate that is still valid, including an experienced measuring expert, so that it is always ready to re-measure on demand.

3. **Bouwplank**

   After the measurement (setting out) is complete, the Contractor must install the Bouwplank. Bouwplank must be made from materials approved by the Consultant and must be flat. Bouwplank must be placed in a location that is free of distractions during work and is easily visible. In the bouwplank marked signs indicate the building's axis is complete with levels that indicate the height. Generally, the bouwplank is made of Samarinda wood boards measuring 2 x 20 cm.

4. **Work Plan Related to Land**

   The project locates adjacent to a building that is still being used by UNDP and should not be disturbed during construction work. The Contractor will be given a project land with clear boundaries. The Contractor in the bid is obliged to propose a work plan, including among others are the placement of the barrack of directors, storage, workflow, and other matters related to this project so that the work is completed according to the agreed schedule. The Contractor must make their effort so that during the implementation of work does not interfere with the operational activities of the Office.

5. **Water drainage in and around the project area**

   Contractors must propose a drainage system in the project area. This water channel must be able to flow water smoothly and thoroughly so that the work will be implemented well. Water coming from within the project must be treated carefully, and it is not permissible to dispose of mud and other impurities into waterways outside the project. The Contractor must also maintain all waterways around the project so that they remain in good condition and can flow smoothly. Poor channels repaired, and this takes into account the offer.

3.2. EARTH WORK

3.2.1. Earth Cutting Work

1. **Scope of work**

   a. **Workers, materials, and tools**

   This work includes the supply of workers, materials, and assistive devices needed to carry out and secure this work correctly and under this specification.

   b. **Soil cutting on the old building foundation**

   This work includes excavation of soil for pile cap, foundation blocks, and other structures located inside or above the ground, as stated in the plan drawings or according to the needs of the Contractor so that the work carried out smoothly, properly, and safely. In the bid, the Contractor must consider the possibility of an unknown old building foundation planted.

   c. **Cleansing Plant Roots and Traces of Tree Roots**

   Plant roots and old tree roots found in the soil can rot and become organic material that can affect the strength of the ground. In all project sites where the soil functions as a building support, especially the lowest floor support, the plant roots, and the remaining tree roots must be dug up and thrown clean. The former dug hole filled with materials that meet the requirements.

   d. **Trees on project land**

   Some trees in this project must be preserved. The Contractor must study this matter carefully so that they do not cut down trees without coordination with the Consultant or UNDP. Trees located in buildings are to be built and cut down.

2. **Requirements of Implementation**

   a. **Excavation level**

   Soil excavation carried out according to the level listed in the plan drawing. The Contractor must know with certainty the relationship between the level of the building and the level of the original land. If this is not clear, immediately discuss this with the Consultant before the excavation carries out. Mistakes made as a result of this are the responsibility of the Contractor.

   b. **Utility network**

   If it turns out that there are drainage pipes, electric cables, telephones, etc., the Contractor must immediately notify this to the Consultant to obtain a settlement. The Contractor is responsible for any damage caused by negligence in securing the utility network. The active utility network that is found underground and located in the work location moved to a place approved by the Consultant and the UNDP upon the Contractor's responsibility.

   c. **Unsuitable errors**

   If the excavation carries out exceeds the specified depth, the Contractor must fill the excavation with material that meets the requirements and compacted in a way that meets the requirements. Or the excavation can be filled with other materials such as mortar or other materials approved by the Consultant and UNDP.

   d. **Backfill**

Backfill of the excavation conducted under the requirements in the chapter on "Backfill and Compaction Work." This backfill work conducted after inspection and written approval from the Consultant.

e. Excavation of basic excavation

The base of the excavation must be flat and free from plant roots or other organic materials. Furthermore, the excavation base should be compacted under the applicable requirements.

f. Water in the excavation

If the groundwater level is less than 4.00 meters in the subsurface, the Contractor must anticipate this in the offer and must provide a water pump or mud pump with sufficient capacity to avoid a puddle of water and mud on the bottom of the excavation. The Contractor must plan correctly, where the groundwater flowed, so there is no puddle of water/flood at the location around the project. In the quarry location, proper drainage made to control the flow of water during the work.

g. Excavation safety structure and excavation protector

If the excavation done turns out to be deep enough, then the Contractor must make the excavation safeguard in such a way that no landslides occur on the excavation edge. Open excavation is only permitted if a slope greater than 1: 2 (vertical: horizontal) obtained—the excavation site protected with a concrete mortar reinforced with reinforcing webs immediately after the excavation carried out. Before the concrete mix installed, the excavation must be protected with waterproof materials such as sheeting/canvas so that the excavation protected from rain or sunlight. The landslide caused by excavation is the responsibility of the Contractor.

h. Protection of objects encountered

The Contractor must protect or save objects found during excavation work in progress. Next, the Contractor must report the matter to the Consultant. Unless they agreed to move, these objects must remain in place, and damage caused by the Contractor's negligence must be repaired/replaced by the Contractor.

3.2.2. Solid Sand Fill Work

1. Scope of work

a. Workers, materials, and tools

This work includes the supply of workers, materials, and tools needed to carry out and secure this work correctly and under specifications.

b. Job location

Solid sand fill works are carried out based on excavated soil under the working floor layer. They used for all concrete structures related to the soil, such as pile cap, foundation footprints, foundation beams, and other specific works directly related to the soil.

c. Cleaning the roots of plants and remaining excavation

If below the bottom of the excavation found the roots of plants or organic soil, then the base of the excavation must be cleaned from the above and the previous excavation filled with materials that meet the requirements.

2. Material Requirements

a. Solid sand fill material

The sand used must consist of clean, sharp, and hard grains, free from mud, clay, and organic matter. This material must have written approval from the Consultant.

b. Working water

The water used must be clean and not contain oil, alkaline acids, and other organic materials, and can be drunk. Before use, water checked in the laboratory for validity. If the test results are found not to meet the requirements, the Contractor must find work water that meets the requirements.

3. Requirements of Implementation

a. Thick sandfill

If not listed in the work drawings, then under the work floor must be given a layer of 10 cm thick solid sand or according to the drawing. Compaction carried out so that it can accept the burden of working.

b. Method of compaction

Compaction is done by pouring water and then compacted by a compactor approved by the Consultant. Compaction carried out until it reaches no less 95% outside the building and 90% for inside the building from the optimum density of the laboratory. Compaction carried out in sufficient excavation conditions, so that good density results obtained. The excavation conditions must be maintained until the compaction work is completed. Compaction must be repeated if the above conditions are not met, and the incurred costs are the Contractor's responsibility.

c. Water at the compaction location

If the groundwater turns to inundate the compaction location, the Contractor is required to provide a pump, and the bottom of the excavation must be dry before the sand placed. This location must always be in a dry condition until the concrete casting is completed. The Contractor must make the right plan so that groundwater flowed to an area lower than the bottom of the excavation, for example, by making a sump pit at a particular place.

d. The soil around the backfilled sand

The Contractor Agency must ensure that the soil around the location is not mixed with backfilled sand. If the sandpit is mixed with other soil, the Contractor is obliged to replace the sandpit with other clean material.

e. Approval

Further work carried out if the fill work gave written approval from the Consultant and UNDP.

3.2.3. Filling Work and Compaction

1. Scope of work

a. Workers, materials, and tools

This work includes the supply of workers, materials, and tools needed to carry out and secure this work correctly and under specifications.

b. Job location

As stated in the plan drawing, this work is at the location, with the elevation, as stated in the contour map submitted at the Minutes of Explanation Meeting.

c. Cleaning the roots of plants and remaining excavation

If plant roots or organic soil are found, then the location must be cleared from the above, and the previous hole filled with materials that meet the requirements.

2. **Material Requirements**

   a. **Excavated materials inside the project site**

   The former quarry can be considered for use if it meets the criteria for use. The soil must be free of mud and other organic materials.

   b. **Fill material from outside the project site**

   If the backfill must be brought in from outside, then the backfill must meet the following requirements:

   - Has a permeability coefficient of less than 10-7 cm/sec;
   - Contains a minimum of 20% silt and clay particles and is free of organic soil, dirt and rocks measuring more than 50 mm and containing less than 10% particle gravel;
   - Has a Plastic Index (PI) of more than 10 percent. Material that has a PI of more than 30 percent will be difficult to compact;
   - The lumps must be loosened, and the material must be loose to make it compact.

2. **Materials that do not meet the requirements**
   All inadequate materials must be removed from the project site and replaced with materials that meet the requirements.

3.2.4. Requirements of Implementation

1. **How to fill and compact**
   The fill must be done layer by layer with the maximum thickness of each layer 20cm released, and compaction carried out until it reaches the Maximum Density at the Optimum Moisture Content specified in the plan drawing. Filling compaction carried out using a compactor approved by the Consultant. If not listed in the plan, then compaction must be carried out until it reaches a degree of density 95% outside the building and 90% for inside the building.

2. **Installation of stakes**
   At the location of the reservoir should be given stakes, the height following the height of the plan. For areas with a certain height, pegs are made with a particular color.

3. **Drainage system**
   The Contractor must construct temporary channels so that all locations can continue in a dry/free of water condition. Drying did with the help of a water pump. The Consultant must approve the planned drainage system. And the drainage system must always be maintained during the work to function adequately to cope with the existing water.

4. **Dirt and mud and organic material**
   The location to be enclosed must be free of mud or dirt, garbage, and similar materials. Collection cannot carry out if the excrement is not removed from the work location.

5. **Optimum Density Test in the laboratory**
   The Optimum Density Test must comply with the provisions of ASTM.D-1557 or AASHTO. The results of this test used to determine the compaction method in the field. Tests carried out include:

   - "Density of soil in place by sand-cone method" AASHTO.T.191.
   - "Density of soil in place by driven cylinder method" AASHTO.T.204.
   - "Density of soil in place by the rubber ballon method" AASHTO.T.205.

6. **Layer density and field test**
   For the same material, each layer of soil that compacted tested in the field, which is 1 (one) test for every 500 m2, namely the "Field Density Test" system. If the Filling is thick enough, the density must meet the following conditions:

   - For layers that are deeper than 50cm from the plan surface, the dry mass of stable soil in the field must reach at least 95% of the laboratory's dry weight calculated by the Standard Proctor Test.

- For layers 50 cm from the surface plan, the density must be at least 95% outside the building and 90% for inside the building from the Standard Proctor Test.

7. **Flatness tolerance**
   An acceptable implementation tolerance for excavation and retrieval is 50mm against the specified flatness.
8. **Final level**
   Field test results must be written and known by the Consultant. All work results must be re-examined against reference benchmarks to find out where the land surface is.
9. **Protection of compaction results**
   The surface part declared dense must be maintained, guarded, and protected so as not to be damaged by external influences such as wet by rainwater, solar heat, and so on. Protection did by covering the surface with plastic.
10. **Compaction**
    Before starting with the next layer, each layer must be worked under the required density and checked through adequate field testing. When the material does not reach the desired thickness, the layer must be repeated by its work or replaced, by the specified methods of implementation, to obtain the required density. The Contractor must submit the testing schedule to the Consultant.

3.3. REINFORCED CONCRETE WORK

3.3.1. Scope of work

This work includes the supply of workers, materials, equipment, and transportation to complete all concrete work by what is listed in the drawings, as well as work-related to concrete, such as deckings, real steel, and admixtures. Also included the scope work is the security of both workers and other facilities in the vicinity so that the work can run smoothly and safely.

3.3.2. Regulations

Unless otherwise stipulated in the following requirements, the following rules used are:

- Procedures for calculating concrete structures for buildings, SNI 03-2847-2002
- Concrete Guidelines 1989 (SKBI - 1.4.53.1988)
- Procedures for planning earthquake resistance for buildings, SNI 03-1726-2002
- Planning Guidelines for Regular Reinforced Concrete Structures and Reinforced Wall Structures for the 1983 Building
- General Requirements for Building Materials in Indonesia (PUBI-1982) / NI-3
- Portland Cement Indonesia Regulation 1972 / NI-8
- Portland Cement Quality and Test Method (SII 0013-81).
- Concrete Aggregate Test Quality and Method (SII 0052-80).
- ASTM C-33 Standard Specification for Concrete Aggregates
- Concrete Reinforcement Steel (SII 0136-84)
- Welding Steel Wire Networks for Concrete Reinforcement (SII 0784-83).
- American Society for Testing and Materials (ASTM)
- Local Government Development Regulations.
- Building Structure Planning Guidelines for the Prevention of Fire Hazards in Homes and Buildings (SKBI-2.3.53.1987 UDC: 699.81: 624.04).

3.3.3. Expertise and Carpentry

The Contractor must make concrete with the quality of work under the requirements required, including the size, quality, and safety during implementation. All concrete works must be carried out by experienced experts during the work, including experts for decking/formwork, to anticipate all possibilities. Also, The Contractor must use skilled artisans so they are familiar with the work being carried out, especially during and after casting. All experts and artisans must supervise the job until the concrete maintenance work is completed. For this reason, no later than ten days before work begins, the Contractor must propose work methods and must be approved by the Consultant. If deemed necessary, the Consultant has the right to appoint experts outside those designated by the Contractor to help evaluate all the Contractor's proposals, and all costs incurred are the expense of the Contractor.

3.3.4. Material Requirements

1. **Cement**
   The cement used for the manufacture of concrete must be of the type of cement specified in SII 0013-81 or the Indonesian General Standard for Building Materials 1986 and must meet the requirements specified in the standard. All cement to be used must be from the same brand and in new condition. If the cement that is shipped is in a bag of cement, then during transportation, the cement must be protected from the rain. The cement wrapped in original sacks (bags) from the factory and in a tightly in closed condition. The cement must be stored in well-ventilated storage, not damp and placed in a high place so that it does not touch the floor and is safe from unwanted possibilities. The cement not stacked for more than ten sacks. The cement storage system is arranged in such a way that the cement is not stored for too long. The cement that is in questionable quality and is damaged by mismanagement, such as petrification, is not permitted. Material rejected must be immediately removed from the field at least within 2 (two) days at the Contractor's expense.

2. **Aggregate**
   In making concrete, there are two sizes of aggregate used, namely coarse aggregate / broken stone and fine aggregate / concrete sand. These two types of aggregates are required as follows:
   a. Coarse aggregate
      - The maximum nominal grain size of the coarse aggregate must not exceed 1/5 of the smallest distance between the side planes of the mold, or 1/3 of the plate's thickness, or minimum the minimum net distance between the reinforcing rods or prestressed tendons or 30 mm. Gradation of the aggregate must be under the requirements of ASTM so that no gravel or cavity nests occur with the following conditions:

Table 2 Aggregate Gradation

Remaining on the Mesh	(% of weight)
Mesh 31.50 mm	0
Mesh 4.00 mm	90 - 98
Difference between the next 2 meshes	02 – 10

b. Fine aggregate
   - It must consist of grains that are clean, sharp, and free of organic material, mud, and other impurities. Sludge levels must be less than 4% by weight. Fine aggregate must consist of items of varying magnitude and must meet the following requirements if sifted.

Table 3 Fine Aggregate Requirements

Remaining on the Mesh	(% of weight)
Mesh 4.00 mm	02
Mesh 1.00 mm	10
Mesh 0.25 mm	80 – 95

- The Contractor must carry out testing by the requirements in this specification. If the aggregate source changes for some reason, the Contractor is obliged to notify the Consultant in written statement. Aggregate must be stored in a clean, hard surface and prevented so that mixing does not occur with the soil.

3. **Water for concrete mix**
   Water used for concrete mix must be clean, must not contain oil, alkalic acid, salt, organic substances, or other materials that can damage concrete or steel concrete. Drinkable freshwater is generally used. The water must be checked in a laboratory approved by the Consultant. If the water does not meet the requirements for use at the job site, the Contractor must find adequate water for the work.

4. **Steel Rebar**
   Solid Steel rebar must always use Deformed Rebar for the primary reinforcement and stirrups unless specified in the drawing. Solid steel rebar must meet the following requirements, to obtain excellent work results:
   - New, free from dirt, oil, rust, and no defects.
   - Concrete steel quality is fy 400 N / mm2 for screw steel (diameter ⩾13 mm) and fy 240 N / mm2 for plain metal (diameter ⩽12 mm) or as specified in the figure.
   - Has a flat and uniform cross-section under tolerance.

   The diameter of the reinforced concrete rebar determined by the 1989 Concrete Guidelines.
   The use of solid steel rebar of a type that is not under the provisions above must obtain approval from the Consultant. Solid steel rebar must be derived from a factory (manufacture). It is not justified to use different brands of rebar for this work. Solid steel rebar equips with a mill certificate containing the label and casting number and the date of manufacture of the concrete.

5. **Admixtures / additional materials**
   In certain circumstances, additional mixtures may use to improve the properties of a concrete mix. The Consultant must approve the type, amount of material added, and use of the additive. Benefits additives are proven through the results of tests using the kind of cement and aggregates that will use in this project. Additional mixtures that serve to reduce the amount of mixing water, slow down, or speed up the binding and hardening of concrete must meet the "Specification for Chemical Admixtures for Concrete" (ASTM C494) or meet the Indonesian Building Materials General Standards.

6. **Concrete Quality**
   All concrete qualities are dominant K-250 columns and beams.
   To ensure that the quality of the concrete plan is achieved, the Contractor must experiment under the requirements of applicable regulations. For this reason, a trial mix should be held in a laboratory.
   If not specified, then work floors, practical columns, ring beams, work floors, and other non-structural concrete must use K-250 quality concrete.

7. **Concrete Mix Design**

The proportion of the concrete base mixture must be determined so that the resulting concrete provides excellent workability and consistency so that the concrete is easy to pour into the decking and around the solid steel, without causing excessive aggregation and separation of water (bleeding). The concrete mixture must be designed under the quality of concrete to be achieved, with the following restrictions:

Table 4 Concrete Quality

CONCRETE QUALITY	K225	K250	K300	K350	K400 and K500
Minimum Compressive Strength, 7 days (kg/cm^2)	158	175	210	245	280
Minimum Amount of Cement (kg/m^3)	300	300	325	350	375
Maximum Amount of Cement (kg/m^3)	550	550	550	550	550

For waterproof concrete or concrete in special environmental conditions, the requirements in Table 4.5.1 of the Indonesian Concrete Guidelines must be met.

Table 5 Minimum requirements for waterproof concrete

Type of Structure	Environment condition related to	Maximum Cement Water Factor	Minimum Amount of Cement (kg/m^3)
Reinforcement Concrete	Freshwater/ Brackish	0.50	290
	Sea Water	0.45	360
Prestress Concrete	Freshwater/ Brackish	0.50	300
	Sea Water	0.45	360

The Contractor must submit the proposed mix-design to the Consultant for the approval. The minimum amount of cement must be under the requirements of the waterproofing supplier, mainly for waterproof concrete.

3.3.5. Material Testing

1. **General**

a. The terms and conditions written below constitute a summary of the 1989 Concrete Guidelines. If there are differences in interpretations or other contradictory matters, they returned to the provisions of the Concrete Guidelines.

b. The Contractor must be responsible for carrying out all tests, including preparing sample specimens with the required amount. The Contractor must submit the test results after obtaining the test results for approval by the Consultant.

c. If the test and implementation do not meet the requirements, the Contractor must carry out a retest with another mixture and then re-evaluate the test results until the desired results are obtained.

d. All tests and inspections in the field must be carried out according to the direction of the Consultant.
e. For all cement and concrete materials sent to the area, the Contractor must obtain a copy of the test certificate from the factory. The test is carried out periodically through testing according to these specifications.

2. **Testing Laboratory**
   a. Before the concrete work is implemented, the Contractor must propose a testing laboratory to carry out the testing of the material used in this project. This laboratory is responsible for carrying out all tests according to these specifications.
   b. Unless otherwise specified, The Contractor must provide testing equipment in the field, as mentioned below, along with experts who master their areas.
      - Coarse and excellent aggregate tester.
      - A moisture content gauge from the aggregate.
      - Measuring slump concrete
      - Test specimens, including storage tanks for maintaining test specimens at average temperatures and avoiding sunburn.

3. **Ready-mix Concrete**
   If the Contractor uses ready-mix concrete, then the equipment (a) and (b) above must be prepared at the ready-mix concrete plant.

4. **Aggregate Testing**
   a. Preliminary Aggregate Testing
      The Contractor must conduct a total initial test as follows:
      - Sieve analysis
      - Testing levels of mud and other impurities.
      - Testing of organic elements.
      - Testing of chloride and sulfate levels.

   The test results must be submitted for approval to the Consultant and UNDP.

   Tests (a) and (b) by testing the water content of each type of aggregate must be carried out on each sample for each trial mix.

   b. Aggregate Test Objects
      The Contractor must carry out tests on the aggregate that will use to produce concrete as required. The minimum amount for aggregate testing used for concrete works is as follows:

Table 6 Concrete Testing of Aggregate Works

Testing Type	Minimum 1 sample
Sieve analysis	Every Week
Moisture content	Every Week
Clay, silt and dirt	Every Day
Organic level	Every Week
Chloride and Sulfate Level	Every 500 m^3 of concrete

If the results of making concrete carried out by the Contractor are unsatisfactory, the Consultant has the right to request additional testing at the Contractor's expense. And conversely, maybe the number of tests can be reduced if the results obtained are satisfactory.

5. **Concrete Testing**

a. Concrete Test Samples

The test samples should be given code/sign indicating the date of casting, the location of the cast of the relevant structural part.
The test sample must be taken from the mixer, or in the case of using ready mix concrete, the samples must be taken at the mixing truck before the concrete is poured to the casting location, as required by the Consultant.

b. Number of Concrete Test Sample

At the beginning of implementation, a minimum of 1 sample per 1.50 m3 of concrete is made so that the first 30 samples are quickly obtained. The samples must be in the form of a cube of 15cm x 15cm x 15cm. Other samples are used if approved by a Consultant.

Furthermore, taking the samples of 4 (four) pieces is done every 25m^3 of concrete or 5 mixer cars, which are 1 maker of a batching plant (if the concrete imported from outside the ready mix concrete location). The samples are randomly determined by the Consultant and treated according to requirements.

The number of concrete samples for the compressive strength test of each quality of concrete poured on one day must be taken at least once. For each concrete sample, two cube samples are to be made. One compressive strength test data is the average yield of the compressive tests of these two samples tested at the specified concrete age, which is 7 days and 28 days, respectively.

If the results of the concrete test are not satisfactory, the Consultant may request several test samples higher than the above provisions, at the expense of the Contractor.

The minimum number of samples that prepared for each quality of concrete is:

Table 7 Concrete Quality Test Objects

Structure Type	Minimum Number of Sample	Maintenance Period (days)		
		3	7	28
Reinforcement Concrete	4	-	2	2
Prestess Concrete	6	2	2	2

c. Concrete test report

The Contractor must make a written report on the results of the actual test from the testing laboratory for approval by the Consultant—the report completed with the calculation of its normal concrete pressure.

d. Evaluation of Concrete Quality based on Concrete Test Results

Standard deviation (S) of concrete production is determined based on the number of 30 cube test results. Deviations calculated from the number of cube samples that are less than 30 pieces must be corrected by the multiplier factor as listed in the following table:

$$S = \sqrt{\frac{\Sigma(fc - fcr)^2}{N - 1}}$$

Table 8 Evaluation of Concrete Quality

Number of Samples (N)	Multiplier Factor – S
15	1.16
20	1.08
25	1.03
30	1.00

Average compressive strength - used as a basis for determining the proportion of concrete mixes take as the greatest value of the following formula:
f'cr = fc '+ 1.64 S or f'cr = fc' + 2.64 S - 40 kg / cm2.

Real compressive strength. The strength level of a concrete achieved satisfactorily if both of the following conditions met:

- The average value of all pairs of test results, each of which consists of 4 compressive strength test results not less than (fc '+ 0.82 S).
- None of the compressive test results (an average of 4 test pieces) have values below 0.85 fc '.

If one of the two conditions above not met, steps taken to improve the average yield of the next compressive strength on the recommendation of the Consultant.

e. Non-Destructive Tests
If the results of the evaluation of the required concrete quality cannot be met, if requested by the Consultant, the Contractor must carry out non-destructive testing, consisting of hammer tests, load testing, etc. and others. All costs of these tests are the responsibility of the Contractor. The location and number of tests will correctly determine on a case by case basis.

6. **Concrete Steel Rebar Testing**

a. Concrete Steel test samples
Before concrete steel is ordered, The Contractor must take 2 pieces of concrete steel test pieces with a length of 100 cm in accordance with the diameter and quality to be used. Furthermore, concrete steel specimens must be taken with witnessed by the Consultant of 2 pieces for every 25 tons for each diameter of concrete steel rebar. The concrete steel rebar test consists of tensile and flexural tests.

Concrete steel quality testing will also carry out if deemed necessary by the Consultant. Samples of real steel taken for testing without witnessing by a Consultant are not permitted, and the test results are considered invalid. All test fees are wholly the responsibility of the Contractor.

The test sample is marked with a code that indicates the date of shipment, location attached, part of the structure concerned, and other data that needs to record.
If, due to a reason such as an unsatisfactory test result, the Consultant has the right to request samples higher than those specified above, with the cost that is at the expense of the Contractor.

b. Concrete Steel test results report

The Contractor must prepare and compile the results of the concrete-steel test from the testing laboratory to submit to the Consultant. The report, accompanied by a conclusion on whether the quality of the concrete-steel meets the specified requirements.

3.3.6. Terms of Implementation

1. **Slump**
   During the implementation, there should be a slump test, which, if not explicitly specified, is between 10 - 12 cm. The slump test method is as follows. Concrete takes before pouring it into concrete molds (formwork). Slump molds are moistened and placed on a flat surface. The mold filled to approximately one third. Then the concrete is pricked 25 times with 16 mm diameter concrete steel, 30 cm long with rounded edges. The filling is done similarly for the next two layers. Each layer pricked 25 times, and each prick must enter up to one layer below it. After the top part flattened, the mold slowly lifted, and the reduction measured. Specifically, for structures that use integral waterproofing, the slump used is 14-20 cm.

2. **Approval of the Consultant**
   Before all subsequent stages of implementation are carried out, the Contractor must obtain written approval from the Consultant. Reports must be given to the Consultant no later than 3 days before the work is carried out. Specific matters will be discussed in more detail between all involved parties. All stages of the implementation are appropriately recorded, and clearly, so it is easy to trace if the data is needed for inspection one day.

3. **Preparation and Inspection**
   The Contractor is not permitted to conduct concrete casting without written permission from the Consultant. The Contractor must report to the Consultant about his/her readiness to do the cast. The report must be submitted no later than 3 (three) days before the casting time, under the agreement in the field, to allow the Consultant to inspect before the cast is carried out. The Contractor must provide adequate facilities such as stairs or other facilities needed so that the Consultant can check the work safely and efficiently. Without these facilities, The Contractor will not be allowed to do the casting. All corrections that occur as a result of the inspection are immediately corrected within 24 hours. Then the Contractor must apply for permission again to be able to carry out the casting. No additional time is justified due to corrections that arise unless specified otherwise by the UNDP / Consultant. Approval to carry outcast does not mean exempting the Contractor from full responsibility for imperfections or errors that arise. Before casting done, it ensured and coordinated Consultant equipment that will embed in the concrete is already in place, and all dirt cleaned from the casting location. Likewise, for jointing, the implementation must be carried out under the requirements.

4. **Construction Joint**
   The Contractor must propose the location of Construction Joint in the work drawings. Construction Joint should be kept to a minimum so that structural weakening is reduced. Construction Joints are not permitted to go through areas that are estimated to be wet areas, such as toilets, reservoirs, etc. unless otherwise specified by the Consultant. If not specified otherwise, the Construction Joint is located in an area where the sheer force is minimal, generally located in the middle third of the productive structure's structural length.

   In casting thick concrete and large volumes, the location of the jointing considered in such a way that it does not cause large temperature differences in the concrete, resulting in cracking of the concrete and unwanted residual stresses. Construction Joint made horizontally and casting divided into layers—the jointing location approved by the Consultant. The Contractor has to consider in the offer, all matters related to the Construction Joint such as water stop, concrete adhesives, dowels, etc., as well as concrete surface cleaners so that the stickiness

between old and new concrete can be guaranteed. Construction Joint must be clean of all impurities and used concrete not well adhered. Before casting is resumed, it grooved/brushed in such a way that large aggregates become visible but remain well attached.

5. Concrete transportation and casting

Concrete is transported in such a way that it can arrive at the project site under conditions that still meet technical specifications. If the location of making concrete is far enough from the project, admixtures are used so that it slows the hardening process of the concrete. When the concrete is transported to the casting site, it must be considered that there is no separation between the essential ingredients of the concrete maker. At the time of casting, the high fall of fresh concrete must be less than 1.50 meters. This is very important so that there is no separation between heavy broken rock and concrete paste, which can result in the decreasing quality of concrete. For this purpose, tools such as tremie pipes must be prepared to meet these requirements. Before casting, concrete must be maintained in a plastic condition in sufficient time so that concrete casting is well produced. The Contractor must propose the number of tools and personnel that will support concrete casting, which is analyzed based on the volume of casting to be carried out. As an illustration, each compactor can condense about 5-8 m^3 of fresh concrete per hour. New concrete must be placed as close as possible to the final location so that the problem of segregation and hardening of concrete avoided. During solidification, the concrete is still plastic. To maintain the continuity of concrete casting, The Contractor must prepare protective equipment that may be useful against such as rain that can occur at any time.

6. Concrete Compaction

a. Concrete compactor

The newly casted concrete immediately compacted by a vibrator of the type approved by the Consultant. The compaction aims to reduce the air in concrete, which will reduce the quality of concrete. Compaction is related to concrete workability. In hot weather, concreteness becomes very short, so a low slump is usually a problem. For this reason, a vibrator is provided in an adequate amount under the large volume of casting to be carried out. At least one spare vibrator is prepared as an alternative if a vibrator is damaged during compaction. The compactor is placed so that it does not touch the concrete steel.

b. Difficult compaction locations

The Contractor must prepare a particular method for compaction of the concrete delivered to the Consultant no later than 3 (three) days before casting carried out, so that porous does not occur in the concrete, so the quality will not be approved. At locations which are estimated to be challenging to be compacted such as in beam-column meetings, thin concrete walls, and tight and complicated fixing areas,

c. Compacting back

If the concrete surface cracks in a still plastic condition, the concrete must be compacted again under the Consultant's recommendations so that the break is removed.

d. Other compaction methods

If deemed necessary, the Contractor can propose other compaction methods that are seen to cause significant temperature differences between the surface and the concrete core. Also, it causes structural cracks and the occurrence of stress in the concrete without the burden of working.

7. The temperature of fresh concrete

Two (2) minutes after the sample is taken, a thermometer with a scale of -5 to 100 degrees C, must be inserted into the sample as deep as 100 mm. If the temperature has been stable for 1 minute, the temperature can be recorded with an accuracy of 1 degree C.

8. Curing

a. Curing purpose

Concrete curing aims, among others, to prevent fluid loss from the moment of initial binding and avoid water evaporation from the concrete at the age of the first concrete and to prevent temperature differences in the concrete, which can cause cracking and deterioration in concrete quality. Concrete curing is carried out once the real compaction work does. For this reason, concrete curing carried out so that there is no rapid evaporation, especially on newly compacted concrete surfaces.

b. Duration of curing

Concrete surfaces treated continuously and adequately, moistened with clean water for at least 7 days immediately after casting finished for vertical elements such as columns and concrete walls, the concrete covered with sacks that are moistened continuously for 7 days.

c. Thick concrete protection

For casting concrete with a thickness of more than 600 mm, the Consultant approved the concrete surface protected with materials (including Styrofoam or other methods) to reflect radiation due to heat. The content is made impermeable so that the surface moisture of the concrete can be maintained.

d. Metal decking

Every decking made of metal, concrete, or other similar material cooled with water before casting. The text must be avoided from direct sunlight because it is easy to absorb and deliver heat. Poor curing will cause severe cracks on the concrete surface.

e. Curing compound

Another method that is widely used today is to use a curing compound. The Consultant must approve the type of curing compound to use. Special attention needs to be paid to avoid a rapid temperature drop on the concrete surface so that it can cause cracks on the concrete surface.

9. Ways to avoid cracking in concrete

a. Monitoring Tool

For concrete work that is more than 400 mm thick, the Contractor must provide the equipment needed to measure all events that may occur during the concrete work. Monitoring carried out for a minimum of 7 days from the time the casting finished. The Contractor must provide a temperature measuring device that will be placed on the base of the concrete, inside the concrete, and the concrete surface with a maximum vertical distance of 50 cm. While the horizontal distance between one point and another is a maximum of 10 meters. The location of the measuring device and the temperature measurement method proposed to the Consultant for approval.

b. Temperature difference

In general, concrete surfaces do not have to be cooled suddenly. The most important thing is that there is no massive temperature difference (> 20 ° C) between the surface and the concrete core, and the concrete avoids direct sunlight or wind.

c. Supporting material

Besides equipment, additional material is also needed that is mixed into concrete or used during concrete curing to prevent rapid evaporation.

d. Crack width

A concrete structure will experience a crack. And the maximum crack width allowed is 0.004 times the thickness of the Cast in-situ Concrete.

e. Anticipate temperature differences

The Contractor must prepare all the equipment needed to cope if the temperature difference becomes more than 20 degrees C, for example, by thickening the insulation that has been used or making insulation entirely impervious for wind and air. This is done immediately so that the temperature difference does not become more excellent. For this reason, insulation materials are prepared more than needed before casting is done.

f. Other conditions

Some conditions that must be considered before, during, and after concrete casting are:

- Try to keep all necessary materials used in a protected condition from the sun, so that the temperature is not high when mixing begins.
- The water used must be cooled, for example, by replacing some of the water with ice, so the temperature becomes lower.
- Cement used has low hydration.
- If possible, add liquid nitrogen to the concrete mixture.
- The time between stirring concrete and casting must be limited to a maximum of 2 hours.
- Perform continuous casting in such a way, for example, by making horizontal jointing on thick concrete, so that the thickness of one casting layer becomes approximately 1 meter, and the temperature difference controlled.
- If possible, it recommended that casting be done at night, where the field temperature is already lower than during the daytime.
- Even heat insulation must be prepared evenly on all exposed concrete surfaces to prevent wind gusts and to keep the temperature from being too different in all concrete sections.
- Perform initial curing immediately after compaction is complete and must continue until the isolation system is fully installed.
- Protect so that the concrete surface is protected from sunlight and wind. It does by making walls around the casting area with plastic or similar material, as well as on the top.

10. Crack outside the required limits

If, after the compaction is complete, there are cracks outside the permitted limit, the Contractor must report the matter in writing and propose improvements, including the work methods and equipment used along with the mixed composition used, to the Consultant for further evaluation. The Contractor is not permitted to correct the fracture before obtaining written approval from the Consultant.

Concrete Mix made on site (Site Mixing)

To get good quality concrete, for concrete made in the field must meet the following requirements:

- Cement is measured by weight
- Coarse aggregate measured by weight
- Sand is measured by weight
- The concrete mix is made using a concrete batching plant
- The amount of concrete Mix must not exceed the capacity of the mixer.
- Stirring time is not less than 2 minutes after all ingredients are in the blender.
- Stirring machines not used for more than 30 minutes must be cleaned first, before mixing the new concrete.

3.3.7. Steel Bar

1. Concrete Steel Brand

Before an order is made, the Contractor must propose a brand of concrete steel equipped with brochures and technical data from the factory that will use for approval by the Consultant. The metal used is steel by ASTM A706M standards containing alloys of vanadium or niobium in the manufacturing process.

2. **Storage**
   Concrete steel must be stored in a clean and well-supported place so as not to damage its quality. Storage must be sufficiently protected so that rust is avoided.

3. **Working drawings and bending schedule**
   The bending of concrete steel must be done under the drawing plan and based on existing standard detail. Bending does use tools (bar bender) in such a way that it does not cause broken defects, cracks, and so on. All bending does in a cold state, and cutting must be with a bar cutter. Hot system cutting and bending is not permitted at all. For this reason, the Contractor must draw a bending schedule and submit it to the Consultant for approval.

4. **Rust free**
   Installation and adjustment based on elevation following the drawing and tolerance took down. Before concrete steel is installed, the surface of concrete steel must be free of rust, oil, and others, which can reduce the attachment of concrete steel.

5. **Cast in-situ Concrete**
   A Cast in-situ Concrete that complies with standard detailed protected drawings Concrete steel. For the record, the installation of the main reinforcement pull/press sections of concrete must be installed as far as possible from the centerline of the cross-section, so that the use of Cast in-situ Concretes that exceed the above conditions must obtain written approval from the Consultant.

6. **Anchoring**
   Installation of concrete steel circuits, namely hooks, anchor length, channeling, location of joints, and others, must be under the standard drawings contained in the plan drawings. If there are doubts about this, the Contractor must seek clarification from the Consultant.

7. **Concrete wire and support**
   Adjustment of solid steel did carefully, installed in a strong position to avoid moving, using a wire of not less than 16 gauge or an appropriate clip at each of the three meetings. The Steel assembly supported with concrete decking or steel support, spacers, or hanging steel, as shown in the standard drawing or included in the Consultant's specifications. Metal supports not put in contact with the decking. Bonding of the wire is inserted into the concrete section, so it does not protrude on the concrete surface.

8. **Stirrup / *Beugel***
   The stirrups tied to the primary reinforcement and the distance following the drawing ensure the behavior of structural elements following the plan. The stirrups/hooks made as required in the standard drawing so that the stirrups work as desired, likewise, for the steel binder used for binding the primary reinforcement.

9. **Concrete decking (concrete decking)**
   Concrete decking is used to hold the right distance to the reinforcement, and the minimum has the same concrete strength as the concrete to cast. A maximum of 100 cm determines the gap between decking concrete (concrete decking).

10. **Substitution of steel**
    a. The Contractor must make sure that the metal installed is by what is shown in the drawing.
    b. In this case, based on the experience, the Contractor, or in an opinion, a mistake or lack or need to improve the existing correction. The Contractor can add extra steel by not reducing the correction listed in the drawing.
    c. If the Contractor does not succeed in getting the steel diameter following what stipulated in the drawing, then it can be exchanged with the width of the steel closest to the record:
       - There must be written approval from the Consultant.
       - The amount of steel per unit length or the amount of steel in the place must not be less than what is shown in the drawing (in this case, the amount of area meant).

Especially for portal beams, the amount of steel cross-sectional area on the pedestal must also not be higher than the original Steel assembly.

- The replacement may not result in the complexity of repair in the area or in the overlapping area, which can make casting difficult.
- No additional work and additional implementation time.

11. Steel tolerance

Table 9 Steel Tolerance

Diameter of steel (mm)	Diameter tolerance (mm)	Tolerance of weight (%)
&6 < ϕ & 10	0.4	7
10 < ϕ &16	0.4	5
16 < ϕ & 28	0.5	4
ϕ & 28	0.6	2

12. Dimensional tolerances of structural elements

Dimensions of structural elements such as (plates, beams, columns, walls) must meet the following tolerances:

Table 10 Tolerance of Structural Elements

Structural Element Dimension (mm)	Tolerance towards B, (mm)	Tolerance of Cast in-situ Concrete (mm)
B ≤ 200	9.0	5.0
B ≥ 200	12.0	9.0

Where B is the dimension of structural elements for both width and height, the implementation that does not meet these tolerances will be evaluated by the Consultant, subsequently decided. All consequences of these errors are the responsibility of the Contractor.

13. Installation of tools in the concrete/sparing

The Contractor must make a work drawing showing the exact location of the sparing present in the structural elements. The Contractor must study the ME drawing and discuss with relevant parties if there are doubts about the drawing. Sparing needs to be occurred due to design changes that must be informed and coordinated immediately with the Consultant to get the solution. Work of breaking into, making holes, or cutting finished concrete construction should be avoided and, if needed, obtain written permission from the Consultant.

The size of the hole, the installation of tools inside the concrete, the installation of sparing, and so on, the structural drawings and other related drawings or according to the instructions of the Consultant.

Reinforcement in concrete holes for ME work must follow the conditions contained in the standard drawings. If it is not/has not been stated in the drawing, then the Contractor is obliged to inform the Consultant about this to get the solution.

3.3.8. *Bekisting* / Formwork

1. General

a. The Contractor must make a metal decking that can be accounted for structurally good strength, stability, and rigidity as well as feasible to use. Decking is a part of structural work that is useful for forming concrete structures to fit the plan drawings

b. The type of decking following the requirements in this specification. The Contractor can propose alternative deckings provided that they approved by the Consultant. In the bidding, The Contractor must offer according to what specified in the specifications.

c. All parts of the decking used must be dismantled and removed from the work location. The existence of decking parts embedded in concrete structures is strictly prohibited.

2. Scope of work

a. Workers, materials, and equipment

b. This work includes the supply of workers, materials, equipment such as release agents, transportation, and implementation to complete all decking work as concrete molds by construction drawings and other related disciplinary drawings described in the description and Requirements of application, safely and correctly.

c. Special details

d. Making specific deckings as planned must include those offered in the Contractor offer. It also includes having to use unique decking material to produce specific details.

3. Material Requirements

a. Decking and Supporting

The decking material used can be in the form of concrete, steel, plastered masonry, wood, or other material accounted for its quality. The use of particular plant ready-to-use deckings is permitted to be used, as long as the Consultant can approve it. Decking made of multiplex coated with a type of plastic used explicitly for decking multiplex with a minimum thickness of 12 mm. The stiffener correctly made so that there is no change in the shape/size of the concrete element created. Bearings made of steel are preferred, although the use of wood support materials is acceptable. The material and size of the wood used must have the approval of the Consultant. For concrete work that is directly related to the ground, work floors are made of K-250 concrete. A side decking of the concrete can use masonry, bricks, or other material approved by the Consultant. For certain concrete elements such as round columns, it is recommended to use steel deckings.

b. Release Agents

Release agents must be material that meets the following conditions:

1) Cream emulsion
2) Neat oil with added surfactant
3) Chemical release agent that does not damage concrete.

Release agents must be stored and used by the manufacturer's provisions. The Contractor must ensure that the release agent used matches the finishing material used. And if the concrete surface is finishing or commonly called exposed concrete, the Contractor must ensure that the concrete surface produced is under the criteria of the

Consultant. The Contractor must ensure that the release agent will not be in direct contact with real steel.

4. Requirements of Implementation

a. Decking structure

The deckings and supporting elements must be analyzed in such a way as to be able to carry loads in all possible (reliable) directions, without excessive deformation (rigid), and must also meet stability requirements. Deformation is limited to no more than 1/360 spans. A review of the possibility of loads outside the concrete load must also be considered, such as the possibility of construction, wind, rain, etc. All analyses, decking calculations, and supporting elements must be submitted to the Consultant for approval before work is implemented.

b. Dimension of decking

All the sizes listed in the structural drawings are a net cross-section of concrete, not including plaster/finishing. Additional specific elements, such as unique shapes/profiles listed in architectural drawings, must also be taken into account in both expense and cost analysis.

c. Working drawings

The Contractor must make a particular decking work drawing based on the analysis he has done. The working drawings must be complete with the correct size and connection details and then submitted to the Consultant and UNDP for approval. Without this agreement, the Contractor is not permitted to begin the making of deckings in the field.

d. Responsibility

Although the Consultant and UNDP approve it, the strength, rigidity, and stability of the decking become the full responsibility of the Contractor. If there are things that are not in accordance with the estimates or errors that result in additional costs, then all these costs are the Contractor's responsibility. The decking makes per shown in the working drawings. The implementation that is not by the working drawings dismantled immediately.

e. Decking stability

All deckings give a flat and cross reinforcement so that the possibility of moving the text during work is avoided. The Consultant has the right to ask the Contractor to improve the decking deemed imperfect/imperfect with the Contractor's expense.

f. Inspection of Consultants

The arrangement of the decking with its supports must be arranged in such a way that it is easy to be inspected by the Consultant and the UNDP.

g. Decking details

The preparation of the deckings must be in such a way that at the time of disassembly, they do not cause damage to the concrete parts concerned.

h. Total Usage

Decking can only use a maximum of 3 (three) times unless otherwise specified by the Consultant. The recommendation that will use repeatedly must be prepared in such a way so that the decking surface can be kept neat and clean.

i. Accuracy

Decking must be able to produce a construction part whose size is flatness/straightness, elevation, and position by the construction drawings. Size and position tolerances must comply with those listed in this specification.

j. Water drainage system

The decking must be clean and moistened before casting. A flowing water system is prepared so that when it is wet, the water can flow to the desired location, and the decking is not flooded. Decking installed in such a way that there will be no leakage or loss of cement water during casting, remain straight (not change shape), and not sway.

k. Ties of decking in concrete

Previously, with the approval of the Consultant, the bolts and tie rods needed for the ties in the concrete must be arranged so that if the decking dismantled again, it would not damage the concrete made.

l. Revised concrete deckings
If there is, it coated using a release agent on the decking surface attached to the concrete surface. Since the release agent also affects the color of the concrete surface, the types and their use must be carefully selected. The method of casting concrete is calculated in such a way that Construction Joint does not damage the appearance of the exposed concrete. The brands and types of release agents agreed upon may not be replaced with other brands and models. The Contractor must notify the release agent's trade name in advance, the data of the relevant materials, the name of the producer, the type of primary raw materials, how to use them, risks, and other information deemed necessary to obtain approval written from the Consultant.

m. Openings for cleaning
At the lowest part (of each casting phase) of the column or wall decking, there must be a part that is easy to open for inspection and cleaning.

n. Scaffolding
In principle, all supporting deckings must use a steel scaffolding. The scaffolding must be strong enough and rigid and regulated so that the Consultant can quickly check it.

o. Approval of Consultants
After the above work is completed, the Contractor must request approval from the Consultant, and at least 3 (three) days before casting the Contractor must submit a written application for casting permission to the Consultant.

p. Anti-deflection (Cambers)
Unless otherwise specified in the drawing, all deckings to beams and plates prepared using anti-deflection with the following magnitude:

Table 11 Anti deflective decking

Location	% towards the span
In the center of beam span	0.3
At the end of cantilever beam	0.5

5. Dismantle of deckings

The dismantling works should be done carefully, where the construction part dismantled by its decking must be able to carry its weight and the burdens of its implementation.
Dismantling the decking can be done after reaching the following time;

Table 12 Demolition of deckings

Structural Elements	Minimum period
Beam, Column and Wall Sides	3 days
Beam and concrete plate (pole is not disassembled)	7 days
Supporting column of concrete plate	21 days
Supporting column of beams	21 days

Dismantling time is only in a normal condition, and special consideration must be given if the floors are bearing more than the planned load. The Contractor can prepare and propose

methods and calculations to use, and the proposal must obtain written approval from the Consultant, to speed up the dismantling time. There are no added costs for this. All consequences arising from the proposal are the responsibility of the Contractor.

Every plan for dismantling the decking work must be submitted in a written statement beforehand for approval by the Consultant.

The concrete surface must look good when the decking opened, not bumpy, hollow, or cracked and not show porous/imperfect symptoms.
Deckings must be carefully dismantled, not in a way that can cause damage to the concrete and other surrounding materials, and the transfer of the decking must be carried out in such a way so as not to cause damage due to collision at the time of delivery. Repairs that are damaged due to the negligence of the Contractor are the expense of the Contractor.

If, after the decking was dismantled, it turns out that there are concrete parts that are porous or other defects, which will affect the strength of the construction, the Contractor must immediately notify the Consultant, to seek written approval for how to repair, fill or dismantle it. The Contractor is not allowed to close/fill porous concrete parts without the Consultant's written consent. All risks that occur as a result of the work and the costs of repairing, dismantling, filling, or closing the part, are the responsibility of the Contractor.

All unused, used decking materials must be cleared from the project site and disposed of at a designated location by the Consultant so that it does not interfere with the operation of the work.

6. Alternative deckings

As described above, the Contractor can propose alternative types of deckings to use by attaching the decking brochure/drawing and calculations to obtain written approval from the Consultant. Note that the alternative deckings do not constitute added work and do not cause delays in work. The Contractor is expected to submit a decking proposal that can shorten the implementation time without reducing/endangering the quality of the concrete and by applicable regulations.

3.4. CONSTRUCTION WORK OF LIGHT STEEL

3.4.1. General

1. This article regulates the implementation of steelworks along with all necessary supporting equipment as listed in the structural drawings and forms an integral part of the other specifications.
2. This work must be carried out by an experienced Contractor for this work and approved by the Consultant and UNDP. The Contractor must have experienced experts so that they can overcome all field problems quickly and correctly.
3. The Contractor must attach the organizational structure and make a statement guaranteeing that the proposed personnel will be at the project site during the work.
4. The Contractor connects the method of implementation as well as the tools to use in this project due to the order and speed of work.
5. The Contractor must provide the equipment at the work location on time so as not to hamper other work.

3.4.2. Scope of work

1. Workers, materials, and equipment.

This work includes all-steel construction work, including the provision of workers, procurement of materials, both primary materials and connectors, steel equipment, and other assistive devices needed to carry out the work correctly and safely.

a. Field measurement.
   Measuring work includes existing field conditions, such as the results of concrete work carried out, as well as all irregularities that occur so that the work drawings are needed adjustments.
b. Experts.
   The Contractor must provide experienced experts on the job site to solve all problems that arise in the field quickly and correctly.
c. Work drawings/shop drawings
   The Contractor must draw detailed work drawings, before work begins, including adjustments to field conditions until obtaining approval from the Consultant.
d. Drawing as done / As-built drawings.
   After the work is carried out, the Contractor is obliged to make the drawing carried out by the structure implemented and submitted to the Consultant and UNDP by the contract.

3.4.3. Rules

1. Unless specified otherwise in the following requirements, the following regulations used as the basis for implementation:
2. Procedures for planning steel structures for buildings, SNI 03-1729-2002
3. American Institute of Steel Construction Specification (AISC)
4. American Society for Testing and Materials (ASTM)
5. American Welding Society - Structural Welding Code (AWS)
6. General Requirements for Indonesian Building Materials (PUBBI-1982).

3.4.4. Calculation of Steel Construction Weight

1. The specific gravity of steel
   The specific gravity of steel is 7800 kg/m^3. The weight units of the steel elements are according to those listed in the manufacturer's table.
2. Weight of steel in BoQ.
   In calculating the volume of steel in the Bill of Quantity (BoQ), the weight of the steel is calculated based on the theoretical amount (mass) by the structural drawings. The remaining weight or "waste" due to cutting or forming structural elements and connecting devices such as bolts, welds, anchors, and gusset plates take into account in the unit price analysis.

3.4.5. Material

1. Steel
   All materials steel construction use new steel and constitute "Hot rolled structural steel" with ST 37 steel quality (PPBBI-83), or ASTM A 36, or SS 41 (JIS. U 3101 -1970), minimum yield stress, Fy = 240 MPa, and tensile stress Fu = 400 MPa. This type of steel is called carbon steel (Carbon Steel), which contains carbon between 0.25 and 0.29%. All steel materials must be new, free/clean from rust, holes and other damage, straight, not twisted, without bending, and meet the tolerance requirements according to these specifications.
2. Bolts
   Unless otherwise specified in the figure, the connecting bolt used is HTB A325, which has a nominal breaking pull voltage between 105 - 120 KSI (735 - 840 Mpa). The connecting bolt must be new material, and the length of the thread must be as required. If not explicitly mentioned in the drawing, the intended bolt is of type A325-X (thread located outside the

shear plane). Bolts must be equipped with 2 rings, each 1 piece on both sides. The quality of the ring plate must be under the condition of the bolt.

3. Welding electrodes
   If it is not explicitly mentioned in the structural drawing, the welding electrode used is E70XX, according to the location of its use.
4. Anchor
   Unless otherwise specified in the drawing, the anchor used must have a BJTD quality of 40, with a minimum anchoring length of 40 times the diameter. The anchor must have sufficient threads so that when used, it can function correctly.
5. Primer and finishing paint
   All steel materials must be protected with a thick Zinc Chromate base paint, as stated in this specification. Whereas, finishing paints listed in architectural, technical specifications and must follow the provisions in these specifications if not mentioned.
6. Special Anchor
   To connect the elements of the old concrete structure with the new one requires a unique anchor. The anchor is included as a heavy-duty anchor with an adhesive system (chemical). The anchor drag and shear capacity used to follow what has been stated in the drawing plan.

3.4.6. Profile / Cross-section Change

In principle, in the planning stage, the profile used is the profile produced by the factory. If it turns out that the profile is not available, then the Contractor can replace the pattern with another profile approved by the Consultant. The proposed changes must be accompanied by calculations that show that the replacement profile is at least as strong and rigid as the profile replaced. It should also note that the replacement height profile must have the same maximum height as the original profile, so as not to reduce the ME equipment space. Even though the change in profile was approved, the Contractor must still anticipate the difference, so that there will be no claims regarding the time of implementation of the costs.

3.4.7. Dimension tolerance, length, and straightness

1. Dimension tolerance
   The dimensions listed in the plan drawings are the dimensions, as stated in the steelmaking table. In making variations occur, which causes differences with the aspects of the plan. The length, width, and thickness permitted at the smallest price between 1/32 inch (0.75 mm) or 5% of the plan's dimensions.
2. Long tolerance
   For steel elements (beams, columns) mounted in a frame to one another, length tolerances permitted at 1/16 inch (1.50 mm) for elements less than 9.00 meters long and 1/8 inch (3.00 mm) for lengths over 9.00 meters.
3. Straightness tolerance
   The alignment steel element is limited to 1/500 of the span between the 2 fulcrums unless otherwise specified by the Consultant.

3.4.8. Material test

1. Material Examples
   The Contractor must provide samples of material (steel, bolts, etc.) to test in laboratories approved by the Consultant. All testing fees are included in the offer submitted.
2. Welding test
   If deemed necessary by the Consultant, testing will carry out on the welding results. The type number of welding tests is adjusted to the requirements, according to the AWS, and is carried out at the expense of the Contractor.

3.4.9. Requirements of Implementation

1. Work drawings/shop drawings.
   Before manufacturing begins, the Contractor must draw the required work drawings and submit the work drawings for inspection and approval by the Consultant. If approved, the Contractor can start manufacturing work. Review and permission of the Consultant and UNDP on the work drawings only concerned with the strength of the structure:
   a. Profile size/dimensions, plate thickness, bolt/welding size/number, welding thickness. Accuracy of length, width, height, or position measurements of steel construction elements related to transportation is the Contractor's responsibility. Even though the Consultant and UNDP have approved all work drawings, it does not mean reducing or freeing the Contractor from the responsibility of inaccuracy and ease in the erection of steel construction elements.
   b. Measurement with scale in the drawing is not allowed.
   c. The working drawings should have seen additional parts needed for montage purposes and planned montage methods.
2. Manufacturing
   a. During the manufacturing process, the Consultant must place their staff fully experienced in steel manufacturing to oversee the fabrication implementation in the Contractor's workshop.
   b. The Contractor must provide Fabrication Manual Procedures, including Quality Control Procedures, to the Consultant for approval.
   d. Fabrication of steel construction elements must be carried out by experienced craftsmen and supervised by foremen who are experts in steel construction.
   b. All details are fabricated according to the desired sizes and shapes without causing distortions or other damages by taking into account the requirements for handling joints and welding in the field and so on.
   c. The cutting of the elements is carried out neatly, and the steel does with a cutting tool (blender) or a hacksaw. Cutting with a welding machine is not allowed.

3.4.10. Signs in steel construction

1. All steel construction fabricated is distinguished by a clear code according to each part, so it is installed quickly.
2. The system is written with paint, so it is not easily erased.
3. The connection plates and other elements needed for joints in the field bolted / temporarily fixed to each component by being fixed

3.4.11. Welding

1. Welding must be carried out according to the AWS or AISC Specification and carried out after obtaining written permission from the Consultant. Welding must be done by electric welding, not by carbide welding.
2. The welding wire used must be from a product approved by a Consultant. The size of the welding wire adjusted to the thickness of the welding.
3. The Contractor must provide experienced welders with excellent results in carrying out similar steel constructions. It proves by showing a valid certificate.
4. The Contractor pay close attention to the type and size of the welding listed in the drawing (angle welding, blunt welding, etc.), and the Contractor has a tool to measure the welding thickness so that it quickly know whether the welding thickness is by the drawing or not.
5. The surface of the part to weld cleaned of paint, oil, rust, and the marks of rough fire using a mechanical wire brush and for areas that are difficult to use steel brushes. Former pieces of

light must be mashed using hone on an excellent steel surface. The welding former must be cleaned and brushed.

6. The welding method is carried out in such a way that no distortion and residual stress arise in the welded steel construction element. Welding at the meeting of reliable components such as the pedestal does with technic preheating.
7. In welding work where there are many layers of welding (welding more than once), then before the next welding does, the previous layer must be cleaned first from the welding crust/slag and metal splashes that exist. A porous or cracked or damaged layer of welding completely removed.
8. To facilitate the implementation and get a good welding quality, all welding work must be done in the workshop. When going to conduct field welding must have written permission from the Consultant.
9. Special attention is paid to the welding carried out in the field (field weld), where the welder's position must be such that it can easily carry out welding with good results without compromising worker safety.
10. All welding carried out visually to determine whether:
    a. welding preparation does well (clean, adequate gaps, and others).
    b. existing welds are porous, undercut, surface cracked, or other defects.
    c. the size and type of welding in accordance picture.
11. At 30% of all welding locations, a "Liquid Penetrant Test" must be conducted according to AWS D 1.1-90. The Consultant determines the location of the test.
12. If deemed necessary by the Consultant or if there are doubts about the results of the "Liquid Penetrant Test," the Consultant and UNDP may request the Contractor to also conduct a Radiographic Test by AWS D 1.1-90.
13. The designated welding test laboratory must obtain the approval of the Consultant and UNDP, and all welding test costs are the responsibility of the Contractor.

3.4.12. Connecting bolts and spacers

1. The Contractor must carry out the testing of the bolt in the laboratory approved by the Consultant and UNDP before the Contractor orders the bolt to use.
2. The number of bolts tested for each size is a minimum of 3 (three) pieces.
3. Although the bolt test meets the requirements, the Consultant has the right to request that another bolt test be carried out with an amount of 1 (one) bolt out of every 250 bolts used. The Contractor bears bolt testing costs.
4. The bolt holes' position must be exact and by the bolt's diameter. If it was not explicitly mentioned in the drawing, then the maximum bolt hole diameter is 1.60 mm (1/16 inch) greater than the bolt diameter. The Contractor may not make new holes in the field without the permission of the Consultant.
5. Making bolt holes must use a drill, for thin construction, a maximum of 10 mm, may use a puncher machine. Making a bolt hole with fire is not allowed.
6. The installation and tightening of the bolt do with the torque moment lock previously calibrated, as follows:

Table 13 Bolt Installation and Tightening

Diameter of Bolt		Torque	
(inches)	(mm)	(lbs. ft)	(kg.m)
½	12	90	12,454

5/8	16	180	24,908
¾	19	320	44,287
7/8	22	470	65,038
1	25	710	98,249
1 1/8	28	960	132,844
1 ¼	32	1.350	186,872
1 ½	38	2.580	357,018

7. Every bolt tightening is carried out until it reaches the bolt pulling force according to AISC specifications. The implementation must be supervised directly by the Consultant.
8. The length of the bolt must be such that after tightening, there can still be at least 4 threads protruding on the surface without damaging the threaded bolt. The length of the bolt that does not meet this requirement must be replaced.
9. The bolts tightened marked with paint.

3.4.13. Trial Appointment in Workshop

It is necessary to conduct a trial assembly in the factory (workshop assembly) to facilitate the removal of steel construction in the field. It also knows about the accuracy of the steel construction elements installed along with the connections. The experiment is essential to carry out, so it can be identified with certainty the efficiency of the size and the strength of the steel construction and improved before the steel installed in place.

3.4.14. Appointment Method

1. Time of submission
   No later than 2 (two) weeks before the appointment begins, the Contractor must submit a written application for this. The Supervisory and Technical Consultant must approve the appointment method and schedule. Appointment methods must include, among others:
   a. Steel delivery plan from the workshop.
   b. The storage location of steel elements to be installed.
   d. The tools used are the following equipment.
   e. The appointment sequences.
   f. Safety measures during the appointment.
   d. Temporary stiffener for construction safety during lifting.
   e. Schedule for lifting steel elements.
   f. Equipment needed before and during removal.
2. Final inspection before delivering
   The Contractor must make a schedule for sending the factory to the field to the Consultant. With this schedule, the Consultant can arrange the time for the final inspection before the steel is sent. The Consultant can refuse any shipment without prior notice, and the risk of costs and other consequences is the full responsibility of the Contractor.
3. Location of steel placement in the field
   Placement of steel elements in the field must be in a dry/protected place so that the components remain in good condition until they are installed. Consultants and UNDPs have

the right to reject steel elements that are damaged due to misplaced or damaged due to any process.

4. Time of appointment
   The appointment of steel elements is only carried out after the Consultant and UNDP approve the appointment method and schedule.
5. Position anchor etc.
   Before the appointment begins, the Contractor must re-examine the steel anchor position/position to ensure that everything is in good condition and not damaged, as well as the distance and others according to the work drawings.
   Special attention is required in the installation of anchors for steel frames where the distances/positions of anchors are fixed and accurate to prevent mismatches in the erection. It maintained so that while casting, the anchors do not shift, for example, by welding the column reinforcement/roof beam.
6. Safety in the field
   The Contractor is responsible for the safety of their workers in the field. For this reason, the Contractor must provide a safety belt, a safety cap, gloves, and other equipment needed during the work.
7. Appointment failure
   The Contractor must plan this appointment well and prepare all supporting tools so that the appointment process can go according to plan. Failure to appoint due to negligence or other causes is the full responsibility of the Contractor, both in terms of cost and time.
8. Damage to steel elements
   In principle, steel elements that are damaged either due to wrong cutting or do not meet the required tolerance are not permitted for use in this project unless authorized by the Consultant and UNDP.
9. Expert staff for an appointment.
   The Contractor must provide experts in the field of steel construction for the appointment process in the area who are always supervising and responsible for this work. The expert to supervise the work must obtain written approval from the Consultant.
10. Field welding.
    In principle, welding in the field wherever possible is avoided. If welding has to do in the area for a particular reason, the Contractor must prove that the field welding results are technically eligible. For this reason, the Contractor must propose a way of testing the effects of this field welding, so that the Consultant and UNDP can approve it. The welding test includes welding thickness, weld quality, and weld density.

3.4.15. Painting

1. Preparation for Painting
   All surfaces of steel elements before painting must be free of:
   - Mill layer, i.e., a shiny thin layer originating from a steel mill.
   - rust
   - oil and other chemicals.
   - dirt that will affect the quality of the painting.

   Cleaning does use a "mechanical wire brush" (mechanical steel brush). It may not use a manual steel brush, except for surfaces that are entirely inaccessible to the "mechanical wire brush," before painting carried out. Cleaning using sandblasting is highly recommended, especially for steel surfaces that undergo corrosion.
2. Primary / Basic Painting
   After preparation of painting as mentioned above, the primary steel elements painted as follows:

Table 14 Primary / Basic Painting

Item	Basic Paint
Type	*Zinc Chromate*
Brand	Danapaint, Equivalent
Thickness	35 micron
Paint done in	*Workshop*/ Manufacture

If the base paint is not perfect, then the Contractor is obliged to improve this condition by cleaning the base paint and repainting it according to the existing procedure.

3. Paint Finish
   If not explicitly mentioned, the paint finish must be done 2 (two) times with the following conditions:

Table 15 Paint Finish

Item	Finishing Paint I	Finishing Paint II
Type	Doff Paint	Doff Paint
Brand	ICI or Danapaint	ICI or Danapaint
Thickness	30 micron	30 micron
Paint done in	Manufacturer	Manufacturer

Just like the base paint, the finish paint I and finish paint II can only be done after the previous coat of paint is completely dry. The Contractor is obliged to paint so that the results obtained are as desired. Imperfect results must be corrected, and the Contractor is responsible for all risks that occur.

4. Examination of paint thickness
   To check the width of the paint, the Contractor must provide a particular measuring instrument for it.
5. Wrapped steel and temporary steel
   The surface is only painted with primers, especially for steel elements that will pack in concrete or non-permanent steel.

3.4.16. Anti-deflection

In general, steel construction fabricated concerning anti-deflection, especially for truss and cantilevers. The amount of anti-deflection is a minimum equal to the amount of deflection due to dead load. The amount of anti-deflection seen in the drawing or, if not explicitly mentioned, the amount is 1/350 timespan.

IV ELECTRICAL WORK

ELECTRICAL WORK

4.1. GENERAL REQUIREMENTS

4.1.1. General

This requirement is part of the general requirements. If there is a clause of these requirements being rewritten in this general requirement, it means that special attention is needed on the clauses mentioned, or it does not mean eliminating other clauses from the general requirements.

Drawings and specifications of this plan are a unity that cannot be separated even though there is a part of work or material, or even tools needed so this installation works well, that is only stated in one of the plan drawing or plan specifications only.

Physical implementation should be done in accordance with the technical standard applies.

4.1.2. Drawings

1. The plan drawing does not show all detailed accessories and fixtures. Although all parts mentioned do not show or mentioned specifically, it should be planned and installed by the Contractor, so the system can work appropriately.
2. Installation drawing shows layout installation generally from the installation equipment. Installation should be done with paying attention to the site condition. Architectural and Structural/civil drawings should be used as a reference for the implementation and finishing detail of the project.
3. Before the implementation starts, the Contractor should propose work drawing and detail drawing (shop drawing) which should be proposed to the Consultant for obtaining approval. Every shop drawing proposed by the Contractor to be approved by the Consultant will be considered that the Contractor has evaluated the situation and has coordinated with other workers.
4. The Contractor should make detailed notes from the adjustment of work implementation in the site. Those notes should be written in one whole set drawing (tracing paper) and three-set of complete blueprint drawing as drawing fit with the implementation (as-built drawing) should be submitted right after the work is finished.

4.1.3. Coordination

1. The Contractor of installation work in this work should coordinate with other fields or disciplines so that all the activities can work well according to the schedule appointed.
2. Good coordination should be maintained to prevent hindering/obstructing of other works.

4.1.4. List of Material of Samples

1. On the bidding period, the Contractor should attach "List of Material" which describes more detail from all material which will be installed on this project, in accordance with requirements in the specification should mention factory, brand, manufacture, complete type with catalogue.
   Other provisions should be fulfilled on bidding should state :
   a. Equipment Capacity.
   b. Installation Instruction.
   c. Dimension.
   d. Equipment that is offered should be marked.
2. Before the work initiate, the Contractor should submit a sample of materials that will be installed to the Consultant. All expenses related to submission and obtaining samples will be the responsibility of the Contractor. Before material sample approved by Consultant and UNDP, those materials are not allowed to be installed.

3. The material used is in accordance with what is written in this technical specification and should be prepared in new condition. Experts in their field should do the work.
4. The Contractor is required to do rechecking on every measurement/equipment capacity (equipment), which will be installed. If there is hesitancy, the Contractor should contact the Consultant and UNDP for consultation as soon as possible.
5. If there is a mistake that occurs from measurement or the choosing of equipment's capacity that has not been consulted to the Consultant and UNDP previously, it will be the responsibility of the Contractor. Equipment and material choosing should obtain approval of the Consultant.

4.1.5. Testing and Commissioning

1. The Contractor of this installation work should conduct all testing and measurements which considered necessary to check/acknowledge if all installations which conducted could function well and which fulfills the requirements applied.
2. All powers, material, and equipment needed in those testing work mentioned is the responsibility of the Contractor. This includes special equipment needed for testing the network in accordance with suggestions from the manufacturer, also has to be prepared by the Contractor.

4.1.6. Equipment Mentioned with the Brand and the Replacement

Materials, tools, equipment, accessories, and others mentioned and required in Technical Specification, the Contractor is obligated to provide per tools/brands mentioned.

Replacement can be done with approval and provisions from the Consultant and UNDP.

4.1.7. Owner Protection

For the use of materials, systems, and others by the Contractor, UNDP is guaranteed and freed from all claims or other juridical claims.

4.1.8. Testing and Approval

If all types of equipment in accordance with the specifications are sent and installed, it is considered that it has fulfilled testing provisions well.

The Contractor should conduct overall testing of the types of equipment installed, if the testing is done and all types of equipment fulfill the function in accordance with provisions from the contract, the whole unit and its components can be submitted to the Consultant and UNDP.

4.1.9. Defect Liability Period and Work Handover

1. The main equipment should be guaranteed for 1 (one) year starting from the first handover.
2. The defect liability period for the installation is 1 (one) year starting from the second handover.
3. During the defect liability period, the Contractor of this work is obligated to resolve all damages on the installation with no additional cost.
4. During the defect liability period, the Contractor should provide workers needed and be responsible for all installations done.
5. The first handover can be accepted after equipped with proof of examination results of the installation, with a good statement signed altogether by the installer who conducted the work and Consultant, along with testing certification that has been approved by the competent agency attached.
6. If during the defect liability period, the Contractor of the installation does not conduct or not obeying the repairing, replacement, and demerit admonitions during defect liability period, the

Consultant has the rights to handover the repairing work / those demerits mentioned to another party at the expense of the Contractor who conducted the installation work.

7. During the work defect liability period, the Contractor should educate and train workers/officers appointed by Consultant and UNDP to understand the installation system in operation and maintenance.
8. During the defect liability period, routine inspection and maintenance should be done at least once in 2 (two) weeks.

4.2. SPECIAL TECHNICAL REQUIREMENTS OF ELECTRICAL SYSTEM

4.2.1. General

Electrical system works include all material, types of equipment and workers, installation, testing, and repairment provisions during defect liability period and training for prospective operators, so the whole electrical system can operate well.

4.2.2. Scope of work

Electrical system scope of work:

1. Provisions, installations, and connecting various 220V low voltage cable types and sizes in accordance with the drawing.
2. Grounding (earthing) work for lightning rod and other metal material, completed with control tube, ground elect, and accessories.
3. Lighting system and Electrical Socket works include:
   a. Provisions and installation of various types of lamp armature, and ordinary socket.
   b. Provisions and installation of various types of switches.
   c. Provisions, installation and connecting cable protector pipe installation and various accessories such as: box for switch and electrical socket, junction box, flexible conduit, bands/elbouws, socket, and so on.
   d. Provisions, installation and connecting lighting and electrical socket cable installation.
4. Outdoor Lighting System works:
   a. Provision and installation of outdoor lighting complete with pole, lamp armature, and other accessories.
   b. Provision and installation of complete outdoor lighting with conduit and other accessories.
5. Provisions, installation and connecting of complete grounding system with control tube, grounding electrodes and other accessories.
6. Provisions, installation and connecting of non-radioactive lighting rod system complete with other accessories.
7. Provision and installation other works that supporting the system so that they will operate well (such as control tube works, cable tray, supporting equipment, and other accessories).

4.2.3. Work Drawing

The Contractor should submit shop drawings to obtain approval of Supervision and UNDP. The shop drawing explains in more detailed the catalog from the manufacture, dimensions, data, and material use. In this shop drawing, the operation of the tools/equipment in the system as a whole is clearly visible and guaranteed. If changes or deviance of the system planned related to the material list submitted is considered necessary without changing the system function, and the purpose of the initial/actual system can be proposed by giving the appropriate reasons for approval, the above changes must be approved by the Consultant and UNDP.

4.2.4. Standard, Reference and Requirements

Standard, Reference, and Requirements used are compliance with the following standard:

1. General Regulations on Electrical Installation (*PUIL*) of 2000.
2. Regulation of the Minister of Public Works and Electric Power
3. No.023/PRT/1978 about Electrical Installation Regulations (*PIL*).
4. Government Regulation of Public Works and Electric Power
5. No. 024/PRT/1978 about Electrical Connection Requirements (*SPI*).
6. Also used as a reference standard, among others are:
   a. AVE Netherlands.
   b. VDE/DIN Germany.
   c. British Standard Associates.
   d. IEC standard.
   e. JIS Japan standard.
   f. NFC France.
   g. NEMA USA.
7. Must be carried out by the Contractor who has a PAS Permit from PLN, namely a Installation Approval Certificate (SPI) and a Working Permit (SIKA) minimum class D that is still valid and can show evidence of a list of partners in the electricity business issued by the agency authorized.

4.2.5. Equipment Mentioned with Brand and The Replacement

Relating to materials, equipment, tools, fixture, and others mentioned and anything required in this work, the Contractor is obliged to provide in accordance with tools mentioned with the approval of planner with the provision of an official statement letter from the manufacturer stating that the product is no longer produced (discontinuous).

4.2.6. Owner Protection

Regarding the Owner Protection of material usage, material, certificate system, licenses and others by the Contractor, the owner of the building is guaranteed and freed for all claims or other jurisdiction demands.

4.2.7. Protection

All material and equipment before and after installation should be protected against the weather and always kept clean. All cable protectors in the ground that penetrate out of the foundation walls of the outer building must be tightly closed at the ends with sealants to prevent groundwater from entering, and the cable ends must be tightly closed.

4.2.8. Painting

All equipment and material painted, who are chafed by shipping, transport or installation must be immediately covered with putty and painted the same color so that it looks like new.

4.2.9. Guarantee

A test certificate should be submitted by the manufacturer. If the tools are experiencing misconduct in testing the test required in this technical specification, the manufacturer is responsible for the equipment delivered, until that equipment fulfills the requirement. After being retested, a test certificate must be obtained and approved by Consultant and UNDP.

4.2.10. Addition

The Contractor should provide additional tools (accessories) which are not shown in the drawing and the technical requirement, but necessary to support the whole implementation system well and neatly so the system can be operated well and perfect.

4.3. LOW VOLTAGE POWER CABLE

4.3.1. General

Low Voltage Power Cable used are in various size and type which according to the plan drawing (NYA, NYM, NYY, NYFGbY dan FRC 0,6/1KV, and Fire Resistant Cable), Low Voltage Power Cable should be in accordance with SII or SPLN standard.

Before and after being installed, TR cable should be tested with the following tests:

1. Insulation Test
2. Continuity Test
3. Grounding Resistance Test

4.3.2. Cable Installation

1. Material
   All cables used for electrical installation should fulfill the regulation of PUIL / LMK. All cable/wire should be in new condition and should be marked clearly with the size, the cable type, number, and the type of the spinning.
   All wires with 6 mm^2 cross-section and above should be made stranded. This installation should not use cable smaller than 2,5 mm^2 cross-section, unless for remote control usage.
   Unless stated otherwise, the conductor used are from type:
   a. For lighting installation is NYM/NYA with PVC conduit pipe.
   b. For distribution cable is NYY and garden lighting using NYFGbY cable.
   c. All cable NYY planted in pavement (wall, road, concrete, etc.) should be inside of PVC conduit adjusted to the size and should be clamped. The Brand of Conduit installed is EGA.
   d. The cable brand which has low voltage power used should be equivalent to Supreme, Kabelmetal, Tranka, Kabelindo, Voksel, and jointing kit equivalent to Raychem and 3M products
   e. The cable which will be installed should be approved beforehand by the Consultant and UNDP.

2. Splice
   It is not permissible to make "splice" or connections in the Feeder or cable branches, except in the outlet or reachable connector box (acceptable).
   Connections in branch circuit cable should be made mechanically and must be firm electronically with "solderless connector". Pressure cable type, compression type or soldered. In making splice, the connector should be connected to conductors properly, so all conductors are connected, with no visible bare conductors and vibration untrammeled.
   All cable connections inside the junction box, panel, or other places should use a connector made of copper isolated with porcelain or bakelite or PVC, which the diameter is adjusted to cable diameter.

3. Insulation Material
   All insulation material for splice, connector and others such as rubber, PVC, synthetic tape, resin, splice case, composition, and others should from the type that has approved, for usage, voltage location and other things should be installed with the approved way per suggestions

of Government Representatives and/or Manufacturer. The use of Asbestos-containing material (ACM) is not allowed.

4. Cable connection
   a. All cable connection should be made inside connector boxes which specialized for it (for example junction box etc.).
   b. The Contractor should give brochures on installation instruction which stated by the manufacturer to the Consultant and UNDP.
   c. Cables should be connected according to each color or name, and an insulation resistance test should be conducted before and after connecting.
   d. The result of the test should be written and witnessed by the Consultant.
   e. The copper cable connecting should use copper cable connector that is coated with white lead and sturdy. Connecting should be done with the proper size.
   f. Connecting cable insulated PVC should be insulated with PVC pipe/porcelain specialized for electricity.
   g. The special insulator should be used if necessary to maintain certain insulation value.
   h. Ways of casting determined by the manufacturer should be followed, for example, casting temperature, and all air holes should be opened during casting.
   i. If the cable is mounted perpendicular to an open surface, it must be protected with steel pipes with a thickness of 0.3 mm and a maximum of 2.5 mm.

5. Cable Ladder, Cable Tray and Cable Trunking
   Cable Ladder, Cable Tray and Cable Trunking, should be made of Hot Rolled Steel Sheet material, with a minimum thickness of 2,00 mm and 1,6 mm for Cable Tray and Tranking and the Standard Finishing process with Hot Dipp Galvanized, with a coating thickness of 80 microns.
   Cable Ladder, Cable Tray dan Cable Trunking, harus dilengkapi dengan Flat Wise Elbow, Outside Riser, Inside Riser, Hanger dan Bracket serta perlengkapan lainnya.

4.4. LIGHTING AND ELECTRICAL SOCKET

1. Lamp / armature
   Armature Lamp of LED T-8 1x20 watt.
2. Spotlights
   a. The lamp type of floodlight 50 W highlights the interior space and the building view.
   b. Lampholder of Aluminium die-cast type
   c. The type of house and lights are water and impact-resistant in accordance with outside installations.
   d. The lamp can be moved vertically 180°.
   e. Lamp brands from Philips or equivalent
   f. Concrete lamp holder.
3. General Electrical Socket
   The usual socket used is a single-phase socket, rating 250 volts, 10 amperes, for wall mounting. 150 cm high from the surface of the floor. Socket brand should be Phillips or equivalent.
4. Switch
   The switch must be of a type for flat wall mounting, rocker type with a rating of 250 volts, 10 amperes, single gang, double gang. Wall switch and grid switch mounting height 150 m from the floor surface. In accordance with the plan drawing, switch brand should be Phillips or equivalent.
5. Junction Box for Switch and Electrical Socket
   a. Junction Box should be made of metal material with a depth of not less than 35 mm.
   b. Box of metal should have a resistance terminal.

c. The switch or Wall Electric Socket installed in junction box metal using bolt, mounting with floating claws is not permitted.

6. Installation cable
   a. In general, lighting installation cables and socket outlets must be copper core cables with PVC insulation, one or more core (NYM). The cable must have a cross-section of at least 2.5 mm^2.
   b. Color Code of cable insulation must follow *PUIL* provisions as follows:
      - Phase 1 : red
      - Phase 2 : yellow
      - Phase 3 : black
      - Neutral : blue
      - Ground : green-yellow
7. Cable Protector Installation Pipe
   a. Installation pipe of the cable protector installation used is a special PVC electrical pipe.
   b. Pipes, elbows, sockets, junction boxes, clamps, and other accessories must match one another, which is not less than 3/4 "in diameter.
   c. Flexible pipes must be installed to protect the cable between the junction box and the lamp armature.
   d. Whereas the pipes for lighting installation and plugs with PVC pipes, specifically for High Impact conduit heavy-gauge electricity, have a minimum diameter of 20 mm.

4.5. LIGHTNING ROD WORKS

4.5.1. General

1. Scope of Work
   This section covers the supply, testing, and repairs during the defect liability period of a complete lightning protection system according to these specifications, as well as obtaining permits from the authorized body (Occupational Safety Service).
   a. Air Terminal
   b. Conductor
   c. Resistor
   d. Permission from the authorized agency
   e. Other work that supports the work above
   f. Reference
   Work must be carried out in accordance with applicable standards and regulations of the Occupational Safety Service or standards/regulations issued from the factory.
2. Material
   The material used in the lightning protection system is in good condition and in accordance with what is intended and approved by the Consultant and UNDP. Material list, catalog, and shop drawings must be submitted to the Consultant UNDP prior to installation. Material or tools that do not meet this specification will be rejected.
3. Work Drawing
   Working drawings show the general layout of the equipment and its installation. Adjustments must be made in the field because the actual conditions such as distance and height are determined by field conditions.
4. As-built drawing
   The Contractor must make careful notes of adjustments in the field. The notes must be written in a complete set of drawings as drawings according to the implementation (As-built drawing). As-built drawings must be submitted to the Consultant and UNDP after this work is completed.
5. Standard and Regulations.
   All work must be carried out in accordance with applicable standards and regulations. Besides that, it must also obey the local laws and regulations which are related to this work.

6. Material and Workers.
   The materials to be installed must be new and in accordance with what is intended. Samples of materials, brochures, and shop drawings must be submitted to the Consultant 30 days before the above work is carried out.

4.5.2. Lightning Rod System Used

All steel parts in the building must be properly grounded by connecting the available earthing head/copper plate.

The connection between fixed and moving parts are made with a flexible copper tape which must be protected from mechanical interference.

All connections on the grounding system must be made with copper alloy bolts. Earthing electrodes are made of copper rods of 1" diameter and must be planted for a minimum of 6 meters so that a maximum of 2 Ohms can be achieved with a minimum of 5 Ohms.

The conditions that must be used are as follows:

Table 16 Lightning Rod System

Cross-section Power conductors used (mm^2)	Cross-section of the earth conductor (mm^2)
< = 10 mm^2	6 mm^2
16 mm^2	10 mm^2
35 mm^2	16 mm^2
70 mm^2	50 mm^2
120 mm^2	70 mm^2
>= 150 mm^2	95 mm^2

1. Material
   a. The material used is Conventional Lightning Rod (Franklin Stick)
   b. The tip of the lightning rod is installed at a minimum distance of 5 meters or according to the drawing.
   c. Two (2) pieces of spitzen on the roof of the building with a downward channel (down conductor) using BC 50 mm^2 cable are installed.
   d. The channel for down conductor is mounted on a support clamp as drawn in the drawing with a clamping distance of 50 cm between one another.
   e. Conductor cables that go down through space where there is human activity must be protected with PVC pipe wrapper diameter 1 "and clamped themselves to the protection pipe so as not to overload the down conductor cable.
   f. In places where a ground rod is installed, a junction box of the size according to the drawing must be made, the junction box outside of the building.
   g. The BC channel from the control tub over the building must be protected with galvanized pipe with diameter 3/4 ”. The control tub must be covered.

h. The vertical channel BC is mounted on the outer wall of the building must be protected with a PVC pipe 1" as high as 2.5 meters from the floor.
i. The BC channel for down conductor is drawn along the concrete column of the building by planting it on concrete plastering with protected PVC pipe AW 1 ", this channel must not have a connection in the pipe.
j. BC channels for the entire ground system are not allowed to have connections in undesired places.
k. Ground electrodes use a 1½ "galvanized pipe electrode with a BC 50 mm2 wire of at least 6 meters depth or reach the water point.
l. The scattered resistance of the ground electrode may not be exceeded ≤ 5 Ohm.
m. Inspection
The Lightning Protection System will be inspected by the Consultant and UNDP to ensure compliance with these specifications. All parts of this installation must be inspected by the Consultants and UNDP before they are closed or hidden. Any part that does not comply with the specifications and drawing requirements must be replaced immediately, without imposing additional costs on the Project Owner.

4.6. LIGHTWEIGHT FIRE EXTINGUISHER WORK (APAR)

1. Scope of Work

This specification covers the need for carrying out Lightweight fire extinguisher work, as shown in the plan drawings which consist of, but are not limited to:

a. Procurement and installation of lightweight fire extinguisher complete with tubes, extinguishing media, and other accessories.
b. Procurement and installation of safety boxes made of mild steel sheets with a thickness of min. 2 mm and sight glass on the wall / front door of the box for placement of a Lightweight fire extinguisher complete with safety locks, brackets, and other accessories.

2. Technical Specifications of Lightweight Fire Extinguisher Works

a. To cope with possible fires, this building is equipped with Lightweight fire extinguishers as an initial fire exterminator/extinguisher.
b. Fire extinguisher used is a multi-purpose type capacity of 4.5 kg equivalent to Yamato, Gunnebo, Servvo, Chubb. Fire extinguisher totaling 4 pieces and installed at each entrance. The material used is Chemical Dry Powder. Placement of fire extinguisher units on each floor is equipped with boxes made of mild steel sheets with min thickness. 2 mm and sight glass on the wall / front door of the box, bracket, nozzle, hanger, and safety lock.