

**DIVISION D**  
**BUILDING WORKS**

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## SECTION TS 28. BUILDING WORKS

### 28.1 GENERAL

This section of the Technical Specifications covers the requirements for all building works to be completed under the Contract.

### 28.2 SCOPE

The scope of the building works comprises all the work necessary for the construction, completion, commissioning of all mechanical, electrical and plumbing systems, and rectification of defects for the construction of buildings and other works in accordance with the Drawings for Building Works and Specified herein.

The Building Works consists of the following:

- Simongan Weir Management Complex comprising the following:
  - Operation / Management Building
  - Storage House 1
  - Storage House 2
  - Electrical Building
  - Guard House
  - External Works
- Weir Buildings comprising:
  - 4 No. Gate Control Houses
- Intake Buildings
  - Intake Gate Shed on Right Bank
  - Intake Gate Shed on Left Bank

### 28.3 SPECIFICATIONS FOR BUILDING WORKS

The following specifications shall be applicable to Building Works.

- The General Specification contained in Division A
- The following specifications contained in Division B
  - TS 1 Preparatory Works
  - TS 2 Earthworks
  - TS 3 Concrete Work
  - TS 4 Precast Concrete
  - TS 5 Prestressed Concrete
  - TS 8 Handling and Erection of Prestressed Concrete Units
  - TS 9 Concrete Repairs
  - TS 10 Falsework and Scaffolding
  - TS 12 Epoxy Resins
  - TS 17 Stone Masonry

TS 19 Weep Holes

TS 20 Roads and Pavements

- The following specification contained in Division C

TS 24 Protective Treatment of Metalwork

- The whole of Division D including all of the technical specifications appended to this section TS 28.

Note:

In the event of a conflict between the requirements of the technical specifications appended hereto and those in Division B or Division D, the former shall govern.

## 28.4 PAYMENT

Payment for building works shall be made in accordance with the various lump sums entered in the priced Bill of Quantities which shall include the entire cost of completing the work including materials, labour, equipment, transportation and any other associated costs.

Interim payments for work-in-progress shall be made in proportion to the completion of sub-sections of the work based on the lump sum breakdowns provided by the Contractor with his bid.

The following pay items shall be measured and paid for under this clause:

Pay Item No.	Description	Unit of Measurement
K.3.1	Operation/Management Office (including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door & Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.
K.3.2	Storage House-1 (including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door & Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.
K.3.3	Storage House-2 (including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door & Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.
K.3.4	Electrical Building (including excavation, demolition existing wall, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door & Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.

K.3.5	Guard House (including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door & Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.
K.3.6	External Works (including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door & Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.
K.3.7	Gate Control House 1 (including excavation, filling, grading, foundation, reinforced concrete, roofing, concrete block, brick, plastering, door & Windows, glazing, miscellaneous metal, interior finishing, tile, sanitary, electrical and painting works)	L.S.
K.3.8	Intake Gate Shed on Right Bank (including steel column and beam, roofing, steel handrail, electrical works and painting works)	L.S.
K.3.9	Intake Gate Shed on Left Bank (including steel column and beam, roofing, steel handrail, electrical works and painting works)	L.S.

## APPENDICES TO TS 28. BUILDING WORKS

The standard building specifications listed below and appended hereto shall form part of the specification for the Works:

TS - 02280 - TERMITE CONTROL

TS - 0215 - UNIT PAVEMENT

MP - 2616 - SEPTIC TANK AND ABSORPTION

TS - 02900 - LANDSCAPE WORK

AR - 0401 - UNIT MASONRY

CS - 0402 - STONE MASONRY

AR - 0404 - CEMENT MORTAR

CS - 0501 - STRUCTURAL STEEL FABRICATION

CS - 0502 - STRUCTURAL STEEL ERECTION

AR - 0509 - ORNAMENTAL METALS

AR - 0602 - CARPENTRY

AR - 0705 - WATERPROOFING

AR - 0714 - CAULKING AND SEALING

AR - 0722 - RAIN GUTTER AND LEADER

TS - 07321 - ROOF MATERIAL

AR - 0821 - FINISH HARDWARE

TS - 08110 - STEEL DOOR AND FRAME

AR - 0824 - ALUMINIUM DOORS AND WINDOWS

AR - 0825 - GLASS AND GLAZING

AR - 0903 - CEILINGS

AR - 0914 - PAINTING

TS - 09250 - GYPSUM PANEL

TS - 09300 - TILE WORK

TS - 09545 - METAL PANEL

TS - 09930 - TRANSPARENT COATING

AR - 1011 - WASHROOM ACCESSORIES

MP - 1504 - PLUMBING SYSTEM

MP - 1515 - VENTILATION AND AIR CONDITIONING SYSTEM

EL - 1601 - ELECTRICAL WORKS

EL - 1652 - LIGHTNING PROTECTION AND GROUNDING SYSTEM

CS - 0304 - PRECAST CONCRETE

# TS – 02280 – TERMITE CONTROL

## 1.0 DESCRIPTION OF WORK

The work shall cover the following :

- Underground termite control
- Termite control for wooden material.

## 2.0 REFERENCE STANDARDS

- a. Technical Specification AR 0602 –Carpentry.
- b. Perform the work within the requirements and restrictions of all application codes.
- c. The contractor is responsible for being familiar with the applicable regulations.

## 3.0 GENERAL PROCEDURES

### 3.1 Submittals

Submit 3 copies of manufacturer's detailed product data and application instruction.

Upon completion of the work, submit applicator's certification stating that the work has been done in compliance with the manufacturer's instructions and the specification requirements.

### 3.2 Quality Assurance

The work of this section shall be carried out by an approved contractor having specialised in this work as performed satisfactorily work of this type and magnitude.

Employ only craftsmen who are thoroughly skilled in the various crafts, and who are completely familiar with the specified requirements. Provide the services of competent foreman or supervisor who shall be available at all times during the progress of the work of this section.

Company's data and qualification shall be as follows :

- a. A legal and valid company's data.
- b. A valid government license of the termite control operations.
- c. A valid reference of termiticides application issued by Department of Labour Force.
- d. A valid permit of the use of restricted termiticides issued by the Department of Health and the Pesticide Commission.
- e. References of capability/learning of termite control operations and the field experiences.
- f. A reference of a back-up of an authorised consultant of termite control.
- g. Company's tax number.
- h. Selected Termite Control Company shall be approved by the Engineer.
- i. The company shall be able to exhibit a design following the submittance of a proposal of the application and cost of the termite control to the building.
- j. Appropriate drawing for this purpose may be acquired.

- k. The building ground into which termiticides will be dispersed, shall be at least 8 metres from the water source to be drilled.
- l. The building area shall be furnished with an adequate drainage system.

### **3.3 Environmental Conditions**

Do not apply soil poison when surface water is present.

If soil is disturbed after treatment, retreat the disturbed area.

Take adequate precautions to protect all persons at the site from the danger of toxic materials.

## **4.0 MATERIALS**

### **4.1 Product**

Out of the so many, there are three groups of termiticides permitted by the GOI to be applied, such as :

- Chlorinated hydrocarbon (status : restricted).
- Organophosphates (status : general).
- Pyrethroids (status : general).

Each termiticide has its own rating and characteristics, toxicity, class and price value.

So far, skilfully applied, there has not been any report recorder of the occurrence of a negative side effect to the environment. The selected termiticides for the job shall be in the original packing available for inspection.

### **4.2 Equipment**

The minimum requirement for an adequate termite control equipment consist of :

- A power sprayer set, included water containers and accessories.
- Spray and injection guns.
- A compressor set, included containers and accessories.
- A set of labour safety equipment for each operator.
- A first aid box.

## **5.0 CONSTRUCTION REQUIREMENTS**

### **5.1 Government Regulations**

In the applications process, regulations shall be pertinently followed, in compliance with the following :

- a. The regulation for the safety of the labour, issued by the Department of Labour Force
- b. The regulation of transport and the use of pesticides and pesticides empty container's disposal, issued by the Department of Agriculture.
- c. The regulation to safe guard the environment from pollution, issued by the state Minister of Life Environment.



## 5.2 Soil Treatment

### 5.2.1 During preparation, step shall be taken to :

- Clean Soil from roots and other wood water.
- Non-horizontal soil-level must be treated differently so that no overflow of termiticides solution fall into the soil.

### 5.2.2 And no application is permitted when :

- The soil is under running water.
- A rain burst is expected.
- If the soil area is closed to a planned water source hole or reservoir or water well of neighbouring buildings.
- The soil shall easily cracks during hot season.

### 5.2.3 Termiticides preparation shall be as follows :

- The termiticide solution container shall be ready and clean, after regular usage.
- Clear water will be filled into the container and mix with the needed termiticides in correct ratio with the label instructions.

### 5.2.4 Chemical-Mechanical Method.

This method is applied to buildings which are fitted reinforced beams and slabs over the foundation structure.

The treatment consists of the following :

#### a. Foundation Soil Treatment

After the cavity along both sides of the foundation has been filled with soil , the filler is injected with termiticide solution on a rate of 5 litre / meter linear and 0.30 meter depth.

Places and spots susceptible to termites' penetration shall be treated with the same solution on a rate of 4 – 7.5 litre per square meter, depending on their intensity and the condition.

The same treatment shall be applied to the area of pipes and cables' entrances into the building.

#### b. Floor soil

Prior to the spread of the sand – layer upon which the tiles will be plastered into the floor, the floor soil shall be sprayed uniformly with termiticides' solution on rate of 5 litre / m<sup>2</sup>.

At the 1 meter distance from the outer wall around the building, the same treatment shall be conducted.

The time of application shall be prepared and prearranged and scheduled in conformity with the construction progress.

### 5.2.5 Landscaping Soil Treatment.

Although landscaping soil is not included in the building's structure treatment, if the placement of the soil is adjacent to the building, the same treatment shall be conducted as in the floor soil treatment procedure.

The other part may not be treated with the non persistent termiticides.

**5.2.6 Wood Treatment.**

Wooden structure shall be chemically treated in accordance with the SKBI -- 3.6.53 -- 1987 standard.

An alternative method is the application by power spraying of termiticide solution to wooden structure in conformity with the manufacturer's printed instructions before the wood is painted.

# TS – 0215 – UNIT PAVEMENT

## 1.0 DESCRIPTION OF WORK

This work shall cover the delivery, materials, labour, equipment and installation of unit pavement, as indicated in the Drawings.

## 2.0 REFERENCE STANDARDS

- a. Standar Industri Indonesia (SII).
- b. British Standard (BS).
- c. TS 1.
- d. TS 2.

## 3.0 GENERAL PROCEDURES

### 3.1 Sample and Technical Data

The Contractor shall submit sample and technical data concerning this work to the Engineer for approval prior to delivery.

Technical data shall contain descriptions, characteristics and installation instructions.

Cost of samples and testing shall be Contractor's responsibility.

### 3.2 Shop Drawings

Contractor shall submit Shop Drawings to the Engineer prior to installation. The Shop Drawings shall be in close conformity with the shape, size, dimensions and class of concrete required in this Specification.

### 3.3 Inspection and Testing

All works in concrete block pavement shall be inspected and tested. Any unsatisfactory installation of concrete block pavement shall be removed and replaced with another concrete block pavement without additional expenses to the Owner.

Unit pavement not passing the laboratory test as required in this Specification shall be rejected and replaced with better quality product by the Contractor without any additional cost.

## 4.0 MATERIALS

### 4.1 Paving Blocks

Paving block made of concrete shall have compressive strength not less than 200 kg/cm<sup>2</sup>, unless otherwise specified by the Engineer.

Unless otherwise specified, paving block shall be Trihex type in natural colour and in red colour, with thickness of 80 mm.

### 4.2 Grass Block

Grass block made of concrete shall have compressive strength not less than 200 kg/cm<sup>2</sup>, having thickness of 60 mm with type or shape as indicated in the Drawings, and shall come from Cisangkan product or equal.

### 4.3 Curbing

Curbing shall be K-1 type from Cisangkan product or approved equal.

Precast concrete curbs shall consist of Class D concrete complying with the requirements specified in sections TS 3 and TS 4 of the Technical Specifications.

### 4.4 Sand

Sand for bedding and filler between concrete block pavement shall be hard, clean, free from clay and mud and shall be well graded and approved by the Engineer.

Gradation of aggregate shall be as follows :

Sieve	% By Weight Passing Sieve	
	Bedding	Filler
9.52 mm	100	-
4.75 mm	95 - 100	-
2.36 mm	80 - 100	100
1.18 mm	50 - 85	90 - 100
0.600 mm	25 - 60	60 - 90
0.300 mm	10 - 30	30 - 60
0.150 mm	5 - 15	15 - 30
0.075 mm	0 - 10	5 - 10
Water content ( % )	< 10	< 5
Clay content ( % )	< 3	< 10

## 5.0 CONSTRUCTION REQUIREMENTS

### 5.1 Sand Bedding Layer

Subgrade and sub-base shall have been prepared to the correct transverse and longitudinal profiles and having minimum cross fall of 2 %, or as indicated in the Drawings.

Subgrade preparation shall be in accordance with the requirements of Technical Specification TS2, and sub-base shall be in accordance with the requirements of Technical Specification TS2.

Sub-base shall be spread uniformly in thickness as specified in the Drawings.

The bedding sand is spread loose upon sub-base or base course in a uniform layer, thickness of which shall be determined on the basis of field trials to give a depth after compaction of 50 mm, or as indicated by the Drawings.

### 5.2 Laying Concrete Block Pavement

Concrete block pavement shall be laid manually on the uncompacted screeded sand bed in accordance with the pattern as specified.

Cutting block pavement at the edge shall be done by using mechanical saw in sizes precisely matched with the place to be filled.

After laying the concrete block pavement units, they were compacted to achieve consolidation of the sand bedding and brought to design levels and profiles by not less than 3 (three) passes, employing a suitable plate compactor.

The sand for joint filling shall be spread out over the pavement. The jointing sand shall be brushed to fill the joint.

Excess sand shall be removed from the pavement surface and the jointing shall be compacted by not less than two passes of the plate vibration.

### **5.3 Laying of Curbing**

Concrete curbing shall be placed at the edge of concrete block pavement area as indicated in the Drawing.

Portion on excavation for foundation of concrete curbs shall be well compacted, cushioned with 30 mm thick concrete of K-125 or as indicated in the Drawings. It shall be worked out to the desired depth and dimensions.

Any unsuitable projections on the base shall be removed.

# MP – 2616 – SEPTIC TANK AND ABSORPTION

## 1.0 DESCRIPTION OF WORK

The work shall cover the supply of materials, tools, equipment, labour and construction of septic tank and absorption in order to fully complete the work in accordance to the lines, grades, location and dimensions shown in the Drawings and in conformance to the requirements of this Specification.

It shall include but not be limited to the following :

Surveying works.

Excavation, backfilling and compaction.

Installation of piping and fitting systems.

## 2.0 REFERENCE STANDARDS

- a. Pedoman Plambing Indonesia
- b. Persyaratan Umum Bahan Bangunan di Indonesia (PUBI)
- c. Japanese Industrial Standard (JIS)
- d. Standar Industri Indonesia (SII)
- e. TS 2
- f. TS 3

## 3.0 GENERAL PROCEDURES

The Contractor shall stake and locate properly the site of the septic tank and absorption well as shown in the Drawings.

The Contractor shall submit the following for the Engineer's approval :

- Samples and technical data of all materials which shall be used.
- Detailed Shop Drawings.

## 4.0 MATERIALS

### 4.1 Septic Tank

Septic tank shall be fabricated and made of concrete, in capacity, size and form as specified in the Drawings.

Concrete shall be as specified in Technical Specification TS 3.

### 4.2 Piping

Pipes and fittings shall be of PVC and shall have a working pressure of 5 kg/cm<sup>2</sup> which shall comply with JIS 6741 specification in thickness, diameter and its properties, such as Pralon product or equal.

Diameter required shall be as indicated by the Drawings.

### 4.3 Absorption Well

Septic tank shall be completed with absorption well in size as indicated by the Drawings.

### 4.4 Cement Mortar

Cement mortar, if needed, shall be in accordance with the requirements of Technical Specification AR-0404.

## **5.0 CONSTRUCTION REQUIREMENTS**

### **5.1 General**

Septic tank and absorption well shall be installed, constructed and placed in accordance with the Drawings, the approved Shop Drawings and this Specification.

All concrete works shall be carried out in accordance with Technical Specification TS 3.

All piping works shall be carried out in accordance with the manufacturer's recommendation.

Excavation, backfill and compaction work shall be in accordance with the requirements of Technical Specification TS 2.

### **5.2 Installation and Construction**

Septic Tank shall have air space of not less than 0.20 metre from the top slab and under-part of tank cover.

The septic vault of tank shall be watertight concrete. The inside walls shall be applied 2 mm thick of finish plaster with cement mortar mix of 1 : 3.

All outside walls directly in contact with earth shall not be plastered and this includes the absorption pit system.

Cement mortar shall be in accordance with the requirement of Technical Specification AR-0404.

# TS – 02900 – LANDSCAPE WORK

## 1.0 DESCRIPTION OF WORK

The work shall cover all labour, materials, equipment and other required tools which are needed to complete the work as required in this Specification.

The work shall be as indicated by the Drawings and as directed by the Engineer, but not be limited to the following works :

- Soil preparation such as clearing unwanted vegetation and establishing levels required.
- Planting or shrubs, trees, ground cover and grass.
- Maintenance of plants.

## 2.0 REFERENCE STANDARDS

- a. Work shall conform Local Standards and shall be in conformance with "Balai Pengawasan dan Sertifikasi Benih" Horticultural Standards for Nursery and Good Horticultural Practice.
- b. TS 1.
- c. Technical Specification TS 0215 – Unit Pavement.
- d. Technical Specification TS 0509 – Ornamental Metals.
- e. Technical Specification TS16500 – Lighting.

## 3.0 GENERAL PROCEDURES

### 3.1 Drawing and other Data Requirements

The Contractor shall prepare a landscaping sketch plan showing strip sodding, sprigging centre to centre, contours, planting sequence and details or fertiliser application.

The area involved shall be properly labelled and dimensioned.

### 3.2 Other Requirements

In the event of any discrepancy between Drawings and location on site, the Contractor shall bring such discrepancy to the attention of the Engineer for resolution.

Any plant position on site is changed or differed from the specified Drawings caused by site condition, shall have and approval from the Engineer.

### 3.3 Expert Labour

The Contractor shall employ a trained landscape expert who majors in plant breeding and who implement the requirements of this Specification, and shall be approved by the Engineer.

## 4.0 MATERIALS

### 4.1 Plants

All kinds of plants, whether shrubs, trees, grounds cover or grass to be planted, shall be approved by the Engineer and shall be in accordance with the specified Drawings and Technical Specification.



List of plants and distance of planting shall be as indicated in the table on the following page.

Type grass to be planted shall be in accordance with the specified Drawings or as determined by the Engineer.

Type of grass sod to fill grass block shall be Korean grass and napier grass shall be planted on other area as indicated in the Drawings.

Grass shall be planted in a cluster.

#### 4.2 Fertilisers

Well rotted animal manure which comes from cow or horse shall be used for raising micro and macro element. Animal manure shall be clean from grass root and wild plant and shall be in a fine texture.

Chemical fertiliser which shall consist of NPK elements such as Rustica Yellow (15 -- 15 -- 15) shall be used to develop the growth of root, flowers and fruits.

Chemical fertilisers such as ZA (Zwavelzure Amoniak) or Urea shall be used for grass.

PLANT SCHEDULE

NO.	PLANT NAME	LOCAL NAME	HEIGHT (cm)	CANOPY DIA. (cm)	DISTANCE (CM)	SHADE	SORT OF PLANTS	PLANTING PATTERN	HABITUS
1	<i>Oreodaxe regia</i>	Palem Botol	250-300	300	400	-	Greenery	One row	Trees
2	<i>Felicium decipines</i>	Kerai Payung	150-200	200	300	-	Shade	One row	Trees
3	<i>Cassuarina montana</i>	Cemara Angin	-	-	-	-	Shade	Existing	Trees
4	<i>Manilkara kauki</i>	Sawo Kecil	-	-	-	-	Shade	Existing	Trees
5	<i>Ficus benjamina</i>	Beringin	-	-	-	-	Shade	Existing	Trees
6	<i>Cyrtotachys lakka</i>	Palem Merah	200-250	200	-	-	Greenery	Solitaire	Trees
7	<i>Duranta repens</i>	Pangkas Kuning	20	5	5	-	Greenery	Cluster	Shrubs
8	<i>Terminalia catappa L.</i>	Ketapang	300-400	400	-	-	Greenery	Solitaire	Trees
9	<i>Ixora Javanica</i>	Soka	20	30	30	Yellow/red	Flowerly	Cluster	Shrubs
10	<i>Allamanda cathartica</i>	Alamanda	50	50	-	Yellow	Flowerly	Solitaire	Shrubs
11	<i>Malpighia coccigerati</i>	The-the-and	30	5	5-10	-	Greenery	Cluster	Shrubs
12	<i>Agave americana</i>	Agave	50	50	-	-	Greenery	Solitaire	Shrubs
13	Blue eyes	Blue eyes	5-10	5	-	Blue	Flowerly	Cluster	Ground Cover
14	<i>Cyias revoluta. thumb</i>	Sikas Halus	50-100	100	-	-	Greenery	Solitaire	Trees
15	<i>Axonopus compressus</i>	Rumput Pahitan	-	-	-	-	Greenery	Cluster	Ground Cover

#### **4.3 Backfill Material**

Backfill to be used shall be a healthy soil that is clean and free from unused building materials, grass, or plants.

This healthy soil shall consist of a mixture between fine soil and well rotted animal manure in proportion of 1 : 1.

#### **4.4 Absorption Plane**

Absorption plane along the drip line of the roof shall consist of gravel 2-3 cm in diameter and 5 cm deep, bristle 10 cm thick and sand 10 cm thick.

#### **4.5 Miscellaneous Landscape Materials**

##### **4.5.1 Gravel**

Water-worn, hard, durable gravel, washed free from loam, sand, clay and other foreign substances, and the following size and colour:

Size : 50 mm maximum, 25 mm minimum.

Colour : submit samples prior to start work.

##### **4.5.2 Unit Pavement**

Unit pavement, such as paving block, grass block, pebble stone p[aver and others, shall be in accordance with the requirements of Technical Specification 0215.

##### **4.5.3 Boulders**

Shall be in natural state to form a harmonious stone composition in height, magnitude and colour, half embedded in soil, expressing scenery intermingled with different sizes of gravel.

##### **4.5.4 Lamp**

Lamps to brighten certain eye-catching spots worth to expose at night, shall be in accordance with Technical Specification 16500.

##### **4.5.5 Retaining Wall and Outdoor Treads**

Due to difference in level, provide treads in masonry with some retaining walls to accentuate the walkways in the garden courtyard.

##### **4.5.6 Seating Bench**

Provide seating benches along the walkways, walking bay's, of concrete cast-in-place, enhancing courtyard's creative and comfort.

##### **4.5.7 Trench, Grating, Grilles, and Plant Trellis**

Trench, grating, grilles and plant trellis shall be composed of steel round and/or steel plates and other profiles as specified, in sizes as shown in the Drawings.

## 5.0 CONSTRUCTION REQUIREMENTS

### 5.1 General

All landscape works shall be carried out in accordance with the applicable landscape standards, the specified Drawings and as directed by the Engineer.

Prior to site work, the Contractor shall make co-ordination with other works of civil/structure, architecture, mechanical/piping and electrical, especially in doing soil preparation and finishing, so there is no mistake on demolition, unwanted excavation towards other works which have been finished or which are still ongoing.

Site preparation, establishing levels required and clearing unwanted vegetation shall be carried out in accordance with the specified Drawings and the requirements of this Specification.

Placing of stakes labelled with co-ordinate of the position shall be carried out, especially for preliminary planting of each type of plant.

After establishing ground according to the shape/sloping/levels specified in the Drawings, digging holes shall carry on for planting preparation.

All planting shall take place at evening or after 3.30 p.m. so as not to allow the plants to dry out except if the planting take place under shelter, protected from the sun, where the planting can be carried out any time.

All plants shall be delivered in healthy and good condition which are to be as follows :

- All plants shall be free from disease, insect and fungi.
- Branches, roots and leaves shall have no broken and torn part.
- Plant's condition (height and width) shall be as required by this Specification.
- Removing of a plants shall be carried out according to the following requirements :
  - Trees to be removed, shall be prepared previously by digging 1 week ahead before moving them, and the trees may require some cutting back prior to planting to improve their shape, then followed by wrapping the roots.
  - Trees which are already in their container, shall immediately be brought to the shelter location at every area and stored there for a few days until the planting times comes
  - Shrubs and ground covers shall be prepared with roots being wrapped.

### 5.2 Site Preparation

#### 5.2.1 Staking

Staking shall be done to determine points of planting. Planting shall be proceed after all points to be planted have been approved by the Engineer.

#### 5.2.2 Excavation

Soil preparation by excavation shall be carried out to separate soil from debris of wasted building materials such as nails, bricks, timber and left chemical materials, if any.

Excavation shall be carried out no less than 40 cm depth for shrubs and no less than 60 depth for trees, to make sure that layer having debris have been removed.

#### 5.2.3 Fertilising

To raise micro and macro elements of the soil which have been prepared, well rotted animal manure shall be mixed with fine soil in proportion 1 : 1 as specified in section 4.3. of this Specification.

#### 5.2.4 Planting of Trees and Shrubs

Plants shall be delivered according to the planting schedule, so as to prevent the plants stay too long in the shelter, and shall be carried out according to the following :

- Trees and shrubs to be planted shall be of the ones which come from the shelter or the ones which have been prepared for transplanting at their former digging place, with minimum height as specified.
- Firstly dig a large hole, several time larger than the size of the plant container, and retain the soil dug out.
- Into the hole place a mixture of well rotted animal manure and fine soil as specified in section 4.3. of this Specification, retaining a certain amount to mix into the soil that is to be returned to the hole.
- Carefully remove the tree or shrub from its container and place into the hole.
- Return the soil around the roots, firming it down carefully so that there are no air pockets.
- When the hole is two – thirds refilled, water well after stamping down gently with feet.
- Soil around the base of plants shall be form shallow to allow water to run naturally toward the trunk of the plants.
- Trees and shrubs shall be hold by hardwood stakes to keep them at their place.

#### 5.2.5 Planting of Grass and Ground Cover

Grass and ground cover levels shall be as specified by the Drawings.

Soil for grass and ground cover shall be excavated/dug at the depth of 20 – 30 cm, then fill it with healthy soil as specified in section 4 . 3. of this Specification.

Every time after planting of grass and ground cover shall be followed by watering with water free from deadly matters.

#### 5.2.6 Maintaining of Plants

Maintenance of plants shall include watering, weeding out, replacement of damaged plants, pruning, feeding and insect and weed control.

Maintenance of plants shall be carried out according to the following requirements :

- All works shall be carried out in accordance with the requirements of the Drawings, Technical Specification and as directed by the Engineer.
- Maintenance shall be done by the Contractor as soon after the planting work finished. Maintenance time shall be as decided in the Contract.
- All that time, the Contractor shall be obliged periodically to maintain all plants and to replace every damaged or dying plant.
- All plant replacement with the new ones shall be the Contractor's responsibility.
- Plant's maintenance shall be suited with the characteristic and kind of plants to be planted.
- Material and equipment to be used for every kind of maintenance shall be real good, comply with the working standard needed and not to damage plants.
- Fertilisers and insect killers to be used shall be as specified in this Specification.
- Plant replacement shall be in accordance with the plant type/shape/colour to be planted and approved by the Engineer.

#### 5.2.7 Watering

Watering shall be with clean water free from any organic/chemical /other material which can damage the plants growth.

Watering shall be carried out in the following methods :

Using special tools for watering such as sprayer which has many holes at the outlet so as to spread the water uniformly to the surface of the plants to be watered.

Using water hose made of plastic which is connected to the closest water supply /tap. Watering shall be done by spraying the water using nozzle or sprinkler.

Watering shall be done periodically especially on dry season for plants and grass newly planted and also for the plants in shelter.

Watering schedule shall be as follows :

Twice a day periodically for all kinds of plant and grass newly planted and for all plants at the shelter, before 10.00 am at morning and after 3.30 p.m. at evening until all the plants grow healthy and strong.

All plants and grass which are looked well-grown and strong shall be watered once a day at evening time after 3.30 p.m.

Watering shall be done until each area gets a good soaking.

Plant area which still has wet soil at the evening, shall not be watered.

Over-watering shall not be allowed. Water shall be absorbed well by soil around plants.

#### 5.2.8 Weeding Out

Weeding out shall be done periodically to loosen the ground, once every month for trees and grass, and once every two weeks for shrubs.

Weeding out for grass shall be done to remove weeds and other kind of grass which differs from the one to be planted.

Type of tools to be used for this work are hoe and small hand fork.

#### 5.2.9 Plant Replacement

The Contractor shall be responsible to make any replacement of each tree, shrub or grass found damaged or dead.

All replacement with new plants shall be the responsibility of the Contractor until the maintenance period is ended.

Plant replacement shall be in accordance with the plant type/shape/colour to be planted and approved by the Engineer.

Plant replacement shall be carried out in such a manner so as not to damage the adjacent plant when taking the old one and placing the new one.

Plant replacement shall be carried out at evening time between 3.30 p.m. to 6.00 p.m., and followed subsequently by watering.

#### 5.2.10 Pruning

Pruning shall be carried out to remove misplaced branches /stem or in order to maintain and to improve the shape growth as required.

Dead or dying branches and stem shall be removed by cutting.

All pruning work shall be carried out using cutting tool to cut branches and stems from underneath to make the cut sloping away (300 – 400) from the bud at the remaining branch/stem wherever possible so that the new growth can shoot from that bud.

Pruning without using sharp cutting tool which can cause damage upon branch/stem shall not be allowed.

The scar caused of cutting shall be completely sealed by painting with a plant wound dressing to prevent infestation by wood decay fungi or insects that can damage and kill the plant. Pruning shall be carried out periodically once every month.

#### 5.2.11 Feeding

Well rotted animal manure shall be used to make healthy soil by mixing it with fine soil in proportion of 1 : 1, which shall be used for backfilling work.

NPK shall be used to feed trees after they are aged 3 (three) months from the time they were planted.

NPK shall be given as much as 25 gram per plant in order to push the growth of roots and fruits.

Feeding shall be carried out by placing the fertiliser at least 10 cm deep around the drip line of the trees, at every 60 cm in a circle around the trees.

Feeding shall be repeated after 3 (three) months.

ZA or Urea for feeding grass shall be given as much as 12 gram/m<sup>2</sup>. Feeding shall be carried out once in every month. Fertiliser shall be mixed with water and watered over the grass surfaces by sprayer.

#### 5.2.12 Insect and Disease Control

Disease control shall be carried out before plants are being attacked.

Insect control shall be carried out by spraying all leaves, stem and branch surfaces.

Material to be used for insect control shall be a mixture of Basudin/Diazinon 60 EC and water in proportion of 2 ml for every 1 litre water.

For destroying fungous growth or similar, a mixture of fungicide of Dithane M-45 and water in proportion of 2 gr. : 1 litre shall be by spraying all surfaces of leaves, stem and branch.

Metadex shall be used to destroy *Achatina fulica* by spreading it around the trees, and BHC shall be used to destroy penggerak batang.

Spraying for destroying insect and fungus shall be as follows :

- Twice in a month for grass
- Once a month for plants

Insect and fungus control shall be carried out by turns. Spraying of different disease control, shall not be done simultaneously, but shall be carried out in different time in two weeks lapse.



# AR - 0401 - UNIT MASONRY

## 1.0 DESCRIPTION OF WORK

This work shall consist of unit masonry laid contiguously in mortar, including all related masonry work as indicated in the Drawings and/or herein specified.

## 2.0 REFERENCE STANDARDS

- a. Persyaratan Umum Bahan Bangunan di Indonesia (PUBI-1982)
- b. Peraturan Beton Bertulang Indonesia (NI-2, 1971)
- c. Australian Standard (AS)
- d. Standar Industri Indonesia (SII)
- e. American Society for Testing and Materials (ASTM)
- f. TS 3 Concrete Work
- g. Technical Specification AR-0714 - Caulking and Sealing

## 3.0 GENERAL PROCEDURES

### 3.1 Samples

Samples of unit masonry shall be submitted for approval before deliveries are commended.

All subsequent deliveries shall generally be up to the standard of the approved samples.

Spot samples of representative batches may be ordered periodically by the Engineer.

### 3.2 Handling and Storage

Care shall be taken in unloading, stacking and handling of materials, and any damage incurred thereby shall cause the unit masonry to be affected. Therefore they shall be replaced by the Contractor at no cost.

Unit masonry shall be stacked under cover and off the ground. Cement materials shall be stored in a weatherproof, ventilated shed upon platforms above the ground and effectively protected from weather or moisture unit used. Logistically it shall be first in - first out.

All unit masonry shall be brought to the site and stored. Storage shall be arranged in a manner as to keep the blocks dry, either by tarpaulin or shed roof or combination of same.

Unit masonry shall be stored at secure place without giving disturbance at flow of work.

Blocks stored in contact with ground shall not be used. Storage shall be free from water (dried place).

## 4.0 MATERIALS

### 4.1 Brick Unit Masonry

Brick unit masonry shall be made from fine material and shall conform with PUBI and/or SII.

Minimum ultimate crushing strength over the gross area shall be 25 kg/cm<sup>2</sup>.

Brick unit masonry shall have nominal dimension of 230 mm x 110 mm x 55 mm.

#### **4.2 Cement Mortar**

Cement mortar shall conform with Technical Specification AR-0404. Cement mortar for concrete block masonry unless otherwise specified shall be composed of three (3) parts of sand : one (1) part of Portland cement. Waterproofed mortar shall be made by adding to the base mixture, a waterproofing compound such as Calbond or approved equal which shall be mixed in accordance with the manufacturer's direction, and as approved by the Engineer. Contractor must submit the sample of mixing materials.

#### **4.3 Rubble Stone Masonry**

Rubble Stone Masonry, Stones shall be clean and wetted prior to pitching. And the masonry shall be in such a way that there shall be no small stones enclosed or stones of the same sizes grouped in a stretch. Employ big stone stones for the bottom layer and at corners.

Newly employed masonry shall be protected from outside disturbances and or weather conditions.

#### **4.4 Caulking**

A plastic, non-staining compound such as Dow Corning 790 or equal as specified in Technical Specification AR-0714, for exposed joints at the perimeters of door and window frames, window openings for equipment and others. Sample materials must be submitted for approval.

#### **4.5 Anchor Ties**

Anchor ties shall be of mild steel with dimensions as shown by the Drawings.

#### **4.6 Reinforcement**

Stiffening members and columns shall be made of reinforcing steel of 8 mm in diameter.

Reinforcing steel shall be in accordance with PBI (NI-2, 1971) and/or Technical Specification TS3.

### **5.0 CONSTRUCTION REQUIREMENTS**

#### **5.1 General**

Wall shall be classified as 150 mm thickness of brick unit masonry, laid contiguously in mortar and bonded as specified herein.

All units shall be laid with full mortar joints and all head, bed and other joints shall be completely filled with mortar.

#### **5.2 Brick Laying**

All bricks shall be kept damp during construction and shall be laid in running bond pattern on a full bed of mortar. On one day, the brick unit masonry shall not exceed 100 cm in height. End of masonry shall be left in staggering steps and shall not clogged to prevent cracks in the future. Brick laying shall follow the proper regulation for which between one layer with the other shall have half length difference of brick length.

All joints between bricks shall be filled with mortar mix and joints shall be of the same spread and equal thickness. The average spread distance shall be 12.5 mm with a tolerance of 2.5 mm.

Brick unit masonry shall be dampened before laying, and before contact with mortar.

Vent block unit shall not be dampened before laying, however the surface shall be moistened before contact with mortar.

No damaged units shall be used.

Blockwork shall be built in a uniform manner in truly plumbed and level courses, shall be true to vertical or battered lines. Corners and other advanced work shall be rack back and not raised above the general level more than 100 cm. The maximum vertical tolerance for out of vertical is 10 cm in 400 cm.

Where so described or directed, reveals and piers shall be built, fixing and/or railing blocks and embedded items, for the work of other trades shall be incorporated as the work proceeds in location as shown by the Drawings.

Brick shall be required to chip and/or level wherever necessary to gain the required heights.

Reinforcement shall be used at least every 300 cm in length of walls and at all piers, corners, plates, beams and others.

On places or openings where wooden or metal frames shall be installed, the brick unit masonry shall be left until it is strong enough to proceed with anchors, dowels and fastening devices for the frame, and shall be covered with concrete or grout.

All brick unit masonry on which ends bear a steel or concrete beam, shall be grouted with concrete to the bearing course, and shall also be reinforced with 8 mm diameter bar.

All embedded items associated with the main or secondary structure, shall be set in said grout at time of pouring.

### **5.3 Parging and Jointing**

The inner surface of all face block shall be fully parged. Bed and head joints shall have square profiles, which shall be accomplished with a tool suitable for the purpose, joints in masonry below grade and in pipe tunnels above ceilings, behind cabinets, shelving and others, shall be struck smooth, and pointed with waterproof mastic below grade or equal water proofing agent, as approved by the Engineer.

### **5.4 Interior Wall and Partitions**

Jointing between brick wall and partition wall should be made carefully as shown in the Drawing or proposed and approved Shop Drawings.

### **5.5 Anchoring Doors and Windows**

The adjustable steel fixing lugs supplied with metal window and door frames shall be anchored into suitable courses in the walls. Jambs in brick wall openings shall be plumbed true and any apertures between door/window frames and brick wall shall be mortared and neatly pointed. Wherever practicable, these items are to be built-in during wall construction.

Fischer or other type fasteners are permitted where concealed, or grouted in new opening.

Whenever needed, a Shop Drawing proposal must be submitted for approval by the Engineer.

## **5.6 Auxiliary Ancillary Items**

### **5.6.1 Caulking**

Exposed joints at the perimeters of door and window frames shall be filled solidly with a plastic, non-staining compound material as specified in Technical Specification AR-0714.

This shall be forced into place with a pressure gun in a neat workmanlike manner. All joints and spaces to be caulked shall be thoroughly clean and dry before the compound is installed.

### **5.6.2 Anchor Ties**

Anchor ties shall be welded to structural steel members or embedded in concrete masonry at a maximum of 450 mm centres.

### **5.6.3 Reinforcements**

Stiffening members shall be located at every 12 m<sup>2</sup> wall area and corner

Stiffening columns shall consist of 4 reinforcement bars of 8 mm in diameter

Reinforcement concrete stiffening members to masonry walls and reinforcement lintels shall be in accordance with Technical Specification TS3.

Stiffening columns shall consist of 4 reinforcement bar of 8 mm corner.

Walls higher than 300 cm shall have also horizontal reinforcement bars consisting of 4 reinforcement bars of 8 mm in diameter.

### **5.6.4 Chases**

Chases in block work for conduits and others shall be accurately cut as required, in positions and dimensions as directed in the Drawings and by the Engineer.

### **5.6.5 Reinforced Concrete Stiffening Members**

Reinforcement concrete stiffening members to masonry walls and reinforcement concrete lintels shall be in accordance with Technical Specification TS 3. Stiffening members shall be placed at every 12 m<sup>2</sup> of wall surface or as in this case there shall be one stiffening member between columns.

### **5.6.6 Protection and Cleaning**

Architectural fixtures and finished surfaces shall be protected against damage during the progress of the works. Sills, jamb and heads shall be protected by casings as soon as built.

Newly laid block work shall be protected from the harmful effects of rapid drying, running or surface water and detrimental impact.

Newly laid block work shall be dampened continuously at least until 7 (seven) days after being laid.

### **5.6.7 Plaster**

All plastering shall be carried out in accordance with the requirements of Technical Specification AR-0404.

#### 5.6.8 Rubble Stone Masonry

Rubble Stone Foundation shall be employed under the walls or columns, or construction of ditches, drains, retaining walls etc. as shown on the Drawings.

The surface of the foundation pit shall be covered with tamped sand layer of 10 cm thick prior to lay the first stone layer. The dry riprap shall be employed with one stone vertical with the diameter shown on the drawings.

# CS – 0402 – STONE MASONRY

## 1.0 DESCRIPTION OF WORK

This work shall consist of the construction of those structures as shown in the Drawings or as determined by the Engineer to be made in stone masonry, such as boulder foundation, ditches, headwalls and the like.

The work shall include but not necessary be limited to supplying all materials, labour and all work required to complete the structures in conformity with the lines, grades, sections and dimensions as shown in the Drawings.

## 2.0 REFERENCE STANDARDS

- a. Peraturan Beton Bertulang Indonesia (NI-2,1971).
- b. Technical Specification AR-0404 - Cement Mortar.

## 3.0 GENERAL PROCEDURES

### 3.1 Samples

Representative samples of stone of 20 kg shall be submitted to the Engineer and approved by the Engineer.

### 3.2 Inspection and Testing

Inspection and testing shall be done, upon particular jobs as follow :

- Lay out,
- Excavation.
- Material on site includes tools and equipment,
- Sand bed placing,
- For every 1.20 m in height installed.

During the testing, the Contractor shall provide qualified Quality Assurance personnel and facilities to the Engineer without extra costs to the Client.

## 4.0 MATERIALS

### 4.1 Stones

All stones shall be river stone and shall have the maximum size of 15 cm.

Material shall be sound, durable, tough, dense and shall not break into pieces, due to excessive spalling or flaking.

### 4.2 Cement Mortar

Cement mortar for stone masonry work shall be in accordance with Technical Specification AR-0404.

## 5.0 CONSTRUCTION REQUIREMENTS

### 5.1 General

All equipment such as concrete mixers for this construction shall be approved by the Engineer prior to operation. It shall be new, with standby machine or available spare parts.

All operational equipment, tools and parts implicated therewith, shall be fairly new and good quality. They are subject to approval or rejection by the Engineer.

## 5.2 Selection and Placement of Material

When stone masonry is to be placed on a prepared foundation bed, the bed shall be firm and well compacted, and normal to the face of the wall, and shall be approved by the Engineer.

Care shall be taken to prevent bunching of small stone or stones of same size. Large stone shall be used for the bottom courses and large, selected stones shall be used in corners.

All stones shall be cleaned thoroughly and wetted before setting and the bed which is to receive them shall be cleaned, free of inorganic matter, and moistened before the mortar is placed. Stones shall be laid with the longest faces horizontal in full beds of mortar, and the joints shall be flushed with mortar.

The exposed faces of individual stones shall be set parallel to the faces of the walls in which the stones set.

During construction, the stones shall be handled in such manner which shall not disturb or displace the stones already set. Suitable equipment shall be provided for setting stones larger than those that can be handled by two (2) masons. Rolling or turning of stones already installed on the walls shall not be permitted. If a stone is loosened after the mortar has set initially it shall be removed, mortar cleaned off and re-laid in place with fresh mortar.

Tolerances of finished level of ditches shall vary not more than 1 cm above or below the design level at any point.

## 5.3 Beds and Joints

Bed for face stones shall vary from 2 to 5 cm in thickness. They shall not extend in an unbroken line through more than five (5) stones.

Joints may vary from 2 to 5 cm in thickness. They shall not extend in an unbroken line through more than two (2) stones.

It shall be at angles with the vertical from 0° to 45°. Face stone shall bond at least 15 cm longitudinally and 5 cm vertically. At no place, shall corners of four (4) stones be adjacent to each other.

Cross beds for vertical face shall be level, and for battered walls may vary from level to normal to the batter line of the face of the wall.

## 5.4 Headers

Headers shall be distributed uniformly throughout the walls of structures so as to form at least one fifth (1/5) of exposed faces.

They shall be of such lengths as to extend from the front face of the wall into the backing at least 30 cm. When a wall is 45 cm or less in thickness the headers shall extend entirely from front to back face.

## 5.5 Backing

The backing shall be built of larger stones and shall be installed in workmanlike manner. Stones composing the wall backing must be properly bonded with stones forming the wall facing. All cavities or small openings shall be filled with mortar. Stones showing minimal spalling shall be consolidated by, and surrounded with mortar, tamped into spalls.

**5.6 Pointing**

Bed and vertical joints shall be filled with mortar and finishing must be flushed with the exposed stone faces.

**5.7 Weathering**

All stone masonry walls shall be weathered on top with the addition of 2 cm thick layer of mortar finished to an even surface as shown in the Drawings, and finished with chamfered edges.

The weathering shall be inside the dimensions of the walls.

**5.8 Weep Holes**

All retaining walls and abutments shall be provided with weep holes. Unless otherwise shown in the Drawings, weep holes shall be located at the lowest points where free outlets can be obtained and shall be spaced not more than 2 m or 5 cm in diameter maximum.

Aggregate suitable for filter shall be placed behind each weep hole.

**5.9 Cleaning Exposed Faces**

Immediately after the mortar is laid, all exposed stone faces shall be thoroughly cleaned of mortar stains and shall be kept until work completed.

**5.10 Curing**

The stone masonry described herein shall be protected from the sun and continuously wetted by any approved means within a period of not less than three (3) consecutive days after completion.



# AR – 0404 – CEMENT MORTAR

## 1.0 DESCRIPTION OF WORK

This work shall comprise the supply of manpower, materials and machine mixers, and execution of all work for the cement mortar. It shall include but not limited to plastering of walls, grouting of stone masonry, jointing and waterproofing with the required quantity of admixtures. Such work shall be performed in accordance with the correct lines, grades and alignments as shown in the Drawings, or as determined by the Engineer.

## 2.0 REFERENCE STANDARDS

- a. American Society for Testing and Materials (ASTM)
- b. American Concrete Institute (ACI)
- c. Peraturan Beton Bertulang Indonesia (NI-2, 1971)
- d. Persyaratan Umum Bahan Bangunan di Indonesia (PUBI-1982)
- e. TS 3 Concrete Work

## 3.0 GENERAL PROCEDURES

### 3.1 Samples

Prior to construction, the Contractor shall submit to the Engineer samples of all materials for cement mortar work, for approval.

### 3.2 Delivery and Storage

All cement in bag or bulk shall be delivered and stored according to Technical Specification TS 3.

Fine aggregates shall be stored in a clean ground area, free of surface water run-off, provided the area has sufficient drainage and is free from foreign materials. Height of stockpile shall not exceed 1.20 m in order to prevent segregation.

## 4.0 MATERIALS

### 4.1 Cement

Portland cement of type I shall conform to and be tested according to the requirement of ASTM and SII.

Portland cement shall be from one trade mark, unless otherwise specified by the Engineer.

### 4.2 Fine Aggregates

Fine aggregates shall be clean, hard, solid, rough edges and shall not contain harmful amounts of mud, clay or organic matters. Fine aggregate shall conform to and be tested according to ASTM C 33. Test shall start 30 days prior to the start of the work.

### 4.3 Water

Water for mixing shall be clean and free from harmful and deleterious substances such as alkali, acids, salt and other inorganic matters.

Water of known quality and suitable for human drinking consumption need not be tested. However, as the case may happen, all water except what as mentioned herein shall be tested and shall be approved by the Engineer.

#### **4.4 Waterproof Admixture**

Waterproof admixture for cement mortar shall be from approved product.

### **5.0 CONSTRUCTION REQUIREMENTS**

#### **5.1 Composition**

Unless noted and/or shown on the drawings, cement mortar shall compose of Portland cement and sand or fine aggregate. The mortar shall have a compressive strength of at least 50 kg/cm<sup>2</sup> in 28 days. The proportions of Portland cement and sand for cement mortar shall be 1 cement and 3 sand, or as indicated on the Drawings.

Sample of mixture shall be tested and approved.

Waterproof admixture shall be applied in the cement mortar in accordance with the manufacturer's recommendations in order to provide effective waterproofing.

#### **5.2 Mixing**

All materials except water shall be properly mixed in a tight box or in an approved mortar mixer, until the mixture attained a uniform colour after which the correct amount of water shall be added and the mixing continued.

Mortar shall be mixed for the required quantity to be used and minimum mixing time shall be 1 to 2 minutes prior to application. Mixed mortar that is not used within the period of 45 minutes after mixing shall be discarded or rejected. Retempering will be strictly prohibited.

#### **5.3 Application**

All surfaces to receive cement mortar shall be free of laitance, loose carbonate scale and other objectionable matter.

#### **5.4 Inspection and Testing**

All works shall be free of access for inspection and testing. The Contractor shall provide assistance to the Engineer at all times necessary to get samples on completed finishes. Any portion found out unsatisfactory shall be repaired and worked out in same manner of what was previously done without any additional expense to the Owner.

# CS – 0501 – STRUCTURAL STEEL FABRICATION

## 1.0 DESCRIPTION OF WORK

This work shall include the transportation, furnishing, fabrication and inspection of structural steel in shop or field, as indicated in the Drawings or as described in this Specification.

## 2.0 REFERENCE STANDARDS

- a. Pedoman Perencanaan Bangunan Baja untuk Gedung (SNI.1729.1989-F).
- b. Standar Industri Indonesia (SII).
- c. Japanese Architectural Standard Specification for Steel Work (JASS 6, 1982).
- d. Japanese Industrial Standards (JIS, 1993).
- e. American Institute of Steel Construction (AISC)
  - AISC M013-83 Detailing for Steel Construction
  - AISC M013-84 Engineering for Steel Construction
  - AISC M016-89 Manual of Steel Construction ASD
- f. American Welding Society, Inc. (AWS)
  - AWS D1.1-90 Structural Welding Code Steel
- g. American Society for Testing and Materials (ASTM, 1993).
- h. Technical Specification AR-0914 - Paintings.
- i. Technical Specification CS-0502 - Structural Steel Erection.

## 3.0 GENERAL PROCEDURES

### 3.1 Mill Certificates and Other Information

3.1.1 Mill certificates covering the dimension, microstructure and chemical, physical, charpy V-notch properties, the heat treatment data (as applicable) and dimension of all steel to be used shall be submitted to the Engineer for approval prior to fabrication.

3.1.2 Prior to ordering of material, all the order lists shall be properly prepared by the Contractor and submitted to the Engineer for approval.

3.1.3 Prior to starting shop work, the Contractor shall furnish the Engineer with the following information :

- Job management personnel and organisation.
- Fabricator's facilities.
- Materials intended for use and material manufacturers and suppliers.
- Certificate and test report
- Mill certificate.
- Report of tensile properties and bend tests for steel shapes, bars and plates.

- Shop drawings procedures and schedule.
- Measuring tapes intended for use.
- Quality control methods and procedures.
- Product procedures and schedule.
- Marking, cutting, bending, drilling, milling and treating of frictional surface for bolt connection, etc.
- Shop assembly facilities and procedure.
- Welding : Proposed welding details. Proposed manufacturer for flux, gas, welding rod and wire together with manufacturers recommendations for storage. Temporary welding, welding sequence and procedure, pre-heating, welding equipment and accessories, arc-air gauging/chipping.
- Method of embedding anchor bolts and setting base plates. Installation procedures and allowable tolerance of anchor bolt location.
- Inspection :
- Organisation of fabricator shop inspection.
- Type of inspection including : Full-size drawing inspection, marking drawing inspection, assembly inspection, welding inspection, material inspection, product inspection.
- Criteria for accept:
- A copy of the Contractors inspection record form shall be submitted. The proposed inspection record form shall be attached.
- Proposed method of correction of faulty work.
- Method of paint application.
- Storage at plant yard and at site.
- Transporting facilities and route from shop to site.
- Qualifications of welders and other specialists.
- As the work progresses, maintain the following records of the structural steel assembly and erection prepared separately for the following items : (indicate the methods and results of tests and inspections)
- Material test.
- Test method of welders skills.
- Test of welding work.
- Inspection for shop made products (welds, shape, dimension, appearance and others).
- Inspection of work performed in the field. (tightening of high strength bolts, erecting tolerance and others).
- Tolerance of anchor bolts.
- Records of test, inspection and corrections required by the Engineer.

- Photographs of each section of the work. Submit the completed records to the Engineer.

### **3.2 Shop Drawings**

Contractor shall submit Shop Drawings to the Engineer for approval prior to fabrication.

The following items shall be included in the Shop Drawings as applicable :

- Material specification.
- Piece mark numbers.
- List of material parts.
- Fabrication details.
- Welding details.
- Painting requirements.
- Shop splice details and locations.
- The approval of Shop Drawings by the Engineer does not relieve the Contractor of his responsibility for errors and omissions.
- No alterations shall be made in the finally accepted Shop Drawings by the Contractor without written consent of the Engineer.
- Changes initiated by Contractor for his convenience shall be subject to the Engineer's approval and made at Contractor's expense.

### **3.3 Inspection and Testing**

Materials, connections and workmanship generally shall be subject to tests or inspection in the mill, shop and field.

Tests and inspections shall be conducted by a qualified person or testing laboratory retained by the Contractor and approved by the Engineer. The Contractor shall furnish all materials for testing and any access to, or handling of materials required to perform material tests.

Chemical composition and mechanical properties of materials shall be tested and inspected prior to shop work.

Inspect shop assemblies and welding for conformance with the specified requirements.

Clean, grind and prepare all areas as required for ultrasonic and radiographic tests.

The Engineer shall have the right to carry out and/or order the carrying out of test and inspections at any time.

The Engineer shall have the right, at all reasonable times, to enter the Contractor's fabrication plant for the purpose of testing and inspecting the work. All labour and tools required for testing and inspecting in the fabricator shop shall be provided by the Contractor.

The Engineer reserves the right to reject materials and/or workmanship not conforming to the design drawings at any time before final acceptance. The Engineer's acceptance of material of workmanship shall not prevent its subsequent rejection if defects are discovered later. The Contractor shall remove installed materials which are rejected by the Engineer and replace them at no additional cost to the Employer.

### **3.4 Weather**

Work shall not be performed when, in the opinion of the Engineer, the weather does not permit satisfactory workmanship, or conditions prevent adequate inspection.

### **3.5 Welding**

All welders shall have valid current licenses. If required by the Engineer, the Contractor shall perform tests of welder's skill. Tests, when required, shall be conducted at no additional expense to the Employer.

### **3.6 Steel Measuring Tape**

The Contractor shall provide the number of precise tapes required for the carrying out of the work (minimum of 3 tapes).

At all times, the ambient temperature shall be recorded and thermal adjustments made to all measurements. Measuring tape used in the fabricator shop of the steel work shall be compatible with those used for site erection of the steel work. The Contractor shall arrange such test as necessary to allow the Engineer to approve the tolerance between the tapes used on either location as negligible. All measurements shall be the Contractors Responsibility.

### **3.7 Handling and Storage**

All steel materials shall be delivered complete with original mill certificates.

All steel materials shall be handled with extreme care, in such a manner so as not to cause excessive scratches or dents, as determined by the Engineer.

Material shall be stored out of contact with the ground in such manner and location as will minimise rusting and corrosion.

## **4.0 MATERIALS**

### **4.1 General Requirement**

All material values shall be in accordance with and as stated in this Specification, unless otherwise noted.

Chemical composition, mechanical properties, dimensions and other qualities of materials are specified in each standard. These material qualities shall be confirmed by a testing prior to shop works whether it is equivalent with the manufacture certificates.

### **4.2 Structural Steel**

4.2.1 All steel material shall be new and be free from defects impairing strength, durability or appearance and shall be of the best commercial quality, and shall comply with the relative standard.

4.2.2 Structural steel shall be standardised products as listed below or their equivalents approved by the Engineer :

- a. Pedoman Perencanaan Bangunan Baja untuk Gedung (SNI.1729.1989-F), 2.2.Tegangan-tegangan Baja Tabel 1. Harga Tegangan Dasar.

Steel grade	Tension test requirements		
	Yield Strength kg/mm <sup>2</sup>	Tensile Strength kg/mm <sup>2</sup>	Relative Elongation %
St 37 (Bi 37)	24.0	> 37	-

- b. JIS G 3101-87 Rolled steel for general structure (SS 400)  
 c. JIS G 3350-87 Light gauge steels for general structure (SSC 400)  
 d. JIS G 3444-88 Carbon steel tubes for general structure purposes (STK 400)  
 e. JIS G 3466-88 Carbon steel square pipes for general structure purposes (STKR 400)

Steel grade	Tension test requirements		
	Yield Strength kg/mm <sup>2</sup>	Tensile Strength kg/mm <sup>2</sup>	Relative Elongation %
SS 400	> 24	41 - 52	> 17
SSC.400	> 24	41 - 55	> 21
STK.400	> 24	> 41	> 23
STKR.400	>25	> 41	> 23

- f. ASTM A36/A36M-89 Specification for Structural Steel

Steel Type	Tension test requirements		
	Yield Strength kg/mm <sup>2</sup>	Tensile Strength kg/mm <sup>2</sup>	Relative Elongation %
Plates, Bars and shapes	25 - 31 (36 kei)	40-78-56-25 (58-80 kei)	21

#### 4.2.3 Shape and Dimensions

- a. The shape and dimension of steel plates, stainless steel plates and other related items shall meet the requirement of the following standards or their equivalents :
- JIS G 3101-87 SS400 Rolled steel for general structure.
  - JIS G 4305-91 SUS304 Cold rolled stainless steel plates, sheets and strips.
- b. The steel to be used shall not have any structural defects and not be obtrusively corroded. The shape and dimensions shall be according to the relative SII, JIS, ASTM, or equivalent.
- c. The dimensional tolerance of structural steel members shall be according to :
- SII 0163-79 Mutu dan Cara Uji Baja Siku Sama Kaki Bertepi Bulat Canai Panas.

- SII 0233-79 Mutu dan Cara Uji Baja Kanal Bertepi Bulat Canai Panas.
- SII 0234-79 Mutu dan Cara Uji Baja Bentuk "I" Bertepi Bulat Canai Panas.
- SII 0999-84 Baja Kanal C Ringan.
- JASS 6-82 Standard of Structural steel tolerances.

#### 4.2.4 Bolts, Nuts, Washers, Anchor Bolt and Plates

Ordinary bolts, nuts and washers shall meet the requirements of the following standards or their equivalents :

- SNI.1729.1989-F St 37 (Bj 37)
- JIS B 1180-85 Hexagon head bolts and hexagon head screws
- JIS B 1181-93 Hexagon nuts and hexagon thin nuts
- JIS B 0205-82 Metric coarse screw threads
- JIS B 1251-84 Spring lock washers
- JIS B 1256-78 Plain washers
- ASTM A307-89 Specification for Carbon Steel Externally Threaded Standard Fasteners.
- JIS B 1180-85 and JIS B 1181-93, finishing grade shall be "Medium", precision grade shall be "3rd class" and mechanical properties shall be "4T".

Anchor bolts shall meet the requirements of the following standards or their equivalents :

- SNI.1729.1989-F St 37 (Bj 37)
- JIS G 3101-87 SS 400
- ASTM A36/A36M-89

Nuts, washers and screw threads shall be according to standards of ordinary bolt listed above.

Set of high strength bolt shall meet the requirement of the following standard or their equivalent.

- JIS B 1186-79 Set of high strength hexagon bolt, hexagon nut and plain washers for friction grip joint.

Steel grade	Tension test requirements		
	Yield Strength kg/mm	Tensile Strength kg/mm	Relative Elongation %
F10T A	> 90	100-120	14

If the Contractor intends to used torshear type high strength bolt, he shall submit the manufacturer's mechanical and chemical test certificates for approval of the Engineer.

- ASTM A490M-89 Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints [Metric].



#### 4.2.5 Test of Materials

For standardised items the certificates proving the conformity of the products to the approved standards may be submitted in lieu of tests. However the Engineer may, when necessary, request the Contractor to carry out mechanical tests of the materials at the Contractor's expense.

#### 4.3 Welding Materials

Electrodes to be used for welding shall be standard products conforming to "JIS Z 3211-91 Covered electrodes for mild steel" or equivalent. The appropriate electrodes shall be selected best fitting the type of steel to be welded.

Welding materials other than those stipulated above shall be selected according to the method of welding to be employed.

When base metals of two different yield stress are welded together, filler metal shall be selected based on the base metal which has the higher yield stress.

#### 5.0 PAINTING

##### 5.1 Surface preparation to be painted shall conform to :

- JIS K 3151-68 Phosphatizing compounds under painting
- JIS K 5633-83 Etching primer
- FS<sup>\*1</sup> TT-C-490 (Rev. C)(Amd.1) Cleaning methods for ferrous surfaces and pre-treatments for organic coatings.
- FS<sup>\*1</sup> TT-P-645 (Rev. A) Primer, paint, zinc-chromate, alkyd type. \*1 FS : Federal Specification (America)

##### 5.2 Rust preventive paint shall be conform to :

- JIS K 5627-84 Zinc chromate anticorrosive paint
- SSPC<sup>\*2</sup> PS 8.01-82 One-Coat Rust Preventive Painting System with Thick-Film Compounds.
- \*2 SSPC : Steel Structures Painting Council (America)

#### 6.0 CONSTRUCTION REQUIREMENTS

##### 6.1 General

The Contractor shall give the Engineer one (1) week's notice before commencing any major fabrication segment, such as enclosing the sides of any major structure.

Steel items shall be of the sizes, shapes and construction as indicated or specified.

Prior to the fabrication, all the necessary measurements shall be verified and checked in accordance with the quality control procedures of the AISC requirements.

Unless otherwise specified, the items shall be fabricated in accordance with an efficient shop method.

The Contractor shall be responsible for correction of all errors and omissions in detailing, layout and fabrication at his own cost.

## 6.2 Location of Fabrication

Structural steel shall be fabricated and assembled in the Contractor's shop or yard or in location as approved by the Engineer.

Basically welding at the field shall not be permitted.

## 6.3 Welding

### 6.3.1 Welder

The qualification of welder shall, in principle, conform to the respective stipulations of "JIS Z 3801-79 Standard qualification procedure for welding technique" according to a type of welding to be carried out. The welder shall have more than recent one year of continuous experience in structural welding and shall receive the approval of the Engineer.

If the Engineer has any doubts of the welder qualification although an approval has been given, the Engineer may direct to carry out examination tests in accordance with relevant JIS or other equivalent standards or may cancel the approval.

### 6.3.2 Preparation of materials

#### a. Edge Preparation.

Groove angle shall be in accordance with the design and shop drawings. However it may be modified according to a type of welding to be carried out with the approval of the Engineer.

Grooves shall be made to the shape as stipulated above by automatic gas cutting or other mechanical methods. Manual gas cutting may be allowed under inevitable situations with the approval of the Engineer.

#### b. Welding Material

Electrodes shall be carefully handled and due precaution shall be taken so as not to use electrodes which have their covering materials peeled, contaminated, deteriorated and exposed to moisture.

Welding materials shall be stored dry, and shall be sufficiently dried before their use in case they have been exposed to moisture.

### 6.3.3 Assembly of Elements

Accurate assembly of elements shall be achieved by using proper jigs.

Where fillet welding shall be carried out the element shall be closely adhered to the base metal as possible.

Temporary welding shall be held at a minimum and shall avoid areas where it is structurally or erection wise impeding. Where it becomes part of the permanent welding the welding shall be without faults.

### 6.3.4 Welding Equipment and Ancillary Equipment

A welding equipment shall be of a type best meeting the requirements for a material and dimension of joints to be welded and be able to achieve and even welding.

Ancillary equipment shall have the required performance characteristics and shall be well maintained.

### 6.3.5 Cleaning of Base Metal

Welding surface of the base metal shall be sufficiently cleaned of slag, moisture, dirt, corrosion, oils, paints or other contaminants before welding.

### 6.3.6 Welding Works

#### Currents, voltage etc. :

Welding shall be done at proper speed, correct current and voltage according to a type and position of welding.

#### Jigs :

Shop welding shall, whenever possible, be done facing downwards using a rotating jig positioner.

#### Pre-heating :

Steel elements shall be pre-heated as required according to plate thickness and type of materials.

#### Welding :

Method and sequence of welding shall be planned so as not to cause any strain or to leave residual stress.

Before or during the permanent welding, temporary welding shall be removed, if the temporary welding has any damage.

#### Finished state :

The surface of welding shall have an uniform wave pattern, and size and length of welding shall not be less than a dimensions shown in the Drawings. The size of welding may be larger than specified but shall not be overtly large or be irregular in pattern.

The welded part shall not have cracks, incomplete, fusion, lack of penetration, slag inclusion, pits, blowholes, undercutting, overlapping unevenness of legs or other faults.

#### Fillet welding :

In case of equal leg fillet welding, it shall not be overt difference between the two legs.

A dept of reinforcement of weld shall be less than  $0.1S + 1$  mm (S : the specified fillet size).

#### Arc :

Special care shall be taken to prevent lack of penetration and slag inclusion at the starting point of arc. An arc shall be moved along the base metal or the element to be welded whether it is the beginning of a weld or a continuation of a bead.

Care shall be taken so as not to cause cracks in the bead of the arc end.

#### Cleaning of welded surfaces :

Slag and spatters shall be removed from the welded surfaces and around surface of the welding.

### 6.3.7 Weather Conditions

Welding shall not be done when a welding surface is wet due to rain or other reasons or when strong winds are blowing. However if the position of weld

and the welder is adequately protected and proper curing of the base metal is carried out, welding may be carried out after confirmation of no remained moisture on the surface, and with the Engineer's approval.

**6.3.8 Correction of Materials.**

Warping caused in the materials shall be corrected by mechanical means or by heating in such a way as not to cause any pernicious affect to the materials.

**6.3.9 Inspection of Welding**

During and after welding proper in-shop inspection shall be performed. Defective portions shall be corrected repeatedly to the satisfaction of Engineer. The charge shall be counted as Contractors Cost.

After welding and after the above mentioned in-shop inspection the weld shall be inspected by the Engineer's. However the above may be abbreviated with the Engineer's approval by submission of the result of the in-shop inspection.

**6.4 Bolt Connections**

Hole Diameter

All holes for bolted connections shall be of a diameter 0.25 mm larger than bolts used, unless otherwise indicated.

Hole Fabrication

All holes shall be drilled at right angles to the surface of the metal and shall not be enlarged by burning. Enlarging of holes shall be by reaming only with the approval of the Engineer.

Holes shall be clean-cut without torn or roughed edges

Outside burs resulting from drilling or reaming operations shall be removed with a tool making a 0.15875 cm bevel. All holes shall be drilled and reamed as necessary prior to application of protective coating.

Hole Reinforcement

Where holes are provided for the connection of equipment or for cable and piping access, and affect any major structural members, said members shall be reinforced adequately as designated by the Engineer.

**6.5 Cutting, Shearing and Clipping**

Shearing, flame cutting and clipping shall be done carefully and accurately by a mechanically guided tool. All edges shall be left free of slag. Any bevelled edge that has been damaged shall be restored to the minimum tolerances.

**6.6 Fabrication Tolerances**

The location of each member is essential to the design of the structure. Each member shall be accurately located as shown in the Drawings, within the fabrication tolerances given in AISC.

## **6.7 Product Inspection**

In-shop inspection report of finished products shall be submitted to the Engineer for approval.

After the in-shop inspection, the products shall be inspected by the Engineer. The product shall be laid in a way not to hinder inspection and instruments necessary for inspection.

Faulty portions shall be promptly rectified.

## **6.8 Painting**

### **6.9 Shop Painting**

After fabrication and inspection structural steel shall receive two full shop coats of anti-corrosive paint per the relative stipulation.

Surfaces to be embedded or to come with concrete shall not be painted.

### **6.10 Finish Coating**

Application of finish coating refer to Technical Specification AR-0914.

### **6.11 Galvanizing**

Provide as indicated or specified. Galvanize after fabrication where practicable.

Method of galvanizing shall conform to JIS H 8641-82 Zinc Hot Dip Galvanizing, and the weight of zinc coating shall average not less than 275 g/m<sup>2</sup> (21 microns).

The testing of galvanizing shall conform to JIS H 0401-83 Methods of Test for Hot Dip Galvanized Coatings.

Use galvanizing repair paint for galvanizing damaged part caused by handling, transporting, cutting, welding or bolting. Do not heat surfaces where repair paint has been applied to.

### **6.12 Erection**

Erection of structural steel shall be as specified in Technical Specification CS-0502.