

BID DOCUMENTS (DRAFT)

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AGREEMENT

FOR

CONSTRUCTION OF MODEL INFRASTRUCTURE

ON

AGRICULTURAL COOPERATIVE PROMOTION PROJECT

IN

THAILAND

AGREEMENT

For Construction of Model Infrastructure on Agricultural Cooperative Promotion Project in Thailand

This Agreement is executed on the day of, at the JICA Thailand Office between

Japan International Cooperation Agency, Thailand Office by Mr.
Title Resident Representative as its authorized representative of the JICA Thailand Office, hereinafter called "the JICA" of the one part, and Cooperative Promotion Department, represented by Mr. Title Director-General hereinafter called "the CPD", of the other part.

Both parties mutually agree under the terms of this Agreement as follows:-

Article 1. Purpose of Agreement and Contract Price

The CPD agrees with the JICA to perform the Works for the construction of two (2) Model Infrastructure on Agricultural Cooperative Promotion Project Located at Muang and Pak-Thong-Chai Area. For the total amount of Baht. (Baht), hereinafter called "Contract Price".

The following documents shall form integral part of this Agreement.

Term and Conditions of this Agreement

Technical Specification

Bill of Quantities

Drawings

Article 2. Payment

The JICA agrees to effective payments for the Work to the CPD in the following manner:-

- (a) Advance Payment, to be effected upon the bringing of equipment and materials required for the Works and properly stores at the job site by the CPD and of value estimated by the Engineer, Bah which corresponds to thirty (30) percent of the Contract Price shall be paid upon signing of this Contract.
- (b) Interim Payment, to be effected according to the progress of the Works satisfactorily executed by the CPD and accepted by the Engineer. Baht which corresponds to thirty (30) percent of the Contract Price shall be requested for payment at
- (c) Final Payment, to be effected upon the satisfactory completion of the Works by the CPD and accepted by the Engineer.

The remainder of Baht which corresponds to forty (40) percent of the Contract Price, shall be paid after the Final Certificate by the JICA for payment to the CPD.

Payment under (b) and (c) shall be effected within ten (10) days after the respective acceptance of the Works by the Engineer.

It is expressly understood that payments by the JICA do not mean acceptance responsibilities under this Agreement.

Article 3. Completion Time

The CPD agrees to commence the Works at the site immediately after the date of signing of this Agreement (commencement date) and the CPD agrees to satisfactorily complete the Works within days (completion time) from the date hereof which will become due on, (completion date).

Article 4. Engineer

The Engineer, authorized to act on behalf of the JICA will be appointed by the JICA and the Engineer is entitled to do all things that the JICA may do so. The Engineer shall control and supervise the Works all the times whether it is in the preparation or implementation of the Works and the CPD shall promptly furnish all necessary facilities for proper inspections of the Works in accordance with the Engineer's request. At any moment the Engineer can request the CPD to stop the Works if necessary, the CPD shall have no claim on the JICA for extension the completion time due to such suspension of the Works under this Article.

The Inspection will not be deemed as the acceptance of the Works, and the CPD shall not be relieved from his responsibility to meet the Agreement requirements by the fact that the Engineer exercises his duties. Should it be found that the Works have not been satisfactorily performed in the faithful manner, the CPD shall correct any part of the Works indicated by the Engineer within the period specified by the Engineer.

Article 5. Discrepancies among the Agreement Documents

If, prior to or during the course of the Works, any discrepancies are found in the drawings and/or the Technical specifications etc. attached to this Agreement, the CPD shall follow the ruling given by the Engineer at no additional cost to the JICA.

Article 6. Modification of Plan

If the Engineer finds it necessary to make modification of construction design, and/or materials and so forth during the course of construction, the JICA has the right to order the modification of the Works to the CPD, and such order shall be made in written form from the Engineer to the CPD.

The JICA agrees to adjust upwards or downwards the necessary expense for such modification to the CPD which will be estimated by unit price in the bill of quantities of this Agreement in case of modification of quantities of construction works. In the case of additional works which are not quoted by unit price in the bill of quantities of this

Agreement, the Engineer will make estimation thereof and the JICA will pay to the CPD for such additional works accordingly. But if the CPD does not agree to such estimation, the CPD is then entitled to negotiate with the JICA. Also the Extension of the completion time due to the modification shall be given by the JICA who shall have the sole right to decide the number of days of such extension.

Article 7. Acceptance of the Works

When the entire Works have been completed, the CPD shall submit the invoice in written form indicating the Work actually completed to the Engineer. If there are compliance with drawings or Technical Specifications, the JICA shall accept the Works as the final acceptance of satisfactory completion Works within 10 (ten) days after the receipt of the written form and it shall be deemed that the final acceptance has been made on such date of the receipt of the written form.

On the other hand, should non-compliance with drawings or Technical specifications or defects be found in the Works executed by the CPD, the Engineer will have the right not to accept the Works and to order the rectification of the Works. The final acceptance will be made in the same manner as described in the first paragraph of this Article.

Article 8. Construction Engineer

The CPD shall appoint a construction engineer at his own expense for the supervision of the Works performance, who shall be authorized to act on behalf of the CPD, and the instructions given to him shall be deemed as given to the CPD.

Article 9. Replacement of Labour, Engineer and Foreman

The Engineer may request the CPD to remove any of the CPD's labours, foremen or engineers if it appears to the Engineer that such labour, foreman or engineer is incompetent for his job or is not suitable is not capable of handling his workmen or staff, and the CPD shall promptly replace any such labour, foreman or engineer.

Article 10. Notice

All Notices required by this Agreement shall be effective only at the time of receipt thereof, and only when received by the parties concerned at following address:-

The JICA

Thailand Office
1674/1 New Petchburi Road
Bangkok

The CPD

Cooperatives Promotion Department
12, Krung Kasem Road
Theves, Bangkok

All Notices required by the terms of this Agreement shall be made in writing in English language, and delivered by registered mail or hand delivery.

JICA

Mr. _____,
Resident Representative
Thailand Office
Japan International Cooperation Agency

CPD

Mr. _____,
Director-General
Cooperatives Promotion Department

Witness

Mr. Hiroshi TAKEUCHI
Team Leader
Agricultural Cooperative Promotion Project

TERMS AND CONDITIONS OF THE AGREEMENT

FOR

CONSTRUCTION OF MODEL INFRASTRUCTURE

ON

AGRICULTURAL COOPERATIVE PROMOTION PROJECT

IN

THAILAND

TERMS AND CONDITIONS OF THE AGREEMENT

Section 1. General Information

1.1 Objective

According to the Record of Discussions signed July 6, 1984, technical cooperation concerning Agricultural Cooperative Promotion Project in Thailand, hereinafter called The Project will be carried out.

The objective of the works are to construct the irrigation facilities, integrated livestock facilities and model vegetable farm facilities for the purpose of promoting the compound farming management.

1.2 Location of the site

The job site is located at the scope about 60 km of Nakorn Ratchasima City.

Section 2. Submission of Notices

2.1 Work schedule

The CPD shall submit the Work schedule in following item before the commencement of the Works at the job site. If the CPD intends to change the Work schedule, the approval from the Engineer shall be obtained prior to the modification of the schedule.

- (1) Preparation of facilities and transportation of equipment etc. to the job site
- (2) Pond
- (3) Irrigation canals
- (4) Appurtenant structures
- (5) Livestock facilities
- (6) Clearing away

Also the CPD shall submit the machineries scheme including the numbers and kind of machineries and using period of them.

2.2 Notices

The JICA and the CPD shall submit the notices to each other, as necessary, in accordance with Article 10 in the Construction Agreement Document within reasonable time except that special articles are provided in the Agreement Document and Terms and Condition of this Agreement.

Section 3. Field Test and Inspection

The field tests in accordance with the Technical specifications and the demands from the Engineer shall be the responsibility for the CPD. The charges for such field test shall be included in the total amount of the construction cost, and the CPD is not entitled to claim any amount of field test charges.

Section 4. Modification of Plan

In case the JICA estimates the cost for the modification in accordance with Article 6, and if there are two portions, one for the increase and the other for the decrease of the construction cost resulting from such modification, the JICA shall have the right to offset them in the payment and pay or claim the difference between the increase and decrease of the construction cost as the case may be.

Section 5. Release from the Works

After the final acceptance of the Works by the JICA, the CPD shall remove its own temporary facilities, office, warehouses, construction roads, electric wiring, surplus materials, debris and so forth which were provided by the CPD within 10 (ten) days. Upon approval of the Engineer for the removal of the abovementioned facilities etc., the CPD will be released from its responsibility of the Works.

Section 6. General Obligations of the CPD

6.1 Fuel storage

In area of temporary office and residence, the fuel tank capacity shall not exceed 1,000 litres and shall be far away from the housing area.

Fuel storage and transportation shall be done with care and shall have a good system of fire prevention. If storage licence is required, the CPD shall arrange for obtaining it.

6.2 Other facilities

All necessary facilities including temporary office, residence and so forth for the Works and the CPD's convenience shall be provided and maintained in good condition by the CPD.

Section 7. General Text

The CPD shall implement the Works in accordance with the Agreement Documents in broad sense such as the Agreement in narrow sense, Terms and Conditions of Construction Agreement and Technical Specification. Should the events occur that the both parties can not reach agreement on the interpretation of the abovementioned Agreement Documents in broad sense, both parties shall negotiate with sincerity and good faith for settlement of any disagreement, failing which the decision of the JICA shall prevail.

COST ESTIMATION

FOR

CONSTRUCTION OF MODEL INFRASTRUCTURE

ON

AGRICULTURAL COOPERATIVE PROMOTION PROJECT

IN

THAILAND

COOPERATIVES PROMOTION DEPARTMENT

CONSTRUCTION COST

A. Direct Cost

	Baht
1. <u>Pak-Thong-Chai area</u>	
1-1 Construction of livestock facilities	
1) Piggery	_____
2) Compost baruyard	_____
3) Water tank	_____
4) Urine treatment basin & drain	_____
5) Hen House (breeding)	_____
6) Hatchery	_____
1-2 Construction of Hen House	
1) Hen House	_____
2) Hen House (material)	_____
1-3 Construction of irrigation facilities	
1) Big pond	_____
2) Pond (Type A)	_____
3) Pond (Type B)	_____
Sub-Total	_____
2. <u>Muang Area</u>	
2-1 Construction of swine raising farm	
1) Piggery	_____
2) Compost barnyard	_____
3) Water tank	_____
4) Urine treatment basin & drain	_____
5) Well	_____
2-2 Construction of irrigation facilities	
1) Canal	_____
2) Appendant structure	_____
3) Pond	_____
4) Lateral canal	_____
2-3 Installation of Vegetable Farm	_____
Sub-Total	_____
Total (1+2)	_____
B. <u>Indirect Cost</u>	(A x %)
Construction Cost (A+B)	_____

TECHNICAL SPECIFICATIONS

FOR

CONSTRUCTION OF MODEL INFRASTRUCTURE

ON

AGRICULTURAL COOPERATIVE PROMOTION PROJECT

IN

THAILAND

BANGKOK OFFICE

JAPAN INTERNATIONAL COOPERATION AGENCY

TECHINCAL SPECIFICATIONS

- PART 1. SPECIAL PROVISION
- PART 2. GENERAL CONSTRUCTION FACILITIES
- PART 3. CARE OF WATER DURING CONSTRUCTION
- PART 4. OPEN EXCAVATION AND FOUNDATION PREPARATION
- PART 5. FILL AND BACKFILL
- PART 6. CONCRETE WORKS
- PART 7. POND WORKS
- PART 8. IRRIGATION CANAL WORKS
- PART 9. LIVESTOCK FACILITIES CONSTRUCTION WORKS
- PART 10. HEN HOUSE FACILITIES CONSTRUCTION WORKS
- PART 11. VEGETABLE FARM FACILITIES WORK
- PART 12. WELL CONSTRUCTION WORKS
- PART 13. OTHER RELATED CONSTRUCTION WORK

TECHNICAL SPECIFICATIONS

PART 1. SPECIAL PROVISION

1.01 The Contractor shall exercise utmost care so that his construction operations will not damage any existing structure except such structures as specified to be dismantled, or will not cause the disturbances not only on the operation of the Land Development Department but also on the cultivation land of the other project. Any damages on the such existing structure or facilities shall be made good by the Contractor at his own expense.

1.02 If it is necessary in the prosecution of the work to interrupt or obstruct the drainage of the surface, the flow of artificial drains and the flow of irrigation canal, the Contractor shall provide for the same during the progress of the work in such a way that no damage shall result to either public or private interest. For any neglect to provide for either natural or artificial irrigation or drainage which he may interrupted, he shall be held liable for all damages which may result therefrom during the progress of the work.

1-03 The Contractor is expected to visit the location of the work and make his own estimate of the facilities needed for the work. In the successful execution of the contract, the Contractor is expected to familiarize himself with local conditions, availability of labour, transportation facilities, uncertainties of weather, and other contingencies. From investigations, made at site, it is believed that topographical conditions are approximately as shown on the drawings, but the nature of the materials and the depth of satisfactory foundations, are not guaranteed. It is expressly understood that JICA will not responsible for any deduction, interpretation, or conclusions made by the Contractor. JICA does not guarantee that other materials will not be encountered or that the proportions of the several materials will not vary from those indicated by the drawings.

1-04 Elevation referred to the datum plane are to be determined from bench marks established by JICA or the Engineers at the site of the work.

1-05 The Engineers will establish the necessary survey monuments and bench marks at convenient points in the area covered by this contract for use of the Contractor in laying the lines and grades required for the proper conduct and execution of the work. All stakes, bench marks, etc., placed by the Engineers in laying out the work shall be carefully guarded and preserved by the Contractor, and in such case stakes or marks are misplaced or rendered useless through the carelessness or negligence of the Contractor or his agents, employees or workmen, they will be replaced by the Engineers at the expense of the Contractor.

1-06 The Contractor shall execute the work to the lines and grades given by the drawings and/or the Engineers. The Contractor shall, at his own expense, furnish all stakes, templates, pattern, platforms and labor that may be required in setting or laying out any part of the work.

PART 2. GENERAL CONSTRUCTION FACILITIES

2-01 SCOPE

This part covers the construction and/or maintenance of access road, setting up of Contractor's camp facilities, providing camp security and the disposition of the Contractor's various facilities at the end of the contract.

2-02 ROADS

(a) The Contractor shall improve, repair and widen, if necessary, existing roads to satisfactorily meet his haulage equipments. He shall also construct all other roads within the construction area which he deems necessary in the prosecution of his work. The improving, widening and maintaining of existing roads and constructing and maintaining new roads shall be made without cost to JICA, and the same shall be the responsibility of the Contractor during and up to the completion of all construction work under the contract.

2-03 CONTRACTOR'S CAMP FACILITIES

(a) If the Contractor deems necessary, he shall grade his camp site; construct his office, employees' housing, warehouses, machine and repair shops, fuel storage tanks; and provide such other facilities that the Contractor deems necessary for maintaining health, peace and order in the camp and work area.

(b) The location, construction, operation and maintenance of such camps and facilities within the areas of Land Development Department shall be subject to the approval of the Engineers. At least ten (10) calendar days prior to the date on which the Contractor desires to begin to work on in feature of camp construction, the Contractor shall submit for the approval of the Engineers drawings and specifications, in sufficient detail to permit determination of suitability of the construction in compliance with these specification, and no camp construction of any kind shall be undertaken until such drawings and specifications have been approved by the Engineers.

2-04 CAMP SECURITY

The Contractor shall provide his own security force to the extent that the deems necessary for maintaining peace and order in the camps and work areas and to safeguard materials and equipments.

2-05 DISPOSITION OF CAMP AND CONSTRUCTION FACILITIES

After the completion of the work covered by the Contract, the entire camp of the Contractor, including its water supply system, quarters, warehouses, shops and other facilities therein; and all other temporary installations at work areas shall be removed by the Contractor and the site shall be cleaned.

PART 3. CARE OF WATER DURING CONSTRUCTION

3-01 SCOPE

In accordance with specifications contained in this part, the Contractor shall care the water during construction so that construction work can be performed in areas free from water. Care of water during construction shall include provision for drainage and pumping system for dewatering the foundation areas and the construction of temporary bulkheads necessary for the protection of construction operations from encroachment by water.

3-02 DRAINAGE AND PUMPING

The Contractor shall be responsible for dewatering the foundation areas so that work may be carried on in a suitably dry condition, draining and/or pumping all water during the process of construction until its completion. The Contractor shall construct drainage ditches, holes, or culverts; furnish, operate, and maintain at his own expense all necessary pumps, to keep all work areas in amply dry condition, and prior to final acceptance of the work by the Contracting Officer, the Contractor shall remove, fill or plug all temporary drainage structures and pumping equipments at his own expense.

PART 4. OPEN EXCAVATION AND FOUNDATION PREPARATION

4-01 SCOPE

In accordance with the Specifications, contained in this part, and as shown on the drawings, or otherwise directed by the Engineers the Contractor shall perform all required open excavation and foundation preparation pertinent to the construction work.

4-02 OPEN EXCAVATION

(a) Generality

Open excavation under these Specifications consists of the removal, hauling, dumping, and satisfactory disposal of all materials from required excavations for farm road, irrigation and drainage canals and miscellaneous excavations for other structures included under this contract. Open excavation shall be performed to the lines and grades shown on the drawings or established by the Engineers. The Engineers may modify slopes of excavation to fit conditions encountered during construction. Such changes or modifications shall not be considered by the Contractor as a basis for additional compensation over and above the unit prices bid. All necessary precautions shall be taken to preserve the ground outside the specified lines and grades in the soundest possible condition.

(b) Foundation in Loose Material

When the surfaces of excavation upon or against which concrete or embankment fill is to be placed consist of loose material, the said loose materials shall be removed or replaced with suitable materials and compacted in a manner satisfactory to the Engineers. The cost of removing the loose materials shall be paid for under the pertinent bid items for open excavation. The cost for the replacement with suitable materials and the compaction of the same shall be paid for under the pertinent bid items for fill.

4-03 DISPOSITION OF EXCAVATED MATERIALS

(a) Spoil Areas

The Contractor shall submit for the approval of the Engineers locations, areas, drawings and other necessary specifications of spoil area which the Contractor proposes to use for the work under this Contract, and any kind of disposition shall not be undertaken before obtaining the said approval. Excavated material not suitable for fill or otherwise not needed shall be wasted in approved spoil areas. Spoil piles shall be constructed to the stable slopes of the material being wasted. Any spoil pile exceeding two (2) meters in height shall not be performed. Spoil material shall be spread and graded so that surface drainage will not be concentrated and will not create and/or accelerate undesirable erosion in spoil areas.

4-04 DEMOLITION, REMOVAL, AND DISMANTLING

When specified in the drawing or the Engineers, existing concrete structures, such as concrete masses, stones, etc., shall be demolished and disposed of accordingly.

4-05 FOUNDATION PREPARATION

(a) Fill on Earth

All horizontal and sloped earth surfaces, upon which embankment material is to be placed or other foundation surfaces whose locations are specifically indicated by the Engineers, shall consist of undisturbed or compacted material and shall be clean, damp, free from standing or running water, free from organic matter; and shall be suitable as a foundation for the material to be placed upon them.

(b) Concrete

All horizontal and sloped earth surfaces upon which concrete is to be placed shall be undisturbed or of approved compaction, clean and damp, free from standing or running water, and shall be otherwise suitable as a foundation for the concrete to be placed upon them.

PART 5. FILL AND BACKFILL

5-01 SCOPE

In accordance with the specifications contained in this part and as shown in the drawings or otherwise directed by the Engineers, the Contractor shall furnish and place the earth fill for land leveling, farm road embankment and for irrigation and drainage canal embankment; backfill for related structures. Any work of fill and backfill shall not be commenced without prior approval of the Engineers. The slope of the embankment shall be finished to the designed gradient by providing fixed rules.

5-02 BACKFILL

Backfill, as used herein, is defined as refill for structures. The materials used for backfill for structures shall be free from roots, stones of more than five (5) centimeters in diameter, and other objectionable materials and subject to the approval of the Engineers. Backfill materials shall be placed in layers, each layer being not more than twenty (20) centimeters thick before compaction, thoroughly compacted by means of power tampers or by other means of approved by the Engineers.

5-03 FILL

(a) Lines and Grades

The fills shall be constructed to the lines, grades and cross sections indicated on the drawings, unless otherwise directed by the Engineers. The Engineers may increase or decrease the slopes of the fill or make such other changes in the design as may be deemed necessary to produce a stable structure. change in quantities of materials, resulting from prescribed changes in section, shall not make cause for claims for increased unit prices. Generally, a tolerance of plus or minus 0.05 meter from the slope lines and grades shown on the drawings will be allowed in the finished surfaces of the embankments except that the tolerances shall not be continuous over an area greater than twenty (20) square meters.

(b) Conduct of the Work

1. The Contractor shall maintain and protect the fills in a satisfactory condition at all times until final completion and acceptance of all work under the Contract. Any approved fill material which rendered unsuitable after being placed in the fills shall be replaced by the Contractor and no additional payment will be made there. The Contractor shall excavate and remove from the fills any material which the Engineers considers objectionable and shall also dispose of such material and refill the excavated as directed, all at no additional cost to JICA. The Contractor may be required to remove at his own expense any fill material placed outside of prescribed slope lines.

2. When the excavation of suitable fill material from required excavation and approved borrow sources progresses at a faster rate than placement in the fills, such excavated materials may stockpiled at approved locations until use is authorized. No separate payment will be made for stockpiling or reloading and hauling of this material to its place in the fills and all costs in connection therewith shall be included in the applicable contract unit price for the fill materials.

5-04 MATERIALS

(a) Sources

The Contractor shall submit for the approval of the Engineers locations, areas, drawings and other necessary specifications of borrow areas which the Contractor proposes to use for obtaining fill material. Materials for fills shall be secured from required excavations and from the borrow areas as approved. There is no guarantee that all the materials in any borrow area will be suitable for use in the fills and the Contractor shall move or modify his operations to avoid unsuitable material. The Contractor shall maintain and operate sufficient excavating and hauling equipments so that an adequate amount of fill material from all sources is available as required. Operations in borrow areas shall not be on danger roads, buildings, or structures. Borrow areas shall be graded to provide drainage from all parts of the excavated areas. When operations in a borrow area have terminated, the area shall be dressed to a neat and orderly appearance, as approved by the Engineers. Any additional material needed shall be obtained from sources approved by the Engineers.

(b) Suitability

Materials containing brush, roots, sod or other perishable material will not be considered suitable for fills. The suitability of the materials shall be subject to the approval of the Engineers.

5-05 PLACEMENT

(a) General

No fill material shall be placed on any part of the fill foundations until such areas have been inspected and approved by the Engineers and until after completion of foundation preparation as specified in PART 4. The gradation and distribution of materials shall be such that the fills will be free from lense, pockets, and streaks.

(b) Earth Fill

The fill material shall be dumped and spread in horizontal layers having an uncompacted thickness of not over 20 cm. When material is spread, chunks larger than 10 cm in size shall be broken down by approved means or removed.

5-06 COMPACTION

(a) General

After a layer of fill material has been dumped and spread, it shall be compacted by hand operated mechanical tampers or by other compaction machine approved by the Engineers to a density more than 85 percent of the maximum dry density of the material or to a density specified by the Engineers.

(b) Fill on or Against Culverts and Concrete Structure

No fill shall be placed on or against concrete surface before a period of fourteen days has elapsed after placing the concrete. Before passage of hauling equipment over the top of culverts or other structures will be permitted, the depth of fill over the concrete shall be sufficient to permit such passage without harmful stresses or vibrations in the structure. Fill placed around and over culverts or other structures shall be compacted by hand operate mechanical tampers or by man power to a density equal to that specified for the other earth fill.

5-07 ADDITIONAL COMPACTION

If, in the opinion of the Engineers, the desired compaction of portion of the embankment is not secured, additional compaction operation shall be made over the surface area of such designated portion until the desired compaction has been obtained, without additional cost to JICA.

5-08 QUALITY CONTROL

If it is required, tests, for moisture content and density, all necessary tests will be made by the Engineers, and from these test, corrections, adjustments, and modifications of methods, materials, and moisture contents may be made in order to secure satisfactory density of the fill materials. The Contractor shall provide necessary unskilled labour in obtaining and preserving samples.

PART 6. CONCRETE WORKS

6-01 SCOPE

In accordance with the Specifications contained herein and as shown on the detail drawings or otherwise directed, the Contractor shall -

- (a) Furnish all materials, and manufacture, transport, place, finish, protect and cure concrete;
- (b) Furnish, construct, erect and dismantle forms;
- (c) Construct expansion and contraction joints and furnish and place waterstops, joint fillers, and sealing compound, if required; and
- (d) Prepare, clean, cut, bend and place steel reinforcement.

6-02 CEMENT

(a) General

Cement for mortar and concrete work shall be Portland Cement which conforms to the requirements of the Standard Specifications for Portland Cement (A.S.T.M. Designation C150-69).

(b) Storage

Cement shall be stored in a dry, weather tight and properly ventilated warehouse with adequate provisions for the prevention of absorption of moisture. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification. Cement which has been stored for more than one month or which are suspected to be damp shall not be used unless otherwise approved by the Engineers.

6-03 FINE AGGREGATE

(a) Composition

Fine aggregate shall be natural sand not including organic matter and other foreign substances.

(b) Quality

Fine aggregate shall consist of hard, tough, durable, uncoated particles. The shape of the particles shall be generally rounded or cubical and reasonably free from flat or elongated pieces. The fine aggregate shall conform to the following specific requirements:

1. Grading - Fine aggregate shall be well graded from fine to coarse and the gradation shall conform to the following requirements as delivered to the mixers;

Sieve Designation U.S. Std. Square Mesh	Cumulative Percentage by Weight Passing
No. 4	95 - 100
No. 16	60 - 75
No. 100	2 - 10

In addition to the grading limits shown above, the fineness modulus shall be in the range from 2.30 to 3.00.

(c) Storage

Fine aggregate shall be stored in such a manner as to avoid the inclusion of any foreign material in the concrete. Sufficient live storage shall be maintained at all times to permit continuous placement of concrete at the rate specified.

6-04 COARSE AGGREGATE

(a) Composition

Coarse aggregate shall consist of gravel, crushed gravel or rock, or a combination of gravel and crushed gravel or rock.

(b) Quality and Grading

1. Quality - Coarse aggregate shall consist of hard, rough, durable, clean and uncoated particles.

All foreign materials and dust shall be removed by adequate processing. The particle shape of the smallest size of crushed coarse aggregate shall be generally rounded or cubical, and the coarse aggregate shall be reasonably free from flat and elongated particles in all sizes.

2. Grading - The coarse aggregate shall be well graded from fine to coarse. The grading of the aggregate as delivered to the mixer shall be as follows:

Sieve Designation U.S. Std. Square Mesh	Per Cent by Wt. Passing Individual Sieves 3/4" Max
1"	100
3/4"	90 - 100
3/8"	20 - 55

3. Size - Unless otherwise directed, the maximum sizes of coarse aggregate to be used in the various parts of the work shall be 3/4 inch.
4. Storage - Storage of coarse aggregates shall be as that specified in Paragraph 6-03 (c) for fine aggregates.

6-05 AGGREGATE SAMPLES

Samples of the aggregate shall be furnished at a point designated by the Engineers for his approval at least ten (10) days in advance of the time when the placing of concrete is expected to begin.

6-06 WATER

Water used in mixing concrete shall be fresh, clean and free from injurious amount of oil, acid, alkali, salts, or organic matter.

6-07 PROPORTIONING OF CONCRETE

(a) The Contractor shall design the mix proportion for every class of concrete placing for the approval of the Engineers. The Contractor shall carry out the mix test in case being requested by the Engineers. the test is to be made at the expense of the Contractor.

(b) The compressive strength of the age of 28 days shall be as follows and desirable mix proportion is also indicated.

Class	Minimum 28 days Compressive strength	Mixing proportion by volume Cement: fine aggregates: coarse aggregates
A (Reinforced concrete)	210 kg/cm ³	1:2:3
B (Plain concrete)	160 kg/cm ³	1:2:4
C (Concrete layer)	135 kg/cm ³	1:3:4

Other proportions for mixed design may be indicated by the Engineers at the site of work, if it is necessary.

6-08 MIXING

(a) Equipment

Concrete shall be mixed by portable concrete mixer unless otherwise approved by the Engineers.

(b) Measurement

The measurement of every ingredient of concrete shall be made in weight. Nevertheless, the measurement in volume is admitted subject to the approval of the Engineers.

(c) Mixing Time and Method

The mixing time of concrete shall be more than two (2) minutes and less than five minutes. Over mixing, requiring the introduction of additional water to preserve the required consistency, will not be permitted. The mixer shall be completely emptied before reserving the materials for the succeeding batch and shall be kept clean and washed out after stopping work at the end of each shift.

On commencing work, the first batch shall contain sufficient excess of cement, sand and water to coat the inside of the drum to avoid the reduction of the required mortar content of the mix.

6-09 CONVEYING

(a) Generality

Concrete shall be conveying from mixer to forms, as rapidly as practicable, by methods which will prevent segregation or loss of ingredients. There shall be no vertical drop greater than 1.5 meters except where suitable equipment is provided to prevent segregation and where specifically authorized. Belt conveyors, chutes or other similar equipment in which the concrete is delivered to the structure in a thin, continuously exposed flow, will not be permitted except for very limited or isolated sections of the work. Such equipment shall be arranged to prevent objectionable segregation.

6-10 PLACING

(a) Approval

Approval of the Engineers shall be obtained before starting any concrete pour.

(b) General

Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items without permitting the material to segregate. Not more than three (3) cubic meter shall be deposited in one pile for compaction. Free water shall be collected in depressions away from the forms and removed by bailing prior to placement of additional concrete. All concrete placing equipment and methods shall be subject to approval.

(c) Cooling of Aggregates

The aggregate shall be cooled by wetting if it is drier than the condition known as saturated, surface dry.

(d) Concrete on Earth Foundation

All concrete shall be placed upon clean, damp surface free from standing or running water. Prior to placing concrete, the earth foundation shall be satisfactorily compacted in accordance with approved methods.

(e) Concrete on Other Concrete

Surface upon or against which concrete is to be placed shall be clean, free from oil, standing or running water, mud, drummy rock, objectionable coatings, debris, and loose, semi-detached or unsound fragments. To insure a firm and tight bond between fresh concrete and other concrete, concrete surfaces, where necessary, shall be chipped or roughened as directed by the Engineers. All surfaces shall be wetted thoroughly to keep them in a completely moist condition before placing concrete. All approximately horizontal surfaces shall be covered with a layer of mortar of the same cement-sand ration as used in the concrete mix before the concrete is placed.

6-11 FORMS

(a) Generality

Forms shall be used, wherever necessary, to confine the concrete and shape it to the required lines, or insure against contamination of the concrete. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall be maintained rigidly in correct position. Forms shall be sufficiently tight to prevent loss of mortar from the concrete. Forms for exposed surfaces against which backfill is not to be placed shall be lined with a form grade plywood or sheet steel. Steel panel forms may also be used.

(b) Cleaning and Oiling of Forms

At the time concrete is placed in the forms, the surfaces of the forms shall be free from incrustations of mortar, grout, or other foreign material that would contaminate the concrete or interfere with the fulfillment of the Specifications' requirements relative to the finish of formed surfaces. Before concrete is placed, the surfaces of the forms shall be oiled with a commercial form oil that will effectively prevent sticking and will not stain the concrete surfaces.

(c) Removal of Forms

Forms shall be removed as soon as practicable in order to avoid delay in curing and to make possible earliest practicable repair of surface imperfections, but in no case shall they be removed before approval. Any needed repair or treatment shall be performed at once, and shall be followed immediately by the specified curing. Forms shall be removed with care so as to avoid injury to the concrete, and any concrete so damaged shall be repaired.

6-12 CURING AND PROTECTION

(a) General

All concrete shall be moist cured for a period of not less than seven (7) consecutive days by an approved method or combination of methods applicable to local conditions, except that the curing period may be reduced to three days for concrete made with high-early-strength cement. The Contractor shall have all equipment needed for adequate curing and protection of the concrete on hand and ready to install before actual concrete placement begins.

(b) Water Curing

Concrete shall be kept wet by covering with an approved, watersaturated material or by a system of perforated pipes or mechanical sprinklers or by any other approved method which will keep all surfaces continuously (not periodically) wet. Water for curing shall be generally clean and free from any element which might cause objectionable staining or discoloration of the concrete.

6-13 REPAIR OF CONCRETE

Repair of imperfections in formed concrete shall be completed within twenty four (24) hours after removal of forms at no additional cost to JICA. Fins shall be neatly removed from exposed surfaces. Concrete that is damaged or honeycombed must be removed to sound concrete and replaced with drypack, mortar, or concrete as hereinafter specified. Where large bulges and abrupt irregularities protrude, the protrusions shall be reduced by bush-hammering and grinding. Drypack filling shall be used for holes left by the removal of fasteners from the ends of form tie rods.

6-14 DRYPACK MORTAR

Drypack shall consist of a mixture (by dry volume or weight) of one (1) part cement to 2-1/2 parts of sand conforming to Paragraph 6-03, Fine Aggregate, except that in gradation, 100% shall pass a No.16 sieve. Only enough water shall be used to produce a mortar which, when used, shall stick together on being molded into a ball by a slight pressure of the hands, and shall not extrude water but will leave the hands damp.

6-15 STEEL REINFORCEMENT

(a) General

The Contractor will furnish all steel reinforcement in accordance with the drawings and these specifications. The Contractor shall prepare, clean, cut, bend and place all reinforcements, as shown on the detail drawings or as otherwise directed. The Contractor shall furnish all chains, supports and ties. All reinforcement shall be reasonably free from loose, flaky rust and scale, and free from oil, grease and other coating which might destroy or reduce its bond with concrete.

(b) Relationship of Reinforcement to Concrete Surfaces

The distance from the edge of the main reinforcement to the concrete surface shall be 5 cm except such portions as shown in the drawings. The concrete covering the stirrups, spacer bars, and similar secondary reinforcement may be reduced by the diameter of such bars, unless otherwise indicated.

(c) Lapping

Lapping length at joints of the reinforcing bar shall be at least thirty times of the diameter of bar and shall be bound by steel wire.

(d) Supports

All reinforcements shall be secured in place by use of metal or concrete supports, spacers or ties. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the concreting operation. The supports shall be used in such a manner that they will not be exposed or contribute in any way to the discoloration or deterioration of the concrete.

PART 7. POND WORKS

7-01 SCOPE

The scope under this part shall consist of the preparation works, excavation, compaction of foundation, embankment in accordance with the Drawings and Specifications or as directed by the Engineer.

7-02 EARTH MATERIALS FOR EMBANKMENT

The excavated earth materials shall be used for the embankment material for the farm ponds, and if those excavated soil are deemed unsuitable for the purpose, the embankment materials shall be borrowed from pits with soils in suitable texture.

7-03 COMPACTION

Foundation of the farm ponds shall be compacted with roller carefully, and also the dike section shall be compacted with roller. Thickness for one compaction shall be spread about 30 cm in spread.

Also compaction water shall be sprinkled for keeping optimum moisture content of the materials.

7-04 SLOPE PROTECTION

Finishing work of embankment slopes shall be made by compacted with hand rammer for protection of slopes from erosion. Where shown on the Drawings or as directed by the Engineer, the Contractor shall construct slope protection concrete work for the ponds. Concrete work shall be constructed in accordance with the applicable provision and the relevant Drawings.

PART 8. IRRIGATION CANAL WORKS

8-01 SCOPE

The scope under this part consist of excavation, embankment and concrete lining for main and lateral irrigation canals, all in accordance with the Drawings and these Specifications or as directed by the Engineer.

8-02 EARTH WORK

Earth works for irrigation canals shall be in accordance with PART 4 and 5.

8-03 CONCRETE WORK

Where shown on the Drawings or as directed by the Engineer, the Contractor shall construct slope protection for the irrigation canals. Concrete work shall be constructed in accordance with the applicable provision as Section 3 and the relevant Drawings.

PART 9. LIVESTOCK SWINE RAISING FACILITIES CONSTRUCTION

9-01 SCOPE

The scope under this part shall consist of furnishing of all labor, materials and equipment for the construction of swine raising facilities in accordance with the Drawings and these Specifications or as directed by the Engineer.

9-02 EARTHWORK AND STRUCTURE EXCAVATION

Earthwork shall conform to the requirements specified in PART 4 and 5.

9-03 CONCRETE WORK

Concrete work shall conform to the requirements specified in PART 6.

9-04 REINFORCING STEEL BARS

All reinforcing steel bars shall conform to the requirement specified in PART 6.

9-05 BRICK MASONRY

(a) The Work under this clause consists of all brick masonry work shown in the Drawing.

(b) Local products can be used and it shall be the first class.

(c) All bricks shall be laid after applying mortar.

9-06 CARPENTRY

(a) The work under this clause consists of all carpentry work shown in the Drawing.

- (b) Local timber can be used, and it should be the hard woods.
- (c) All frameworks shall be jointed by optimum jointing method.

9-07 ROOFING

Local material can be used and the construction method shall conform to Thai Specifications.

9-08 INSTALLATION OF INDOOR LIGHTING

The installation of indoor lighting shall be made strictly in accordance with the manufacture's technical instruction.

PART 10. HEN HOUSE FACILITIES CONSTRUCTION WORKS

10-01 SCOPE

The scope under this part shall cover the preparation works as setting up for the construction sites and the construction works in accordance with the Drawing and Specification or as directed by the Engineer. The farmers carry out the construction works by themselves.

10-02 EARTHWORK

Earthwork shall conform to the requirements specified in PART 4 and 5.

10-03 CARPENTRY

- (a) The work under this clause consists of all carpentry works shown in the Drawing.
- (b) Local timber can be used, and it should be the hard woods.

(c) All frameworks shall be jointed by optimum jointing method.

10-04 ROOFING

Local materials can be used, and the construction method shall conform to Thai Specifications.

PART 11. VEGETABLE FARM FACILITIES WORK

11-01 SCOPE

The scope under this part shall cover the preparation works as clearing and the establishment works of pipes and nets in accordance with Thai Specifications.

11-02 PREPARATION

The vegetable farm shall be prepared to set up the pipes and nets by farmers.

11-03 ESTABLISHMENT

Local materials can be used, and the establishment work shall conform to Thai Specifications or as directed by the Engineer. The pipes shall be fixed in the earth each other.

PART 12. WELL CONSTRUCTION WORKS

12-01 SCOPE

The scope under this part shall cover the preparation work as clearing and setting-up for the boring sites and boring work in accordance with the Drawings and Specification or as directed by the Engineer.

12-02 BORING

The hole shall be made at a depth and a diameter as shown on the Drawings or as directed by the Engineer. The hole shall be made by manpower. Confirmation of the depth shall be done in the presence of the Engineer.

PART 13. OTHER RELATED CONSTRUCTION WORKS

13-01 SCOPE

This part covers the construction of all concrete structures such as regulating diversion facilities in accordance with the Drawings and Specifications or as directed by the Engineer.

13-02 CONSTRUCTION METHOD

(a) All concrete structure construction shall conform to the requirement specified in PART 6.

(b) All construction shall be completed to the specified lines, grades, and dimensions. All timber, metal or other accessories necessary for its completion as shown in the drawings shall be placed and attached.

(c) The dimension of each structure shown in the drawings will be subject to changes as may be found necessary to adopt the structures to the actual field conditions disclosed by the excavation.

JICA