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TECHNICAL SPECIFICATIONS

FOR

CONSTRUCTION OF MODEL INFRASTRUCTURE IMPROVEMENT WORKS

ON

THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

IN

INDONESIA

JAKARTA OFFICE

JAPAN INTERNATIONAL COOPERATION AGENCY

TECHNICAL SPECIFICATIONS

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PART 1 SPECIAL PROVISION

1-01 APPLICATION

This specification is applicable to "Construction of Model Infrastructure Improvement Works on the Strengthening of Artificial Insemination Center Project in Indonesia". Main work quantities are stipulated in Article 1 of this Contract. Specifications entered in the drawing shall be treated in reference to this technical specifications.

1-02 ENGINEER

"Engineer" means the engineer who was appointed to supervise the works by the JICA.

1-03 SITE REPRESENTATIVE OF THE CONTRACTOR

Site representative of the Contractor shall be well qualified in construction or have enough experience of construction. The Contractor shall submit career history of a site representative to the Engineer for his approval.

1-04 WORK SCHEDULE

The Contractor shall submit his work schedule before the commencement of the works at the job site. If the Contractor intends to change the work schedule, the approval from the Engineer shall be obtained prior to the modification of schedule.

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

1-05 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. Any damges on such existing structure or

facilities shall be made good by the Contractor at his expense.

1-06 If it is necessary in the prosecution of the work to interrupt or obstruct the flow of existing water supply pipe, the flow of artificial drains and the drainage of the surface, 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 pipeline or drainage which he may interrupt, he shall be held liable for all damges which may result there from during the progress of the work.

1-07 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 construction, the Contractor is expected to familiarize himself with local conditions, availability of labor, transportation facilities, water and electric supply, uncertainties of weather and other contigenencies. 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 experessly understood that JICA will not be 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.

1-08 Elevations referred to the datum plane are to be determined from benchmarks established by JICA or the Engineer at the site of the work.

1-09 SETTING-OUT

The Contractor shall entirely be responsible for accurate setting-out the works including staking of centerlines for pipeline and roads, etc. based on the information supplied on the Drawings and the instructions given by the Engineer.

All stakes, benchmarks, etc., placed by the Engineer in laying out the works 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 shall be replaced by the Contractor at this expense.

The Contractor shall execute the work to the lines and grades given by the drawings and/or Engineer. 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.

The costs to conform to the requirements of this Clause shall be entered in the Lump Sum Price of the General Works in the Bill of Quantities.

1-10 DRAWINGS TO BE FURNISHED BY THE CONTRACTOR

The Contractor shall submit the drawings of centerline survey results and longitudinal section in two copies for the construction of pipeline and roads, etc.

Construction of any part of the above works shall not commence until the Drawings have been approved by the Engineer, and there after no change shall be made to any drawing so approved without permission of the Engineer.

In addition to the above, during the working execution, the Contractor shall at his own expense prepare reinforcement drawings based on the Drawings supplied by the JICA at needed for performance of the works.

These reinforcement drawings shall include such bar placing drawings, bar list and any otehr reinforcement drawings as may be required to facilitate fabrication and placement of reinforcement.

All reinforcement drawings prepared by the Contractor shall be submitted to the Engineer for approval. All costs incurred by the Contractor in complying with the requirements of this Clause shall be deemed to be included in the item of General works in the Bill of Quantities.

1-11 ASSISTANCE TO ENGINEER'S STAFF

The Contractor shall render all necessary assistance to the Engineer and shall provide as required by and for use of the Engineer, sufficient quantities of pegs, poles, straight edges, stagings, moulds, templates, profiles and all other requisites for checking the Contractor's setting out and the measurement of the Works.

The cost of all labor and materials required by the Engineer for the said purposes shall be borne by the Contractor. All cost incurred by the Contractor in complying with the requirements of this Clause shall be deemed to be included in the General Works of Bill of Quantities.

1-12 REPORTS

The Contractor shall submit daily or weekly reports to each work section to the Engineer.

The report shall contain, but not limited to, the following data: Weather conditions, staff and labor force employed on the Work, materials used, worl in progress, work in preparation, laboratory test data, accidents, photographs and all other information relevant to the progress of the Works.

The payment of all costs incurred by the Contractor in complying with requirements of this Clause shall be deemed to be included in the General work of Bill of Quantities.

1-13 FIELD TEST AND INSPECTION

The field tests in accordance with the specifications and the demands from the Engineer shall be the responsibility for the Contractor. The charges for such fields test shall be included in the item of General Works of Bill of Quantities.

1-14 CLEARANCE OF THE WORK SITE

Upon completion of the works, the Contractor shall clear the site within period of construction.

1-15 GENERAL WORKS

The Contractor shall price the General Works in the Bill of Quantities covering all costs and expenses for preparatory works, temporary works and other common works such as :

- Mobilization and demobilization of equipments (Cause 2-03 and 2-05)

- Maintenance of temporary access road and Construction of haul road (Clause 2-02)
- Land hiring for the Contractor's yard
- Construction, maintenance and subsequent removal of offices, stores, workshops, staff quarters and labor camps with fencing (Clause 2-03)
- Installation, operation, maintenance and subsequent removal of water and electric supply system for the Contractor's offices, workshops, staff quarters and labor camps (Clause 2-03)
- Centerline survey and furnishing of drawings (Clause 1-09 and 1-10)
- Assistance to Engineer's staff for certificates (Clause 1-11)
- Setting out pipeline, roads and structures and staking of reference pegs (Clause 1-09)
- Field tests including provision of testing apparatus, testing engineer, labor and consumables (Clause 1-13)
- Submit of periodical reports and color photographs (Clause 1-12)
- Other works but not limited to.

PART 2 GENERAL CONSTRUCTION FACILITIES

2-01 SCOPE

This part covers the construction and/or maintenance of access roads, 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 requirements. 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 by the Contractor at his expense, and 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, employee's 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 areas.

(b) The location, construction, operation and maintenance of such camps and facilities within the areas of the A.I. Center shall be subject to the approval of the Engineer. 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 Engineer drawings and specifications in sufficient detail to permit determination of suitability of the construction in compliance with these specifications, and no camp construction of any kind shall be undertaken until such drawings and specifications have been approved by the Engineer.

2-04 CAMP SECURITY

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

2-05 DISPOSITION OF CAMP AND CONSTRUCTION FACILITIES

After the completion of the work covered by the Contract, the enitire 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 cleared.

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 foundation areas and the co6struction 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, andmaintain at his own expense all necessary pumps, to keep all work areas in ample 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 equipment at his expense.

3-03 PAYMENT

No separate payment shall be made for the care of water during construction. But the cost of furnishing, constructing, operating, maintaining, and removal of temporary drainage structures, canals, and pumping system necessary to keep construction operations free from water shall be included in the item of GENERAL WORKS as indicated in the Bill of Quantities

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 Engineer, the Contractor shall perform all required open excavation and foundation preparation pertinent to the construction work.

4-02 OPEN EXCAVATION

(a) General

Open excavation under these Specifications consists of the removal, hauling, dumping, and satisfactory disposal of all materials from required excavations for pipe work, roads, and miscellaneous excavatic for other strucutres included under this Contract. Open excavation shall be performed to the lines and grades shown on the drawings or established by the Engineer. The Engineer 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 stone masonry or embankment fill is to be placed consist of loose materials, the said loose materials shall be removed or replaced with suitable materials and compacted in a manner satisfactory to the Engineer. 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 Engineer 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 Engineer, existing concrete and/or stone masonry 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 Engineer, shall

consist of undisturbed or compacted material and shall be clean, damp, free from standing or running water and free from organic matter; and shall be suitable as a foundation for the material to be placed upon them.

(b) Concrete and/or Stone Masonry

All horizontal and sloped earth surfaces upon which concrete and/or stone masonry 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 and/or stone masonry to be placed upon them.

4-06 MEASUREMENT FOR PAYMENT

Open Excavation

A survey of the areas to be excavated shall be made by the Contractor prior to the commencement of the work under this Contract, and all measurements of excavation shall be based on this survey without regard to any change that may occur during the prosecution of the work. All such surveys shall be the subject to check and approval by the Engineer. Volumes will be computed and shall be the amount between the original ground determined by the survey and the slopes, lines and grades shown on the drawings or established by the Engineer.

PART 5 BACKFILL AND EARTHFILL

5-01 SCOPE

In accordance with the specifications contained in this section and as shown in the drawings or otherwise directed by the Engineer, the Contractor shall furnish and place the earthfill for construction work, backfill for related structures. Any work of fill and backfill shall not commenced without prior approval of the Engineer. The slope of the embankment shall be finished to the designed gradient by providing fixed rules.

5-02 EARTHFILL

The earthfills shall be constructed to the lines, grades and cross sections indicated on the drawings, unless otherwise directed by Engineer. The Engineer may increase or decrease the slopes of the fill or make such other changes in the design as may by 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.

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.

5-03 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 Engineer. 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 Engineer.

5-04 MEASUREMENT FOR PAYMENT

(1) Earthfill

(a) Measurement

Measurement for payment of earth fill will be calculated on the number of cubic meters of material placed between the foundation lines as determined on the basis on drawings or a survey made after completion of the excavation and foundation preparation and the lines, grades and slopes shown on the drawings. No allowance will be made for foundation or embankment settlement.

(b) Payment

Payment shall constitute full compensation for all work in connection with the excavation from borrow areas including clearing, grubbing and stripping of borrow areas, hauling, stock-piling, rehandling, foundation preparation, placing, spreading, sprinkling, drying, breaking up, compacting, removal of objectionable material, and all other work required for the construction, protection and maintenance of the fills.

No adjustment in payment will be made for substitution of materials and for additional compaction.

(2) Backfill

Measurement for payment of backfill shall be calculated on the number of cubic meters of materials placed among the original ground line, or designated line of backfill and the structure and the neat pay lines of excavation shown in the drawings. Payment will be made on the unit price bid per cubic meter of backfill.

PART 6 STONE MASONRY WORK

6-01 SCOPE

In accordance with the specifications contained in this Part, and as shown on the drawings or as otherwise directed, the Contractor shall furnish all plant, labor, equipment and materials, and perform all operations in connection with the construction of stone masonry.

6-02 MATERIAL

(a) General

Samples of stone proposed for use as provided herein shall be submitted to the Engineer for approval prior to delivery of any such material to the site of work. Unless otherwise specified, all samples shall be obtained by the Contractor and delivered at his expense to a point designated by the Engineer at least 20 days in advance of the time when the placing of the material is expected to begin.

(b) Sand for Mortar

Sand for mortar shall conform to the requirements for PART 7 relative to fine aggregate for concrete.

6-03 FOUNDATION PREPARATION

Areas on which stone work is to be done shall be prepared in accordance with the requirements of PART 4. Where such areas was excavated below the designed line for foundation, they shall be brought to grade by filling with gravel or other materials approved by the Engineer and well compacted, and no additional payment will be made for foundation preparation and any materials thus required.

In the same manner, when such areas are above the designed line for foundation, said areas be brought to grade and the foundation similarly prepared without additional payment.

6-04 STONE MASONRY

(a) General

Stone masonry shall be placed at the locations as are indicated on the drawings or otherwise directed. Mortar, sand and stone shall conform to the applicable requirements of paragraph 6-02 as to quality and physical properties. Mortar cement shall conform to the applicable requirements of PART 7. The stone shall be kept free from dirt, oil, or any other injurious material which may prevent the proper adhesion of the mortar. Individual stones shall have a thickness of not less than 10 centimeters.

(b) Construction

Mortar shall be one (1) part cement and three (3) parts sand in volume unless otherwise provided. All shaping or dressing of stone shall be done before the stone is laid, and no dressing or hammering which will loosen the stone will be permitted after it is placed. Each stone shall be cleaned and moistened with water before being set. All stones shall be well bedded in freshly-made mortar. After completion, in case any stone is moved or the joint broken, the stone shall be removed, the mortar shall be thoroughly cleaned from bed and joints, and the stone reset in fresh mortar.

6-05 MEASUREMENT FOR PAYMENT

Measurement for payment for stone masonry will be based on the number of cubic meters acceptably placed as computed from the neat lines and grades indicated on the drawings or as directed in the field.

PART 7 CONCRETE WORK

7-01 SCOPE

In accordance with the specifications contained herein and as shownn 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.

7-02 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. Designated 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 Engineer.

7-03 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 3.0.

(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.

7-04 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, tough, 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. Sq. 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 7-03(c) for fine aggregates.

7-05 AGGREGATE SAMPLES

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

7-06 WATER

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

7-07 PROPORTIONING OF CONCRETE

(a) The Contractor shall design the mix proportion for every class of concrete placing for the approval of the Engineer. The Contractor shall carry out the mix test in case being requested by the Engineer. 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^2	1 : 2 : 4
B (Plain Concrete)	160 kg/cm^2	1 : 3 : 6
C (Concrete Layer)	135 kg/cm^2	1 : 4 : 6

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

7-08 MIXING

(a) Equipment

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

(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 Engineer.

(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 receiving 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.

7-09 CONVEYING

(a) General

Concrete shall be conveyed 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.

7-10 PLACING

(a) Approval

Approval of the Engineer 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 meters 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 surfaces 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 Engineer. 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-sand ratio as used in the concrete mix before the concrete is placed.

(f) Consolidation of Concrete

Concrete shall be placed and consolidated with the aid of mechanical vibrating equipment or of hand-spading and tamping. In no case shall vibrators be used to transport concrete inside the forms. In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs.

7-11 FORMS

(a) General

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.

7-12 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, water-saturated 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.

7-13 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.

7-14 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 7-03, 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.

7-15 STEEL REINFORCEMENT

(a) General

The Contractor shall furnish deformed steel bar 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 concrete 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.

7-16 MEASUREMENT FOR PAYMENT

(a) Concrete

1. Measurement for payment for plain or reinforced concrete, will be based on the volume of concrete in place within the lines and grades shown on the drawings.

2. No deduction will be made for rounded or bevelled edges, or space occupied by metal work, or embedded items such as supports, spacers or ties. The cost of construction joint treatment with the attendant loss of material shall be included in the unit price bid per cubic meter of concrete.

3. Payment at the unit prices bid shall constitute full payment for all costs for concrete work. The costs of any dewatering required to maintain dry conditions during the pouring of concrete, furnishing materials, and installing and removing formwork, shall be included in the item of GENERAL WORKS as indicated in the Bill of Quantities.

(b) Steel Reinforcement

Measurement for payment for furnishing, preparing bar cleaning, cutting, bending, and placing steel reinforcement by the Contractor will be based on the number of kilograms placed in accordance with the detail drawings or as otherwise directed. Payment will be made for steel in laps as shown on the drawings; where bars are welded, payment will be made as if they were lapped. Payment will not be made for steel in laps or used which are solely for the convenience of the Contractor. Payment will be made at the unit price bid for steel reinforcement. No separate payment will be made for steel reinforcement supports, and the cost thereof shall be included in the unit price bid.

7-17 WATERPROOFING WORK

(a) General

Waterproofing shall be preformed to the lines and grades shown on the drawings for the following structures :

1. Existing settling box
2. Existing 1st water tank

(b) Material for Waterproof Mortar

Sand and cement shall conform to the requirements for PART 7 relative to fine aggregate and cement. As to the waterproof agent, the MANOR or local mortar agent equivalent to JIS-A6101 can be used.

(c) Construction

Waterproofing mortar shall be placed at the inside walls and floor with the thickness of 1.5 cm after chipping work of the inside concrete surface as shown on the drawings or as otherwise directed by the Engineer.

The mortar shall be one (1) part cement and three (3) parts sand in volume unless otherwsis pvovided. Mixing rate of waterproof agent shall be three percent (3%) of cement weight. The mixing propertion per 10.0 m^2 is shown as follows ;

Cement	Fine aggregate	Waterproof agent
90 kg	0.18 m^3	2.7 kg

PART 8 PIPELINE WORKS

8-1 SCOPE

This part deals with matters of pipeline works from the intake weir to the inlet tank. Carbon steel pipes, valves and appurtenances shall be supplied by the JICA and they are described in the attached list. The contractor shall furnish all pipe materials required except for the pipe materials in the list.

The Contractor shall furnish all labor, materials, equipment and supplies needed for the construction of these pipelines above mentioned and perform installation and testing of them at the site in accordance with Specifications and Drawings.

Pipe materials including gate valves and stop valves proposed by the Contractor shall be submitted to the Engineer for approval prior to delivery of and such material to the site of work. The Contractor shall furnish such materials under the drawings, specification or the direction by the Engineer considering the required bearing water pressure.

8-2 Installation

(a) General

This new pipe line works shall be executed in parallel with the using of existing pipeline, therefore the Contractor shall prepare the bypass pipes as temporary works in accordance with the procedure of pipe installation works and improvement work of existing water tanks.

(b) Excavation of trench

The section of excavation for laying pipes are shown on the Drawings. The excavatkon of trenches shall be made in accordance with specification described in Part 4. Additional costs for the

excavation exceed the limits and backfill to such sections other than by direction of the Engineer shall be borne by the Contractor.

(c) Pipe bedding

The Contractor shall make pipe beds for pipelines as shown on the Drawings.

The bedding material shall be carefully placed on the bottom of the prepared trench, hand tapped and shaped to fit the lower portion of the pipe conduit barrel. Care shall be taken to ensure that the pipe will be uniformly supported on the bedding material.

(d) Pipe joints

Joints for pipe shall be steel welding pipe flange type for high water pressure more than 100 meter and screwed type for less than 100 meter.

In case of flange type, the flange material shall be conformed to the requirements of the standard for Steel Welding Pipe Flanges of JIS B2220.

The contractor shall furnish such flanges including packings, voults, etc. at necessary places shown on the drawings except for supply by JICA.

In case of screwed type steel pipe fittings, they shall be comformed to the requirement of the standard for JIS B 2302.

Joints shall construct the jointing in accordance with the manufacture's technical instruction. In making connections, dirt, moisture and oil shall be cleaned from pipe and fittings. After cleaning, all joint parts shall be painted with asphalt including flanges. Particular care shall be taken not to overstress threaded connections at joint.

(e) Pipe cutting

When cuts are necessary, they shall be perpendicular to the

axis of the pipe and smooth. Cut shall be made with tools in conformity with the pipe manufacture's recommendations.

(f) Appurtenant equipment

Such as gate valves and rappid air valves shall be installed in accordance with the Engineer's instruction.

(g) Protection device

Such as concrete thrust block or locking device shall be done in accordance with the Drawings.

(h) Running test

After comletion of pipe installation, running test shall be executed by the contractor and checked by the Engineer. When the Engineer will approve the result of running test as a satisfactory, the works may be regarded as completion. In case of no approval by the Engineer, the contractor shall repair or improve any part of detect in the construction by the order of the Engineer at the cost of the contractor. Above cost for running test shall be included in the item of GENERAL WORKS in the Bill of Quantities.

(i) LIST OF MATERIALS & EQUIPMENT SUPPLY BY JICA

(To Be Purchased in Japan)

Item / Description	Quantity
1. Pipeline & Related Facilities	
Bended Pipes	
SGP 65A, 2F, coated, less than 30°	11 nos.
" , ", " , 55°	1 no.
" , ", " , 85°	1 no.
SGP 65A, with socket, coated, less than 30°	12 nos.
SGP 50A, with socket, coated, less than 30°	21 nos.
SGP 50A, with socket, coated, more than 30°	5 nos.
STPG 50A, 2F, coated, less than 30°	32 nos.
" , " , " , more than 30°	6 nos.
Special Processed Tee	
STPG 50A, 3F, coated	1 no.
Valves	
Gate valve 50A, 20K, JIS B2083	7 nos.
Rapid Air Valve	
Ø 25, FC, 65A, with fitting pipe	2 nos.
Ø 25, FC, 50A, "	2 nos.
Ø 25, FCD, 50A, "	3 nos.
Ø 25, SCPH, 50A, "	2 nos.
Steel Expansion Flexible Joint	
Victoric joint S-1, Shoulder type Ø 40A	2 set
" , " Ø 50A	4 sets
" , " Ø 65A	2 set
2. Water Supply Facilities	
Stop valve Ø 50A, JIS B2062	1 no.

(j) LIST OF MATERIALS & EQUIPMENT SUPPLY BY JICA

(To Be Purchased in Indonesia)

Item / Description	Quantity
1. Pipeline Facilities	
Piping materials	
Long piece pipe (with accessories)	
SGP 65A, 2F, coated, L=6 m	45 pcs.
SGP 65A, socket, coated, L=6 m	44 pcs.
SGP 50A, Socket, coated, L=6 m	271 pcs.
STPG 50A, 2F, coated, L=6 m	298 pcs.
Short piece pipe (with accessories)	
SGP 65A, 2F, coated, L=2 m (mean length)	18 pcs.
SGP 65A, socket, coated, L=2 m (mean length)	10 pcs.
SGP 50A, socket, coated, L=2 m (")	40 pcs.
STPG 50A, 2F, coated, L=2 m (")	26 pcs.
Tee pipe	
FSGP 65x65x65, 3F, JIS B2311, with short piece pipe	1 nos.
FSGP 65x65x50, 3F, JIS B2311, "	2 nos.
FSGP 50x50x50, 3F, JIS B2311, "	3 nos.
STPG 50x50x50, 3F, JIS B2312, "	5 nos
2. Inland Transportation	
Materials for Pipeline Facilities	1 L.S.

PART 9 COW SHED

9-01 SCOPE

In accordance with the Specifications and as shown on the drawings or otherwise directed by the Engineer, the Contractor shall furnish labor, equipment and materials and perform all operations in connection with the construction of buildings, including earthworks, grading of the houses foundation, concrete works, construction of column, walls, roof, windows, doors, finishings, electrical facilities, water supply facilities and other related works and facilities.

9-02 MATERIALS

All materials used in the building works shall be subject to the Engineer's approval. The Contractor shall submit the Engineer, samples of said materials prior to commencement of relative works for his approval.

9-03 BRICK WORK

Local products can be used and all bricks shall be laid after applying mortar. Mortar shall be prepared in the same way as for plastering. It shall be applied firmly to raked out and well wetted joints with a pointing trowel and well pressed in. All superfluous mortar shall be removed with a trowel.

External surfaces shall be finished with weather struck pointing and internal surfaces given flush pointing.

9-04 CARPENTRY

(a) The work under this paragraph consists of all carpentry works as shown in the drawings.

(b) Local timber can be used. All timber shall be sufficiently seasoned and planned smooth, straight true and free from cracks, cuts, breaks, loose or dead knots, borehole, and any other defect. Metal fittings suitable to local timbers shall be used.
As to the floor material, camphor wood shall be used.

(c) All frameworks shall be jointed by optimum jointing methods. Joints shall transmit required loads and withstand stresses, to which they will be subjected and shall be approved by the Engineer. Unless otherwise stated, all joints shall be fixed with as many nails of a proper type as required.

For columns, studs, beams, binders, joists, rafters, and purlins, one piece of timber extended between the supports or the base on which it is to be fitted shall be used. However, when inevitably it is necessary to joint at an intermediate position, such a method that has been approved to cause no hindrance in structure shall be employed.

9-05 ROOFING

Local asbestos sheets can be used and the construction method shall conform to Indonesian specifications.

Wooden door and window work --- Wood fittings shown in drwings shallbe manufactured in Indonesia by local timber.

Articles of builders hardware shall be of approved type and well finished. Samples shall be submitted to the Engineer for approval before use. Screws shall be of the same metal as the main article.

All articles shall be fixed in a secure and efficient manner. Articles damaged during fixing shall be removed and new fixed at Contractor's expense. Surface of joinery where effected shall be made good.

Glass shall be 3 millimeters sheet glass of good quality, free from specks, bubbles, air holes and other defects. Sheet glass shall be plain, clear. The glass panes shall be fixed either with wood beads or shall be bedded in oil putty, sprigged, firmly back puttied finished to a chamfer. Rabbetes shall be painted one coat of oil paint before glazing. Each pane shall be whole square.

9-06 PAINTING

Painting shall not be carried out to exterior surfaces in wet weather. All surfaces must be thoroughly dry before applying paint. Painting shall not be carried out in windy weather as the paint is likely to be damaged by dust.

Contents of drums or tins shall be stirred well before using. When more than one coat is required to be done, each coat shall vary slightly in shade and shall be passed by the Engineer before the next coat is started. First coat should be thoroughly dry before the second coat is applied.

All brushes, tools, pots, etc. used in carrying out the work shall be clean and free from foreign matter and shall be thoroughly cleaned out before being used for different type of material. Paint shall be applied with proper paint brushes of good quality.

In using proprietary brands of paint, the materials shall be mixed, prepared and applied strictly in accordance with manufacturer's instructions.

9-07 ELECTRICAL AND WATER SUPPLY WORKS

All electrical works and water supply works shall be as shown on the drawings and Indonesian standard specifications or directed by the Engineer.

PART 10 OTHER RELATED FACILITIES

10-01 GENERAL

The construction of model infrastructure improvement works include, under this contract, construction works for apprutenant structure, besides main pipeline and cow shed facility such as improvement works of intake, existing water tanks, farm road and operation road, and constructio of slurry tanks, water supply pipe, feed pipe, inlet tank, slow filter, distributing tank, water valves, fencing works, waterproofing, drainage culvert, etc.

The majority of the apprutenant structures shall be either stone masonry structure or concrete structure or road structure, which shall be constructed by means of either the combination of earth work and stone masonry work or that of earth work and concrete, asphalt work, pipe work.

From the view-point stated above, the specification contained in this part describes mainly special conditions for each work.

10-02 INTAKE FACILITIES

The improvement works of intake facilities comprise as follows:

1. Improvement of the foot protection and apron of existing masonry weir with masonry concrete
2. Installation of screen with steel bars
3. Protection of the intake pipe with masonry concrete
4. Ground levelling works for the treatement place of driftwoods
5. Installation of gate valves

   ϕ100, JIS B 2031, 1 pce, for main pipe

   ϕ 65, JIS B 2031, 1 pce, for main pipe

   ϕ 65, JIS B 2031, 1 pce, for drain pipe of settling box

   Above valves and related short piece of steel pipes shall be furnished by the Contractor.

6. Improvement of settling box including mortar plastering work by water proof mortar, construction of valve boxes with steel cover
7. Installation of drain pipe, VP ϕ 100
8. Removal works for existing pipes at the place of inlet, outlet, drain in the settling box

10-03 PIPELINE FACILITIES

Pipes, high pressure valves and air valves shall be supplied by JICA as shown in PART 9 for main pipeline from the beginning point (No 0 + 14.99) to the inlet box (NO 42 + 30).

The Contractor shall price required temporary facilities for pipe installation works including road maintenance in the item of GENERAL WORKS in the Bill of Quantities.

If there is a shortage of main pipes supplied by JICA, the Contractor shall furnish that parts by the direction of the Engineer.

Gate valves except for high pressure valve (7 pieces) and air valves (9 pieces) shall be furnished by the Contractor.

This pipe line works comprise as follows :

1. Installation of main pipe (ϕ65, ϕ50) including concrete anchor and steel support
2. Installation of blow off valves, gate valves and rappid air valves
3. Installation of drain pipe, VP ϕ65
4. Construction of inspection road with gravel metaling
5. Improvement of 1st water tanks including fence work
6. Removal works for existing pipes at the place of 1st tank
7. Others

10-04 WATER SUPPLY FACILITIES

For the purpose of the improvement of water supply system in the A.I center, the following works shall be executed.

A submarged gate valve itself shall be supplied by the JICA, therefore other all required materials as shown on the drawings shall be furnished by the Contractor.

As to the water supply pipe, all parts shall be newly installed, however feed pipe shall be installed up to the outside of houses and buildings.

As to the water supply pipe for goat feeding facilities, a part of existing water pipe can be used as shown on the drawings.

This improvement and construction works comprise as follws:

1. Construction of inlet tank, filter and distributing tank and related structures including washing structure for filter materials and fence work.
2. Installation of water supply pipe
3. Installation of feed pipe including PVC pipe
4. Improvement of 2nd water tank
5. Improvement of inspection road with asphalt metaling specified by the drawing at the place from 2nd water tank to new inlet tank
6. Other

As to the slow filter materials, the thickness of sand layer and the quality shall be specified as follows:

1. The thickness of sand layer shall be 80 cm.
2. The quality of filter material shall be specified by the standard of water supply services in Indonesia or JWWA A103-1967, Testing method of sand filter for water supply services in Japan.

3. Sand filter shall consist of hard, tough, durable, uncoated particles including much quartz material.

4. The effective grain size shall be 0.3 to 0.45 mm.

5. The uniformity coefficient shall be less than 2.0.

6. Washing turbidity shall be less than 30.

7. Specific gravity shall be 2.55 to 2.65.

8. Maximum grain size shall be 2.0 mm.

The thickness of gravel layer and gravel filter shall be specified as follows:

1. The thickness of gravel shall be 50 cm.

2. The gravel filter with the maximum grain size 60 mm and minimum grain size 3 mm shall be separated into four (4) layers using screen or sleves.

3. Coarse material shall be spread in lower layer and fine material in upper layer in good sequence.

4. The thickness and mean grain size are shown as follows:

Surface layer	:	ϕ 3 ∿ 4 mm : 10 cm
2nd layer	:	ϕ 10 ∿ 20 mm : 10 cm
3rd layer	:	ϕ 20 ∿ 30 mm : 15 cm
Bottom layer	:	ϕ 60 mm : 15 cm

As to the porous brick specified on the drawing, they can be changed to the concrete block with holes by the approval of the Engineer, however the cost for this item shall not be changed.

10-05 COW SHED FACILITIES

All of this facilities are newly constructed at the lower place of A.I Center as shown on the drawings. The major works comprise as follows.

1. Construction of cow shed
2. Construction of trainning shed
3. Ground levelling works
4. Electric fence and wooden fence including entrances
5. Approaching road with gravel metaling for tractor
6. Water supply and electric service works
7. Other

10-06 SLURRY STORE

Three slurry stores shall be newly constructed near existing two bull sheds and new cow shed.

The structures are specified on the drawings.

10-07 FARM ROAD

Improvement of farm road is consists of new construction parts and improvement parts. The contractor shall execute the work to the lines and grades given by the drawings and/or the Engineer including gravel metaling,sodding, culvert, under drain pipe and entrance road to each pasture field.

10-08 OTHER RELATED FACILITIES

Two drinking facilities shall be furnished under this contract. One is used for farmer and the other for bulles in paddock. The structure is specified on the drawings.

第 6 章　添 付 図 面

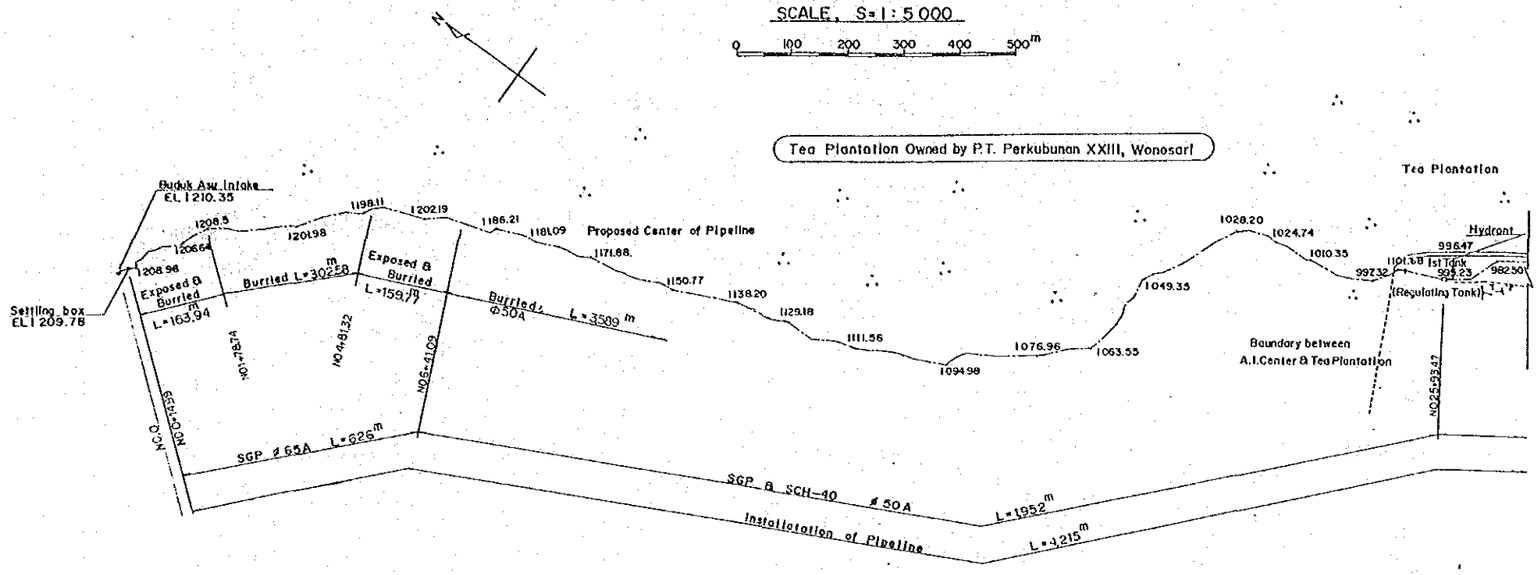
DRAWING LIST

No.	TITLE OF DRAWING
1	GENERAL PLAN
	PIPELINE FACILILIES AND RELATED STRUCTURES.
2	PLAN & PROFILE ,INSTALLATION OF PIPELINE 1/4
3	— ditto — 2/4
4	— ditto — 3/4
5	— ditto — 4/4
6	PLAN OF IMPROVEMENT OF INTAKE,SETTLING BOX & REGULATING TANK.
7	PIPE SUPPORT ,BLOW OFF PIT,AIR VALVE PIT & IMPROVEMENT OF 2nd TANK
8	INSTALLATION SCHEDULE FOR PIPELINE 1/2
9	— ditto — 2/2
	IMPROVEMENT OF WATER SUPPLY FACILITIES
10	INLET TANK
11	BAR SCHEDULE OF INLET TANK
12	FILTER TANK
13	BAR SCEDULE OF FILTER TANK
14	DISTRIBUTING TANK
15	BAR SCHEDULE OF DISTRIBUTING TANK
16	SAND WASHING PLACE AND MISCELLANEOUS
17	PLAN OF PIPE ARRANGEMENT FOR WATER SUPPLY AT. A.I. CENTER
18	HYDRAULIC PROFILE OF WATER SUPPLY FACILITIES 1/2
19	— ditto — 2/2
20	DIAGRAM OF PROPOSED PIPE ARRANGEMENT IN A.I. CENTER
	CONSTRUCTION OF COW SHED FACILITIES
21	ARRANGEMENT OF CATTLE SHED FACILITIES
22	COW SHED FACILITIES 1/3 (GENERAL PLAN,DETAIL OF COW SHED)
23	— ditto — 2/3 (SECTION DETAIL OF COW SHED,DETAIL OF FENCE)
24	— ditto — 3/3 (DETAIL OF TRAINING SHED)
	CONSTRUCTION OF SLURRY STORE
25	SLURRY STORE FOR BULL SHED TYPE-I
26	— ditto — TYPE-II
27	SLURRY STORE FOR COW SHED & DRINKING FACILITY FOR PADDOCK
	IMPROVEMENT OF FARM ROAD
28	PLAN OF IMPROVEMENT OF FARM ROAD AND INSPECTION ROAD TO INLET TANK
29	DRAINAGE CULVERT CROSSING FARM ROAD TYPE-A
30	OUTLINE OF VALVE ARRANGEMENT

GENERAL PLAN
OF
THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

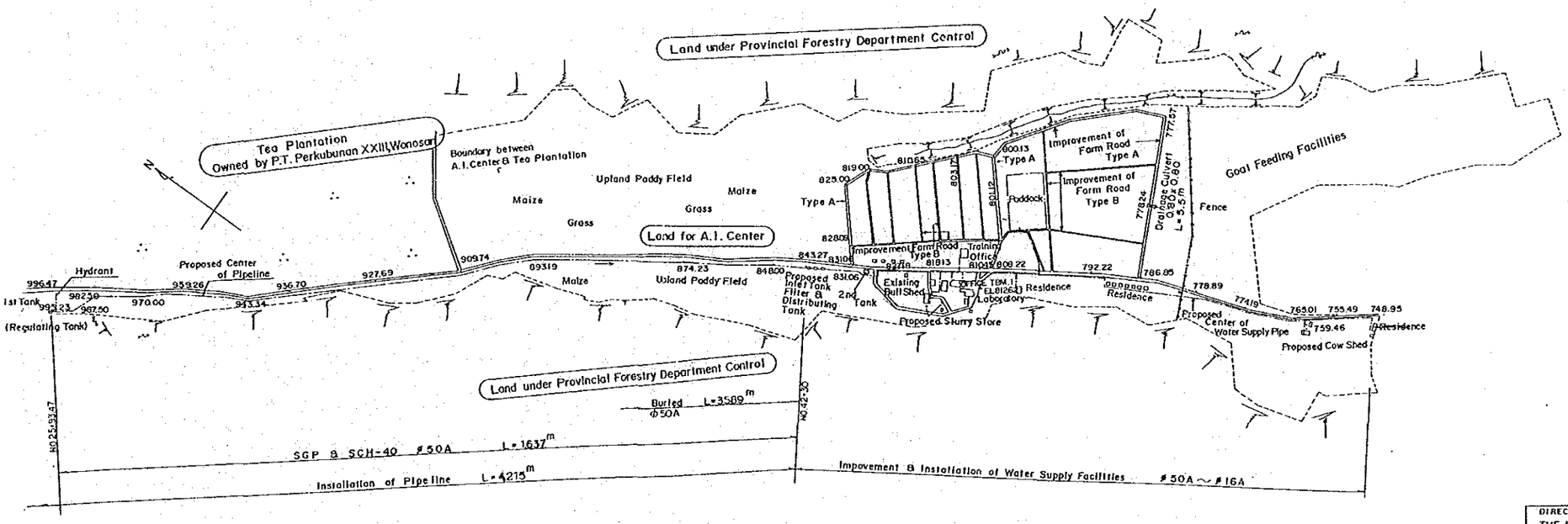
SCALE, S=1:5000

0 100 200 300 400 500m



THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHNING OF ARTIFICIAL INSEMINATION CENTER PROJECT

1. IMPROVEMENT OF INTAKE, PIPELINE & RELATED STRUCTURES	
1. Improvement of intake	1 place
2. Improvement of settling box	1 place
2. IMPROVEMENT OF PIPELINE FACILITIES	
1. Installation of pipeline	4.2 km
2. Improvement of related structures	1 L.S.
3. IMPROVEMENT OF WATER SUPPLY FACILITIES	
1. Inlet, filter and distributing tanks	3 tanks
2. Installation of water supply pipes	2.0 km
3. Installation of feed pipes	1.0 km
4. Improvement of related structures	1 L.S.
4. CONSTRUCTION OF COW SHED FACILITIES	
1. Cow shed and Training shed	2 houses
2. Related structures	1 L.S.
5. CONSTRUCTION OF SLURRY STORE	
1. Slurry store	3 tanks
2. Drain structures	122m
6. IMPROVEMENT OF FARM ROAD	
1. Farm road Type A B=3.5m	1.5 km
2. Farm road Type B B=3.0m	2.3 km
7. OTHER RELATED FACILITIES	
1. Drinking structure on the lower place of 1st regulating tank	1 place
2. Drinking structure at paddock	1 place



DIRECTORATE GENERAL OF LIVESTOCK SERVICES THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT	
TITLE OF DRAWING GENERAL PLAN	
JAPAN INTERNATIONAL COOPERATION AGENCY TOKYO	DWG. NO 1

Buduk Asu Intake Qmax=30 l/s

B.P. of Pipe line, End of Settling Box No.0+14.99

#65A L= 626.29

B.O.(1st) NO.4+60.67 (IP.19)

AV.(1st) #25 FC NO.4+90.32 (IP.21)

AV.(2nd) No.6+40.00 #25 FC

#65A —— #50A NO.6+41.09

#50A L=1942.38

Exposed & Burried L=163.94m SGP #65A·2F

Burried L=302.58m SGP #65A

Exposed & Burried L=159.77m SGP #65A·2F

Buduk Asu Intake Qmax=30 l/s
EL.1210.16

B.P. of Pipe line, End of Settling Box No.0+14.99
EL.1209.78

Gate Valve #100A ×2
" #65A ×1

B.O.(1st) NO.4+60.67 (IP.19)
Gate Valve #65A ×2

AV.(1st) #25A FC NO.4+98.32 (IP.21)

AV.(2nd) #25A FC NO.6+40.00

#65A —— #50A NO.6+41.09

Exposed & Burried L=163.94m

Burried L=302.58m

Exposed & Burried L=159.77m

ORIGINAL GROUND

PIPE CENTER

EQ @ 0.190m

1/300

1/2000

1250.00

1200.00

1150.00

1100.00

I=0.02148 L=219.74m

I=0.03476 L=226.13m

I=0.02047 L=141.68m

I=0.19830 L=55.97m

I=0.07370 L=61.13m

I=0.08972 L=102.65m

I=0.12564 L=93.35m

I=0.04591 L=131.150m

I=0.12976 L=31.90m

I=0.17215 L=30.09m

I=0.10219 L=118.8m

SGP #65A Flange L=163.94m

SGP. #65A L=302.58m

SGP #65A Flange L=159.77m

SGP. #50A L=758.28m

Slope

Pipe

Pipe Center

Ground Height

Accumulate Distance

Distance

Station

Curve

BP, 0+14.99, IP.1, IP.2, IP.3, IP.4, IP.5, IP.6, NO.1, IP.7, IP.8, IP.9, IP.10, NO.2, IP.11, IP.12, IP.13, NO.3, IP.14, IP.15, IP.16, NO.4, IP.17, IP.18, IP.19, IP.20, IP.21, NO.5, IP.22, IP.23, NO.6, IP.24, +40.00, IP.25, IP.26, NO.7, IP.27, IP.28, IP.29, NO.8, IP.30, IP.31, IP.32, NO.9, IP.33, IP.34, NO.10, IP.35, IP.36, NO.11, IP.37

85°8'66"
51°2'35"
2°59'40"
22°54'10"
16°26'35"
23°31'30"
10°19'10"
27°44'30"
14°20'30"
23°22'30"
12°43'40"
14°8'0"
7°44'20"
7°13'50"
17°31'10"
7°38'30"
21°19'10"
14°28'50"
20°30'40"
18°20'0"
25°15'20"
1°20'40"
24°16'20"
22°56'20"
3°49'10"
54°48'20"
47°1'30"
11°11'50"
10°36'30"
11°23'30"
13°36'20"
11°23'30"
4°36'40"
13°24'20"
16°42'20"
14°0'0"
13°30'0"

TYPICAL SECTION

S=1:10

B=1.500
604.9(724.9)
CRUSHED STONE t=100
SAND
SGP 65A
SGP.STPG 50A
1:0.3
300
506.2(708.2)
438.2(638.2)
400(600)
31.9
76.3
500.3(730.3)
430.3(630.3)
400(600)
398.5
70

PIPE SUPPORT

S=1:40

※ SHALL INSTALL EVERY THREE (3) METERS

#65A
H=500~2000
L-80×40×2.3
40×40×3.2
500
250
350 500 150
1000
300
800
450 250
400

EXCAVATION

(TYPICAL SECTION)
TO BE APPLIED FROM BP TO IP 25.

Sodding
Existing Slope, nearly 1:1
1:0.3
H=3.000
2.000

DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

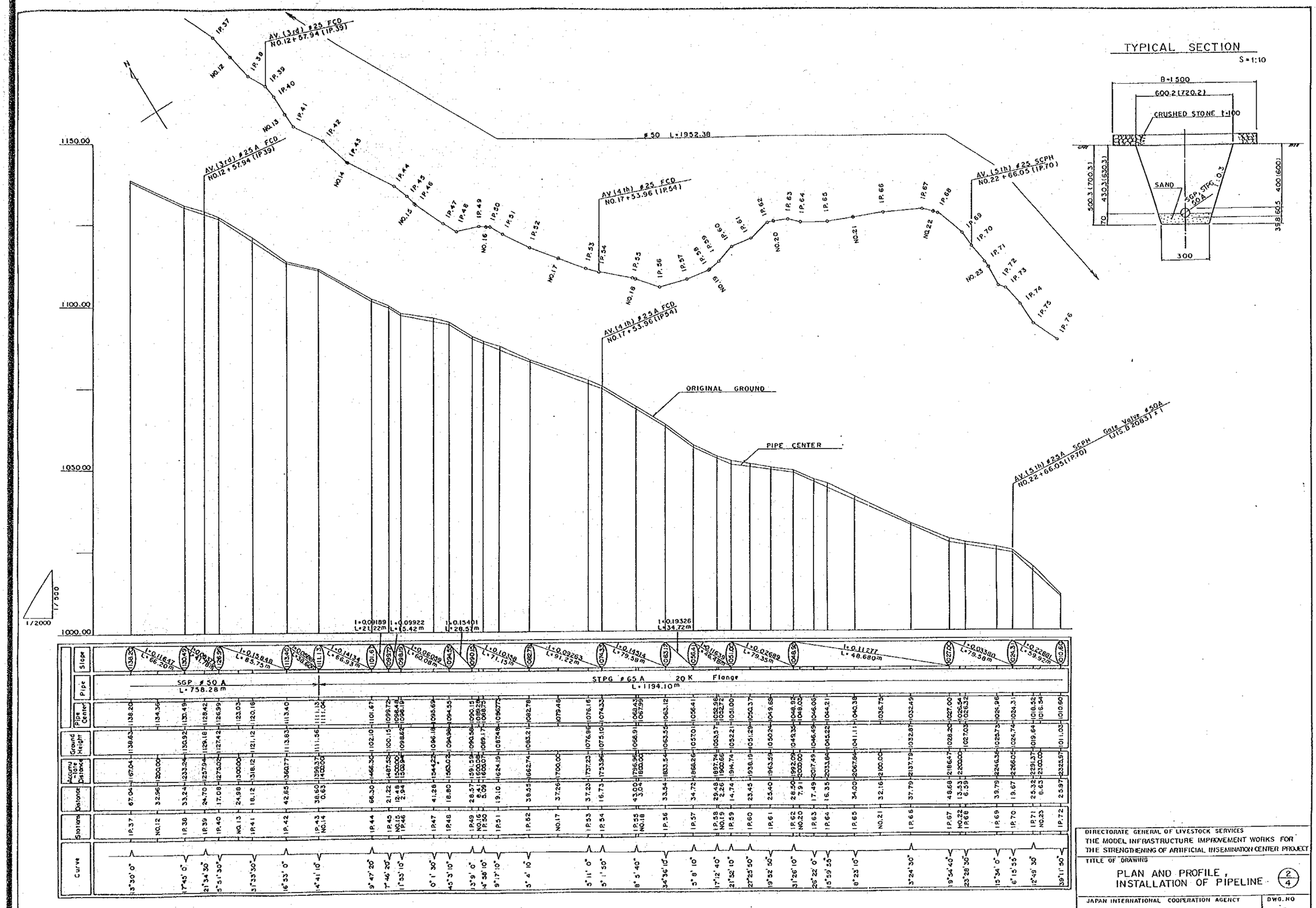
TITLE OF DRAWING

PLAN AND PROFILE, INSTALLATION OF PIPELINE

(1/4)

JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO 2



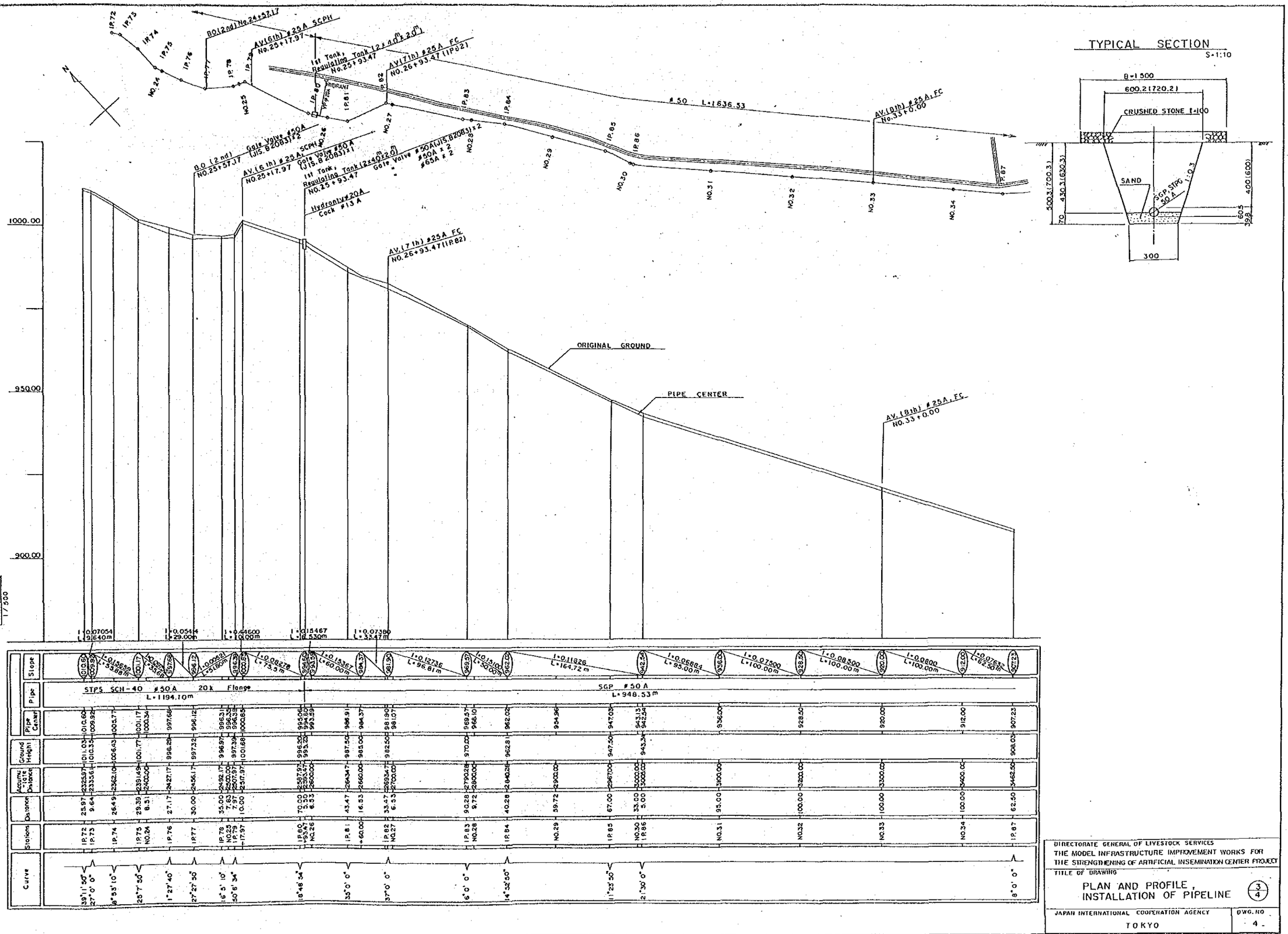
DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING

PLAN AND PROFILE, INSTALLATION OF PIPELINE (2/4)

JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO 3.



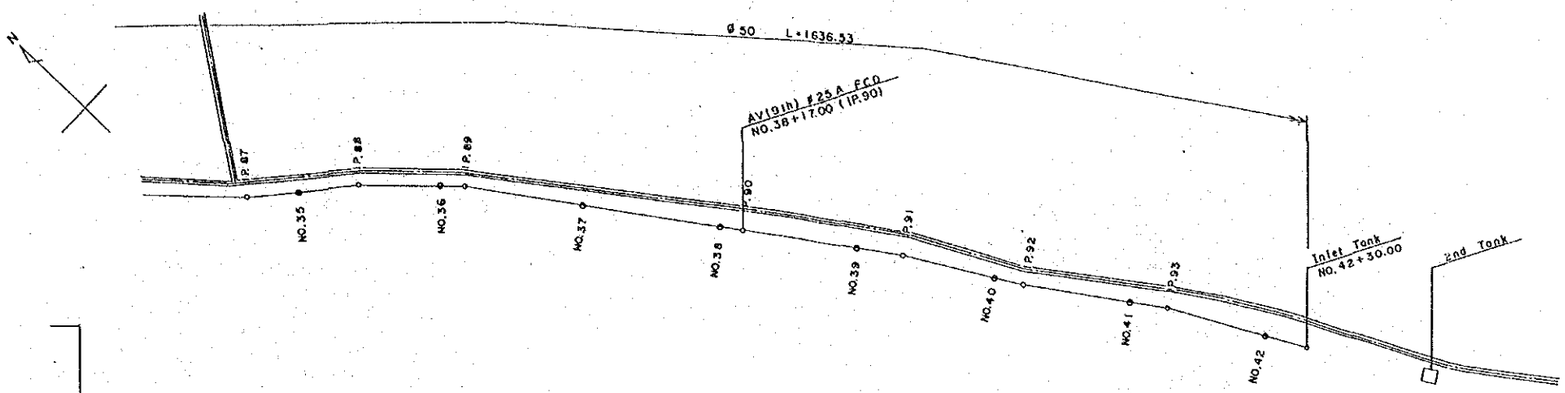
DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING

PLAN AND PROFILE, INSTALLATION OF PIPELINE (3/4)

JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO. 4.



TYPICAL SECTION

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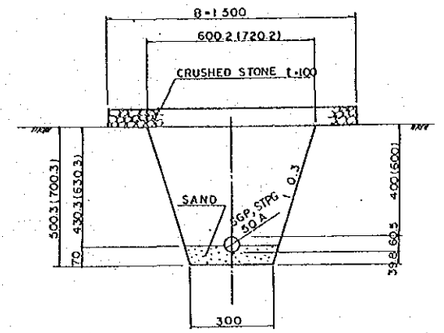
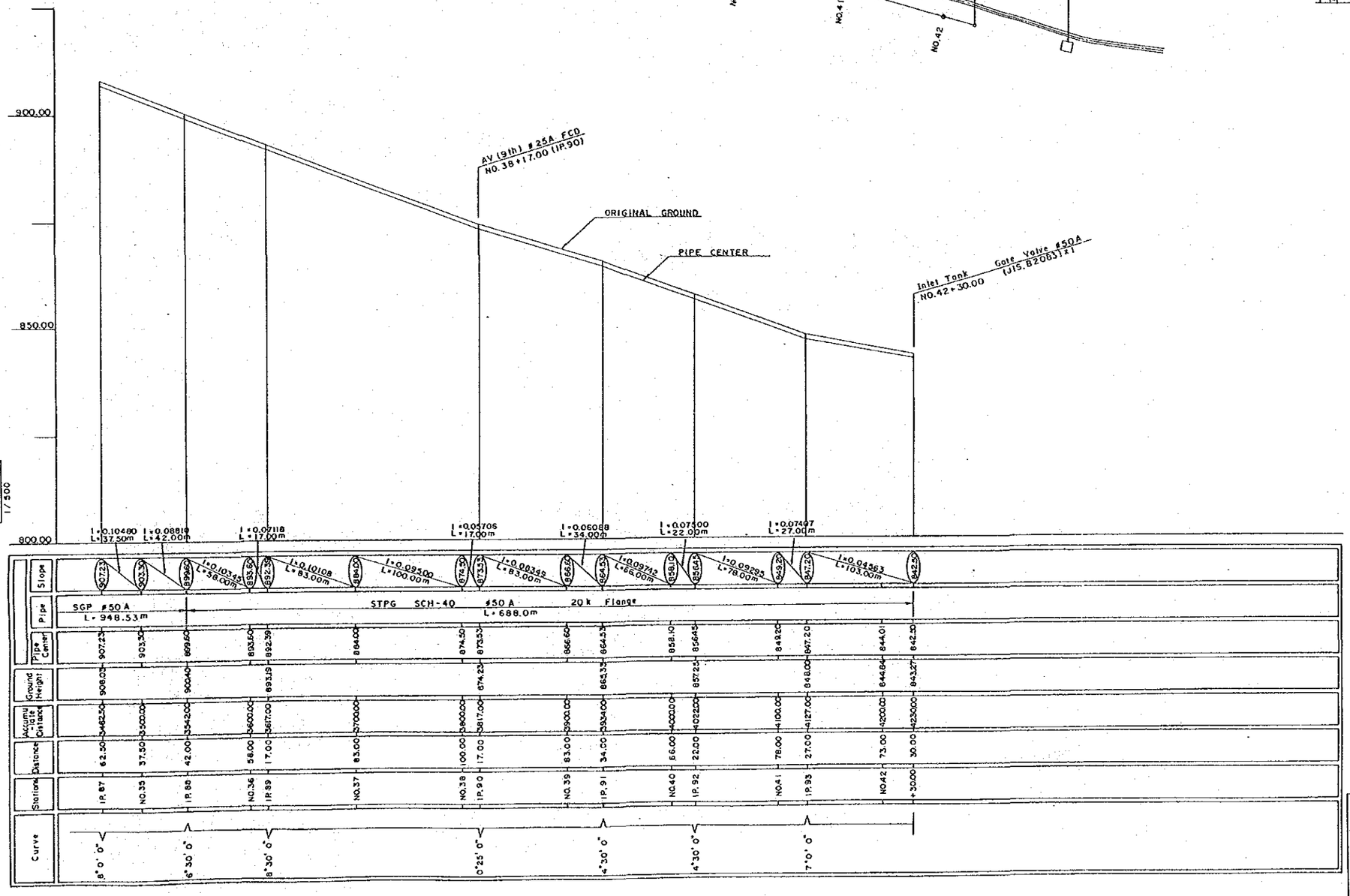
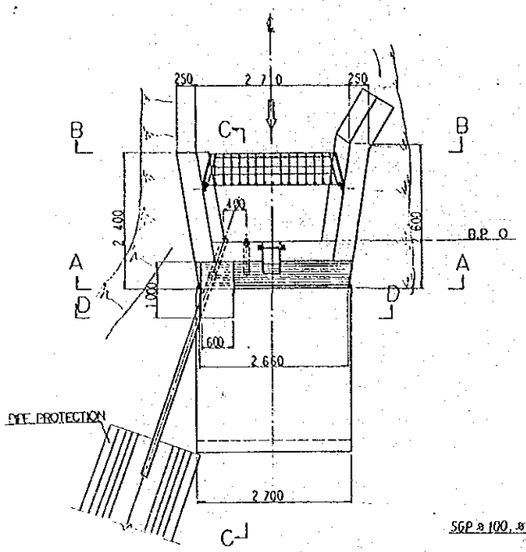




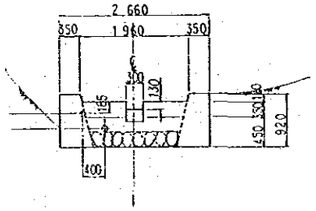
DIRECTORATE GENERAL OF LIVESTOCK SERVICES THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT	
TITLE OF DRAWING PLAN AND PROFILE, INSTALLATION OF PIPELINE (4/4)	
JAPAN INTERNATIONAL COOPERATION AGENCY TOKYO	DWG. NO 5

INTAKE

S=1:50



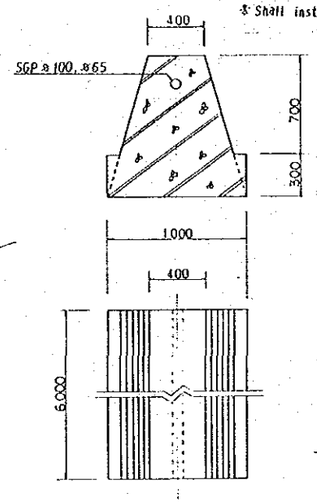
SECTION A - A



PIPE PROTECTION

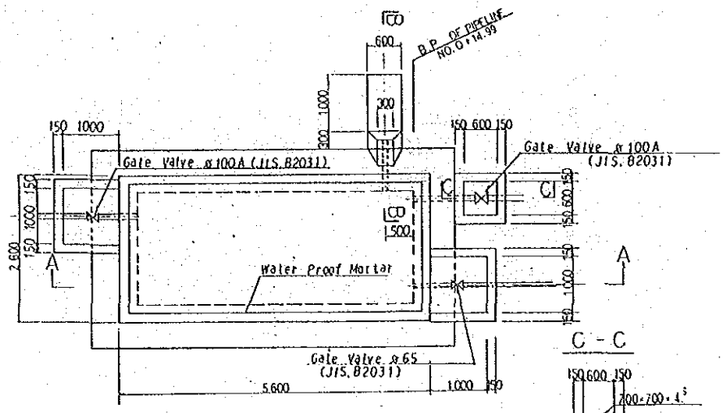
S=1:20

※ Shall install two(2) places

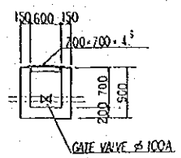


SETTLING BOX

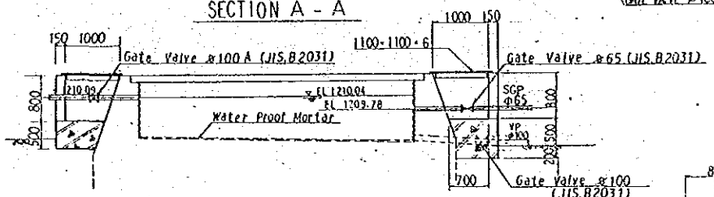
S=1:50

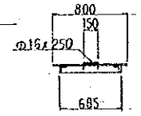


C - C

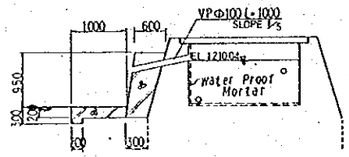


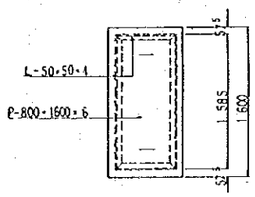
SECTION A - A





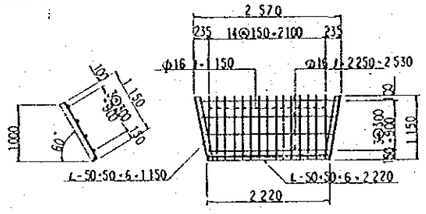
SECTION B - B

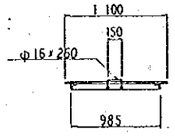


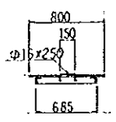


DETAIL OF SCREEN

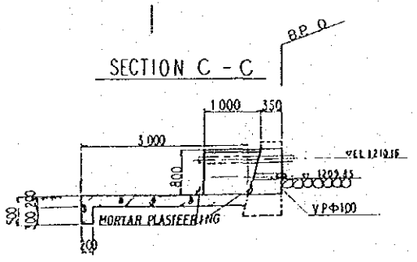
S=1:50



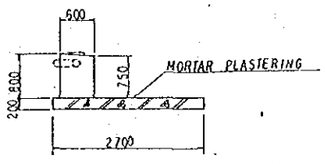


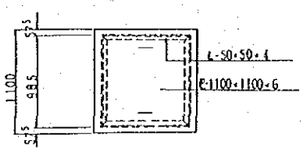


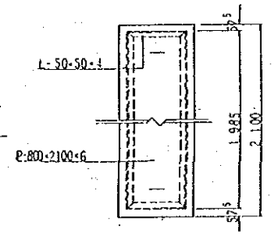
SECTION C - C



SECTION D - D



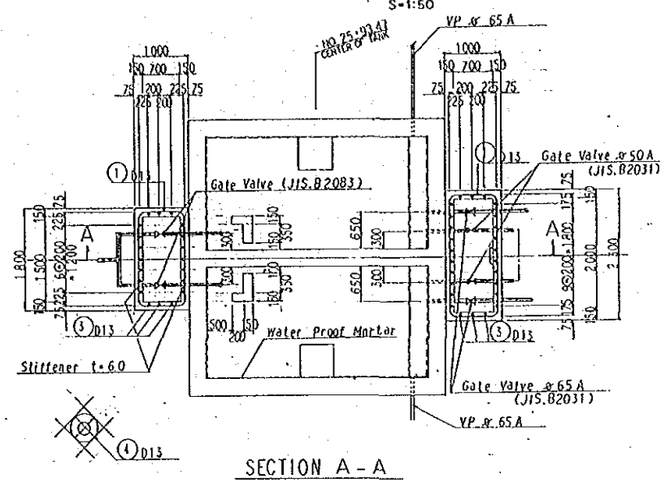




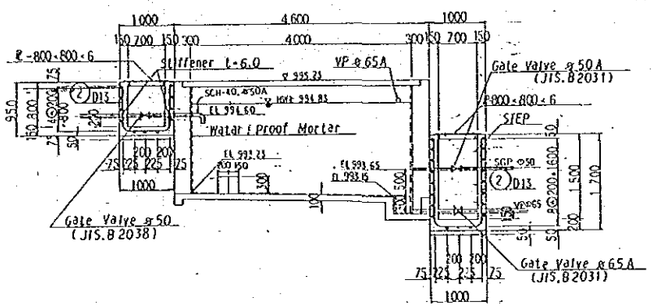
REGULATING TANK

S=1:50

※ SHALL INSTALL 32.0M FENCE.

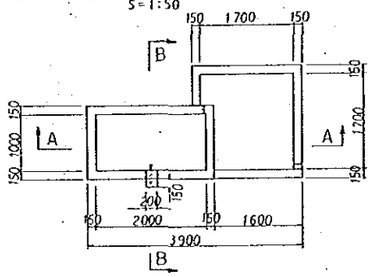


SECTION A - A

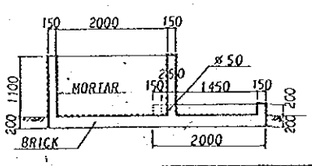


HYDRANT

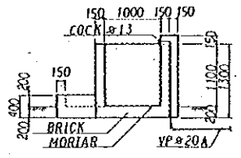
S=1:50



SECTION A - A



SECTION B - B



DIRECTORATE GENERAL OF LIVESTOCK SERVICES

THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING

PLAN OF IMPROVEMENT OF INTAKE, SETTLING BOX AND REGULATING TANK

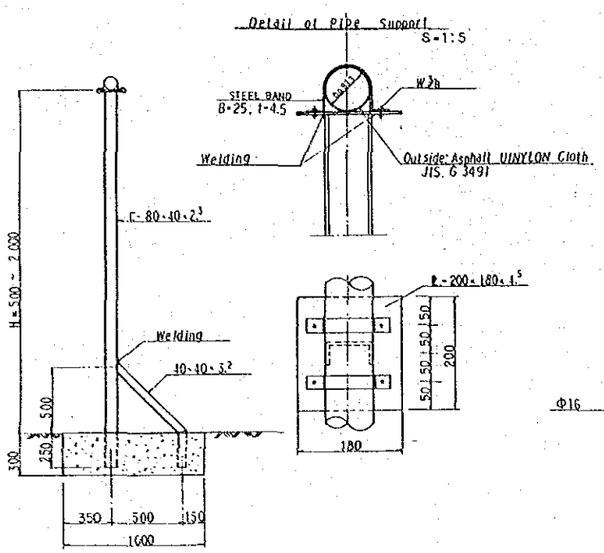
JAPAN INTERNATIONAL COOPERATION AGENCY TOKYO

DWG. NO 6.

PIPE SUPPORT

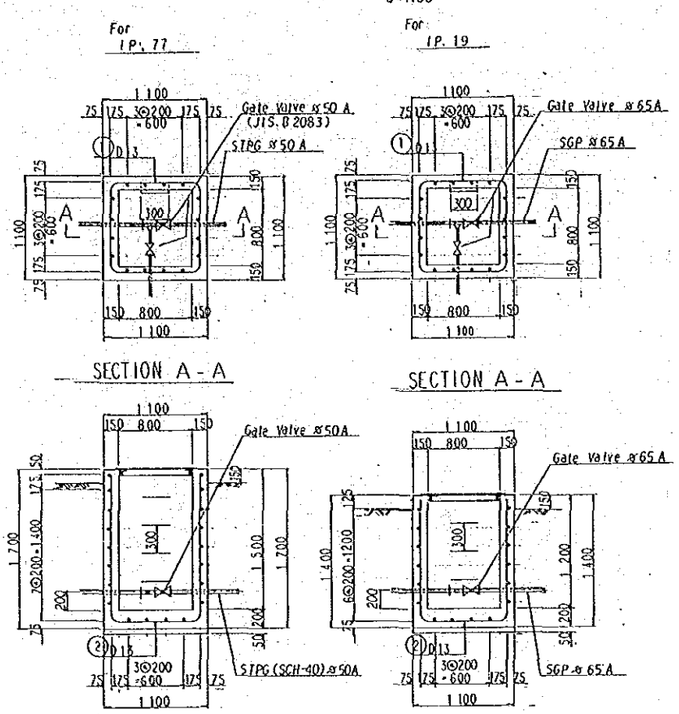
S=1:20

* SHALL INSTALL EVERY THREE(3) METERS

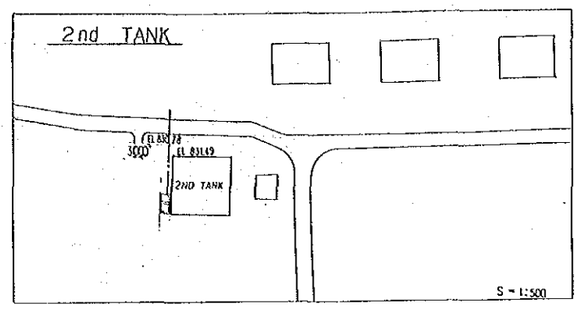


BLOW OFF PIT

S=1:30

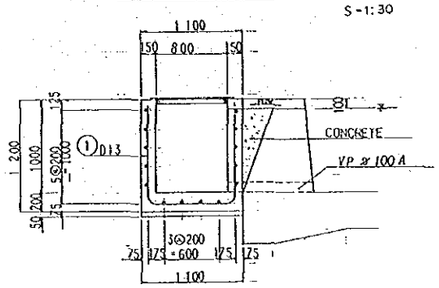


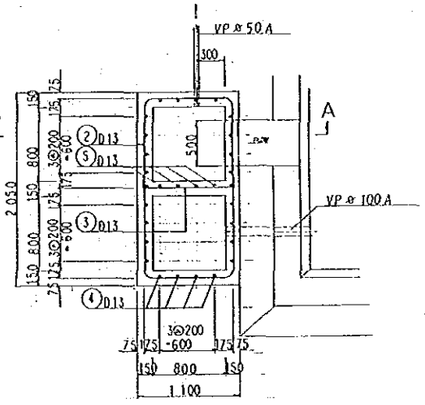
2nd TANK



SECTION A-A

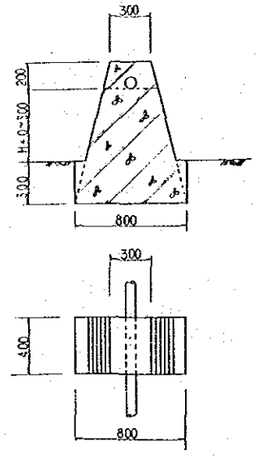
S=1:30

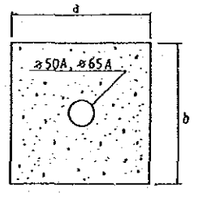




ANCHOR BLOCK

NO Scale

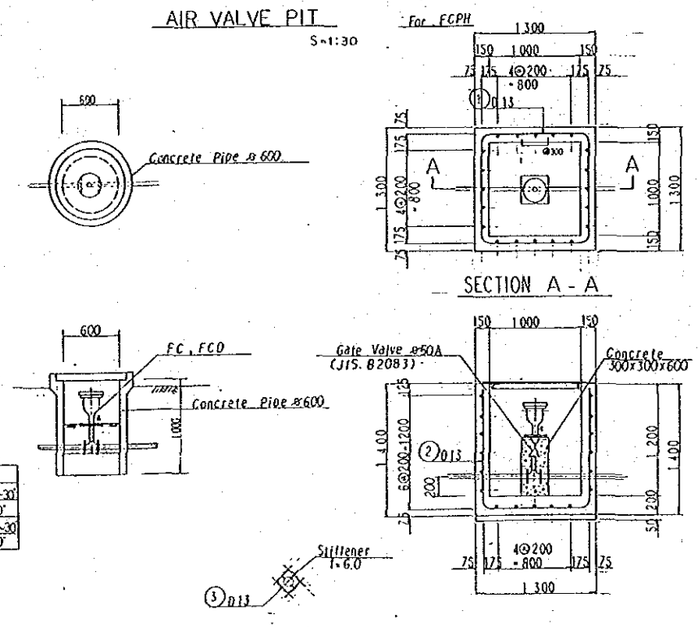


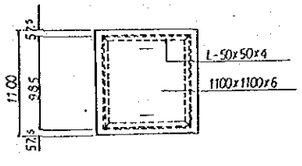


	a	b	L	PLACE	NOTE
Type - I	300	300	500	20	H≤100, θ=15'~30'
〃 - II	300	300	1 000	7	〃 θ≥30'
〃 - III	400	400	1 000	15	H>100, θ=15'~30'
〃 - IV	400	400	1 500	5	〃 θ≥30'

AIR VALVE PIT

S=1:30





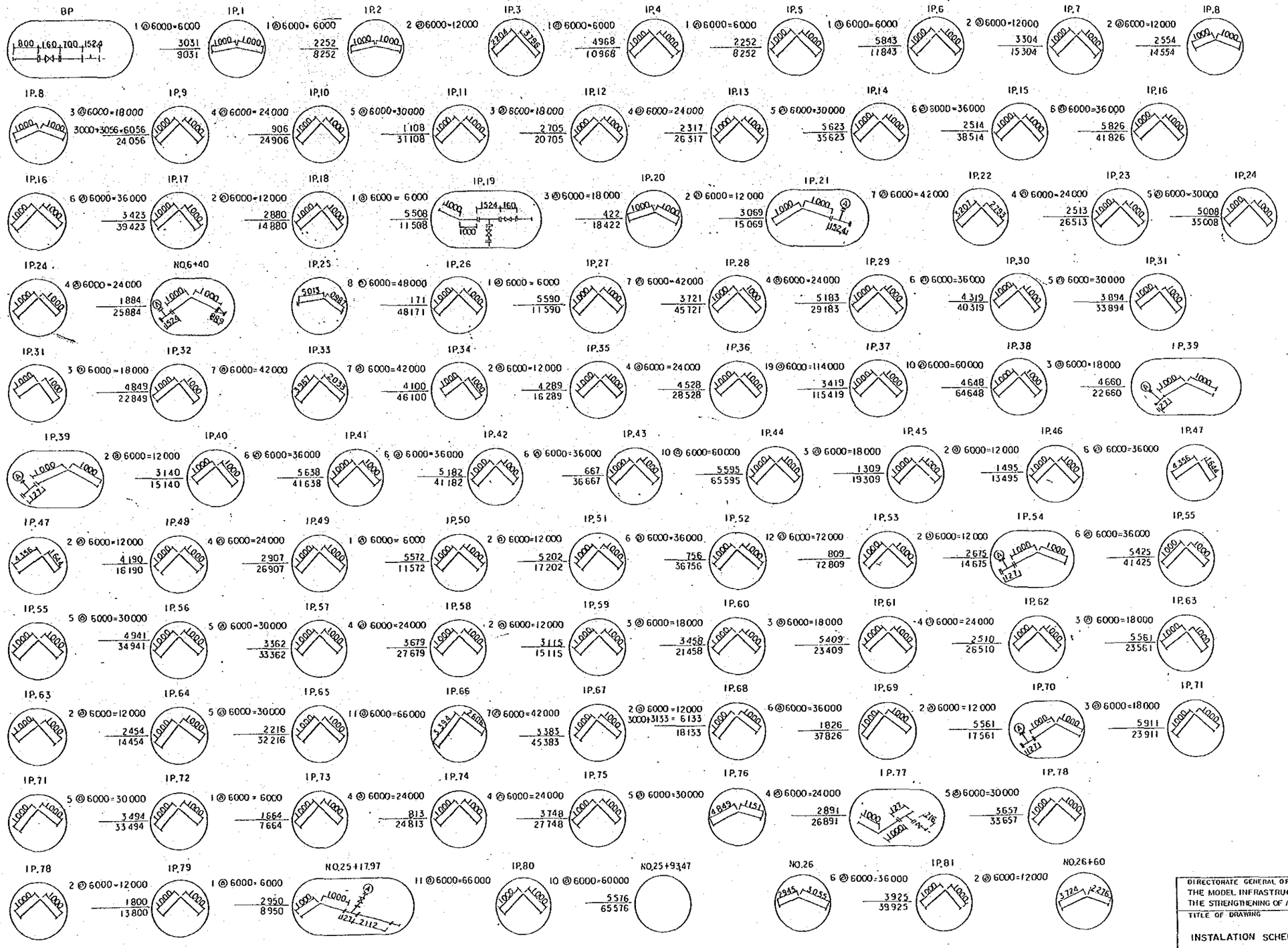
DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING

PIPE SUPPORT, BLOW OFF PIT, AIR VALVE PIT AND IMPROVEMENT OF 2nd TANK

JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO 7



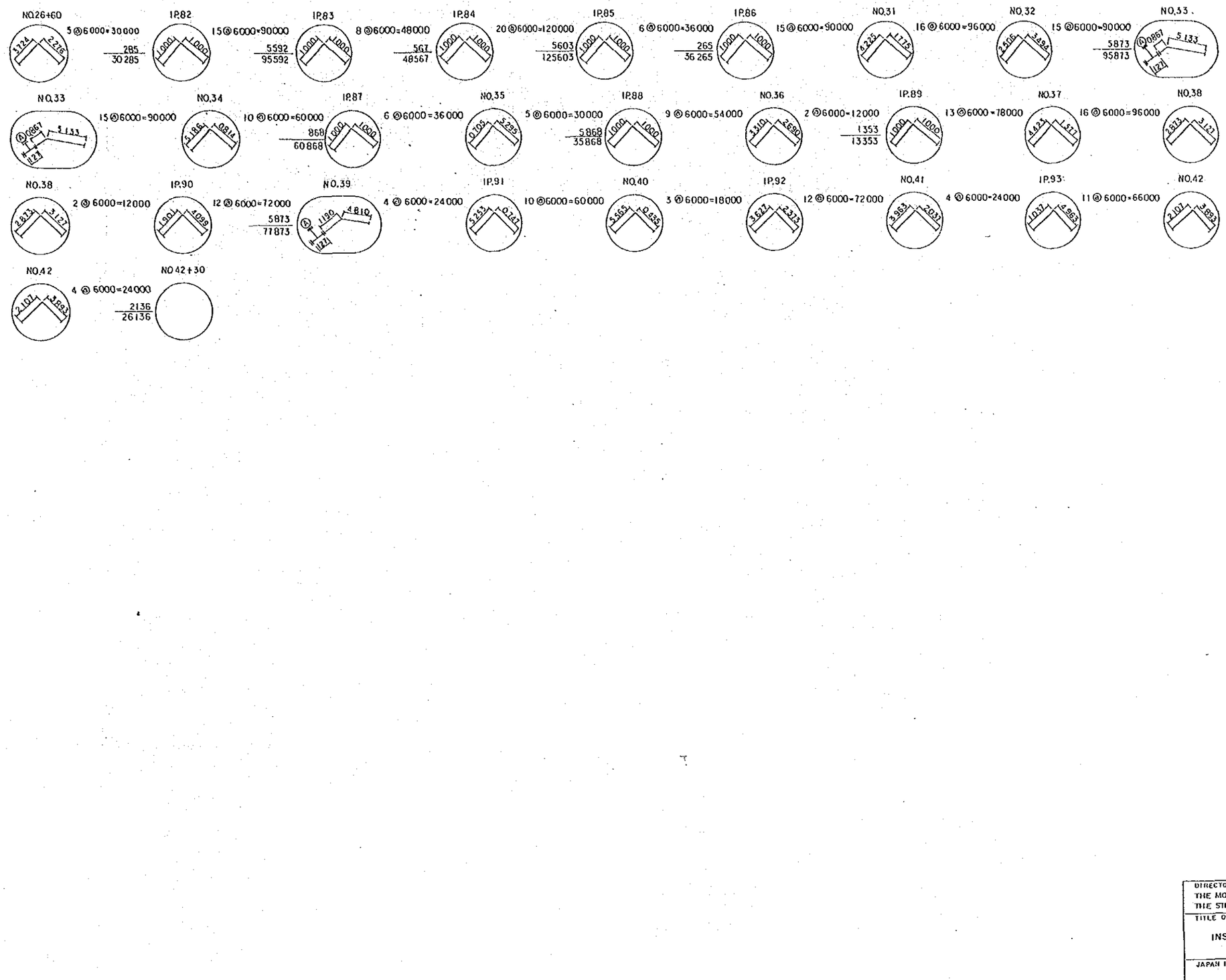
DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR
THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING

INSTALATION SCHEDULE FOR PIPELINE

JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO
8



DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

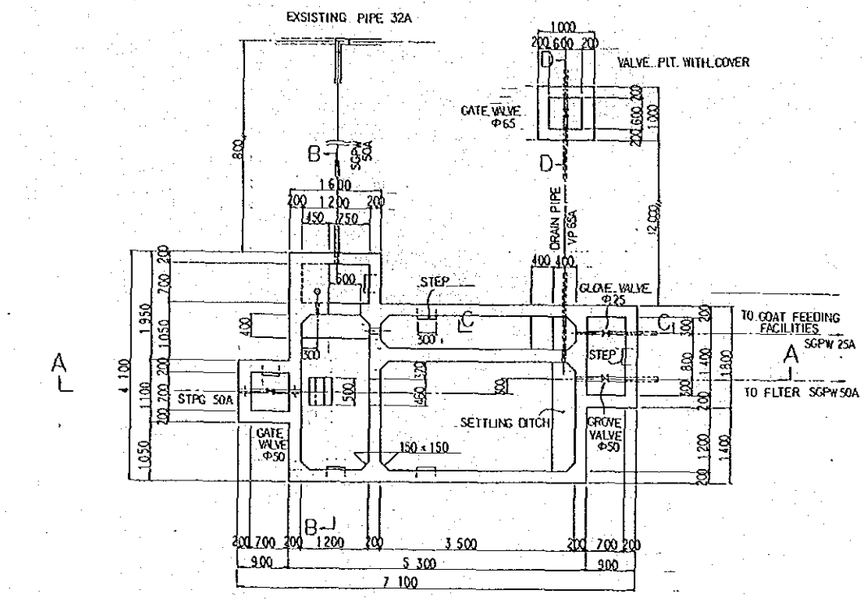
TITLE OF DRAWING

INSTALATION SCHEDULE FOR PIPELINE

JAPAN INTERNATIONAL COOPERATION AGENCY	DWG. NO
TOKYO	9

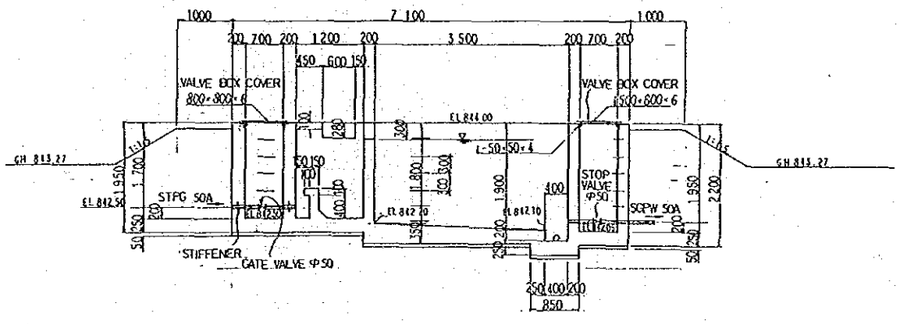
PLAN

S=1:50



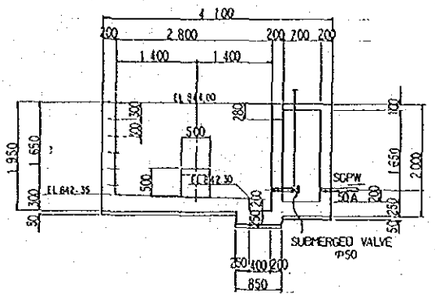
SECTION A - A

S=1:50



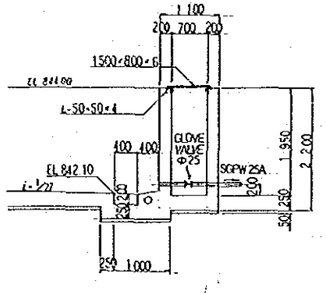
SECTION B - B

S=1:50



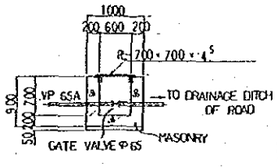
SECTION C - C

S=1:50



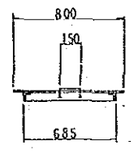
SECTION D - D

S=1:50



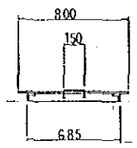
DETAIL OF VALVE BOX COVER

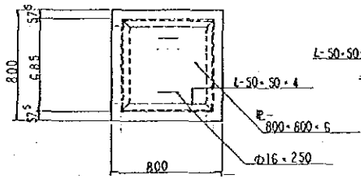
S=1:20

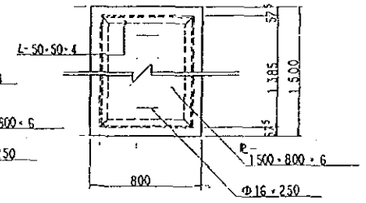


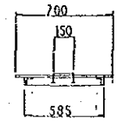
DETAIL OF VALVE BOX COVER

S=1:20



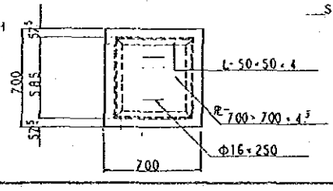


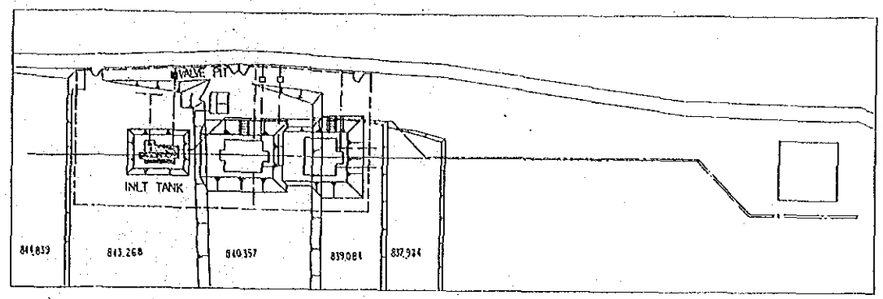




DETAIL OF VALVE PIT COVER

S=1:20





DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING

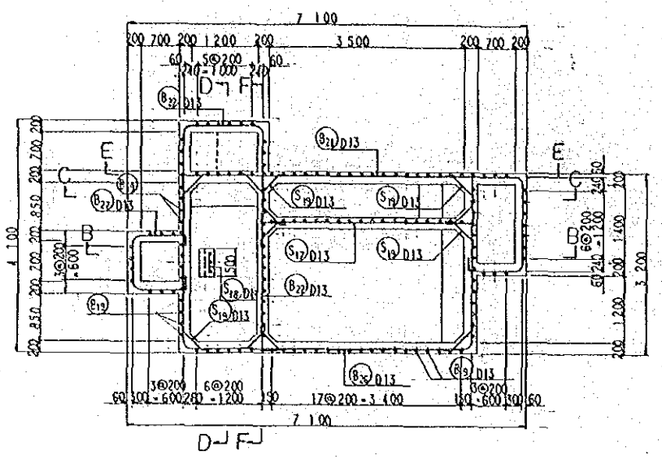
INLET TANK

S = 1:50

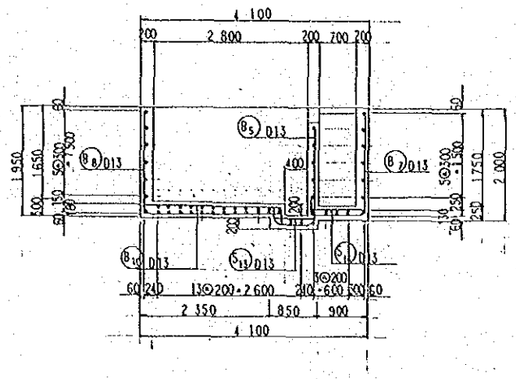
JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO 10

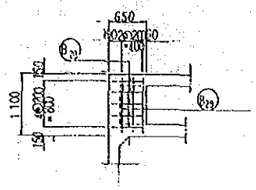
A - A



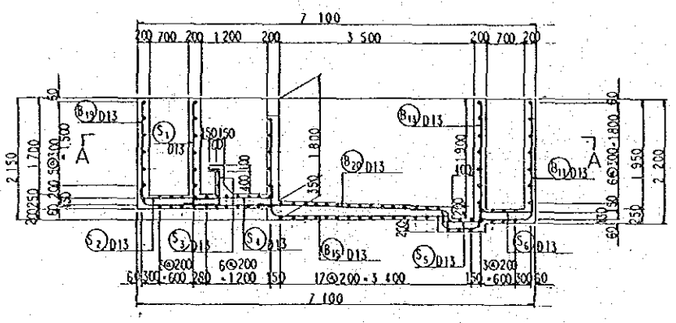
D - D



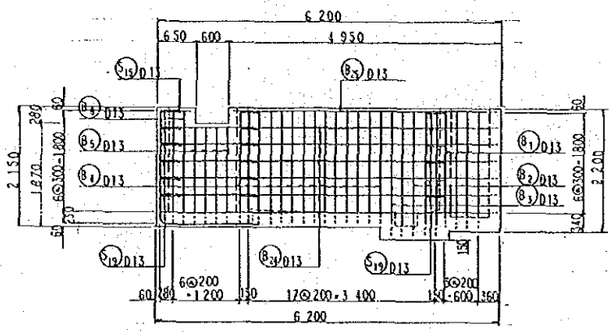
SLAB



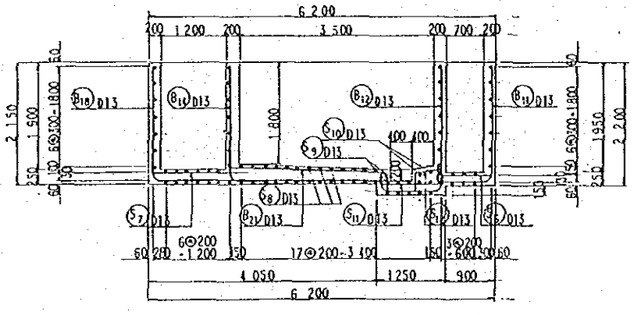
B - B



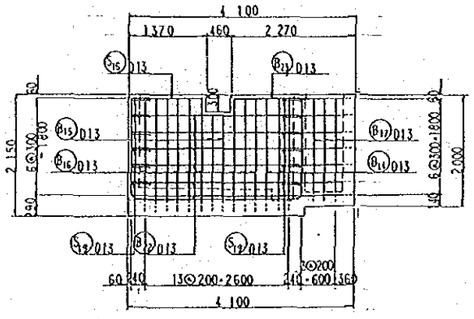
E - E



C - C



F - F



DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING

BAR SCHEDULE OF INLET TANK

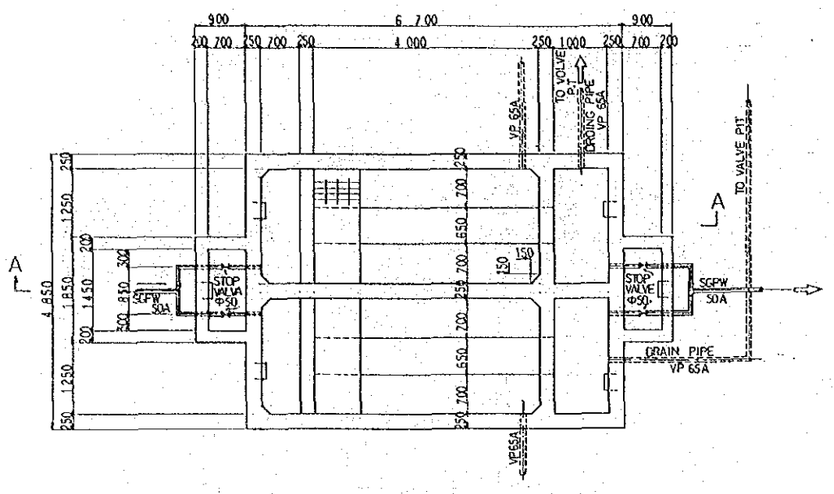
S = 1 : 50

JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO
11

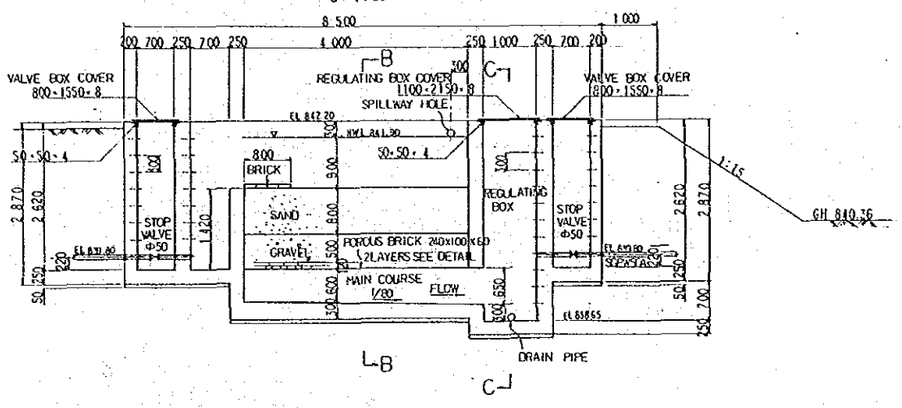
PLAN

S = 1 : 50



SECTION A - A

S = 1 : 50



SECTION B - B

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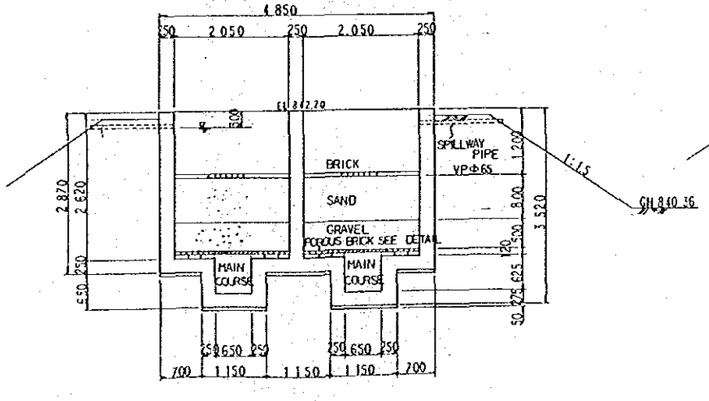

SECTION C - C

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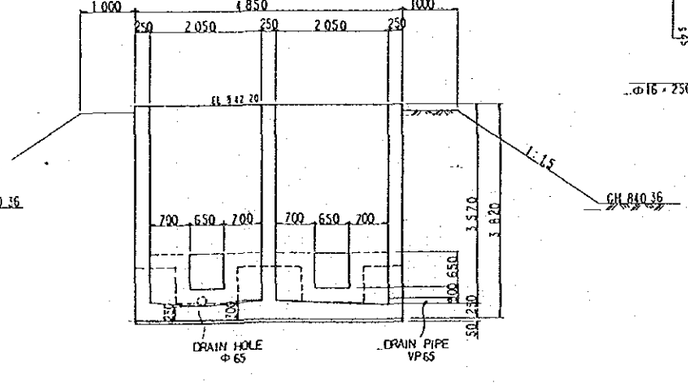
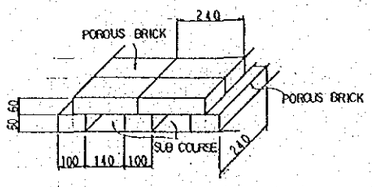


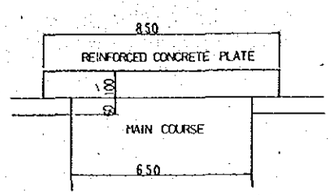
INSTALLATION OF POROUS BRICK

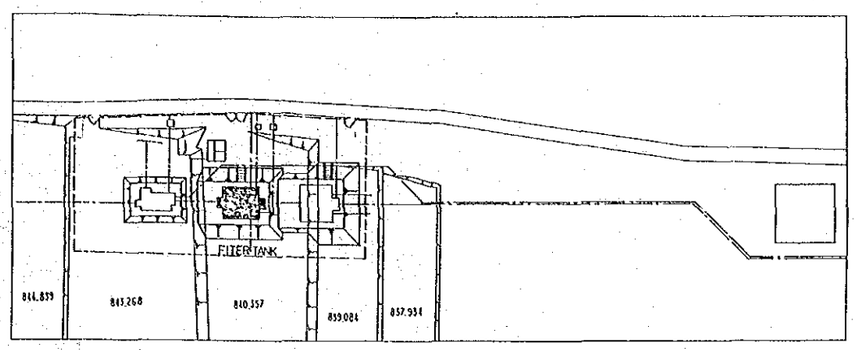
NO SCALE



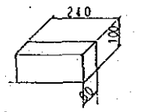
REINFORCED CONCRETE COVER ON MAIN COURSE

S = 1 : 10





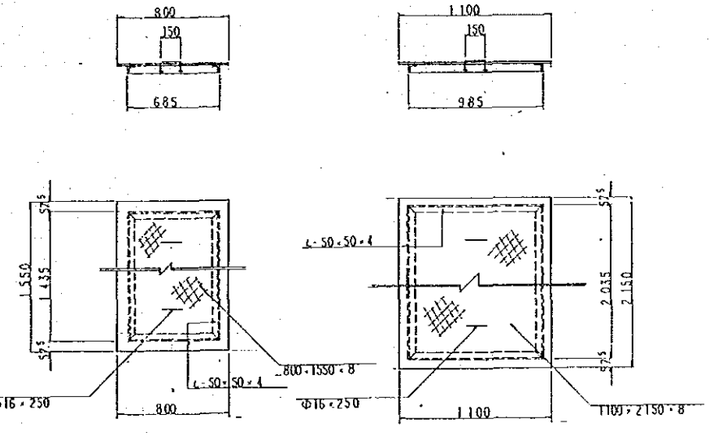
SPECIFICATION OF POROUS BRICK



SPECIFICATION		
COMPRESSIVE STRENGTH	60	kg/cm²
FLEXURAL STRENGTH	7.5	kg/cm²
WEIGHT	2.1	kg

DETAIL OF VALVE BOX COVER

S = 1 : 20



DETAIL OF REGULATING BOX COVER

S = 1 : 20

DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

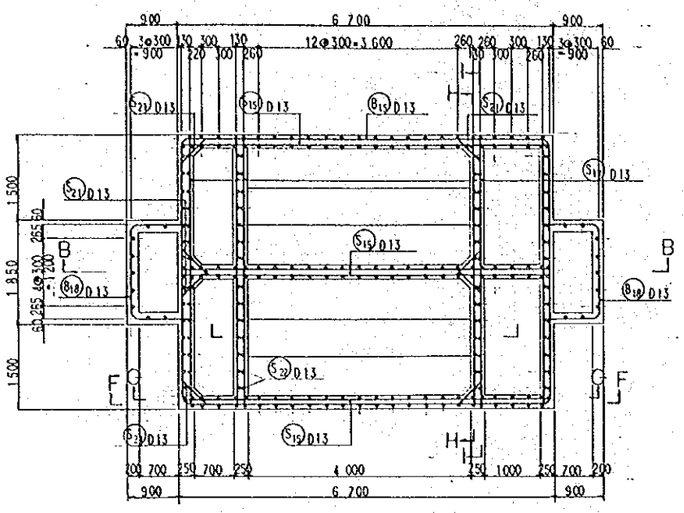
TITLE OF DRAWING

FILTER TANK S = 1 : 50

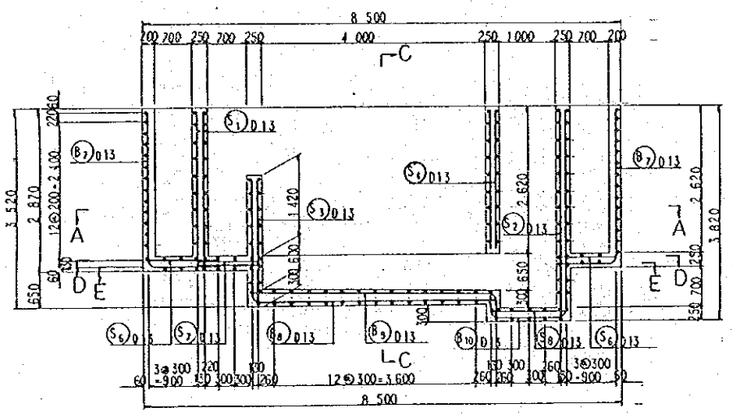
JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO 12

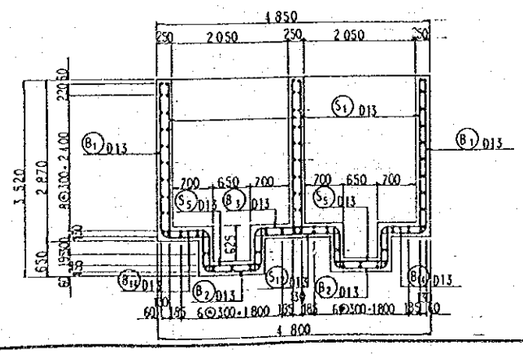
A - A



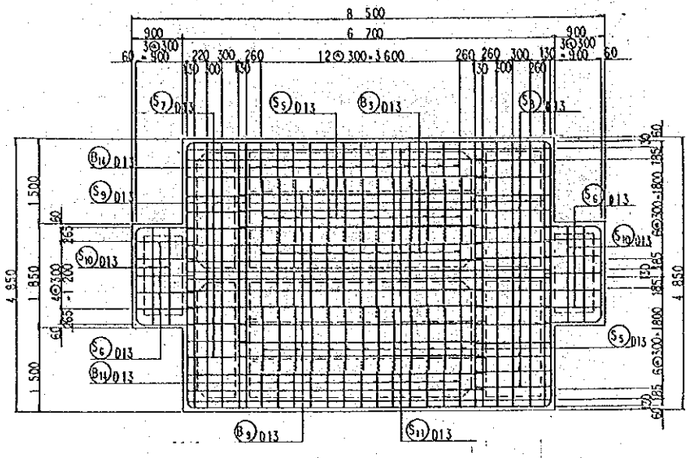
B - B



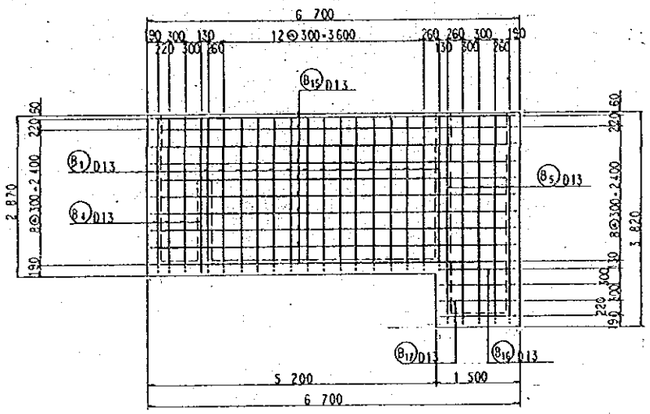
C - C



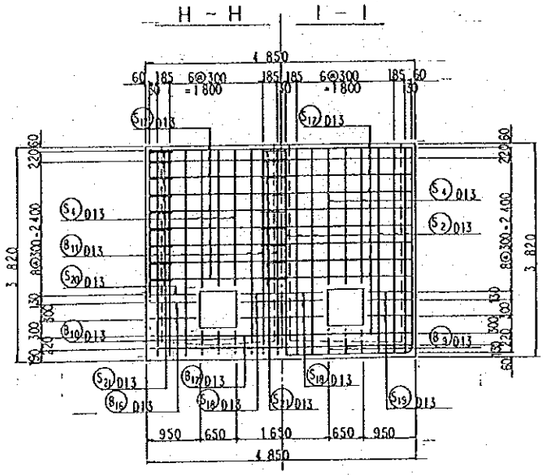
D - D



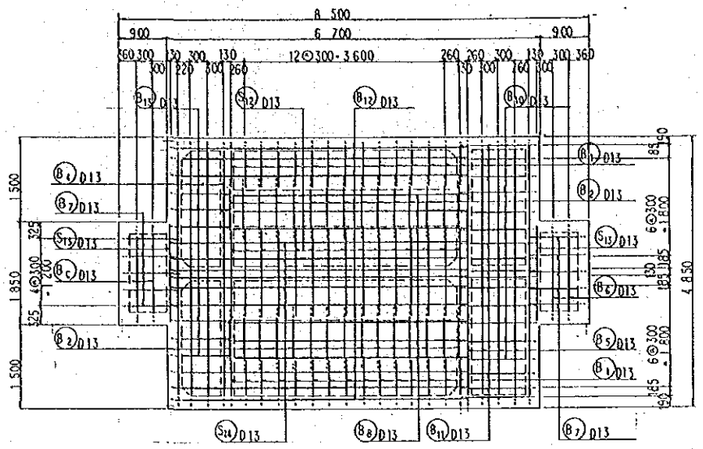
F - F



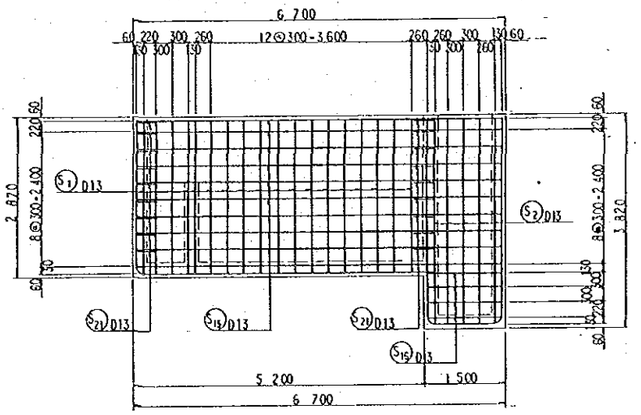
H - H　I - I



E - E



G - G



DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR
THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING

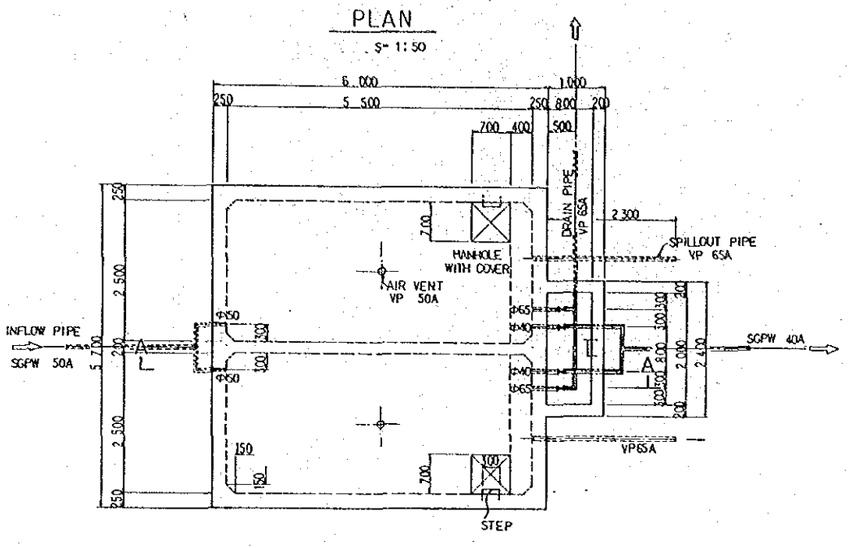
BAR SCHEDULE OF FILTER TANK

S = 1 : 50

JAPAN INTERNATIONAL COOPERATION AGENCY	DWG. NO
TOKYO	13

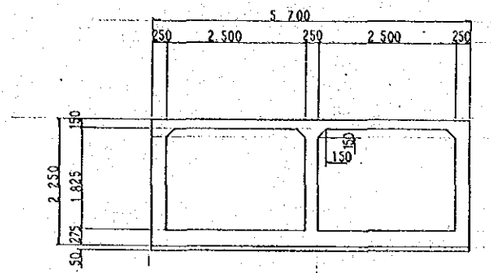
PLAN

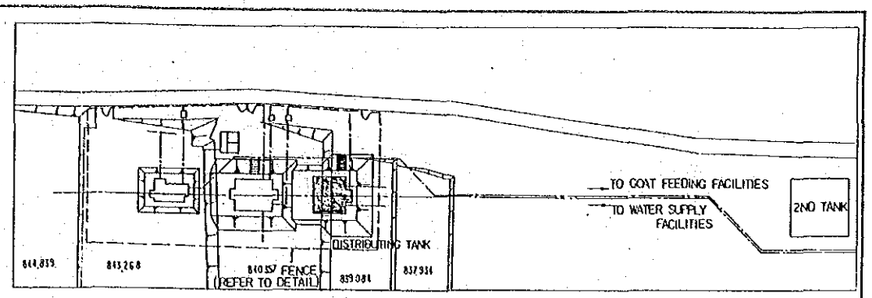
S = 1 : 50



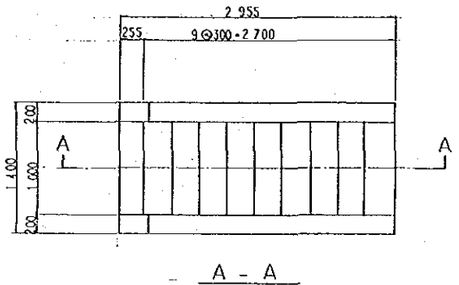
SECTION B - B

S = 1 : 50

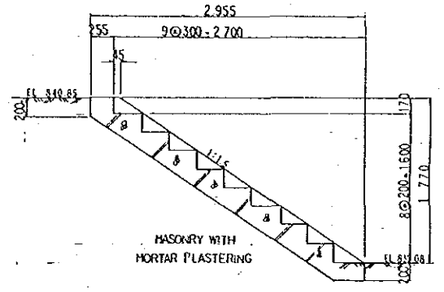




DETAIL OF STEP S=1:30

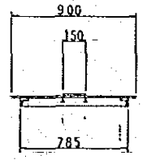


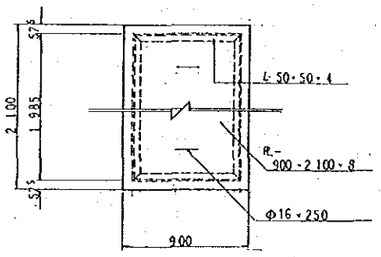
A - A



DETAIL OF VALVE BOX COVER

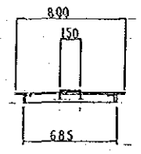
S = 1 : 20

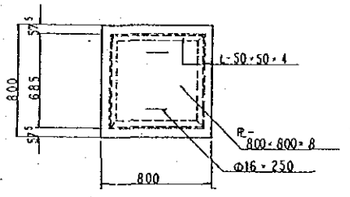




DETAIL OF MANHOLE COVER

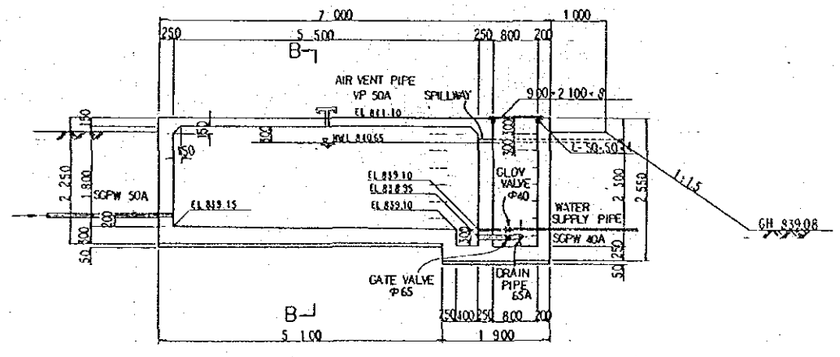
S = 1 : 20





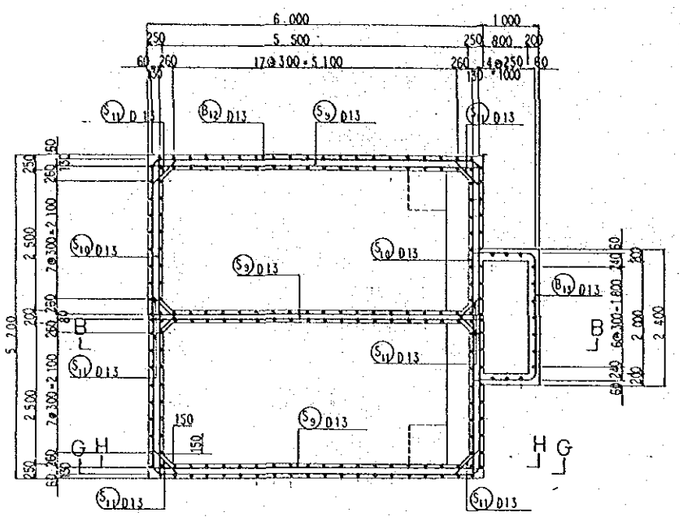
SECTION A - A

S = 1 : 50

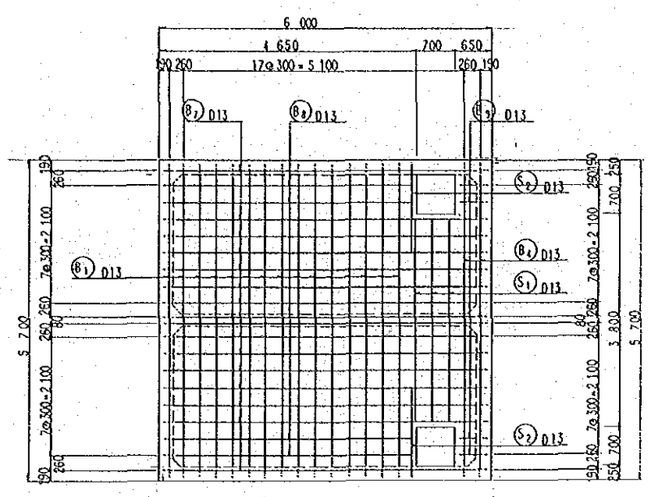


DIRECTORATE GENERAL OF LIVESTOCK SERVICES THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT	
TITLE OF DRAWING DISTRIBUTING TANK S = 1 : 50	
JAPAN INTERNATIONAL COOPERATION AGENCY TOKYO	DWG. NO 14

A - A

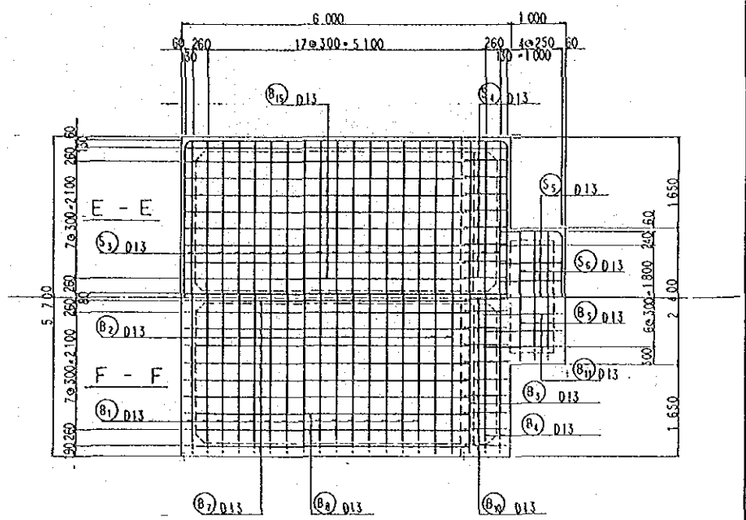


D - D

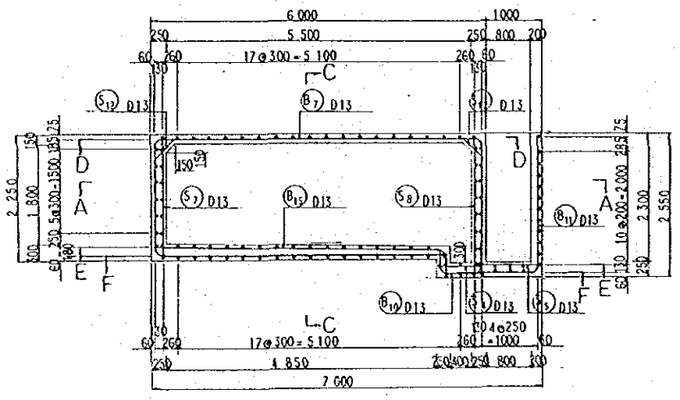


E - E

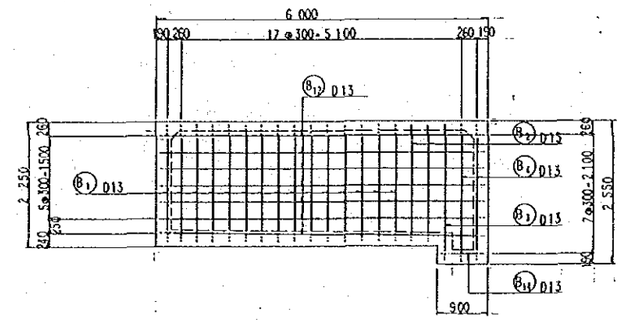
F - F



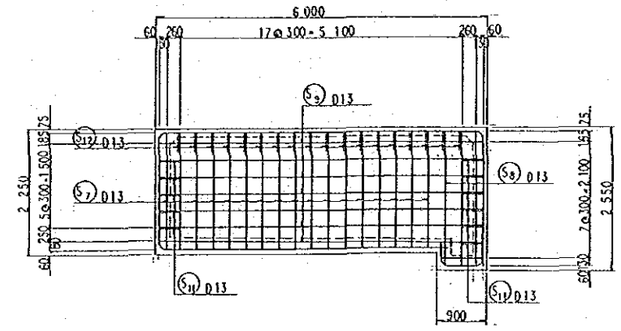
B - B



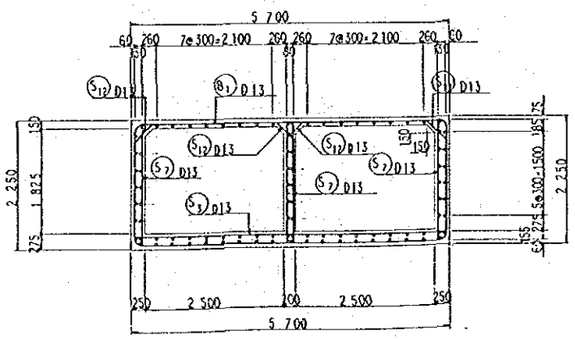
G - G



H - H



C - C



DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR
THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING

BAR SCHEDULE OF DISTRIBUTING TANK

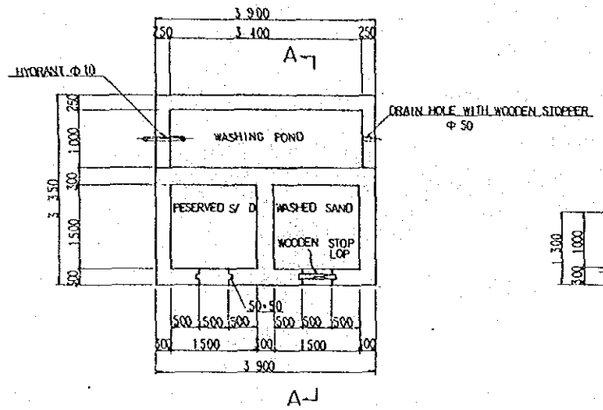
S = 1 : 50

JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO
15

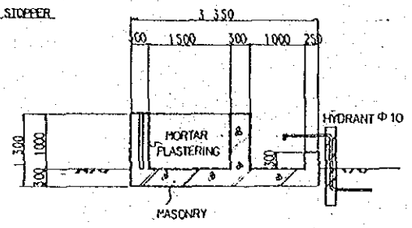
PLAN OF SAND WASHING PLACE

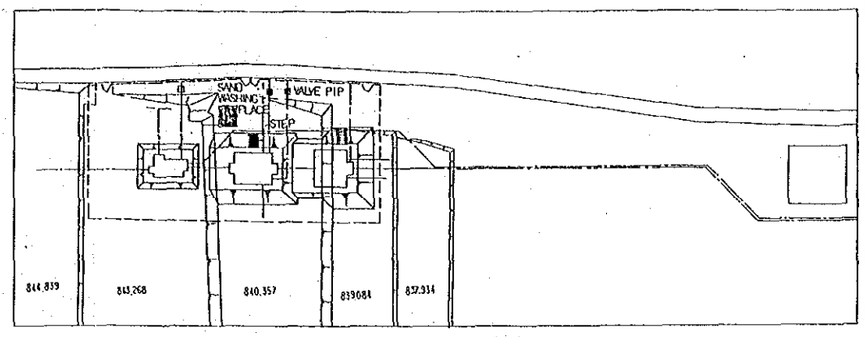
S = 1 : 50



SECTION A - A

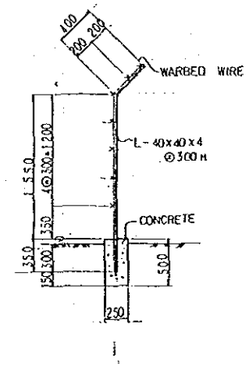
S=1:50





DETAIL OF FENCE

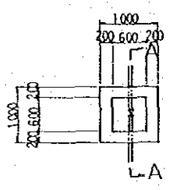
S = 1 : 30



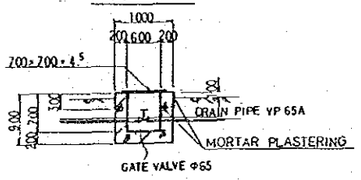
DETAIL OF STEP S = 1:30

DETAIL OF VALVE PIT

S = 1:50

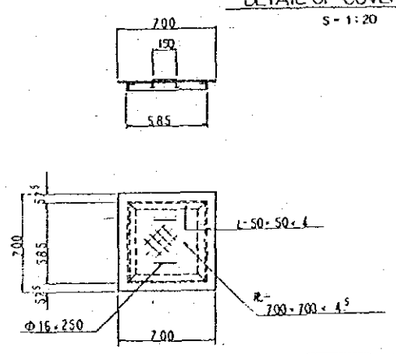


A - A

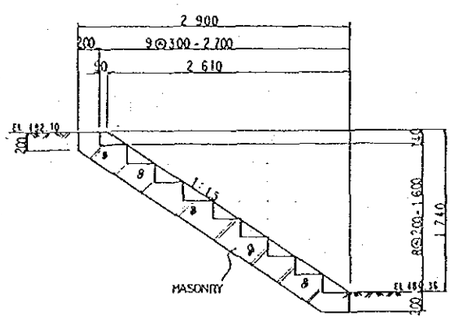


DETAIL OF COVER

S = 1:20



A - A

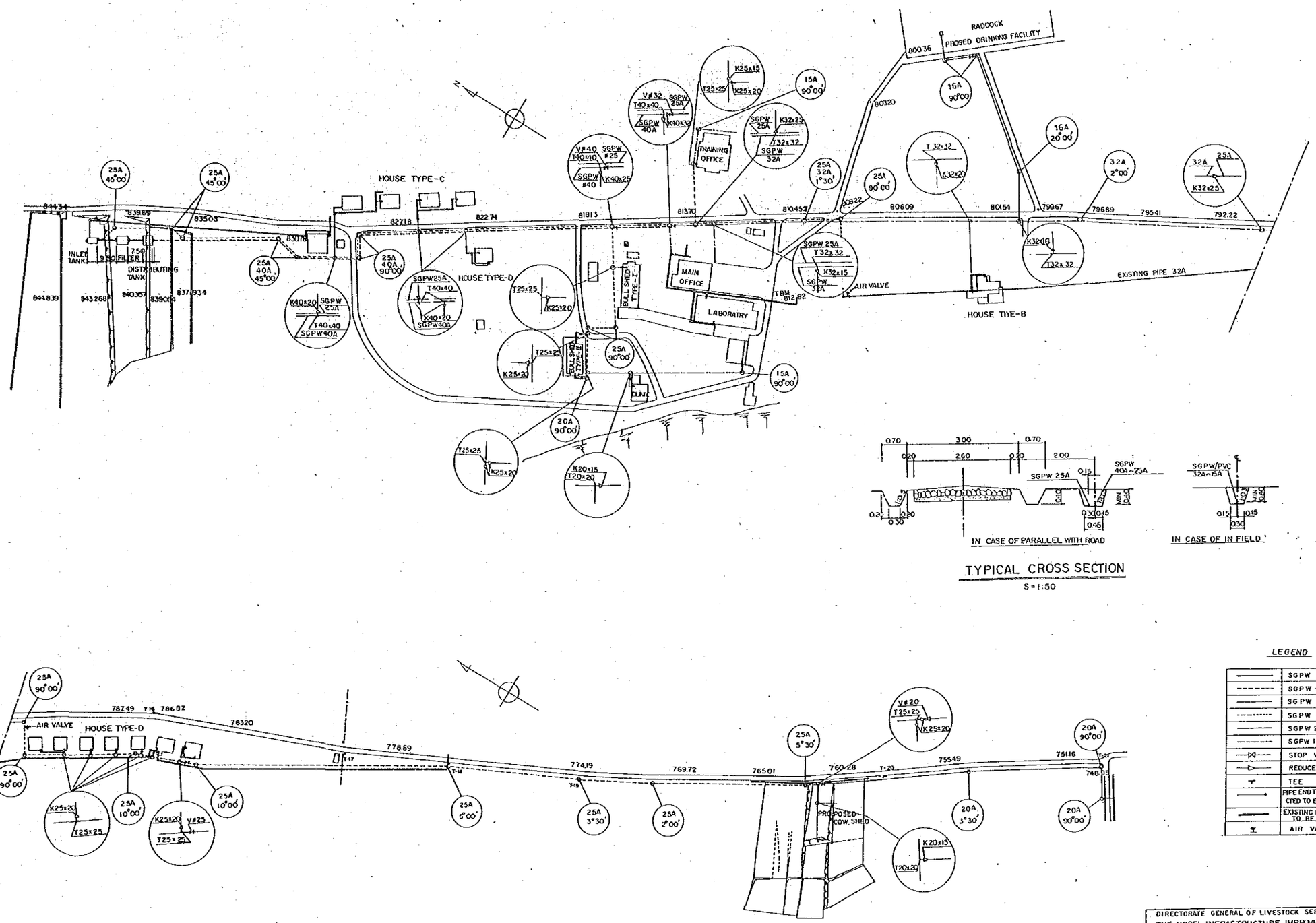


DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING
SAND WASHING PLACE
AND MISCELLANEOUS

JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO
16



TYPICAL CROSS SECTION

S = 1:50

LEGEND

———	SGPW 50A
- - - - -	SGPW 40A
———	SGPW 32A
·····	SGPW 25A
———	SGPW 20A/PVC20A
———	SGPW 15A/PVC16A
——⋈——	STOP VALVE
——▷——	REDUCER PIPE
——T——	TEE
——•——	PIPE END TO BE CONNECTED TO EXISTING PIPE
═══	EXISTING PIPE(32A) TO BE USED
——▼——	AIR VALVE

DIRECTORATE GENERAL OF LIVESTOCK SERVICES

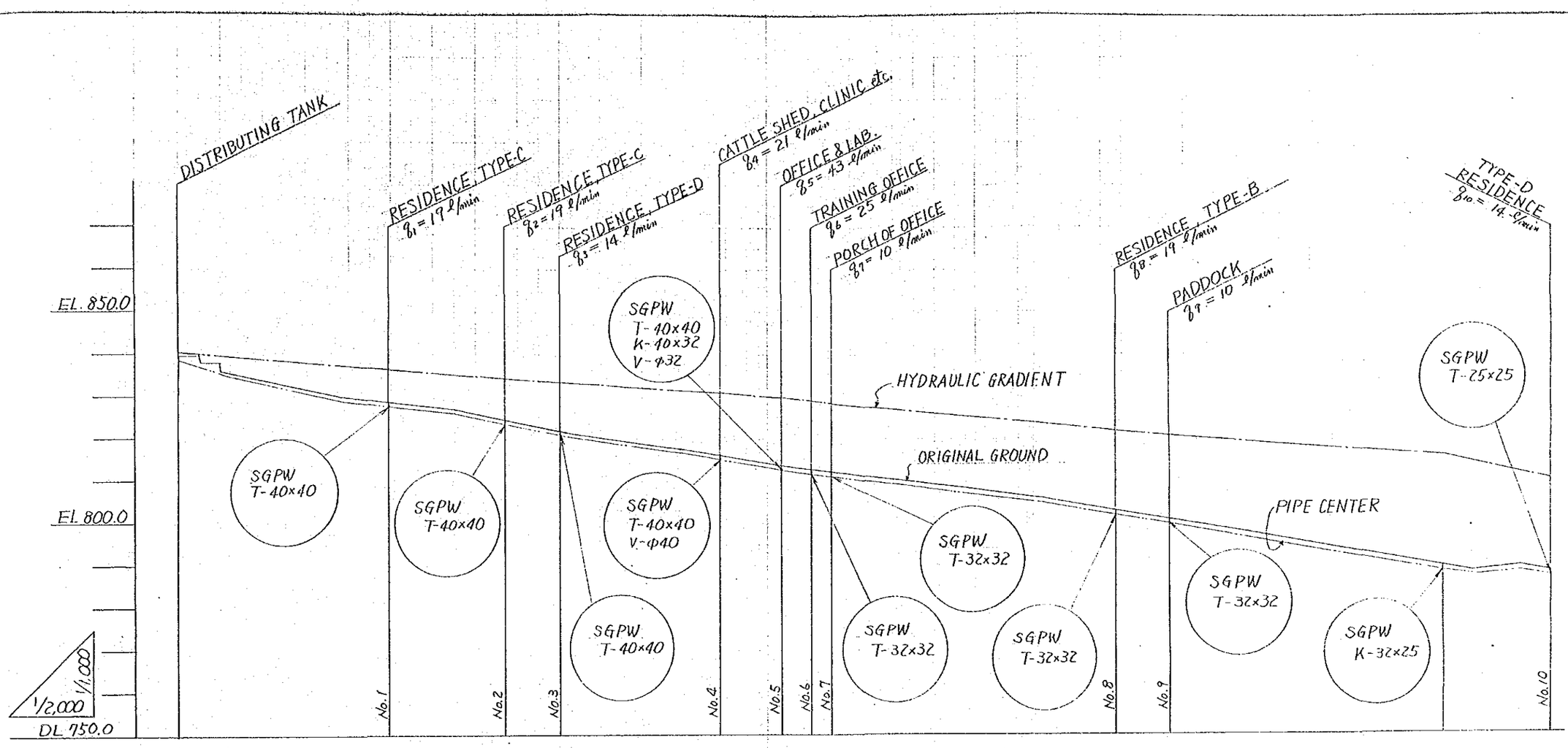
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING

PLAN OF PIPE ARRANGEMENT FOR WATER SUPPLY AT A.I. CENTER

JAPAN INTERNATIONAL COOPERATION AGENCY — TOKYO

DWG. NO 17



PLAN																					
	HYDRAU. GRADIENT	840.65	836.70	834.67	833.70	831.01	829.91	828.90	828.32	821.99	820.94	816.07	810.25								
	HYDRAU. PROPERTY		Q = 75 ℓ/m, V = 0.995 m/s, I = 1/30.86	Q = 73 ℓ/m, V = 0.968 m/s, I = 1/32.35	Q = 111 ℓ/m, V = 0.942, I = 1/33.15	Q = 70 ℓ/m, V = 0.928 m/s, I = 1/34.80	Q = 67 ℓ/m, V = 0.889, I = 1/37.53		Q = 47 ℓ/m, V = 0.974 m/s, I = 1/24.77	Q = 42 ℓ/m, V = 0.870, I = 1/30.09	Q = 41 ℓ/m, V = 0.850 m/s, I = 1/31.37		Q = 41 ℓ/m, V = 1.392 m/s, I = 1/10.10							
	PIPE & DIA. USED		SGPW 40A					Q = 54 ℓ/m, V = 1.119 m/s, I = 1/19.45	SGPW 32A				SGPW 25A								
	DISTANCE	0.0	98.4	35.9	25.7	76.6	30.7	13.9	9.5	136.7	26.0	130.0	50.6								
	ACCUMULATED DISTANCE	0.0	98.4	134.3	160.0	236.6	267.3	281.2	290.7	427.4	453.4	583.4	634.0								

ABBREVIATIONS

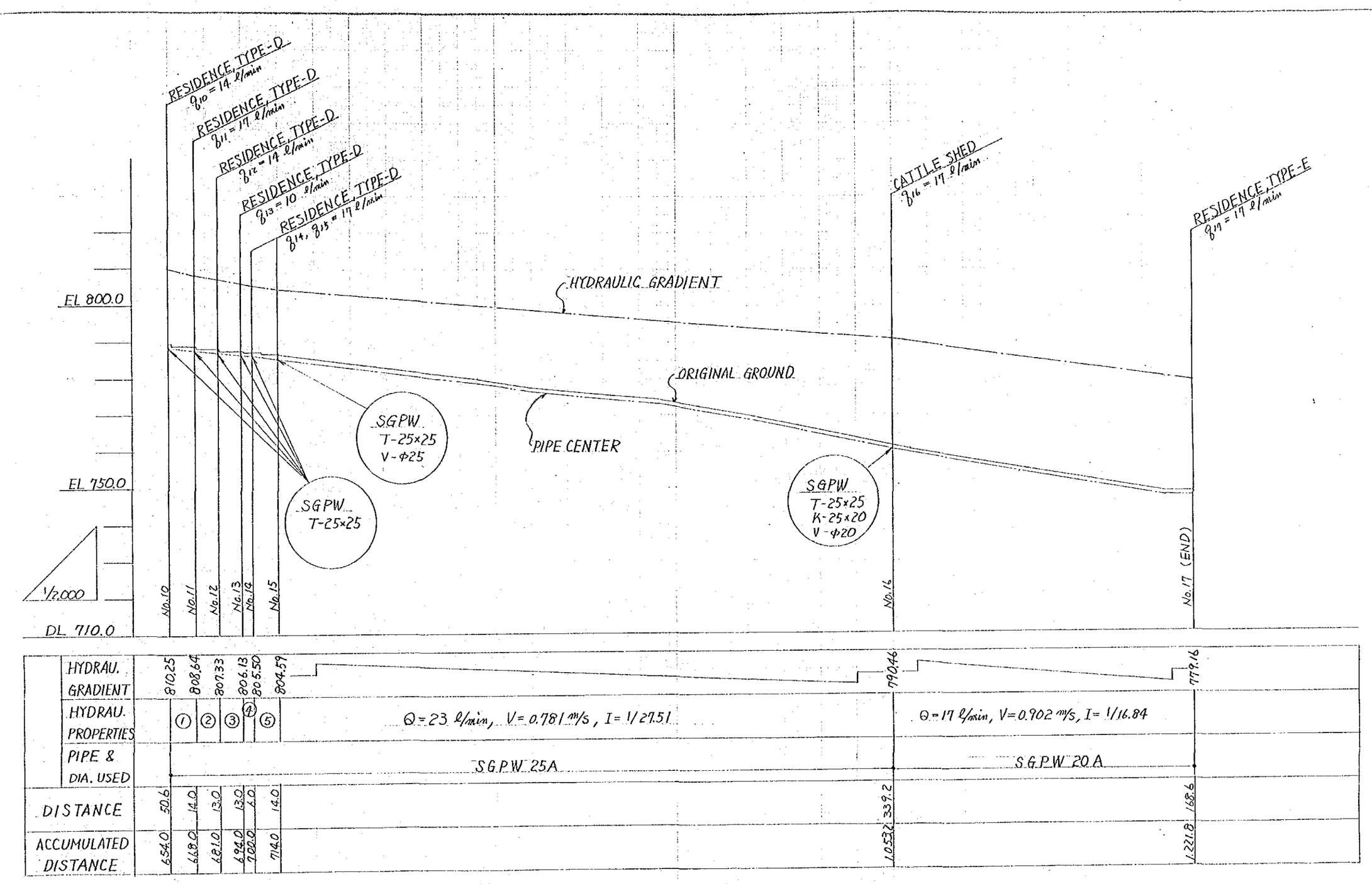
SGPW : Galvanized Steel Pipes for Water Service
T : Tee
K : Reducer Pipe
V : Stop Valve
A : Nominal Size

DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING
HYDRAULIC PROFILE OF WATER SUPPLY FACILITIES (1/2)

JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO 18



① Q = 39 ℓ/min, V = 1.324 m/s, I = 1/11.02
② Q = 36 〃, V = 1.222 〃, I = 1/12.68
③ Q = 34 〃, V = 1.154 〃, I = 1/14.00
④ Q = 33 〃, V = 1.120 〃, I = 1/14.75
⑤ Q = 28 〃, V = 0.951 〃, I = 1/19.61

DIRECTORATE GENERAL OF LIVESTOCK SERVICES
THE MODEL INFRASTRUCTURE IMPROVEMENT WORKS FOR THE STRENGTHENING OF ARTIFICIAL INSEMINATION CENTER PROJECT

TITLE OF DRAWING
HYDRAULIC PROFILE OF WATER SUPPLY FACILITIES (2/2)

JAPAN INTERNATIONAL COOPERATION AGENCY
TOKYO

DWG. NO. 19