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①資料リスト

0．Minutes of Discussion between the Japanese Expart Team and the Peruvian Authorities.

1．日本における反力壁の試設計

設計図、構造計算書、数量調書

2．ＵＮＩ設計案－１　図面及びFUJITASA.の見積り

3．ＵＮＩ設計案－２　図面　BAUTISTAの見積り

仕様書（スペイン語・英文）

4．ペルーにおけるMISSION の試設計図面

5．MISSION の試設計に対する各社の見積、Ｉ期、エスカレーション公式

5－1　FUJITA－GUMI　S.A.

5－2　GURANA y MONTERO

5－3　CONSTRUCTORA UPASE S.A.

5－4　J. y J. CAMET INGS. S.A.

5－5　Cesar Fuentes Artis Ings. S.A.

5－6　COSAPI

5－7　VSL PERU S.A.

5－8　ペルー水道公社　井川専門家資料

6．生コンに関する資料

7．契約書例

7－1　リマ大学（スペイン語．英語）

7－2　ペルー住宅公団

7－3　水道局

7－4　ＵＮＩ教室（ＰＣＩ工事含む）

8．構造実験棟　ペルー側１次案

9．カトリック大学構造実験棟パンフレット

9－1　パンフレット

9－2　図面

10．管理研修棟，土質実験棟図面

11．打ち合わせ相手リスト

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② NORMAS de Diseno Sismo—resistente

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② DISSEMITATION OF ADOBE TECHNOLOGY IN A HOUSING RECONSTRUCTION PROGRAM

③ INVESTIGACIONES EN ADOBE

④ RIESGO SISMICO

⑤ NUEVAS CASAS RESISTENTES DE ADOBE

(PONTIFICIA UNIVERSIDAD CATOLICA DEL PERU DEPARTMENTO DE INGENIERIA)

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② TECNOLOCIA DE CONSTRUCION CON ADOBE

(UNIVERSIDAD NACIONAL SAN ANTONIO ABAD DEL CUSCO)

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(1) COSAPI

(2) GyM

(3) FUJITAGUMI

(4) UPACA

(5) J. & J. CAMET

(6) CESAR FUENTES

(7) VSL PRETENSADO

(8) CARDENAS Y BAUTISTA

地図

3冊

MINUTES OF DISCUSSIONS BETWEEN THE JAPANESE EXPERT TEAM AND THE PERUVIAN AUTHORITIES CONCERNED ON THE PROJECT FOR THE EARTHQUAKE RESEARCH AND DISASTER MITIGATION CENTER

The Japanese Expert Team (hereinafter referred to as "the Team") organized by the Japan International cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Shin OKAMOTO, visited the Republic of Perú starting April 2nd. The team will continue its work until April 26, 1986.

During its stay in the Republic of Perú, the Team had a series of discussions with Peruvian authorities and the members of the organizing committee of the Japan-Perú Earthquake Research and Disaster Mitigation Center (hereinafter referred to as "the Center") headed by Prof. Julio KUROIWA, chairman of the committee, for the purpose of studying the desirable measures to be taken by both Governments for the successful implementation of the Project for the Center.

In the course of the discussions, both sides recognized that since June 26, 1984, both Governments had taken the necessary measures for the implementation of the project for the Center and that both sides have to make further efforts for the early initiation of the Project's activities.

Both sides agreed to record the outline of the discussions in the Annex.

The meeting was held in a very friendly atmosphere and run through smoothly, with mutual understanding and good will.

Lima, April 8, 1986

Mr. Shin OKAMOTO Leader, Japanese Expert Team	Prof. José Ignacio López Soria Rector UNI

ANNEX

(1) PROGRESS OF IMPLEMENTATION OF THE CENTER FACILITIES

1) The construction works for the Academic and Administrative building are now progressing successfuly and will be completed by the end of 1986.

2) The construction works for the Geotechnical Engineering Testing laboratory have already started and will be completed in 1987.

3) The following items must be included in UNI's 1987 budget:

a. The budget needed to start the construction of the Structural Testing Laboratory.

b. Personnel expenses.

c. Furniture for the A.A. building and Geotechnical laboratory.

d. Some research funds.

4) The Peruvian Government has assigned a 1750 m2 lot, located off-campus, in a residential area, for the construction of the building to be used as residence by the experts and participants.

5) The Japanese Government has assigned to JICA's 1986 budget, the funds for the construction of the reaction wall and floor, based on the strong request of the Peruvian side.

(2) MEASURES TO BE TAKEN BEFORE THE SIGNING OF THE RECORD OF DISCUSSIONS OF THE PROJECT FOR THE CENTER

1) The technology Devélopment programs for the Project with well-defined targets to be conducted during the five-year period of cooperation should be handen to JICA by the Peruvian side not later than April 30, 1986.

This Program should be picked up from the long-term programs of the Center which were explained by the Peruvian side in the course of the discussions.

2) The Peruvian side shall hand to JICA by April 30, 1986, the list of equipments with indication of priorities and reasons of its necessity in relation to the Project's activities.

(3) BUDGET EXECUTION FOR THE CONSTRUCTION OF THE REACTION WALL AND FLOOR BY JAPANESE SIDE.

1) In order to start the Project activities as soon as possible the Peruvian side strongly requested the early excution of the budget by JICA for the construction of the reaction wall and floor. Both side recognized the limitation of JICA's budget for this purpose.

2) The team reviewed the drawings for the reaction wall and floor and the preliminary cost estimation prepared by the Peruvian side. Based on this information, and taking into account the limitation of JICA's budget for this construction, both sides agreed to make some tentative adjustment of this structure as shown in Fig. I.

3) Further cost estimation and the examination of related technical problems for the construction are needed.

(4) TENTATIVE SCHEDULE FOR IMPLEMENTATION OF THE PROJECT.

1) The Japanese side confirmed that the conditions for the signature of the "Record of Discussions" and the initiation of the Project had been basically satisfied.

2) The Peruvian side made a proposal to sign the "Record of Discussions" not later than the end of June 1986, for the early initiation of the Project activities. The Japanese side considered adequate this proposal.

3) Both sides agreed on the tentative schedule for implementation of the Project as shown in Fig. II.

(5) CORRECTION IN THE MINUTES SIGNED ON JUNE 26, 1984.

Pg 2, Line 2	Delete : (tentative)
Lines 2 & 5	English: corrected name Japan Perú Earthquake Research and Disaster Mitigation Center.
Lines 6 & 8	Spanish: corrected name Centro de Investigaciones Sísmicas y de Mitigación de Desastres Peruano Japonés. Note: These are the official names adopted in English and Spanish and need to be corrected through the text.
Line 11	Delete: (organization it belong)
Pg 5,	Table: First phase of the program (through one year). Delete: Short term course and seminars Write: Seminars Delete: The whole column refered to individual course. Number of trainees: change 10-15 for 50. Period of training: change 4 months for 1 month. Table: Second phase of the program. Number of trainees: change 10-15 for 15-20.
Pg 8, Line 10	Change: President for Director
Line 11	Add: and reception
Pg 10, Line 6	Change: Director for Section chief
Pg 11, Line 4	Delete this line, and then the order of the letters start from line 5.
Lines 8 to 12	Change: a, b, c, d, e, for 1, 2, 3, 4 & 5.
Pg 12	Fig. I. Change for new Fig. 1.

Pg 16,	Fig. 2: Change for new figure 2
Pg, 21,	List of equipment: A more complete list will be sent by April 30, 1986.
Pg 22,	Plan of the Center: the final location of the buildings will be sent by April 30, 1986.

(6) PARTICIPANTS IN THE MEETINGS

Meetings were held in the room of Organizing Committe of the Center at the Faculty of Civil Engineering of UNI. Two groups were formed:

1. For discussions on the organization of the Center
   Japanese side
   . Shin Okamoto (Team lider)
   . Koji Tanabe
   Peruvian side
   . Carlos Ibañez (C.E. Dean)
   . Julio Kuroiwa (Chairman, organizing committe)
   . Hugo Scaletti
   . Javier Pique
   . Rafael Torres

2. For discussions on the design and cost of reaction wall and testing floor
   Japanese side
   . Toyokazu Shimizu
   . Shaji Kishimoto
   Peruvian side
   . Hugo Scaletti
   Juan Chavez

The meetings were held during the mornings and afternoons of April 3, 4 & 7 and during the morning of April 8, 1976.

FIG.-I ORGANIZATION OF THE CENTER

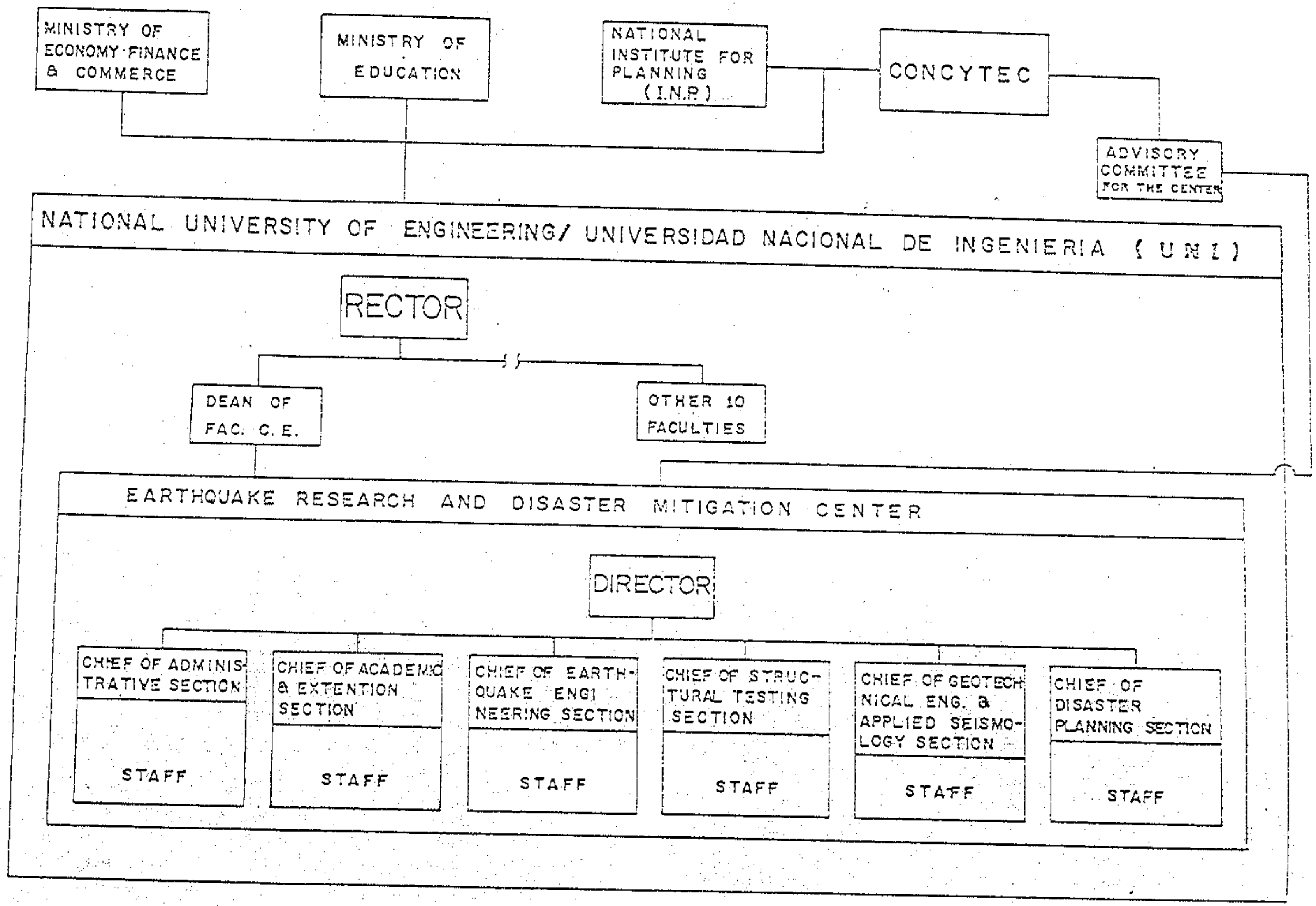


FIG.-2 MANGEMENT SYSTEM OF THE PROJECT

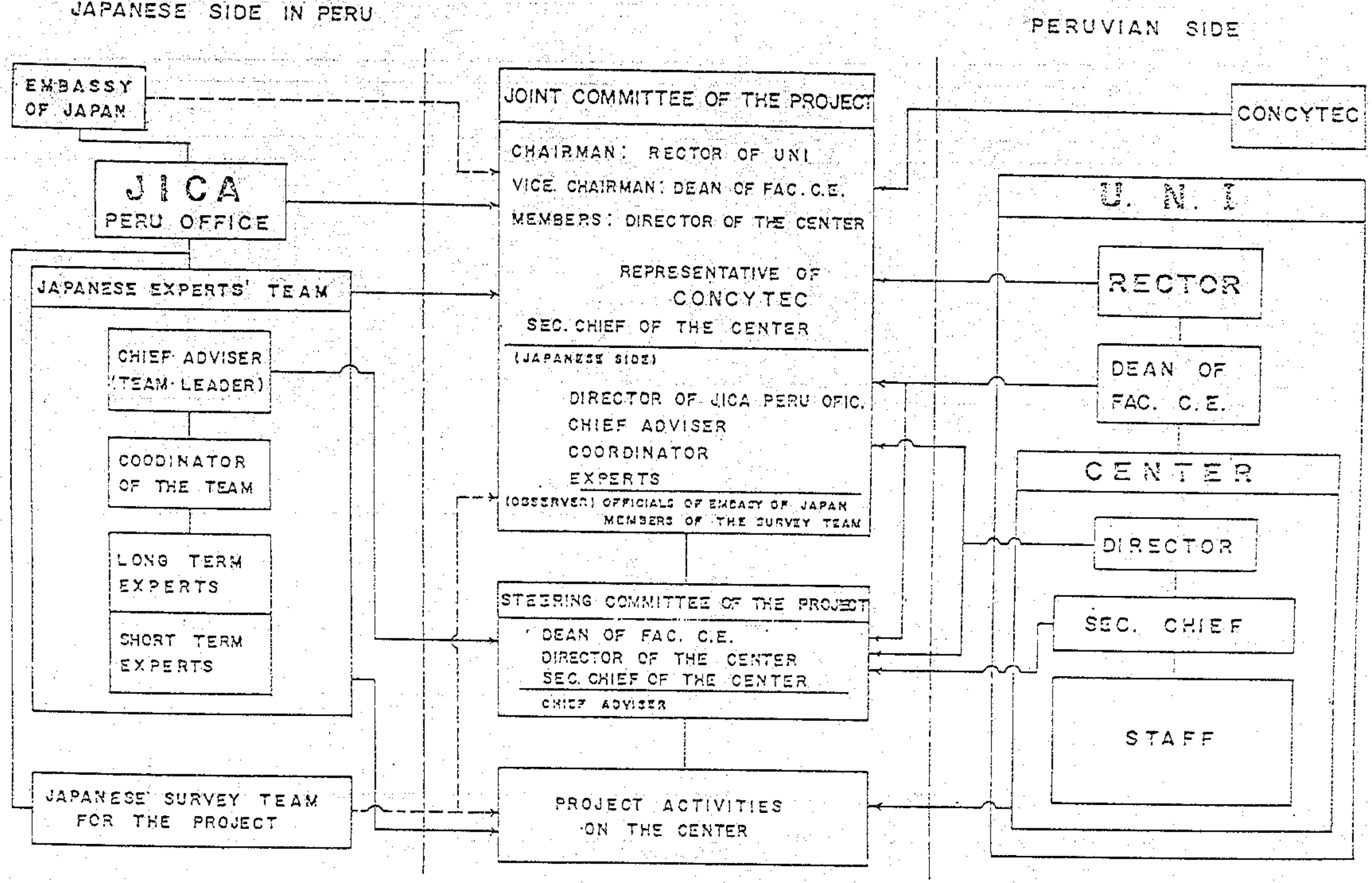


FIG.-I REACTION WALL & TESTING FLOOR.

1) ALLOWABLE BENDING MOMENT

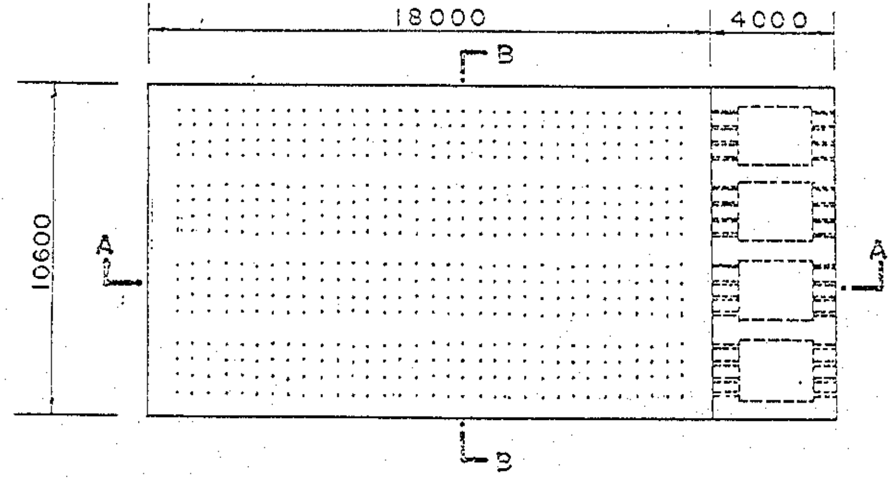
Ma = 4000 tm.

2) ALLOWABLE SHEAR FORCE

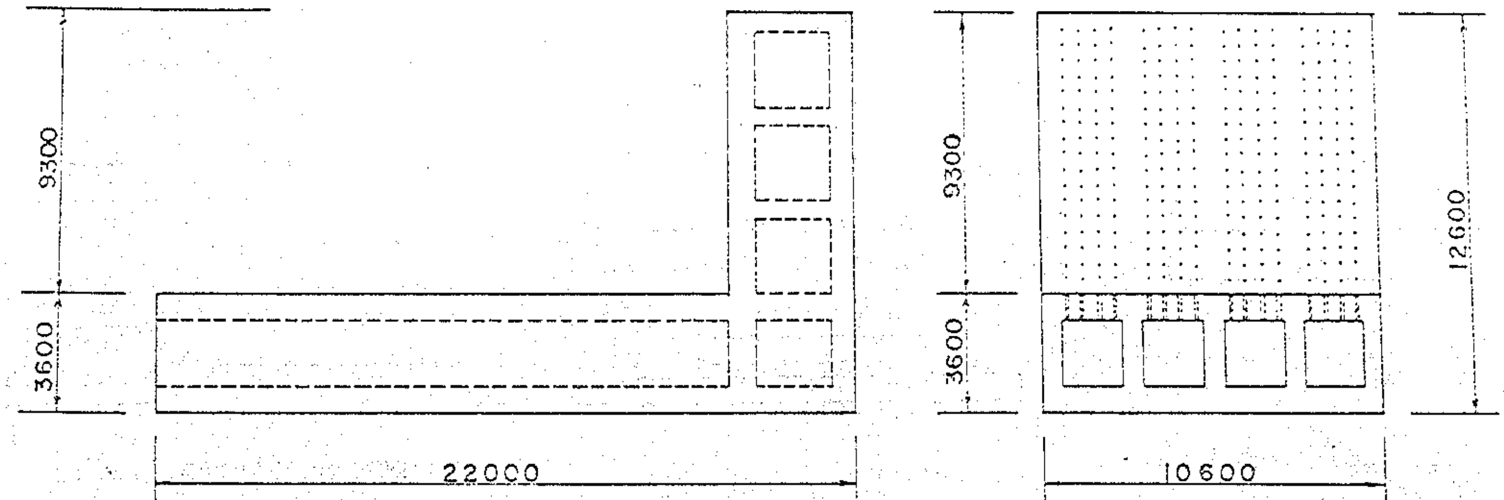
Qa = 1000 ton.

3) ALLOWABLE PUNCHING FORCE

Pua = 100 t/m^2



PLAN



A — A Section

B — B Section

FIG. II TENTATIVE SCHEDULE FOR IMPLEMENTATION OF THE PROJECT

C.Y. / Classification	1986	1987	1988	1989	1990	1991
DURATION OF PROJECT						
PHASE I						
PHASE II						
PERUVIAN ACTIVITIES						
ESTABLISHMENT OF THE CENTER.						
2. PROVISION OF STAFF						
3. CONSTRUCTION						
A.A. (1F)						
A.A. (2F)						
GEOTEC. LAB.						
STRUC. LAB.						
ACCESS & GUARD.						
AUDITORIUM						
GARDENING & FENCE						
4. PROVISION OF OFFICE FURNITURE/INSTRUMENT						
A.A. (1F)						
A.A. (2F)						
GEOTEC. LAB.						
STRUCT. LAB.						
AUDITORIUM						

Classification \ C.Y.	1986	1987	1988	1989	1990	1991
5. PROCEDURE OF RECEIVING EQUIPMENT PROVIDED BY JICA		←———	———	———	———→	
(CUSTOM CLEARENCE, CARRYING IN THE CENTER, INSTALATION, ETC.)						
6. TECHNOLOGY DEVELOPMENT	←———	———	———	———	———	——→
THEORETICAL	←———	———	———	———	———	——→
GEOTEC. TESTING	←———	———	———	———	———	——→
STRUC. TESTING	←———	———	———	———	———	——→
7. TRAINING ACT.						
SEMINAR		←→	←→	←→	←→	
REGULAR COURSE			←——→	←——→	←——→	
ADVANCE COURSE			←——→	←——→	←——→	
8. DISSEMINATION ACT.	←———	———	———	———	———	——→
JAPANESE ACTIVITIES						
1. DISPATCH OF EXPERTS	←→ ←———	———	———	———	———	——→
LONG TERM EXPERTS						
CHIEF ADVISORY	←———	———	———	———	———	——→
COORDINATER	←———	———	———	———	———	——→
GEOTECH						
STRUCT						
DISASTER PLAN						
SHORT TERM EXPERTS						
SUP. OF CONST.						
INST. OF EQUIP.						

Classification \ C.Y.	1986	1987	1988	1989	1990	1991
TRAIN, OF OPER.						
2. TRAINING OF PERUVIAN STAFF IN JAPAN						
3. SUPPLY OF EQUIPMENT						
FOR A.A.						
FOR GEOTEC, LAB.						
FOR STRUC. LAB.						
4. CONSTRUCTION OF REAC-TION WALL & FLOOR.						
5. DISPATCH OF SURVEY TEAM						
R/D TEAM						
EVALUATION TEAM						
OTHERS						

BASIC DESIGN

OF

REACTION WALL & TEST BED

APRIL 1986

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APPENDIX - II DRAWINGS

§1. SPECIFICATION OF DESIGN

(1) TYPE OF STRUCTURE

The type of structure is a prestressed concrete one which is adopted to full prestressing.

Post-tension method is applied to introducing prestresses.

(2) OVERALL SIZE AND DIMENSION

Reaction wall is 9m in height.

Test bed area is 11.5m × 18m.

Size and dimension are refferred to Fig-1.

(3) DESIGN LOAD

Design shear force Qa and bending Moment Ma along the entire width of the wall are as follows.

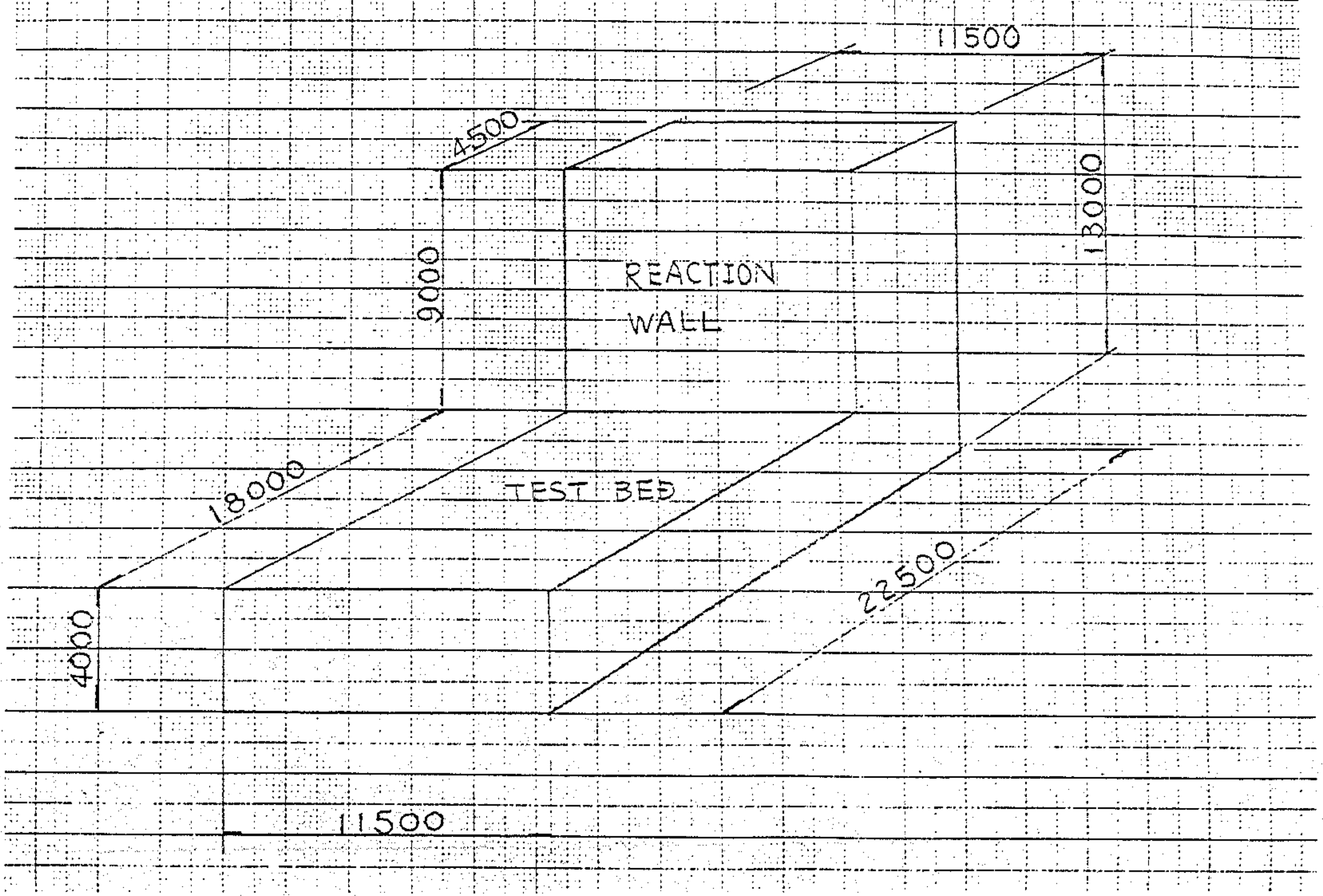
$Qa = 1000$ tonf

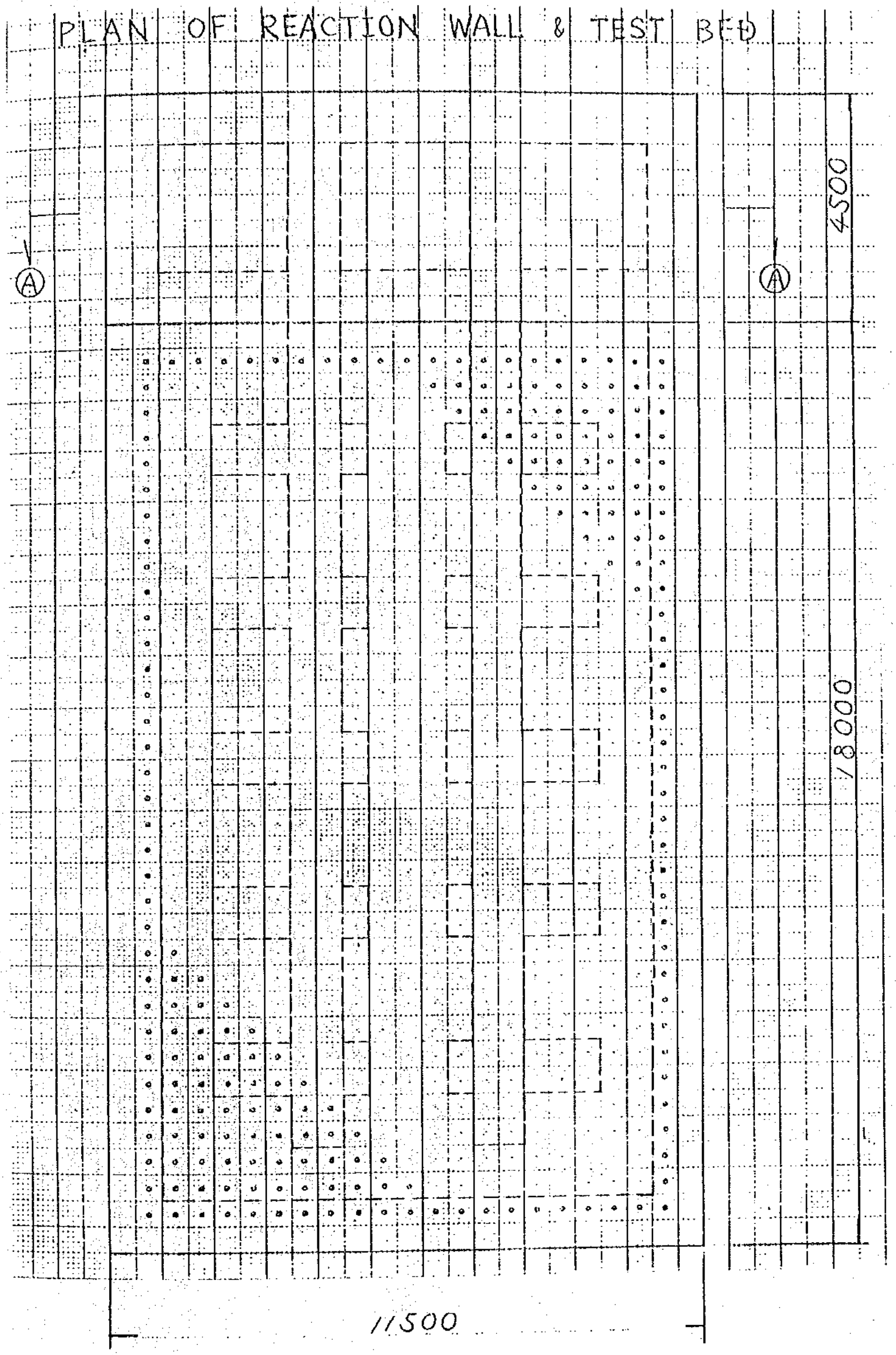
$Ma = 4000$ tonf·m

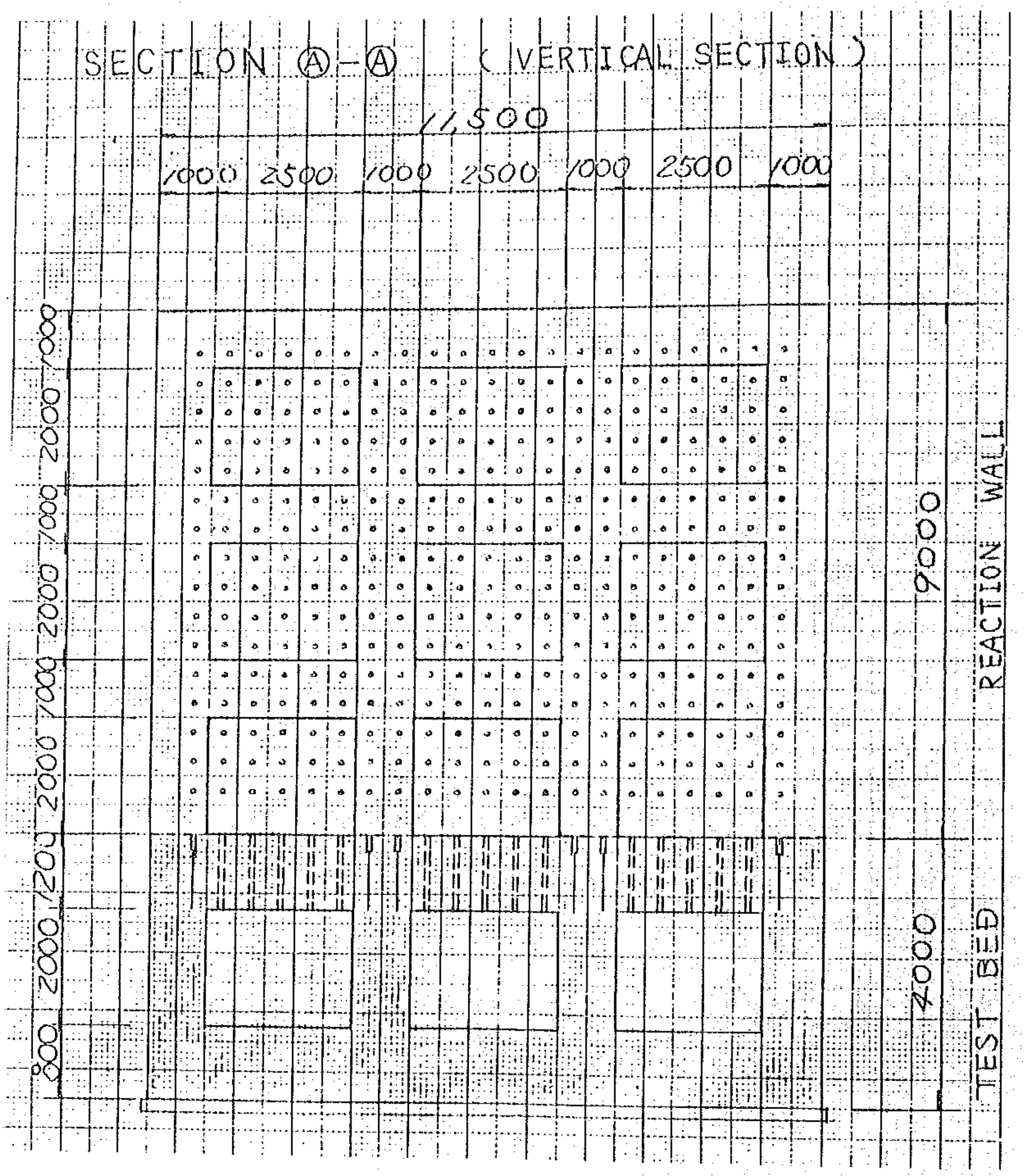
Design Punching shear is 100 tonf/m² at the wall.

Test bed has the same capacity of Reaction wall.

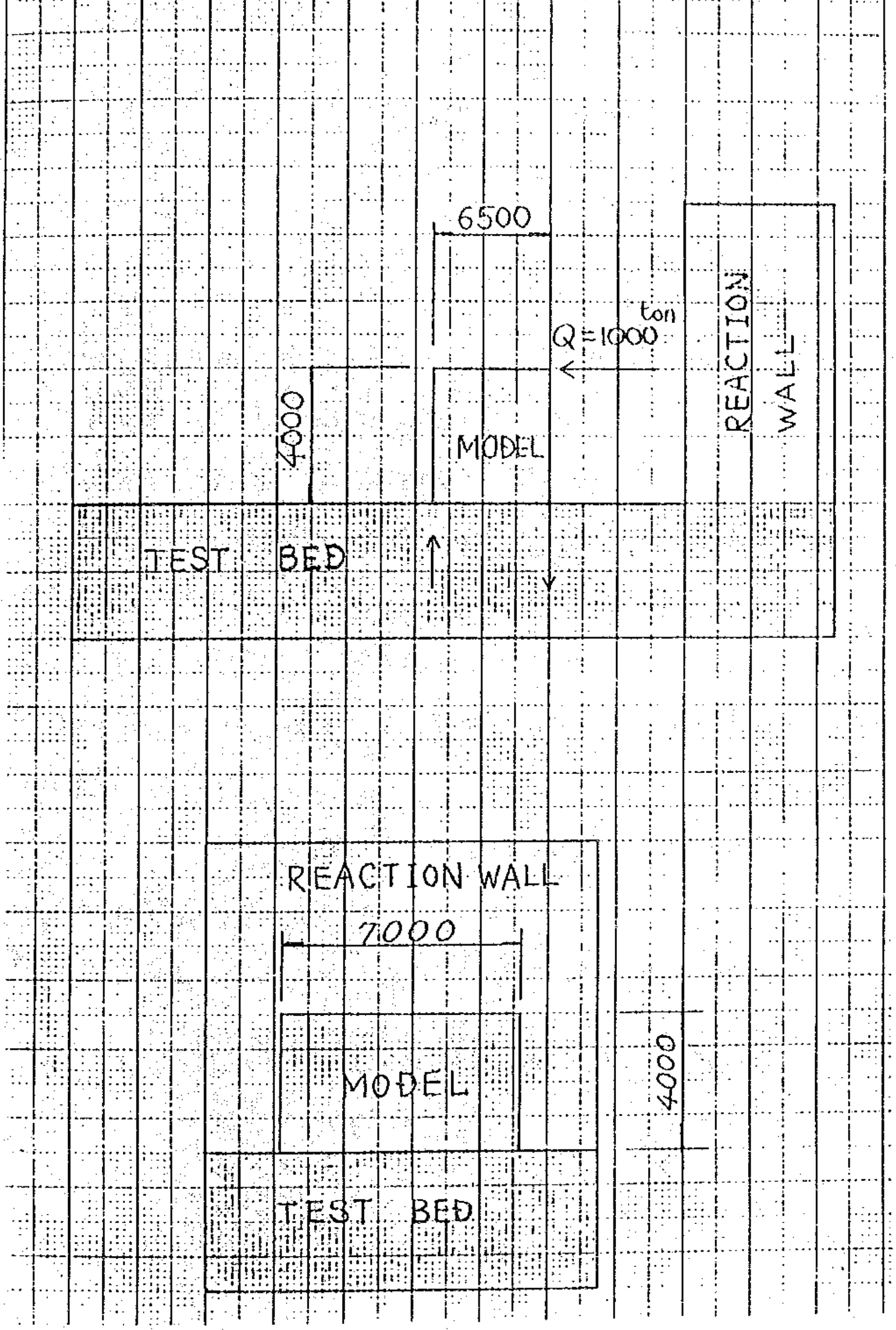
Fig-1 GENERAL VIEW OF REACTION WALL & TEST BED




PLAN OF REACTION WALL & TEST BED
A
A
4500
18000
11500


SECTION Ⓐ-Ⓐ (VERTICAL SECTION)
11,500
1000 2500 1000 2500 1000 2500 1000
9000
REACTION WALL
4000
TEST BED

LOADING CONDITION



§2. ALLOWABLE STRESS OF MATERIAL

(1) ALLOWABLE STRESS OF PRESTRESSED CONCRETE

i) Specified concrete strength : Fc

$Fc = 400\ kgf/cm^2$

ii) Allowable concrete strength

allowable axial compressive unit stress

(construction stage : $f_c' = 0.45\,Fc = 180\ kgf/cm^2$
(Service conditions : $f_c = 1/3\,Fc = 133\ kgf/cm^2$

Allowable axial tensile unit stress

(construction stage : $f_t' = 0.07 f_c' = 12.6\ kgf/cm^2$
(Service conditions : $f_t = 0$

allowable diagonal tensile unit stress : f_t'

$f_t' = 0.07 f_c' = 12.6\ kgf/cm^2$

Tensile strength : σ_t

$\sigma_t = 0.07\,Fc = 28.0\ kgf/cm^2$

Modulus of elasticity : $Ec = 3.2 \times 10^5\ kgf/cm^2$

Compressive unit stress at the time of prestressing

$f_{cp}' = 300\ kgf/cm^2$

Att. 1) Bulk density of concrete ρc is $2.4\ tonf/m^3$

Att. 2) Minimum shear reinforcement ratio

$p_s = 0.25\ \%$

Allowable tensile stress of reinforcing bar $\sigma_{sa} = 2000\ kg/cm^2$

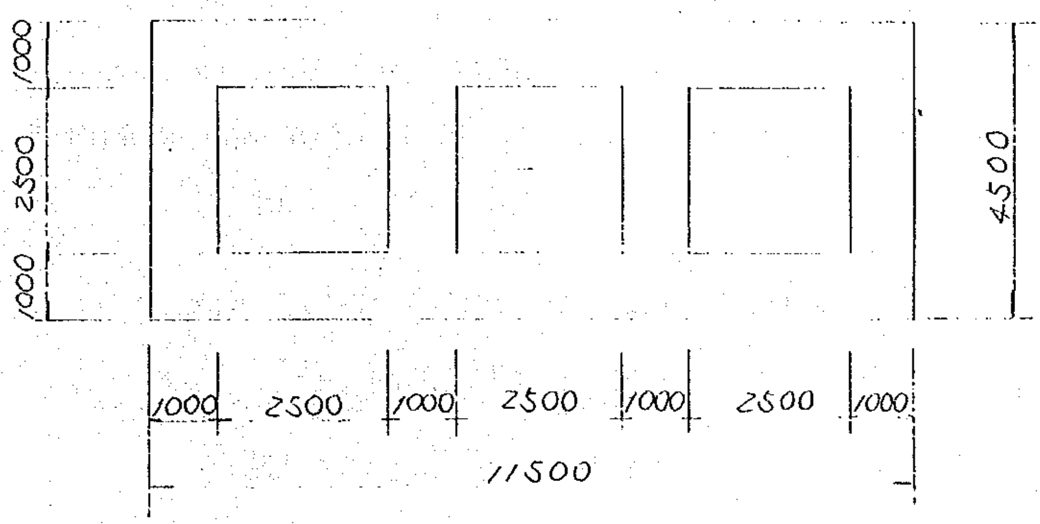
(2) Allowable stress of PC Steel

DIAMETER & TENDON NUMBER	SECTION AREA	WEIGHT	TENSILE STRENGTH σ_{pu}		YIELD STRENGTH σ_{PY}		ALLOWABLE STRESS				REMARKS
							INTRODUCING STAGE SMALLER VALUE EITHER 0.75 σ_{pu} OR 0.85 σ_{PY}		ANCHORING STAGE SMALLER VALUE EITHER 0.7 σ_{pu} OR 0.80 σ_{PY}		
mm	mm^2	Kgf/m	Kgf/mm^2	Kgf	Kgf/mm^2	Kgf	Kgf/mm^2	Kgf	Kgf/mm^2	Kgf	
φ 32	789.3	6.31	110	86820	95	74980	82.5	63733	76	59984	SBPR 7B
12T12.7	1184.52	9.288	190	224400	160	190800	137	162180	129	152640	SWPR 7B
12T15.2	1664.40	13.212	192	319200	160	271200	139	230520	130	216960	SWPR95/110

§3. DESIGN OF SECTION

(1) REACTION WALL

① MAXIMUM STRESS AND INDUCED PRESTRESS



1) SECTIONAL AREA : A_{cw}

$$A_{cw} = 4.5 \times 11.5 - 2.5 \times 2.5 \times 3$$

$$A_{cw} = 33 \; m^2$$

2) GEOMETRICAL MOMENT OF INERTIA : I_{cw}

$$I_{cw} = \frac{11.5}{12} \times (4.5)^3 - \frac{2.5}{12} \times (2.5)^3$$

$$I_{cw} = 84.0 \; m^4$$

3) SECTION MODULUS :

$$Z_{cw} = \frac{I_{cw}}{2.25} = 37.3 \; m^3$$

4) MAXIMUM STRESS AT THE EDGE

$$\sigma_e = -\frac{P}{A_{cw}} \pm \frac{M_a}{Z_{cw}}$$

where P : DEAD LOAD WITH SELF WEIGH OF CONCRETE AT THE BASE OF THE WALL

A_{cw} : SECTIONAL AREA OF WALL

M_a : DESIGN BENDING MOMENT

Z_{cw} : SECTION MODULUS

MAXIMUM VALUE OF COMPRESSIVE STRESS : σ_{ec}

$$\sigma_{ec} = -2.4\ tonf/m^3 \times 9^m - 4000\ tonf \cdot m / 37.3\ m^3$$
$$= -129\ tonf/m^2 = 12.9\ kgf/cm^2$$

MAXIMUM VALUE OF TENSILE STRESS : σ_{eT}

$$\sigma_{eT} = -2.4 \times 9 + 4000/37.3$$
$$= 86\ tonf/m^2 = 8.6\ kgf/cm^2$$

5) REQUIRED PRESTRESS FOR FULL-PRESTRESSING

$$\overset{V}{\sigma}_{PoW} = \frac{\sigma_{eT}}{\eta}$$

where η indicates effectiveness ratio of introduced prestress to effective prestress In case of post-tensioning method ;

$\eta = 0.85$

$$\therefore \quad \sigma_{PoW}^{V} = \frac{8.6}{0.85} = 10.1 \ \mathrm{kgf/cm^2}$$

6) INTRODUCED PRESTRESS : σ_{PW}^{V}

Taking account of creep and shrinkage of concrete and relaxation pc steel, introduced prestress shall be 15 kgf/cm².

$$\therefore \quad \sigma_{PW}^{V} = 15 \ \mathrm{kgf/cm^2}$$

7) INTRODUCE PRESTRESSING FORCE : P_{PW}^{V}

$$P_{PW}^{V} = \sigma_{PW}^{V} \times A_{cw}$$

$$= 150 \ \mathrm{tonf/m^2} \times 33 \ \mathrm{m^2}$$

$$\therefore \quad P_{PW}^{V} = 4950 \ \mathrm{tonf}$$

② CHECK OF DIAGONAL TENSILE STRESS WITH DESIGN SHEAR FORCE

1) SHEARING STRESS

$$\tau_{max} = \frac{3}{2} \times \frac{Q_a}{A_{cw}}$$

$$= \frac{3}{2} \times \frac{1000 \ \mathrm{tonf}}{33 \ \mathrm{m^2}}$$

$$\therefore \tau_{max} = 45 \ \mathrm{tonf/m^2} = 4.5 \ \mathrm{kgf/cm^2}$$

2) DIAGONAL TENSILE STRESS : σ_{tD}

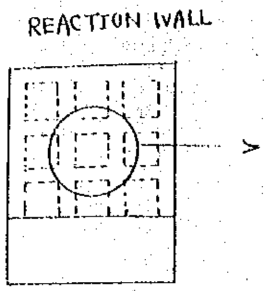
$$\sigma_{t'D} = -\frac{\sigma_{PW}^{V}}{2} + \sqrt{\left(-\frac{\sigma_{PW}^{V}}{2}\right)^2 + \tau_{max}^2}$$

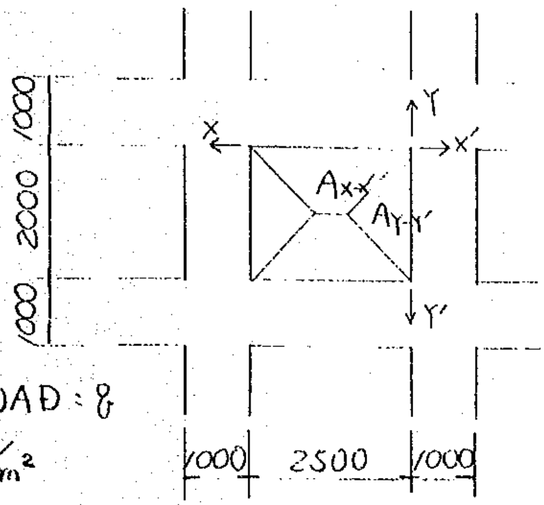
$$= -\frac{15}{2} + \sqrt{\left(-\frac{15}{2}\right)^2 + (4.5)^2}$$

$$\therefore \sigma_{t'D} = 1.2 \ \mathrm{kgf/cm^2} < f_t' = 12.6 \ \mathrm{kg/cm^2}$$

O.K.

③ CHECK OF PUNCHING SHEAR STRESS





PUNCHING LOAD : q

$q = 100\ \mathrm{tonf/m^2}$

(i) X−X′ SECTION

1) BURDEN AREA FOR PUNCHING LOAD : $A_{x\text{-}x'}$

$$A_{x\text{-}x'} = \frac{1}{2} \times (2.5 + 0.5) \times 1^{m} = 1.5\ m^2$$

2) SHEAR FORCE : Q_Y

$$Q_Y = q \times A_{x\text{-}x'}$$
$$= 100\ \mathrm{tonf/m^2} \times 1.5\ m^2$$
$$= 150\ \mathrm{tonf}$$

3) SHEAR STRESS : $\tau_{y,max}$

$$\tau_{y,max} = \frac{3}{2} \times \frac{Q_Y}{A_{cY}}$$

where A_{cY} is sectional area of section x-x′

$$\therefore \tau_{y\,max} = \frac{3}{2} \times \frac{150\ \mathrm{tonf}}{2.5^{m} \times 1^{m}} = 90\ \mathrm{tonf/m^2} = 9.0\ \mathrm{kgf/cm^2}$$

4) DIAGONAL TENSILE STRESS : σ'_{tD_Y}

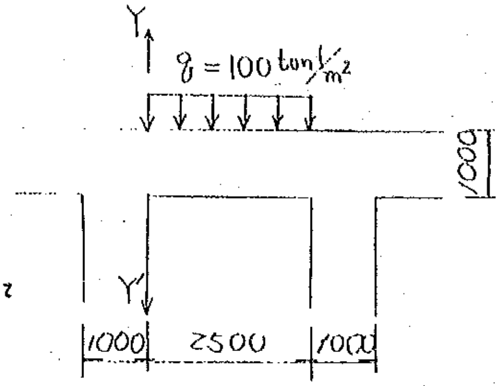
$$\sigma'_{tD_Y} = -\frac{\check{\sigma}_{rw}}{2} + \sqrt{\left(\frac{\check{\sigma}_{rw}}{2}\right)^2 + (\tau_{y.max})^2}$$

$$= -\frac{15}{2} + \sqrt{\left(\frac{15}{2}\right)^2 + 9^2}$$

$$\therefore \sigma'_{tD_Y} = 4.2\ kgf/cm^2 \leq f_t' = 12.6\ kgf/cm^2$$

O.K.

(ii) Y-Y' SECTION



1) BURDEN AREA FOR PUNCHING LOAD : $A_{Y-Y'}$

$$A_{Y-Y'} = 2^m \times 1^m \times \frac{1}{2} = 1^{m^2}$$

2) SHEAR FORCE : Q_x

$$Q_x = q \times A_{Y-Y'} = 100\ tonf/m^2 \times 1^{m^2}$$

$$\therefore Q_x = 100\ tonf$$

3) SHEARING STRESS : $\tau_{x,max}$

$$\tau_{x,max} = \frac{3}{2} \times \frac{Q_x}{A_{cx}}$$

$$= \frac{3}{2} \times \frac{100\ tonf}{2^m \times 1^m}$$

$$\therefore \tau_{x,max} = 75\ tonf/m^2 = 7.5\ kgf/cm^2$$

4) DIAGONAL TENSILE STRESS : $\sigma_{t,Dx}$

$$\sigma_{t,Dx} = -\frac{\sigma_{PW}^H}{2} + \sqrt{\left(\frac{\sigma_{PW}^H}{2}\right)^2 + (\tau_{x,max})^2}$$

where σ_{PW}^H indicates introduced prestress in horizontal direction of reaction wall.

$\sigma_{t,Dx}$ shall be smaller than allowable diagonal tensile stress.

Therefore the following equation shall be satisfied.

$$\sigma_{t,Dr} \leq f_t' = 12.6 \ kgf/cm^2$$

$$\because -\frac{\sigma_{PW}^H}{2} + \sqrt{\left(\frac{\sigma_{PW}^H}{2}\right)^2 + (\tau_{x,max})^2} \leq 12.6$$

$$\therefore \quad \sigma_{PW}^H \geq \frac{(\tau_{x\,max})^2}{12.6} - 12.6 = -6.6 \ kgf/cm^2$$

As a result of calculation, prestress is not required in horizontal direction of reaction wall. But it is considerable that tensile stress will be generated by a restriction of test bed and shrinkage of concrete.
So, it is recommendable to introduce prestress in horizontal direction also.

Introduced prestress shall be at least $10 \ kgf/cm^2$.

5) INTRODUCE PRESTRESSING FORCE : P_{PW}^H

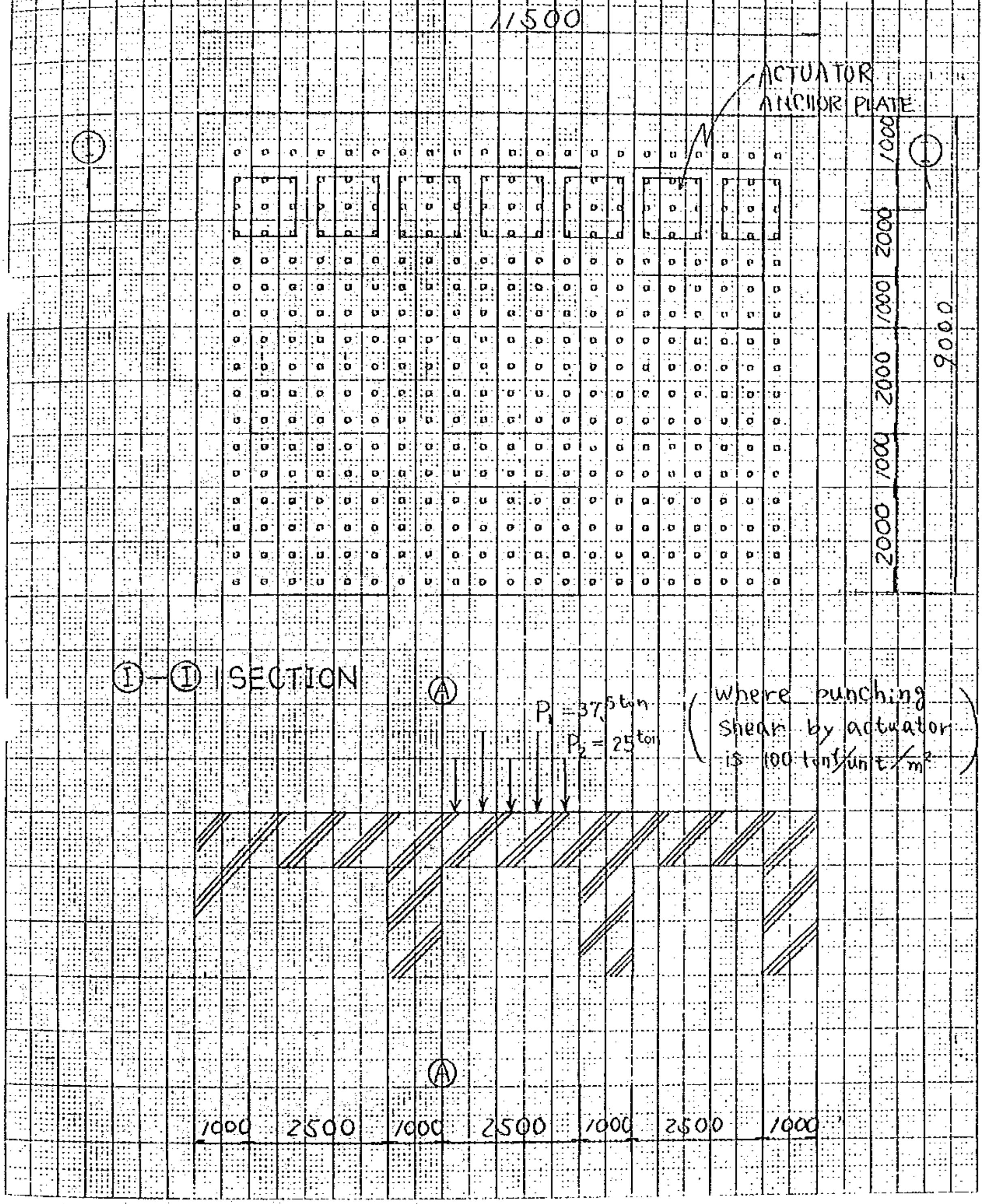
$$P_{PW}^H = \sigma_{PW}^H \times A_{CW}^H$$

$$= 100 \ tonf/m^2 \times 1^m \times 9^m \times 2$$

$$P_{PW}^H = 1800 \ tonf$$

(REFERENCE - 1)

CHECK OF PUNCHING SHEAR BY ACTUATOR REACTION FORCE



(REF-2)

SECTION Ⓐ-Ⓐ

1) SHEAR FORCE : Q

$$Q = \frac{2P_1 + 3P_2}{2} = 75\ \text{tonf}$$

2) SHEARING STRESS : τ_{max}

$$\tau_{max} = \frac{3}{2} \times \frac{Q}{A_{CA}}$$

$$= \frac{3}{2} \times \frac{75\ \text{tonf}}{1^m \times 1^m}$$

$$= 113\ \text{tonf/m}^2 = 11.3\ \text{kgf/cm}^2$$

3) DIAGONAL TENSILE STRESS : $\sigma_{t'D}$

$$\sigma_{t'D} = -\frac{\sigma_{PW}^{H}}{2} + \sqrt{\left(\frac{1}{2}\sigma_{PW}^{H}\right) + (\tau_{max})^2}$$

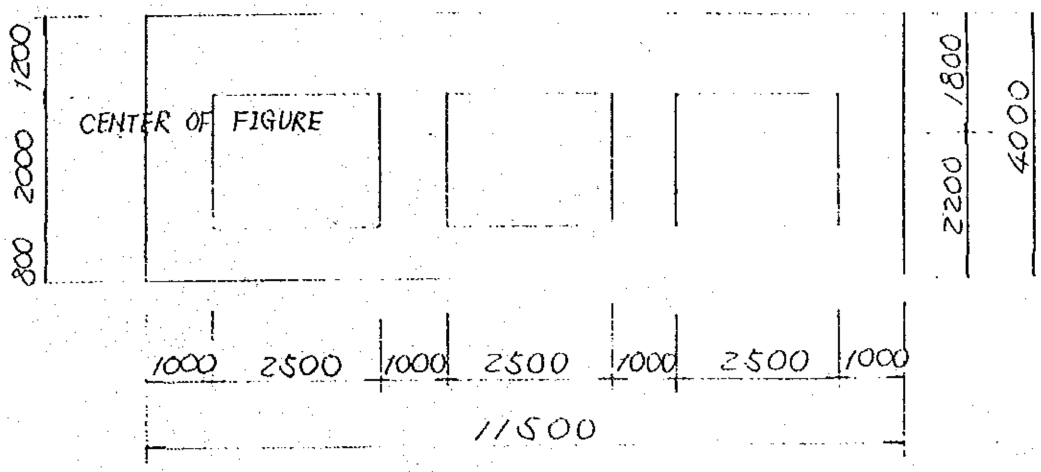
$$= -\frac{10}{2} + \sqrt{\left(\frac{10}{2}\right)^2 + (11.3)^2}$$

$$= 7.3\ \text{kgf/cm}^2 \leqq f_t = 12.6\ \text{kgf/cm}^2$$

O.K.

(2) TEST BED

① MAXIMUM STRESS AND INTRODUCED PRESTRESS



1) SECTIONAL AREA : $A_{CB}^{H_1}$

$$A_{CB}^{H_1} = 4.0^m \times 11.5^m - 2.0^m \times 2.5^m \times 3$$

$$A_{CB}^{H_1} = 31\ m^2$$

2) GEOMETRICAL MOMENT OF INERTIA : I_{CB}

$$I_{CB} = \frac{1}{12} \times b_0 h_0^3 - \frac{1}{12} b_1 h_1^3 \times 3 - (0.2)^2 \times A_{CB}$$

where $b_0 = 11.5^m$, $b_1 = 2.5^m$

$h_0 = 4.0^m$, $h_1 = 2.0^m$

$$\therefore I_{CB} = \frac{1}{12} \times 11.5 \times (4.0)^3 - \frac{1}{12} \times 2.5 \times (2.0)^3 - (0.2)^2 \times 31$$

$$= 54.9\ m^4$$

3) SECTION MODULUS

$$Z_{1T} = \frac{I_{CT}}{2.2^{m}} = \frac{54.9^{m^4}}{2.2^{m}} = 25.0^{m^3}$$

$$Z_{2} = \frac{I_{CT}}{1.8^{m}} = \frac{54.9^{m^4}}{1.8^{m}} = 30.5^{m^3}$$

4) MAXIMUM STRESS AT THE EDGE

$$\sigma_{e_{1},C} = -\frac{Qa}{A_{CT}} - \frac{Ma}{Z_{1}}$$

$$= -\frac{1000}{31} - \frac{4000}{25}$$

$$= -192 \ \mathrm{tonf/m^2} = -19.2 \ \mathrm{kgf/cm^2}$$

$$\sigma_{e_{1},T} = \frac{Qa}{A_{CT}} + \frac{Ma}{Z_{1}}$$

$$= \frac{1000}{31} + \frac{4000}{25}$$

$$= 192 \ \mathrm{tonf/m^2} = 19.2 \ \mathrm{kgf/cm^2}$$

5) REQUIRED PRESTRESS FOR FULL-PRESTRESSING

$$\sigma_{PoB}^{H_1} = \frac{\sigma_{e_{1},T}}{\eta}$$

$$= \frac{19.2 \ \mathrm{kgf/cm^2}}{0.85}$$

$$= 22.6 \ \mathrm{kgf/cm^2}$$

6) INTRODUCED PRESTRESS : $\sigma_{PB}^{H_1}$

Taking account of any factor of reducing prestress, introduced prestress shall be $30 \ \mathrm{kgf/cm^2}$ in longitudinal direction of test bed.

$$\sigma_{PB}^{H_1} = 30\ \mathrm{kgf/cm^2}$$

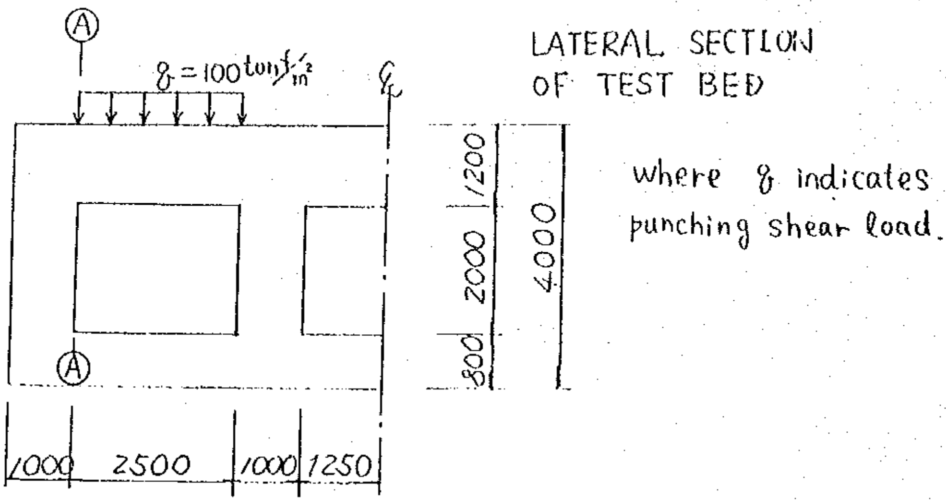
7) INTRODUCED PRESTRESSING FORCE

$$P_{PB} = \sigma_{PB}^{H_1} \times A_{cB}^{H_1}$$

$$= 300\ \mathrm{tonf/m^2} \times 31\ \mathrm{m^2}$$

$$= 9300\ \mathrm{tonf}$$

② CHECK OF PUNCHING SHEAR OF TEST BED



Ⓐ-Ⓐ SECTION

1) SHEAR FORCE : $Q_{Ⓐ}$

$$Q_{Ⓐ} = q \times 2.5^{m} \times 1^{m} \times \frac{1}{2}$$

$$= 100\ \text{tonf/m}^2 \times 2.5^{m} \times 1^{m} \times \frac{1}{2}$$

$$= 125\ \text{tonf}$$

2) MAXIMUM VALUE OF SHEAR STRESS

$$\tau_{max} = \frac{3}{2} \times \frac{Q_{Ⓐ}}{A^{P}_{CB}}$$

$$= \frac{3}{2} \times \frac{125\ \text{tonf}}{1.2^{m} \times 1.0^{m}}$$

$$= 156\ \text{tonf/m}^2 = 15.6\ \text{kgf/cm}^2$$

3) DIAGONAL TENSILE STRESS : σ_t'

$$\sigma_t' = -\frac{1}{2}\sigma_{PoB}^{H_2} + \sqrt{\left(\frac{\sigma_{PoB}}{2}\right)^2 + (\tau_{max})^2}$$

where $\sigma_{PoB}^{H_2}$ indicates a required prestress in lateral direction of test bed.

σ_t' shall be smaller than allowable diagonal tensile stress.

$\sigma_{PoB}^{H_2}$ is lead by the following equation.

$$-\frac{\sigma_{PoB}^{H_2}}{2} + \sqrt{\left(\frac{\sigma_{PoB}^{H_2}}{2}\right)^2 + (\tau_{max})^2} \leq f_t' = 12.6\ kgf/cm^2$$

$$\therefore\ \sigma_{PoB}^{H_2} \geq \frac{(\tau_{max})^2}{12.6} - 12.6 = 6.7\ kgf/cm^2$$

4) INTRODUCED PRESTRESS : $\sigma_{PB}^{H_2}$

$$\sigma_{PB}^{H_2} = \frac{\sigma_{PoB}^{H_2}}{\eta} = \frac{6.7}{0.85} = 7.1$$

$\sigma_{PB}^{H_2}$ shall be $10\ kgf/cm^2$ in lateral direction of test bed.

5) INTRODUCED PRESTRESSIN FORCE : $P_{PB}^{H_2}$

$$P_{PB}^{H_2} = \sigma_{PB}^{H_2} \times A_{CB}^{H_2}$$

$$= 100\ tonf/m^2 \times 1.2^m \times 20^m$$

$$\therefore\ P_{PB}^{H_2} = 2400\ tonf$$

where $A_{CB}^{H_2}$ indicates lateral sectional area of test bed.

§4. PS SYSTEM

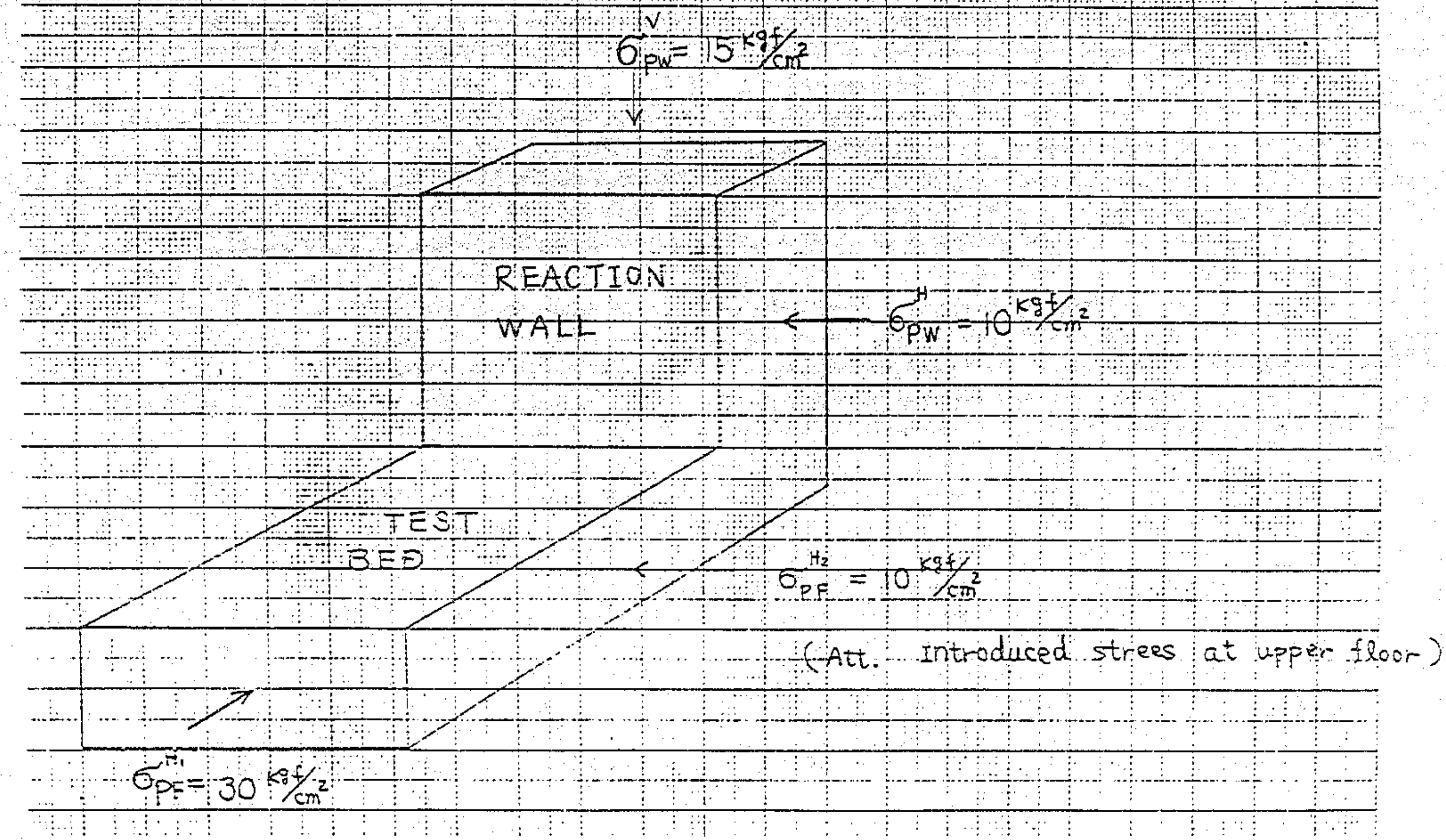
(1) LIST OF PC METHOD

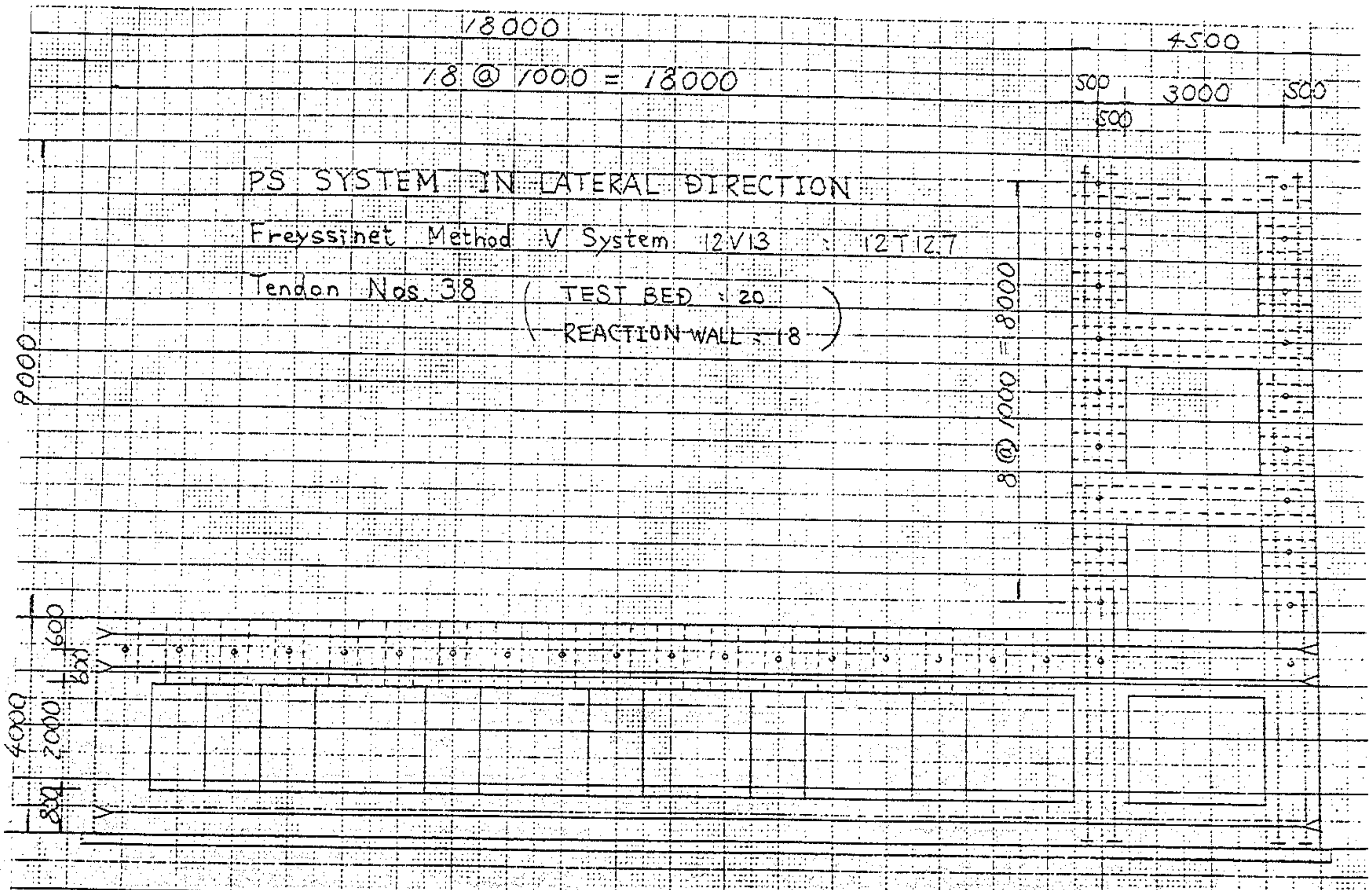
		PC METHOD	ALLOWABLE TENSILE FORCE (tonf)	REQUIRED FORCE (tonf)	REQUIRED NUMBER (Nos.)	ALLOCATED NUMBER (Nos.)	REMARKS
TEST BED	LONGITUDINAL	Freyssinet V system 12 V 15	216	9300	43	50	12T15.2 SWPR7B
	LATERAL	Freyssinet V system 12 V 13	152	2400	16	20	12T12.7 SWPR7B
REACTION WALL	HORIZONTAL	Freyssinet V System 12 V 13	152	1800	12	18	12T12.7 SWPR7B
	VERTICAL	STEEL BAR φ32 NUT ANCHORAGE METHOD	60	4950	86	122	SBPR 95/110

LIST OF QUANTITY OF PS SYSTEM

		PS SYSTEM	LENGTH (m)	QUANTITY (Nos.)	WEIGHT (tonf)
TEST BED	LONGITUDINAL	Freyssinet V SYSTEM 12 V 15	23.4	50	15.5
	LATERAL	Freyssinet V SYSTEM 12 V 13	12.3	20	2.5
REACTION WALL	VERTICAL	PC STEEL BAR SBPR 95/110 φ32	12.8	122	10.0
	HORIZONTAL	Freyssinet V SYSTEM 12 V 13	12.3	18	2.2
TOTAL					30.2

INTRODUCED PRESTRESS BY POST-TENSIONING SYSTEM

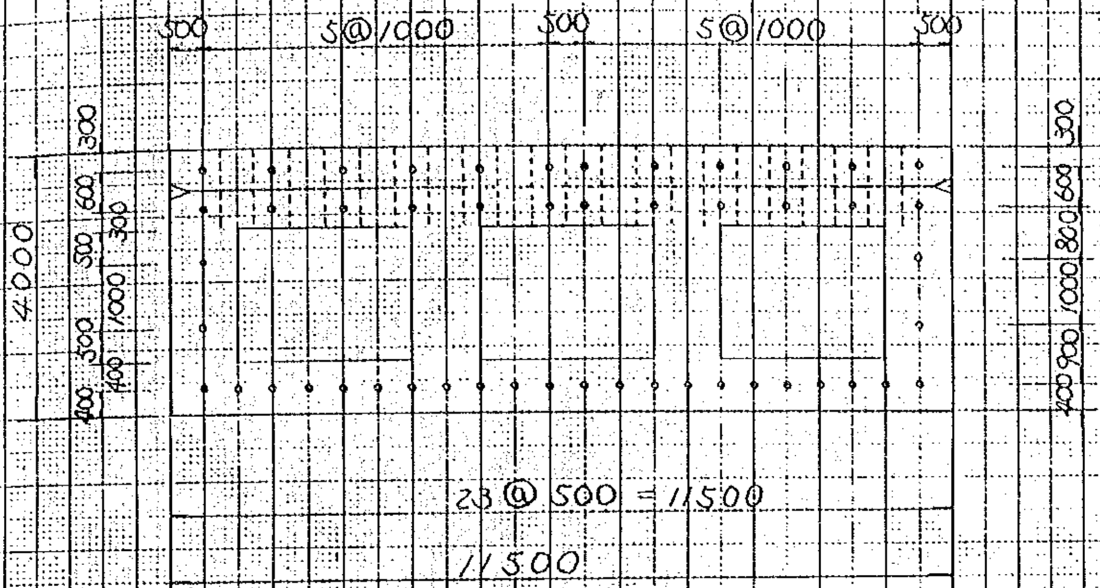




ARRANGEMENT OF PS SYSTEM FOR LONGITUDINAL SECTION

ARRANGEMENT OF PS SYSTEM FOR TEST BED

TRANSVERSE SECTION

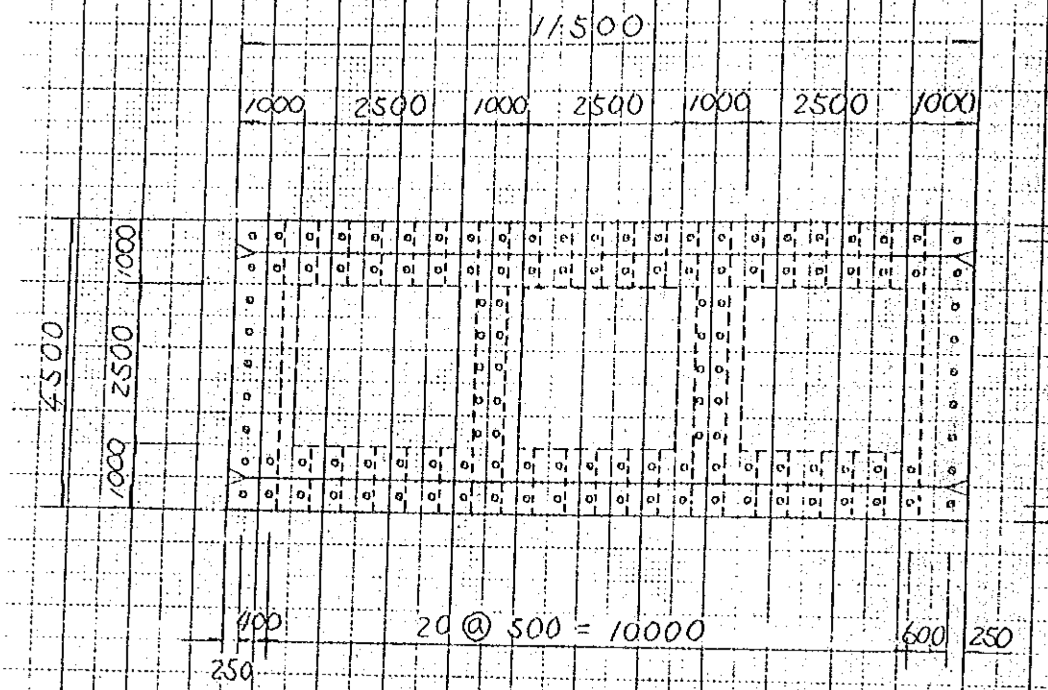


PS SYSTEM IN LONGITUDINAL DIRECTION OF TEST BED

Freyssinet V System 12V15 12T15.2

Tendon Nos. : 50

ARRANGEMENT OF PC STEEL BAR FOR REACTION WALL



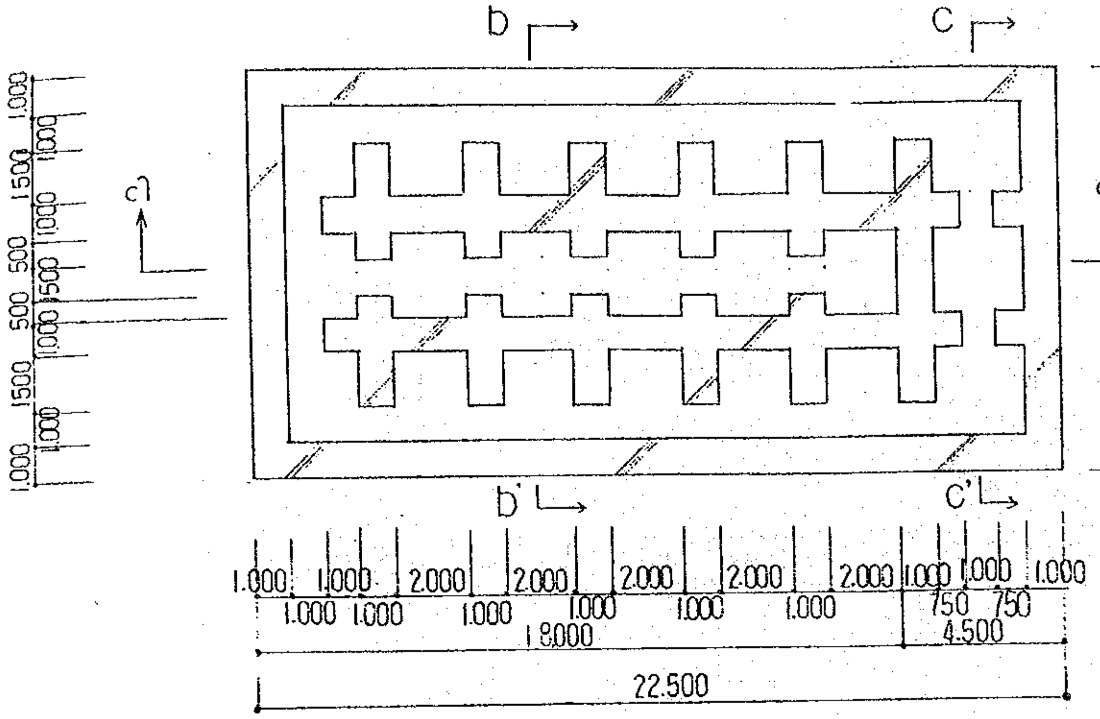
PS SYSTEM IN VERTICAL DIRECTION OF REACTION WALL

PC STEEL BAR : SBPR 95/10

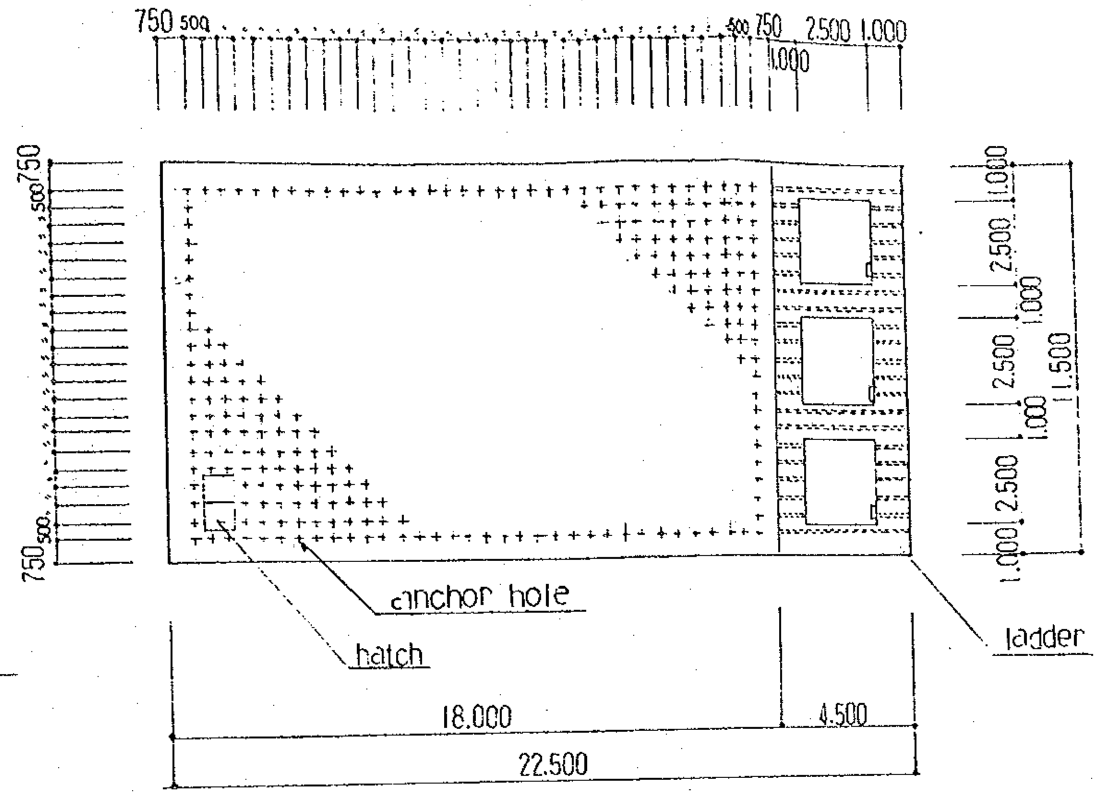
BAR Nos. : 122

TABLE OF QUANTITY FOR MAJOR WORK

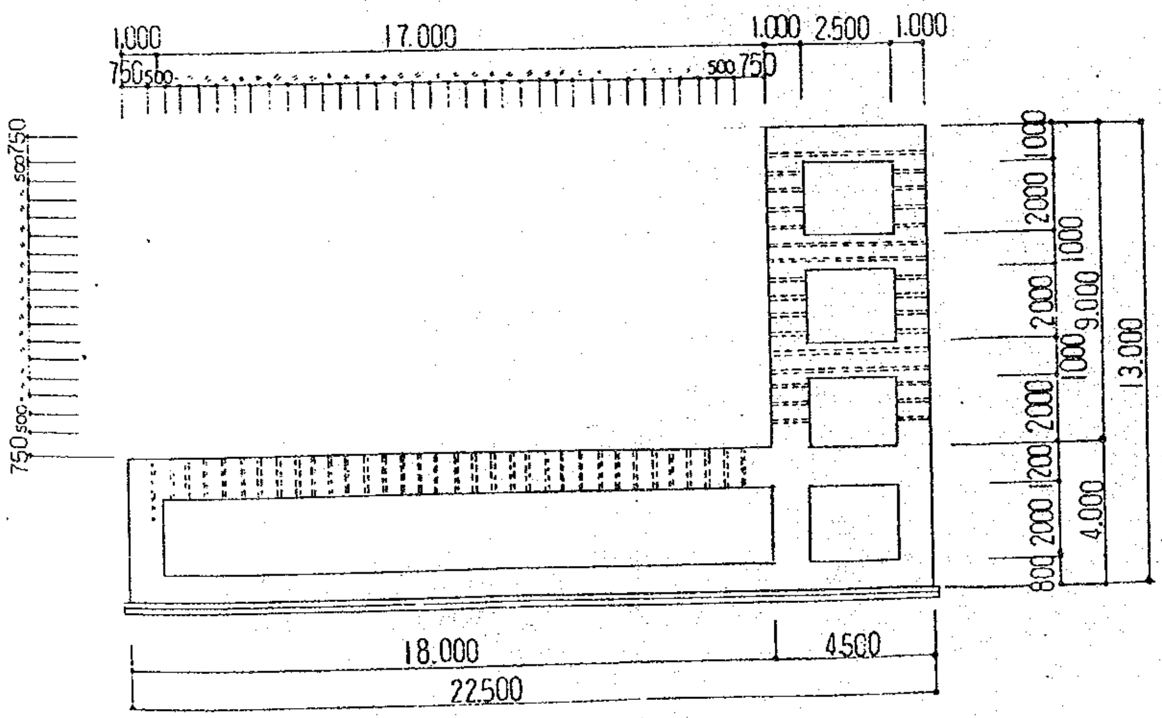
KIND OF WORK	UNIT	QUANTITY	REMARKS
EXCAVATION	m^3	2250	
CONCRETE	m^3	1200	
REINFORCING BAR	t	130	
FORM WORK	m^2	1300	
METAL WORK	t	50	TEMPORARY STEEL FRAME WORK : 25 ton
PC STEEL	t	30.2	
ANCHORAGE PIPE	Nos.	1115	ANCHOR TYPE : 291 SLEEVE TYPE : 824



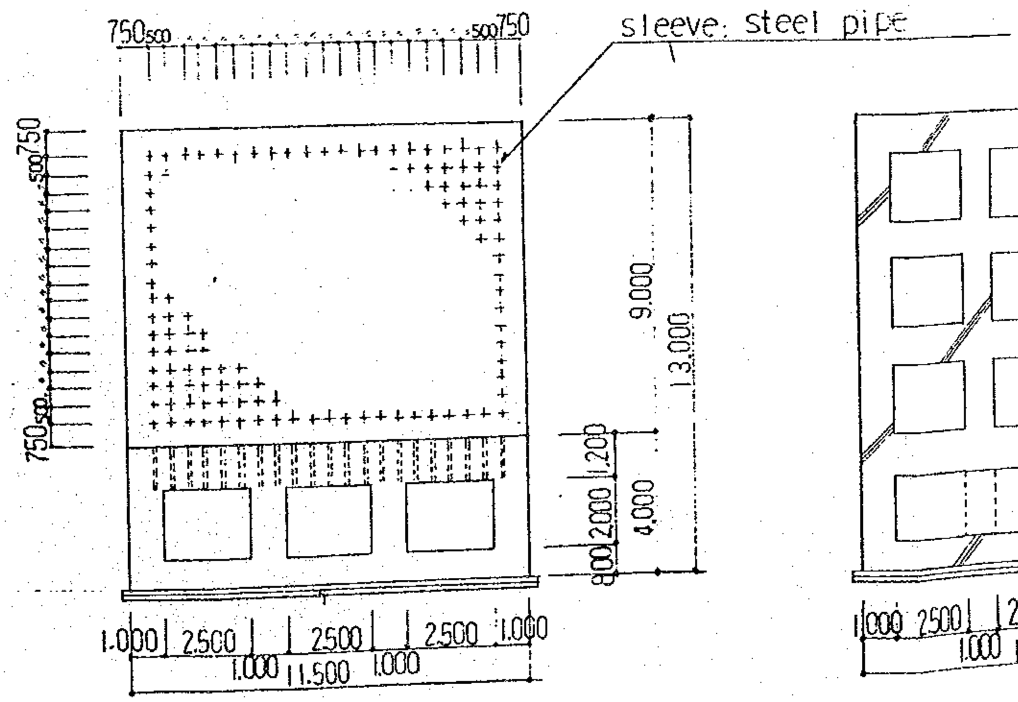
B F PLAN 1/200



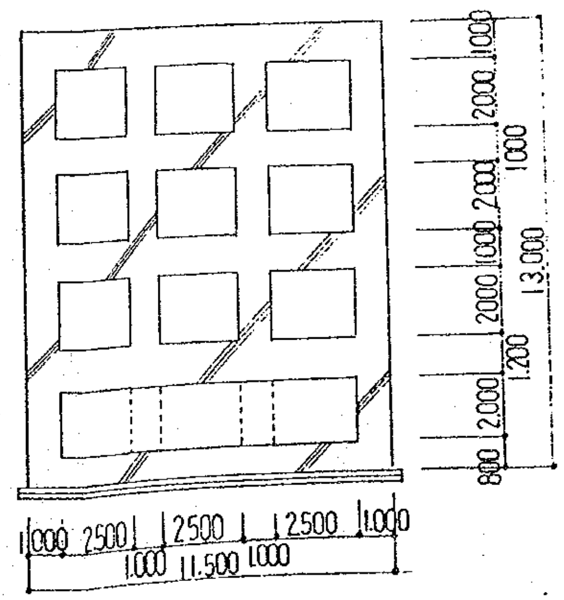
1 F PLAN 1/200



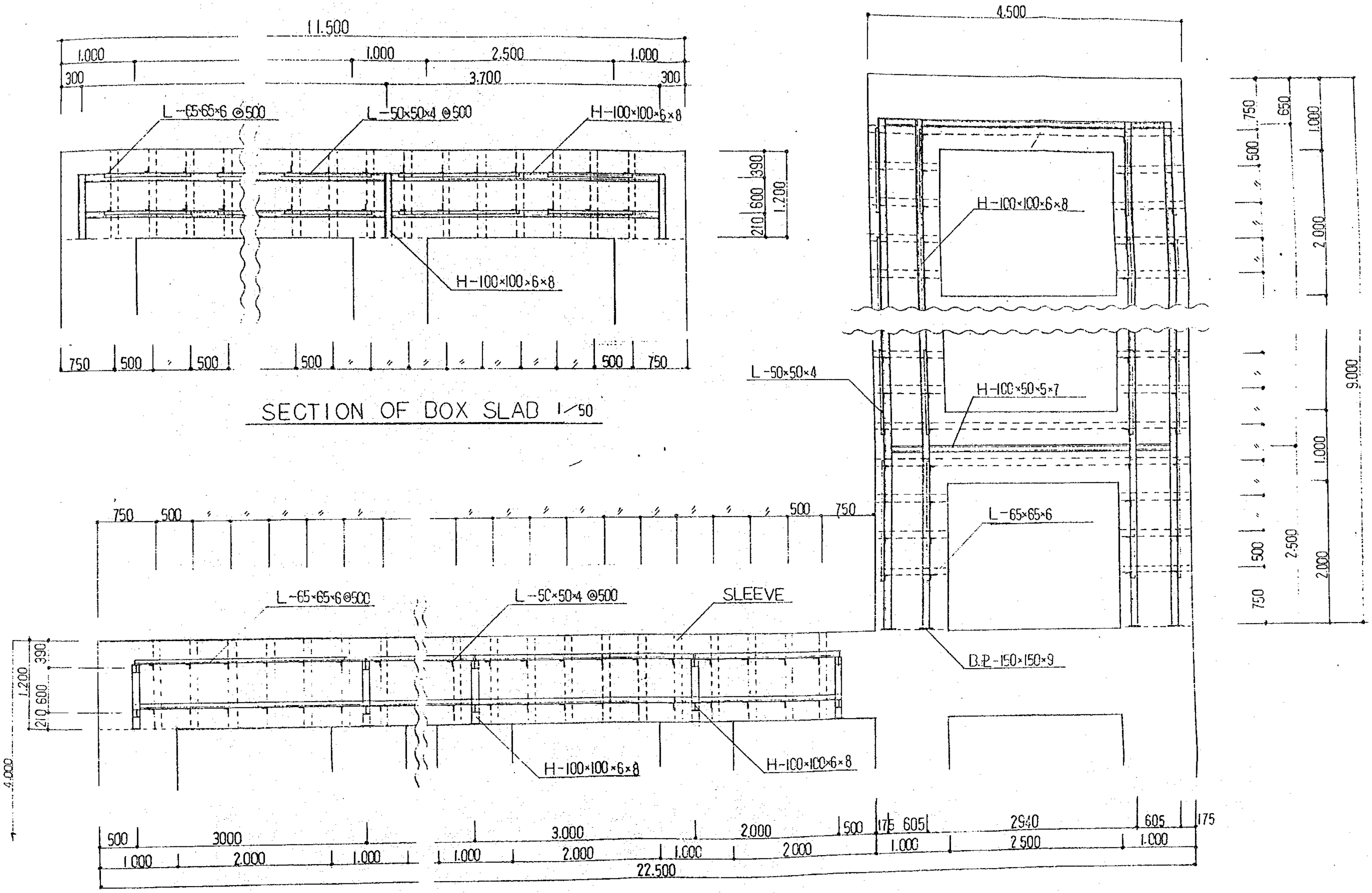
a-a' SEC 1/200



b-b' SEC 1/200

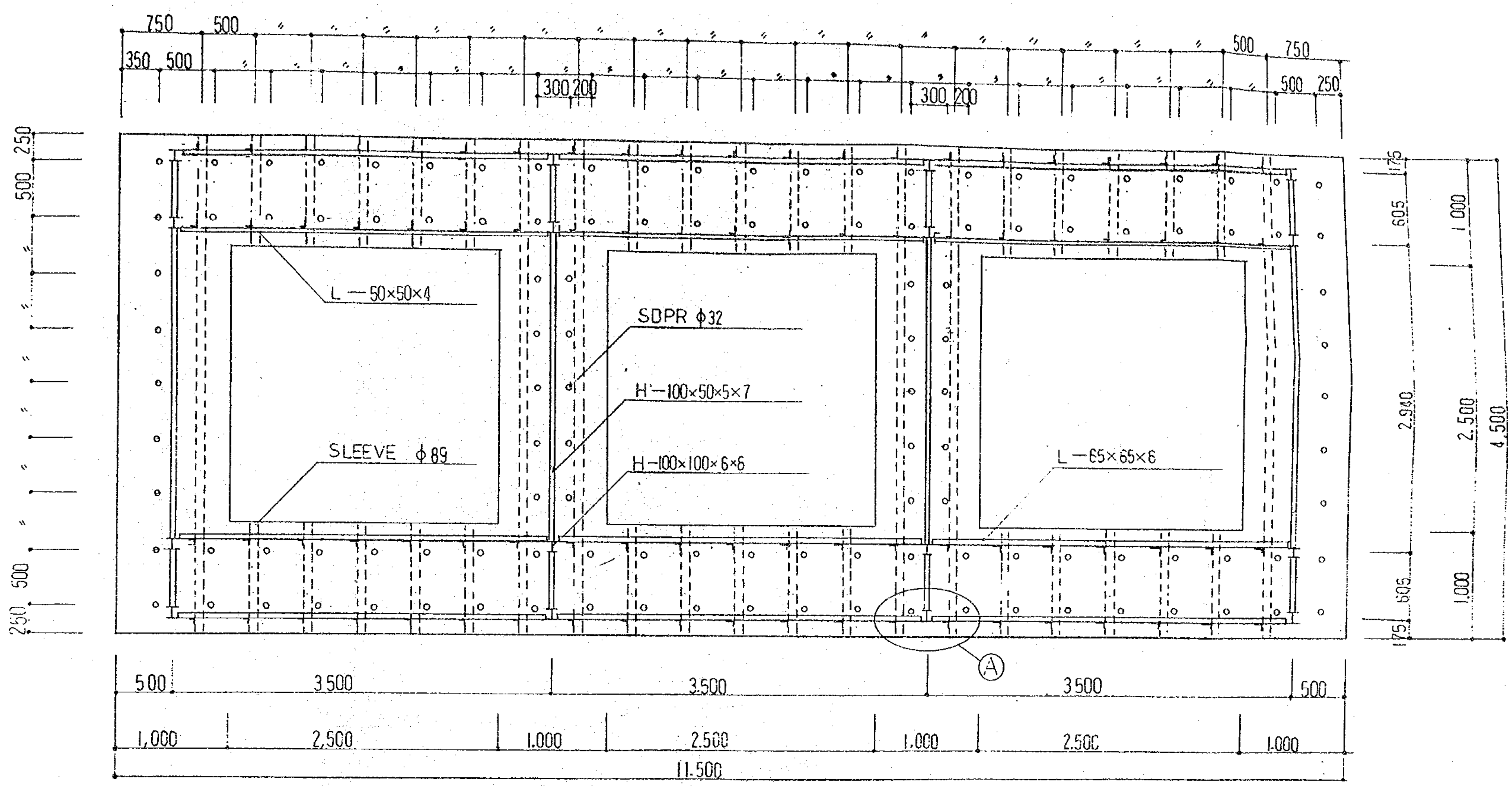


c-c' SEC 1/200

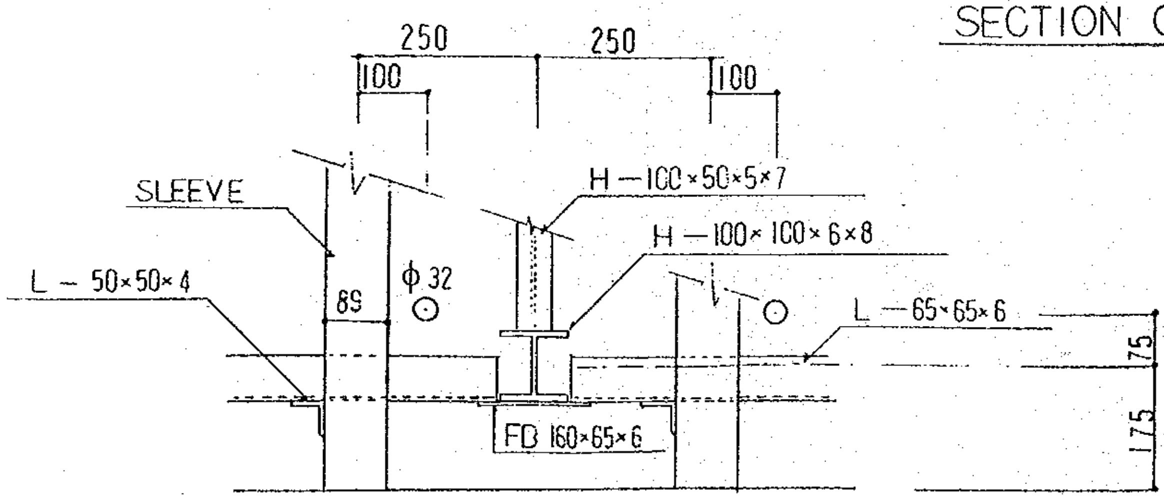


SECTION OF BOX SLAB 1/50

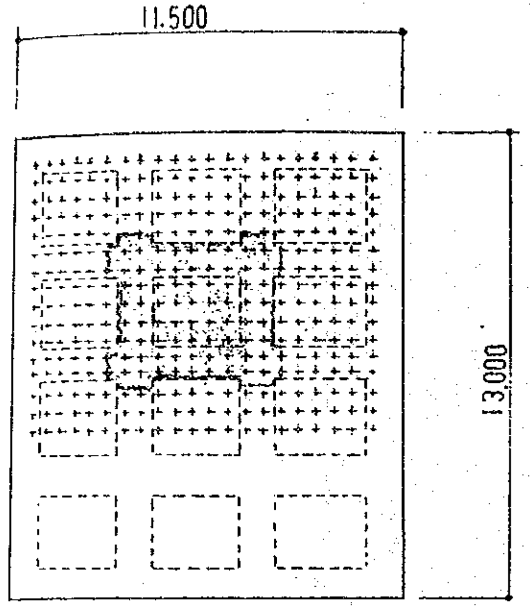
SECTION OF SLAB AND WALL 1/50



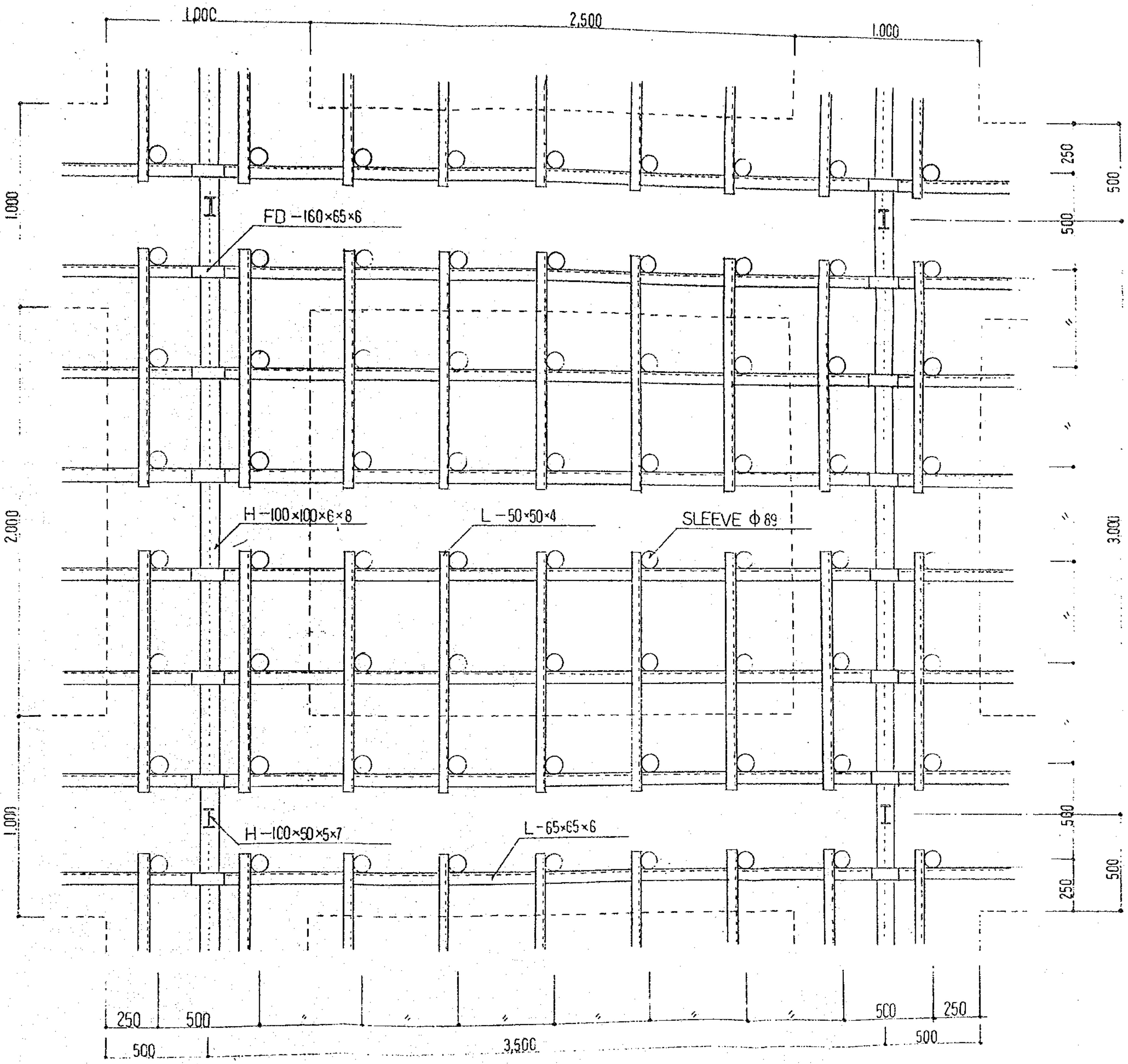
SECTION OF REACTION WALL 1/40



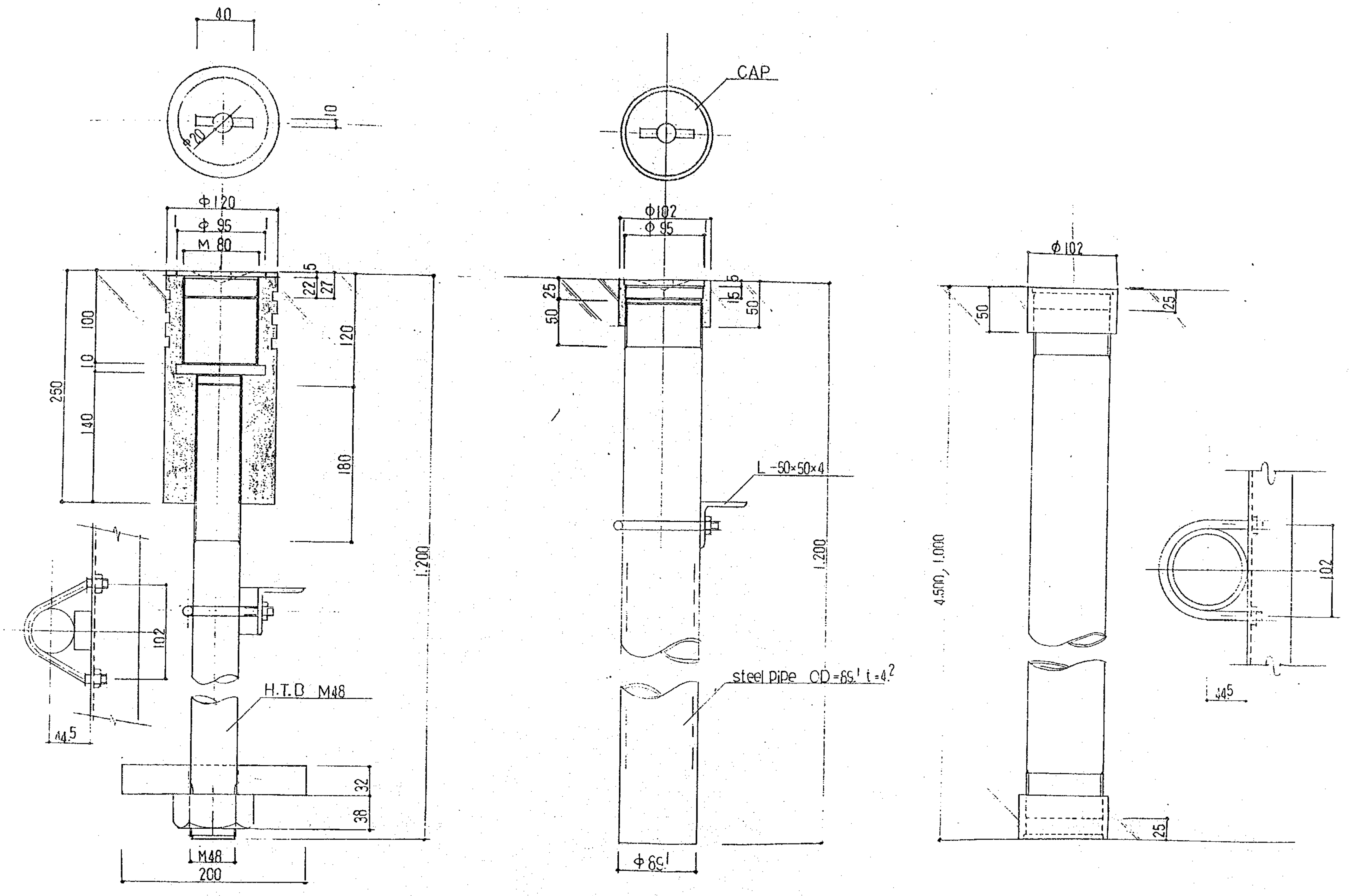
Ⓐ－DETAIL 1/10



REACTION WALL

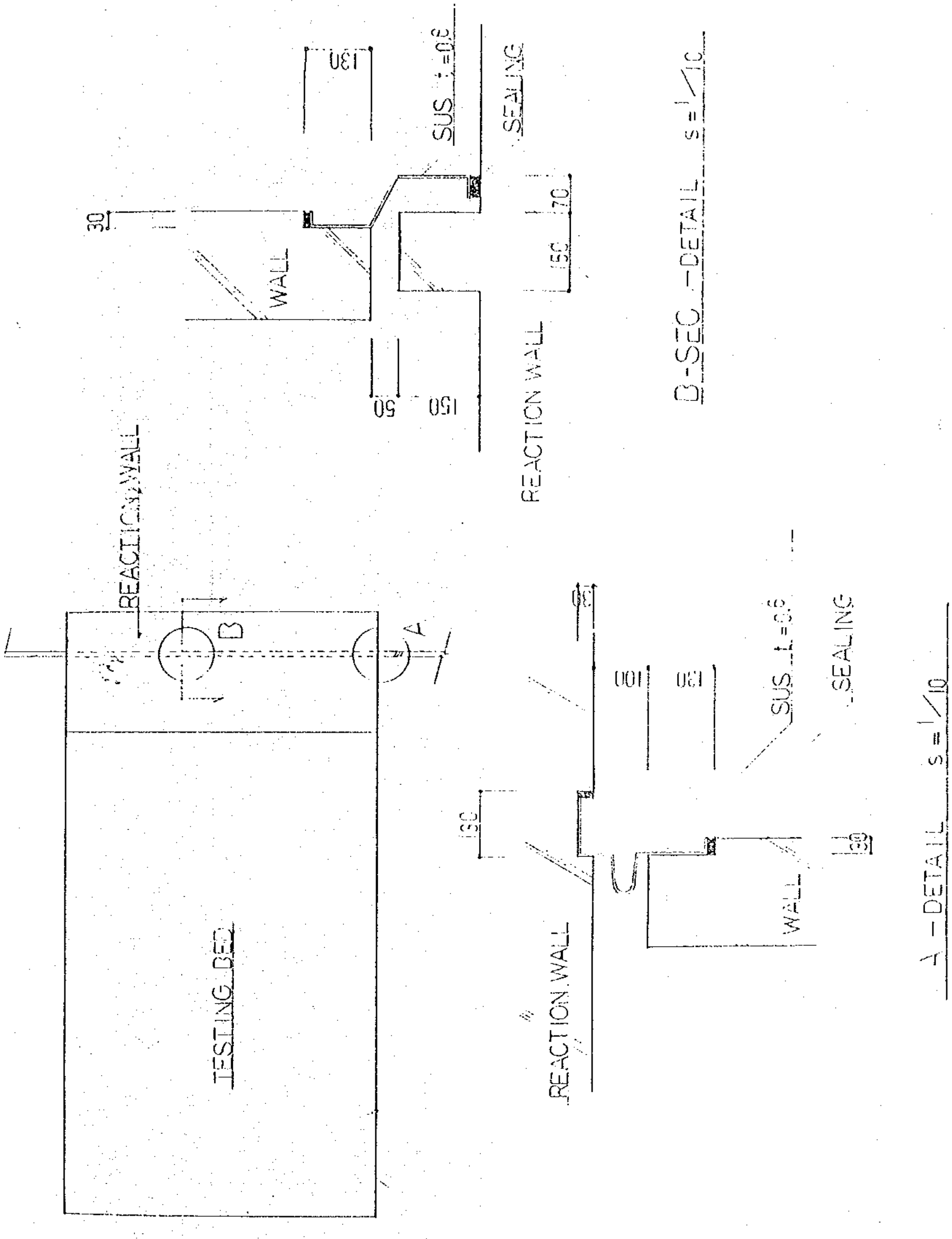


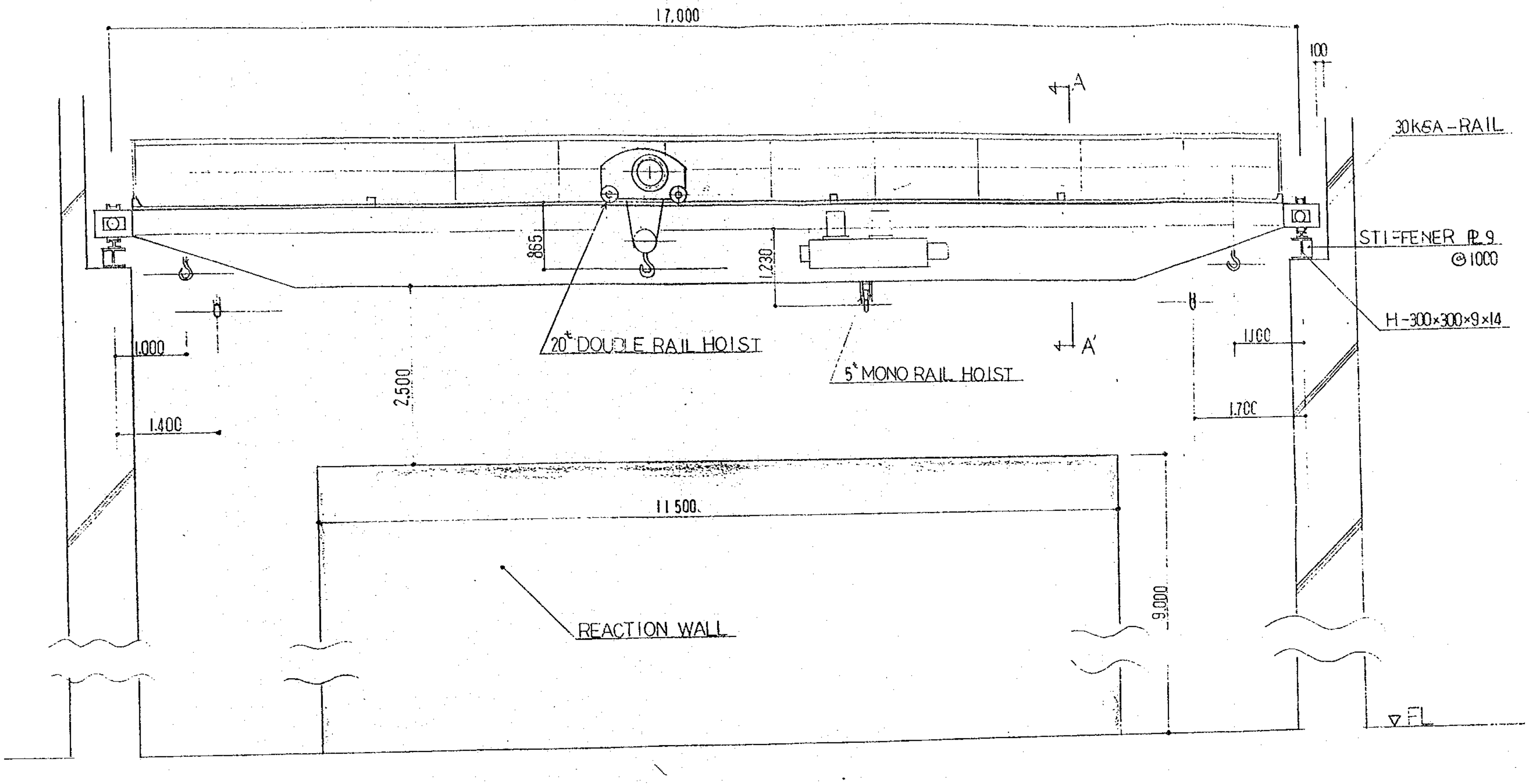
ARRANGEMENT OF SLEEVE HOLDER 1/20

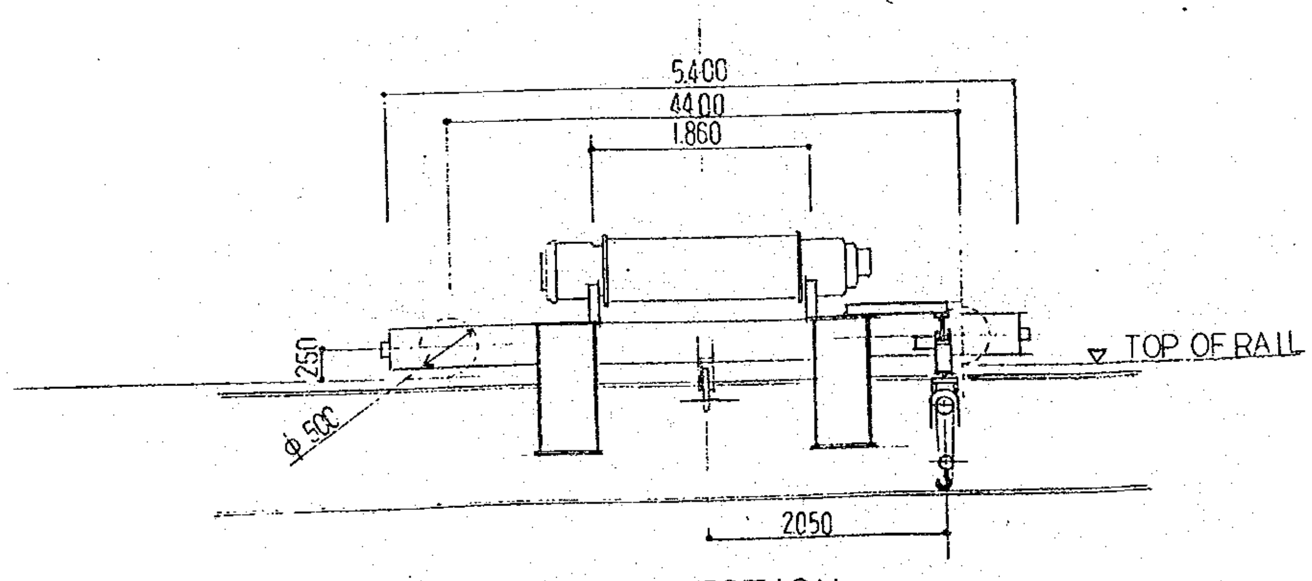


ANCHOR TYPE SLEEVE TYPE SLEEVE TYPE

ANCHOR HOLE S=1/20

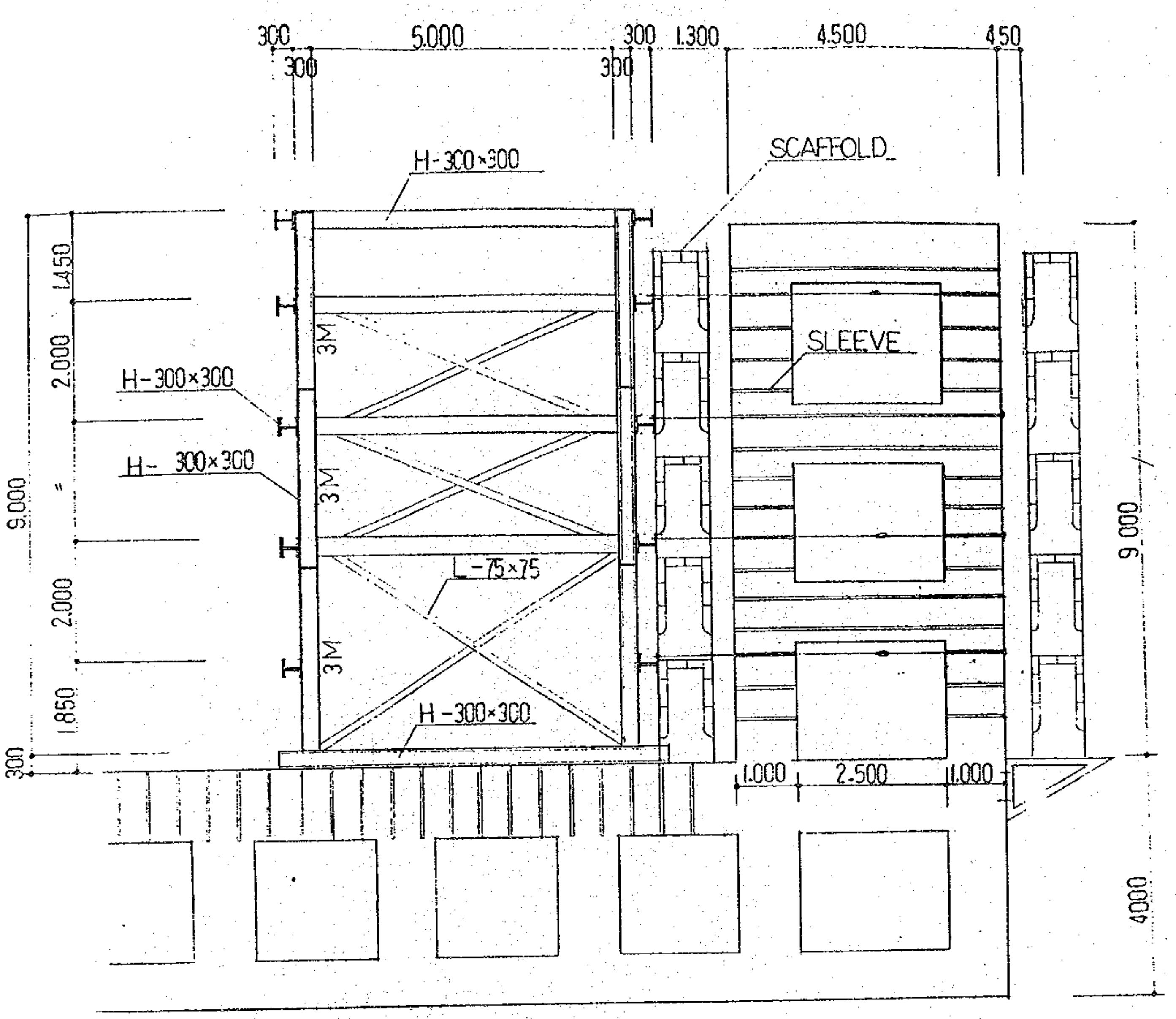

REACTION WALL
B
A
TESTING BED
130
SUS t=0.6
SEALING
30
WALL
150
70
50
150
REACTION WALL
B-SEC -DETAIL s=1/10
100
130
SUS t=0.6
SEALING
150
30
WALL
REACTION WALL
A -DETAIL s=1/10



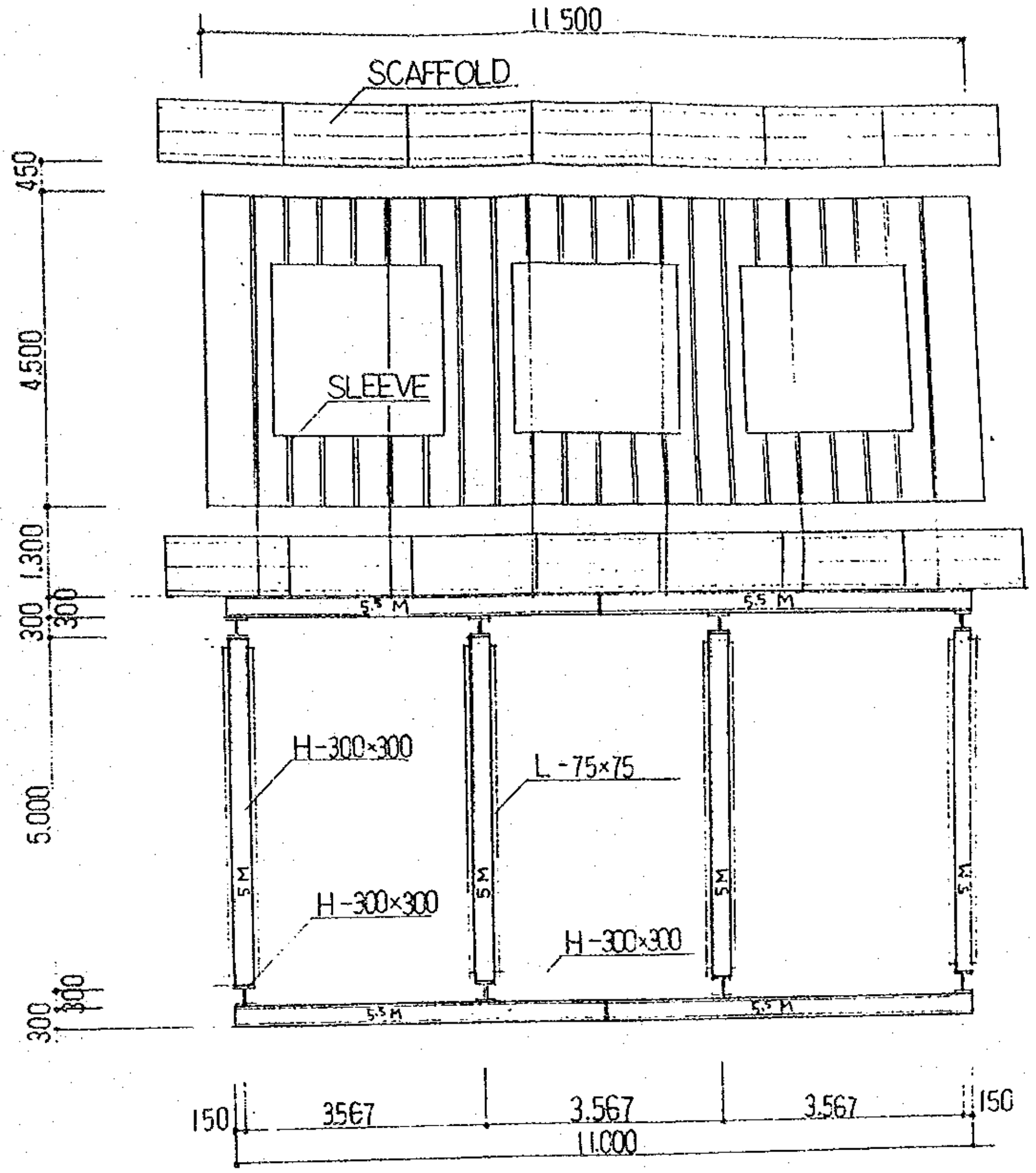


A-A' SECTION

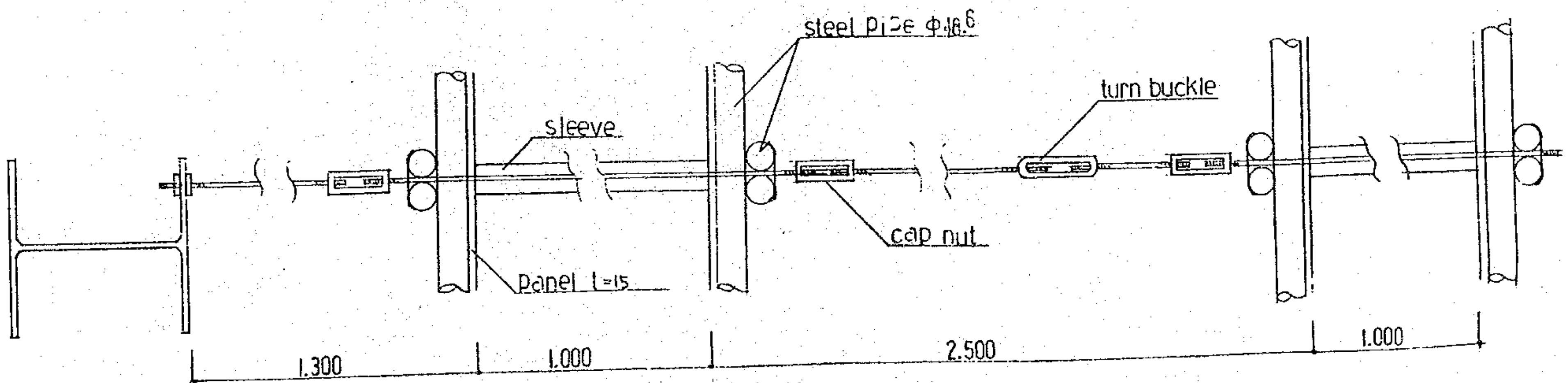
TRAVELLING CRANE S=1/60



SECTION S=1/100

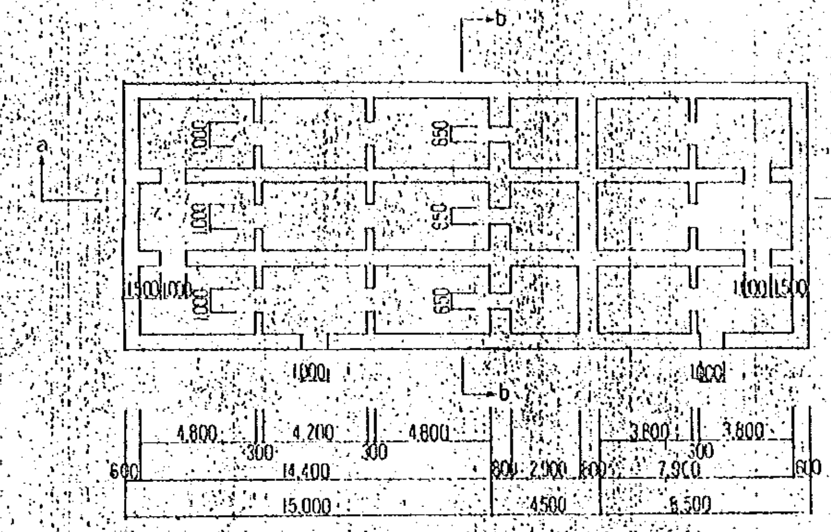


PLAN S=1/100

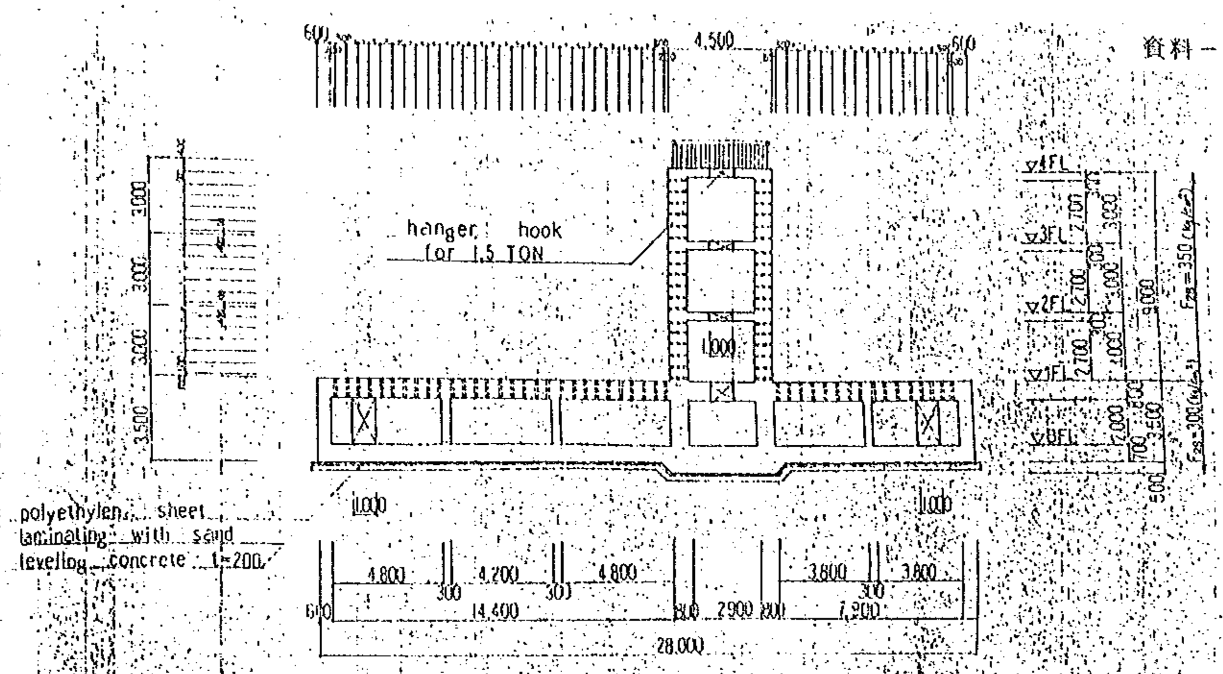


DETAIL S=1/10

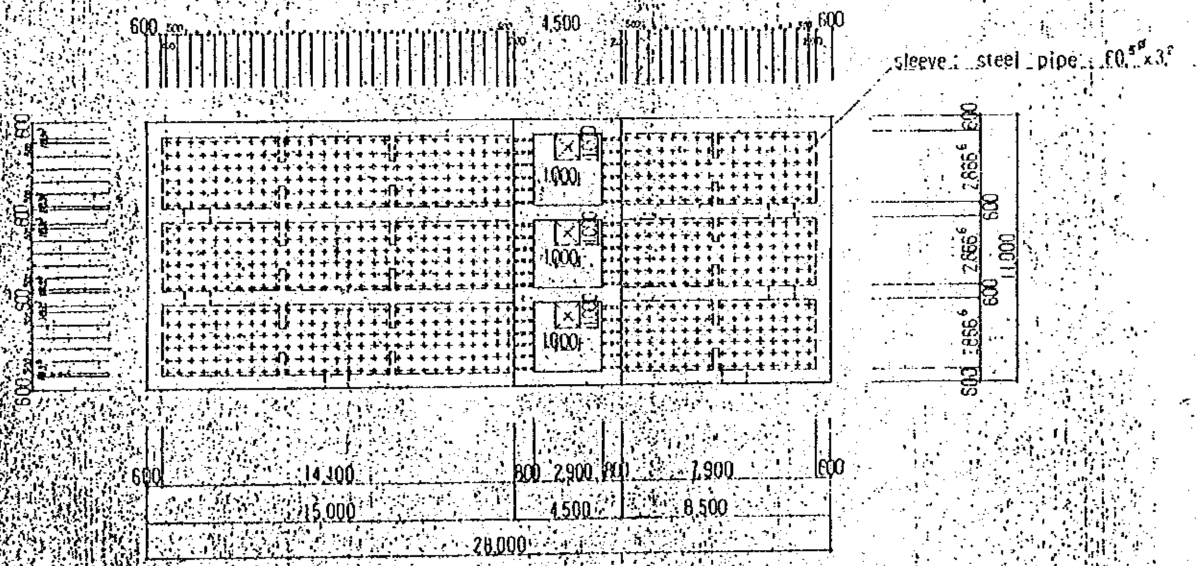
MOLD HOLDER FOR REACTION WALL



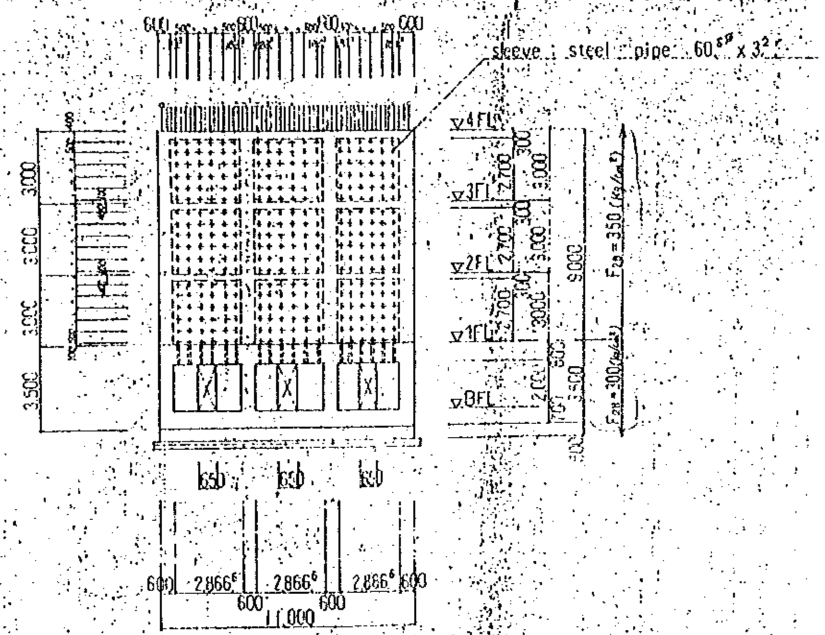
BF PLAN 1/200



a ~ a S.E.C 1/200



1 F PLAN 1/200

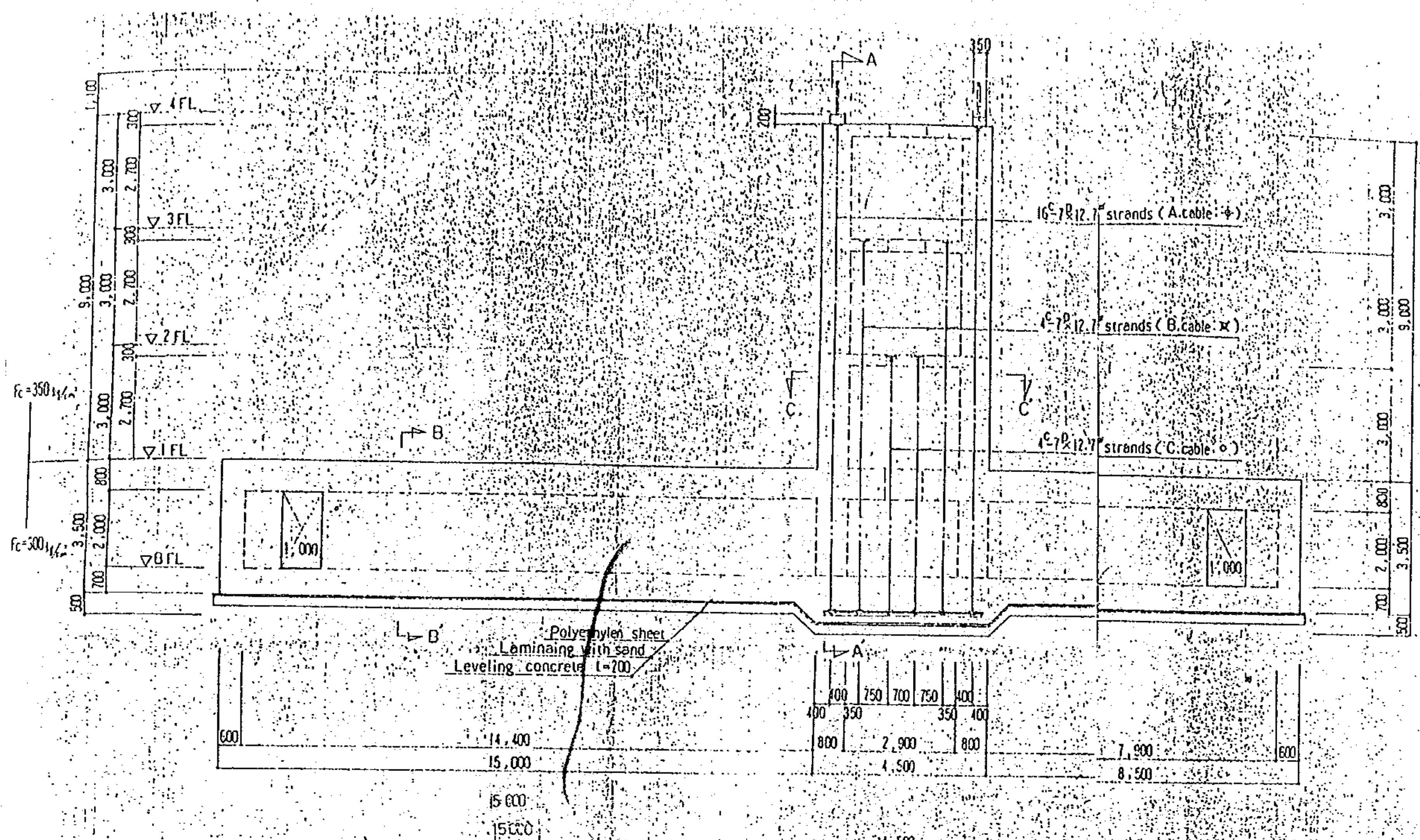


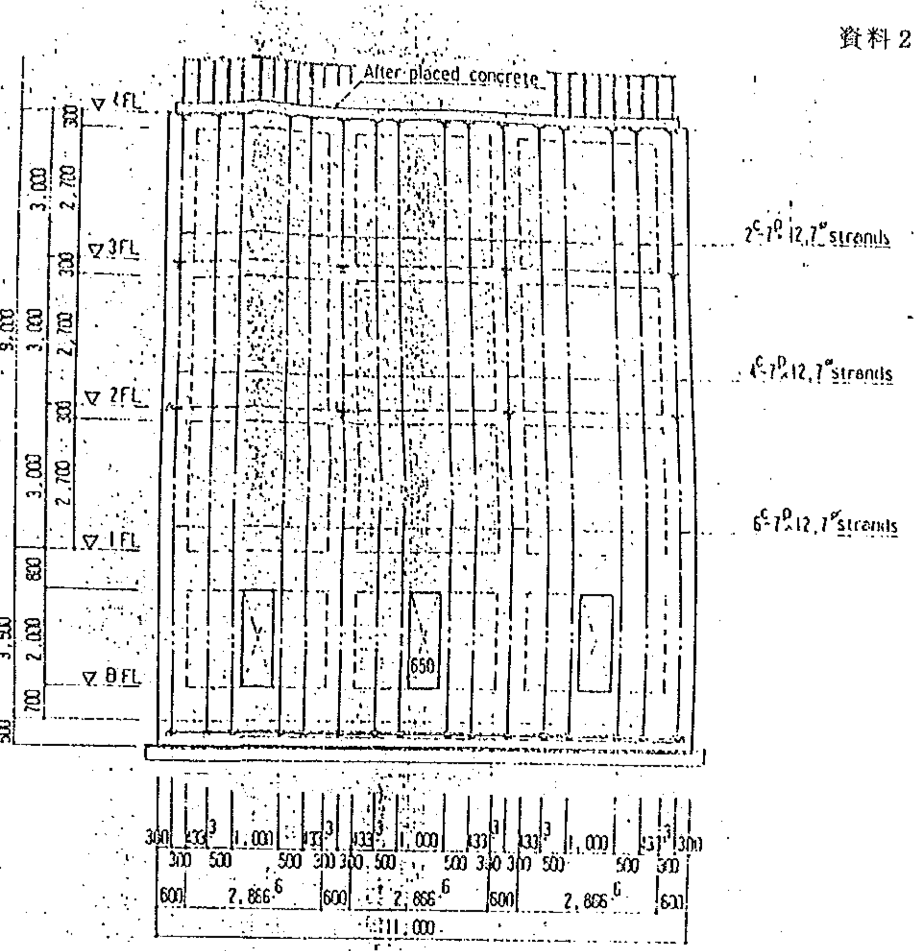
b ~ b S.E.C 1/200

PROPERTY OF REACTION WALL			
	resisting moment	4,000	(TON·m)
	slaughting shear	1,000	(TON)
	maximum of concentrated force of bearing plate in one unit	250	(

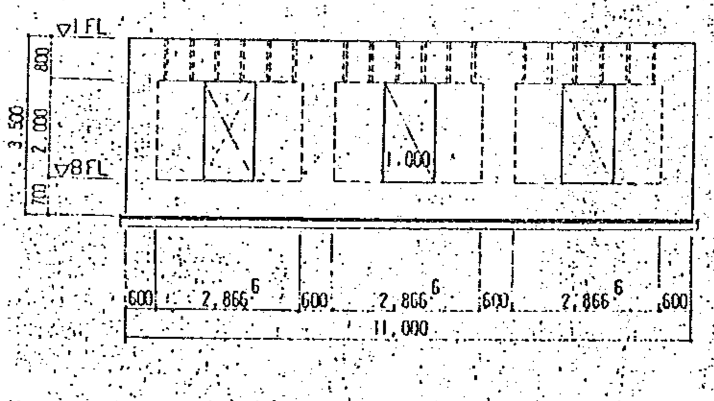
DESIGN CONDITION FOR PRESTRESSED CONCRETE

1. concrete		2. reinforcement	
strength of concrete	F_{28} = 300, 350 (kg/cm²)	SD35	
the concrete strength at transfer	F' = 300	3. prestressed steel	
allowable copressive stresses	f_c = 116.7	P.C. anchorage sistem	VSL sistem
tensile strength	σ_t = 24.5	P.C. cable type	7 x 12.7φ S/C
flexural tensile strength	σ_b = 40.8	area	A = 6.91 (cm²/C)
allowable tensile stresses	f_t = 0	tensile load	P_u = 130.9 (TON/C)
modulus of elasticity of concrete	E_{pc} = 3.0x10⁵	yield load	P_y = 111.3

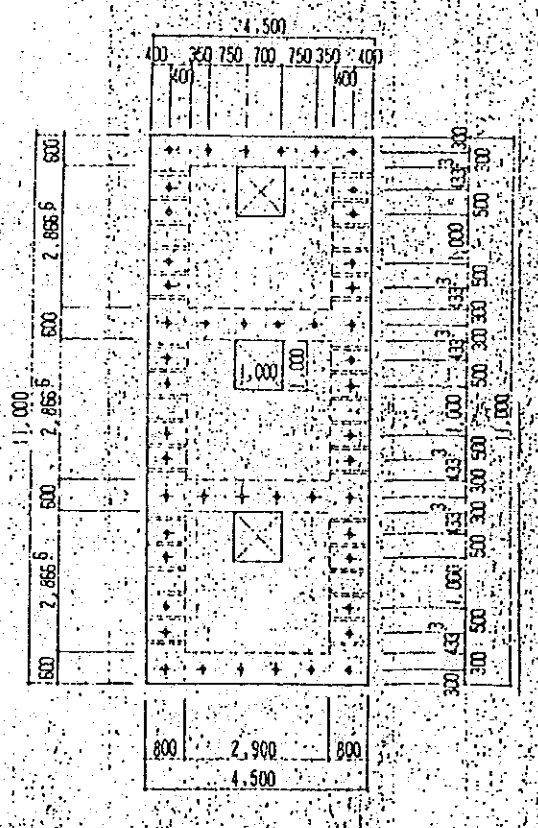




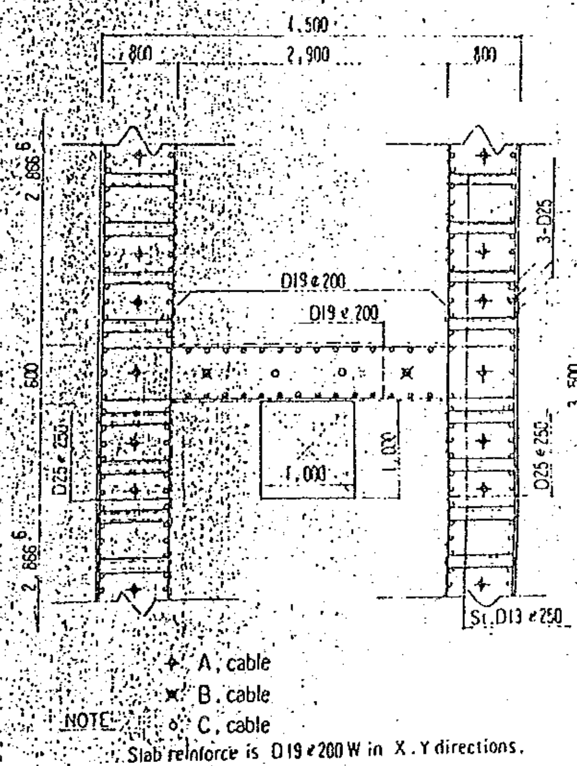
A-A SEC



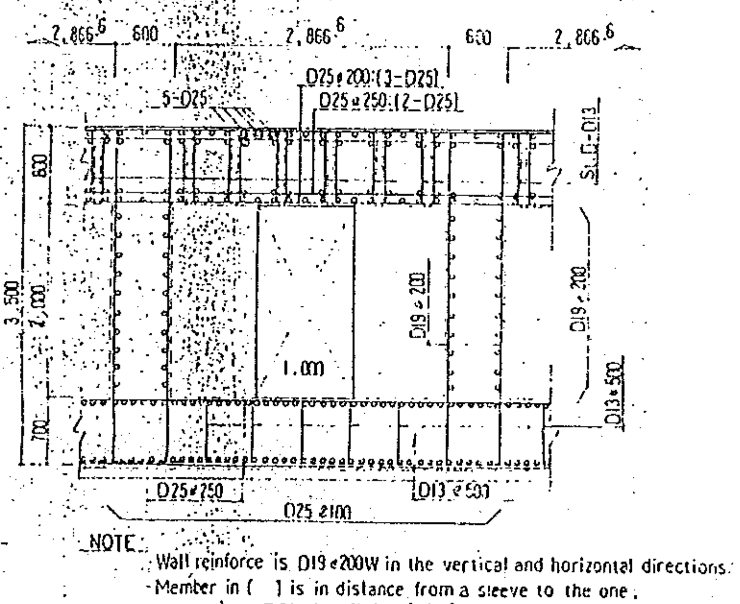
BOX SLAB (B-B' SEC) s=1/100



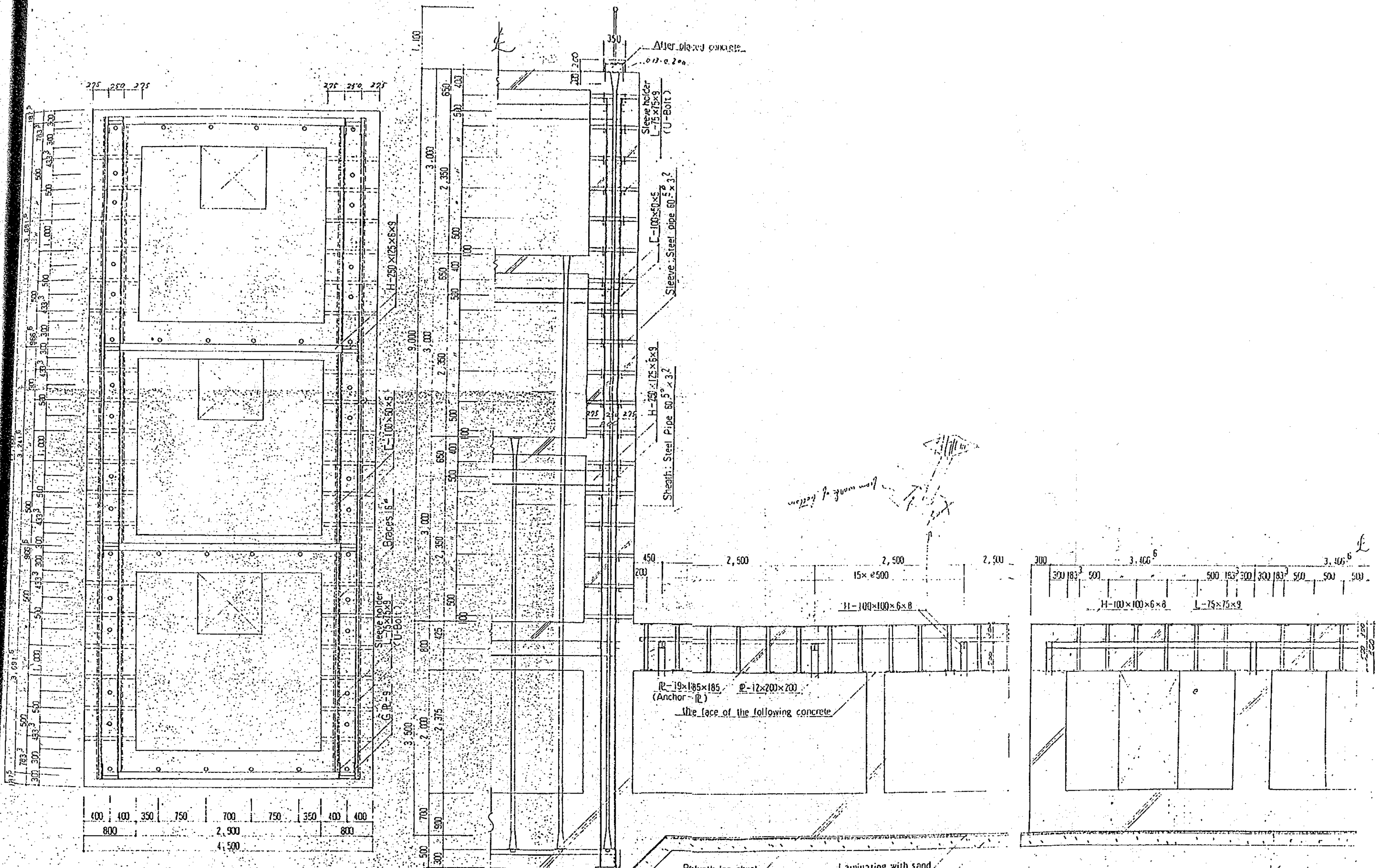
REACTION WALL (C-C' SEC) s=1/100



REACTION WALL (s=1/50)



BOX SLAB (s=1/50)



SECTION OF REACTION WALL S=1/30

SECTION OF BOX SLAB S=1/30

資料－2に対するFUJITA GUMI S.A.の見積り（ミッションの来秘前のもの）

4/3

FUGUSA

"Año del Centenario del Nacimiento de Santa Rosa de Lima"

FUJITA-GUMI S.A.

AV. O. R. BENAVIDES, No. 5125
PARQUE INTERNACIONAL INDUSTRIA COMERCIO - CALLAO
TELEFONOS 520297 - 524115

APARTADO 5503
LIMA - PERU

86-DT-004-163

Callao, 25 de Marzo de 1986

藤田見積り

Señor
Ingº. Julio Kuroiwa H.
Pdte. del Comite Organizador del Centro
de Investigación Sísmica de la U.N.I.
Ciudad.-

Asunto: PRESUPUESTO: "EDIFICACION DE LOSAS DE CARGA Y MUROS DE REACCION DEL LABORATORIO DE PRUEBAS ANTISISMICAS EN LA U.N.I.

Muy señor nuestro:

En atención a lo solicitado y en base a los planos que nos fueron proporcionados, nos es muy grato dirigirnos a Ud., a fin de hacerle llegar nuestro presupuesto elaborado para la ejecución de la obra materia del asunto, la misma que asciende a la suma de I/. 9'789,214.00 ó su equivalente al cambio del dólar oficial en US. $ 699,230.- El mencionado presupuesto se ha confeccionado con precios unitarios vigentes a Marzo '86.

Sin otro particular y en espera de su grata orden, aprovechamos la oportunidad para testimoniarles los sentimientos de nuestra más alta consideración.

Atentamente,

FUJITA GUMI S. A.

JOSE HAMAGUCHI
GERENTE GENERAL

JU/aa

ING°S. CONSULTORES: PROYECTOS CONSTRUCCIONES - INSTALACIONES

PRESUPUESTO

FUGUSA

AV. O. R. BENAVIDES No. 5125
PARQUE INTERNACIONAL INDUSTRIA COMERCIO - CALLAO
TELEFONOS 526297 - 524115

FUJITA-GUMI S. A.
APARTADO 5503
LIMA - PERU

Señor
Ing° [illegible]
Presidente del Comité Organizador del
Centro de Investigación de la U.N.I.

[illegible]

Part. No.	DESCRIPCION	U	Cantidad	Unitario	Parcial
	OBRA: "EDIFICACION DEL LABORATORIO PARA PRUEBA ANTISISMICA - U.N.I."				
1.00	OBRAS PRELIMINARES.-				
01	Transporte de equipo y herramientas.	Est.	1		5,000.00
02	Trazo y replanteo.	Est.	1		1,000.00
03	Caseta de oficina, almacén, comedor, baños.	Est.	1		8,000.00
04	Agua y energía eléctrica.	Est.	1		[illegible]
05	Guardianía.	Est.	1		[illegible]
06	Limpieza general.	Est.	1		5,000.00
	SUB-TOTAL:				36,000.00
2.00	MOVIMIENTO DE TIERRAS.-				
01	Excavación masiva.	m3.	[illegible]	30	47,550.00
02	Eliminación de desmonte.	m3.	2060	50	103,000.00
	SUB-TOTAL:				150,550.00
3.00	OBRAS DE CONCRETO SIMPLE.-				
01	Solado de concreto.	m3.	80	[illegible]	1,360.00
	SUB-TOTAL:				1,360.00
4.00	OBRAS DE CONCRETO ARMADO.-				
01	Losa de cimentación:				
	a) Concreto 300 kg/cm2.	m3.	[illegible]	1,210	[illegible]
	b) Encofrado y desencofrado.	m2.	64	148	9,472.00
	c) Acero.	kg.	22400	10	224,000.00
02	Muro:				
	a) Concreto 300 kg/cm2.	m3.	103	1,210	124,630.00
	b) Encofrado y desencofrado.	m2.	776	154	119,504.00
	c) Acero.	kg.	[illegible]	10	[illegible]
03	Losa maciza (techo)				
	a) Concreto 300 kg/cm2.	m3.	291	1,210	352,110.00
	b) Encofrado y desencofrado.	m2.	310	[illegible]	[illegible]
	c) Acero.	kg.	[illegible]	10	1'014,800.00
04	Muros:				
	a) Concreto 350 kg/cm2.	m3.	209	1410	[illegible]
	b) Encofrado y desencofrado.	m2.	550	154	[illegible]
	c) Acero.	kg.	[illegible]	10	[illegible]
05	Losa maciza (techo).				
	a) Concreto 350 kg/cm2.	m3.	37	1410	[illegible]
	b) Encofrado.	[illegible]	[illegible]	[illegible]	[illegible]
	c) Acero.	[illegible]	[illegible]	10	[illegible]
	SUB-TOTAL:				[illegible]

SIDER PERU

×1.2

1. 単価
2. 仕様
3. 数量
4. 作業

"Año del Cuatricentenario del Nacimiento ..."

PRESUPUESTO

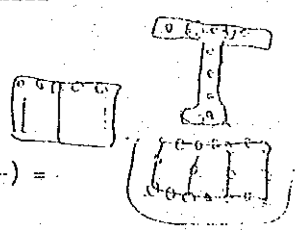
FUGUSA — FUJITA-GUMI S. A.

AV. O. R. BENAVIDES No. 5125
PQUE INTERNACIONAL INDUSTRIA COMERCIO - CALLAO
TELEFONOS 528297 - 524115

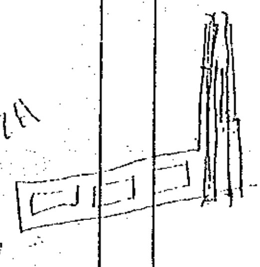
Señor
Ingº JULIO KUROIWA H.
Presidente del Comite Organizador del
Centro de Investigación de la U.N.I.

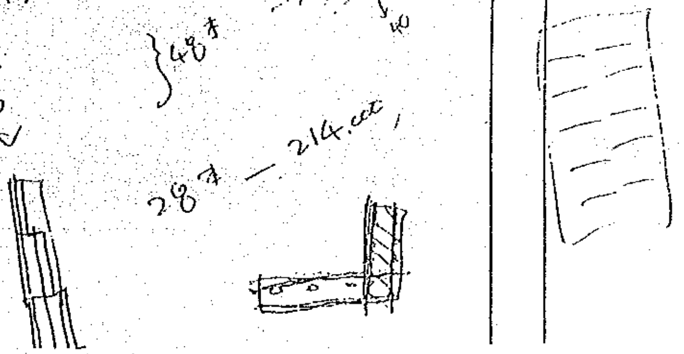
APARTADO 5503
LIMA - PERU
24.03.86

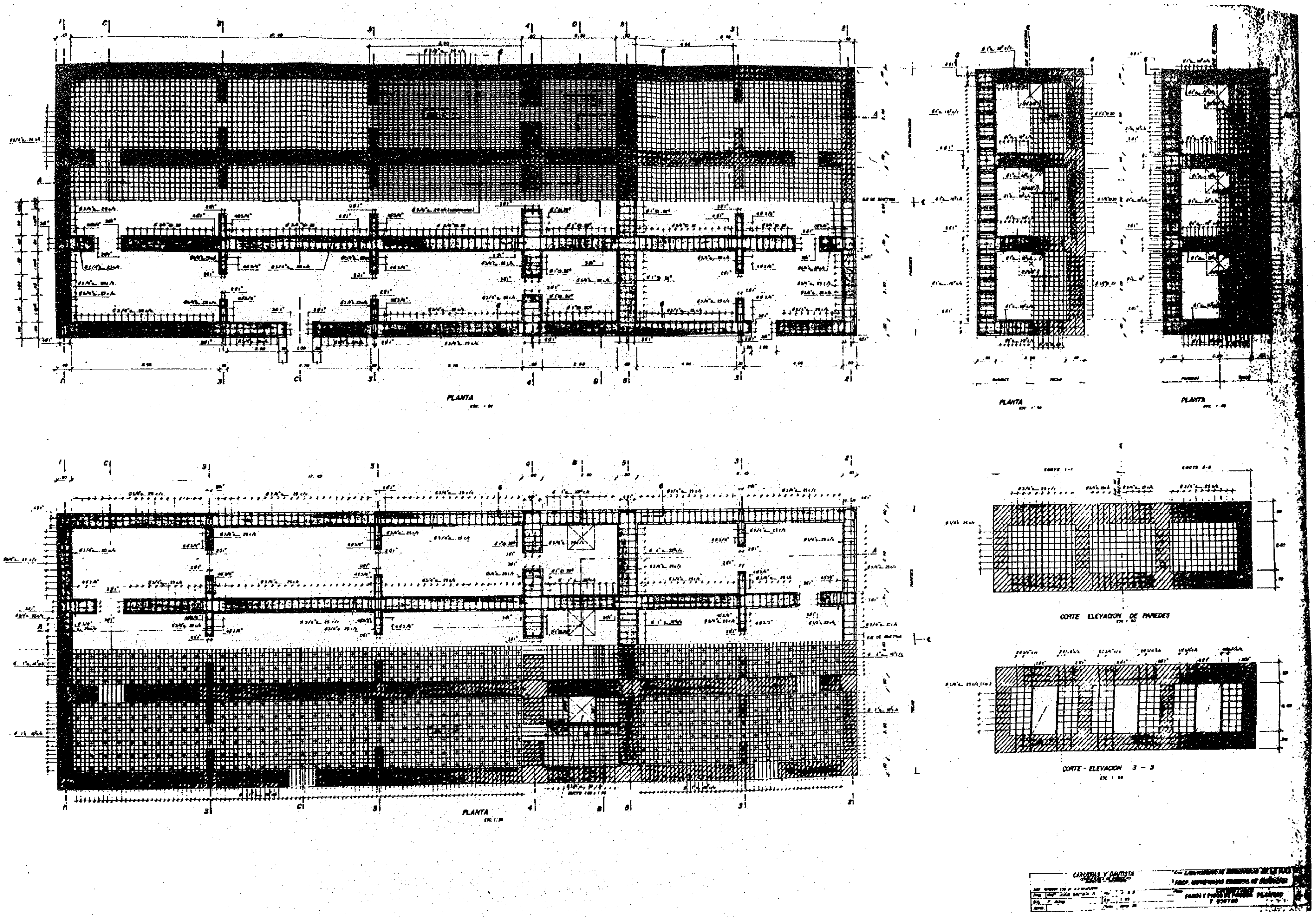
	DESCRIPCION -2-	METRADOS U	METRADOS Cantidad	COSTOS Unitario	COSTOS Parcial
30	OTROS.-				
31	Tubo de acero con planchuela de ∅ 2 ½" = longitud .80	U.	936	378	353,808.00
32	Tubo de acero sin planchuela de ∅ 2 ½" = longitud .80	U.	648	99	64,152.00
33	Perfiles de acero.	Kg.	169,800	22	3'735,600.00
34	lámina de polietileno.	M2.	382	18	~~6,876.00~~
35	Sistema pretensado	Est.	1		800,000.00
	SUB-TOTAL:				4'960,436.00
	TOTAL COSTO DIRECTO:			I/	8'157,678.00
	GASTOS GENERALES Y UTILIDAD:				1'631,536.00
	TOTAL GENERAL:			I/	9'789,214.00
	(Dollar Oficial US.$ = 14.-) =			US.$	699,230.-

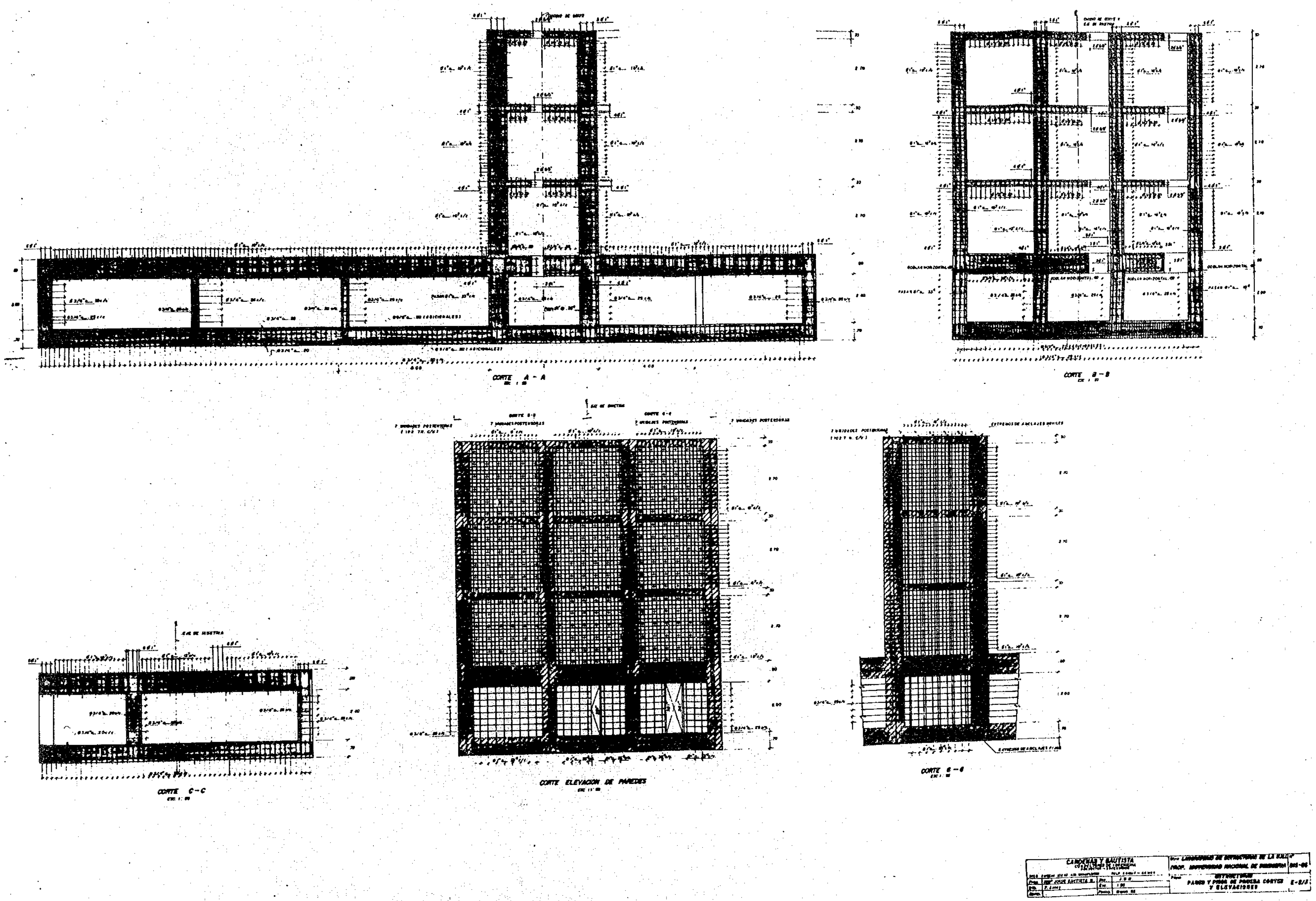


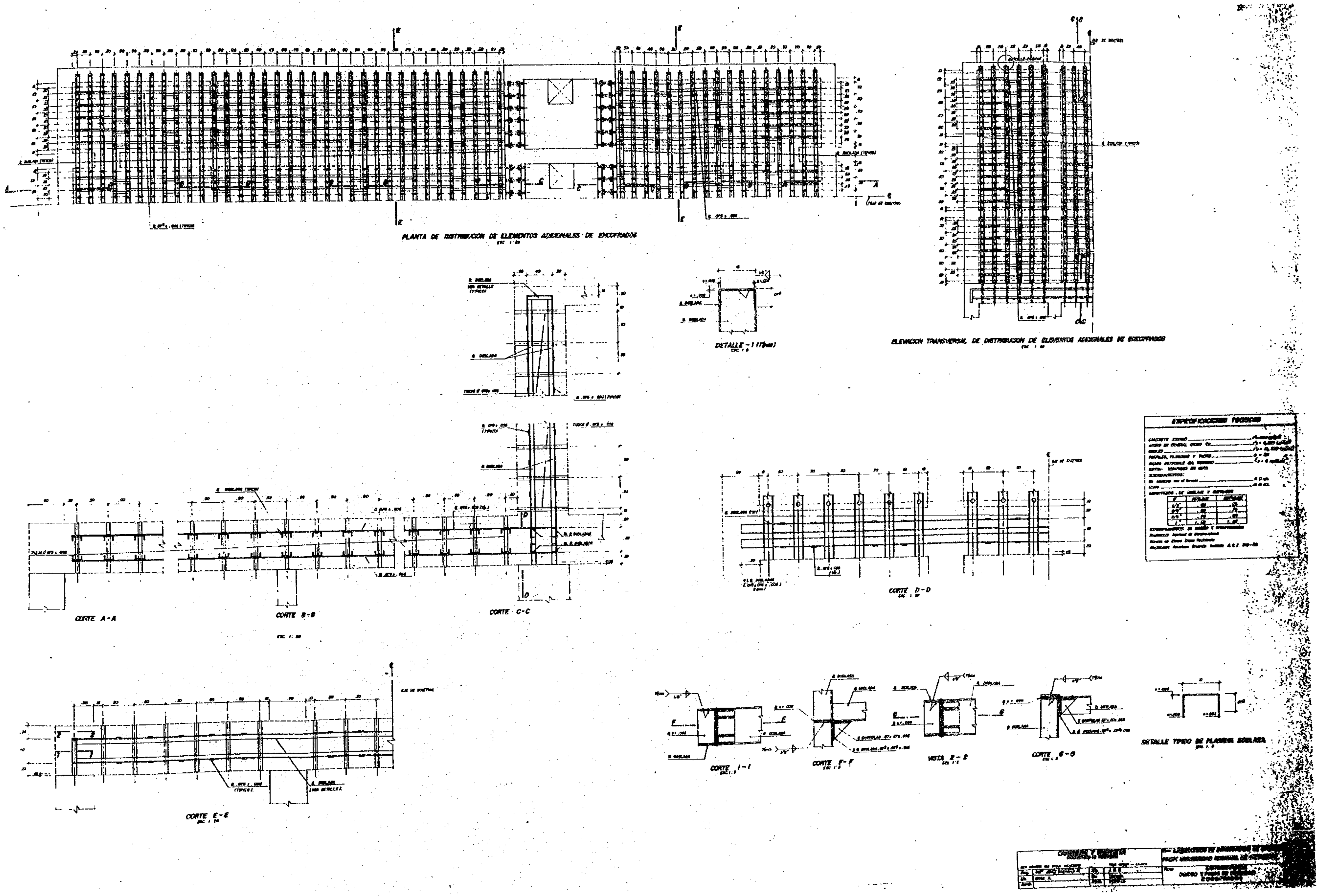
FUJITA GUMI S. A.
JOSE HAMAGUCHI
GERENTE GENERAL






PLANTA
PLANTA
PLANTA
PLANTA
CORTE ELEVACION DE PAREDES
CORTE - ELEVACION 3 - 3


CORTE A - A
CORTE B - B
CORTE C - C
CORTE ELEVACION DE PAREDES
CORTE E - E
CARDENAS Y BAUTISTA


PLANTA DE DISTRIBUCION DE ELEMENTOS ADICIONALES DE ENCOFRADOS
ELEVACION TRANSVERSAL DE DISTRIBUCION DE ELEMENTOS ADICIONALES DE ENCOFRADOS
ESPECIFICACIONES TECNICAS
CORTE A-A
CORTE B-B
CORTE C-C
CORTE D-D
CORTE E-E
CORTE F-F
VISTA 2-2
CORTE G-G
DETALLE TIPICO DE PLANCHA SOBLADA

資料－3 図面に対する仕様書（mission が英訳したもの）

ENGINEERING SPECIFICATIONS

OWNER : JICA, LIMA OFFICE

CONSTRUCTION WORK : REACTION WALL AND TESTING FLOOR

1. SCOPE OF SPECIFICATIONS

These specifications, which are broad in character where the terms do not specify otherwise, describe the works to be carried out for the construction of the Reaction Wall and Testing Floor of the Structural Testing Laboratory. The Inspector has the authority to demand the use of the right quality of materials and the appropriate working method.

In order to ensure their correct implementation, all the works shall be carried out in accordance with the best construction practices.

2. VALIDITY OF THE SPECIFICATIONS, DRAWINGS AND SCHEDULE OF QUANTITIES

In case the documents of the Project differ, the drawings have priority over the Engineering Specifications. The schedules of quantities are referential and complementary and the partial or total omission of an item shall not excuse the contractor from its execution when it is foreseen in the drawings and/or Engineering Specifications.

3. CONSULTATIONS

The Resident Engineer shall make all the consultations related to the construction to the Inspector, who can request the support of experts. All the material and labor used in the work shall be subject to the Inspector's approval, who has also the right to reject the material or completed work that does not meet the conditions stated in the drawings and/or engineering specifications and which must be adequately corrected without any additional charge to JICA, Lima Office.

4. PRELIMINARY WORKS

(1) LAND CLEARING

- The contractor shall be in charge of cleaning and preparing the land.
- Roots and topsoil shall be removed, wallfences and fences shall be demolished, sidewalks located in the area of access of vehicles shall be broken or repaired.

(2) LOCATION

. The contractor shall make sure that the location of the drawings is made on the site, by fixing fiducial axes and grade stakes.

5. EARTHWORKS

(1) LAND LEVELING

- The contractor shall carry out the groundwork, making the necessary cuts and fillings to obtain the grade lines shown in the Project's general distribution drawing.
- The groundwork shall have sufficient grade, so that in subsequent compacting works, the work is carried out in a quick and ordered way.

(2) EXCAVATION

- The excavation shall have 0.50 m more than the dimensions indicated in the drawing. Lateral molds shall be omitted when the consolidation of the land allows it and there is no risk of failures.
- Before proceeding with the dumping, the excavation shall be approved. Likewise, the foundation over backfilling not having an adequate consolidation shall not be allowed. According to the machinery or implements used for the work, an adequate consolidation requires layers of 20 cms at the most.

- The bottom of every excavation for foundation must be clean and even, and all loose material shall be removed. In case the contractor makes the excavation deeper,he will not be allowed to fill it with loose material, but with a mortar mix of 1:2 or in any case with concrete.
- In case the strength of soil were smaller than the one envisaged in the calculation and the water table and its possible variations are within the depth of the excavations, the contractor shall immediately send a written notice to the Inspector who shall take the necessary measures.

(3) FILLING

- Before carrying out the filling of an area, the ground's surface shall be cleaned, removing plants, roots or other organic matter. The filling material shall be free of organic matter and of any other material. Excess material of excavations can be used as long as it meets the required conditions. The concrete which is extracted shall be mainly used for the fillings, which shall be made in successive layers of not more than 20 cms thick. These must be well compacted and watered homogeneously at the optimum humidity, so that the material used reaches its maximum dried density. It is absolutely essential that the Inspector approves the above-mentioned conditions.

- The contractor shall bear in mind that an effective compacting process guarantees an adequate work of the foundation elements and that an inefficient compacting shall affect the structural elements as a whole.

  Once the construction work is finished, the contractor shall leave the ground completely free of spoil or other materials which may interfere with the gardening works or any other works.

- Spoil shall be removed periodically and should not remain on the site more than a month, with the exception of the spoil to be used for fillings.

(4) SHUTTERINGS

The contractor shall make an adequate and safe design of shutterings, both with regard to their thickness as with their shoring, so that there may not be deflections which may cause misalignments, off-plumb elements, off-levels and in order that the emptying may be carried out safely.

Shutterings shall conform to the form, limits and dimensions indicated in the drawings and shall be sufficiently leakproof to prevent mortar losses.

6. REINFORCED CONCRETE

(1) BACKGROUND INFORMATION

Concrete shall be a mix of water, cement-sand and crushed stone prepared in a mechanical mixer. The steel framework shall be prepared according to the structural drawings.

The cement to be used shall be Portland Cement Type I, according to the classification used in the United States of America, i.e., Portland cement, "Normal" Type.

The contractor shall be obliged to carry out a good implementation and design of the wooden falsework, that is to say, of the form or shuttering, so that the requirements set forth in the A.C.I. Code are met. In general, they shall be safe, leakproof and shall not have deflections which may result in the structure's deformation. The contractor shall bear in mind all these considerations.

(2) CEMENT

- As stated above, it shall be of Type I or Normal.
- In general terms, the cement to be used shall not have clots, it should be adequately protected, whether it is in bags or bins, so that the humidity of the environment or the one produced by free water may not affect it. The Inspector shall control the sampling according to the indications or Standards of the ASTM and shall send cement samples to laboratories officially authorized to carry out physical tests and thus meet the requirements of the ASTMC-150 Standard. The age of cement shall be controlled, and it should not have more than 2 months of manufacture.

(3) WATER

- The water to be used in the mixture shall be fresh, clean and potable, free of harmful substances such as oils, acids, alkalis, salts, organic matters or other substances which may damage the concrete or steel. It shall not contain carbon particles, humus or vegetable fibers. Well water can be used provided that it meets the above-mentioned conditions and is not hard water or contains sulphates.

(4) AGGREGATES

- The aggregates to be used are the coarse aggregate (crushed stone) or gravel and the fine aggregate or sand.
- Fine and coarse aggregates shall be considered as separate ingredients.
- Aggregates for concrete shall comply with the specification for aggregates of the ASTM C-33, with the exception of those aggregates that do not comply with the above-mentioned specification but whose non-compliance must be previously shown by special tests and designs.
- In general terms and provided that the following conditions are not in opposition to what has been previously stated, sand shall meet the following requirements:
  . It should be clean, of coarse grain, rough and resistant.
  . In relation to total weight it should not contain a percentage of more than 5% of

material passing through sieve Nº 200 (of the US series). In case the material passing through sieve Nº 200 is free of plastic clays and shaley clays or free of plastic material, this percentage may increase up to 7%.

- In case concrete suffers a strong abrasion, the above-mentioned percentage shall be of less than 3%.
- Organic matter in sand shall be controlled by the ASTM C-40 method and finer material passing through sieve Nº 200 by the ASTM C-17 method.

- In general terms and provided that the following conditions are not in opposition to what has been previously mentioned, coarse aggregate shall meet the following requirements:
  - It should be broken stone or clean gravel, free from particles of plastic clay on its surface, coming from a rock which is not in process of decomposition.
  - The maximum size of the aggregate shall be of 3/4" for reinforced concrete in elements of thickness reduced to the size of the aggregate, provided that a good workability is obtained, the required slump is fulfilled, and the concrete strength obtained is the one indicated in the drawings.

- Fine and coarse aggregate tests shall be made according to the ASTM C-136 method.

(5) REINFORCING BARS

All the provisions set forth in Art. 405 of the ACI 318-63 shall be fulfilled, using reinforcing bars of Grade 60 and fy = 4200 Kg/cm^2.

(6) PROPORTIONING AND CONCRETE MIXING

The proportioning of the different components needed to prepare concrete shall be made on site. The plants, mixing equipment, etc., shall have convenient devices for proportioning the materials according to the approved design.

The use of ready-mixed concrete shall be allowed, as the companies producing them have the convenient devices to proportion cement by weight in their plants. Thus, with regard to ready-mixed concrete, only the dry proportioning system and weighbatching in plant shall be allowed. Proportioning by water weight shall be carried out on the site.

The system that mixes the concrete in plant shall not be allowed, nor the transportation of concrete which has already been prepared, or the addition of water before its arrival to the site.

(7) CONCRETE POURING AND PLACEMENT

In general, concrete shall be placed without interruption or in layers of such thickness, that it is not placed over concrete layers which have already hardened, so that this situation may produce weak planes. If a specific portion cannot be placed continuously, construction joints shall be placed.

The placement rate of concrete shall be such, that before its placement it must still be plastic and mix with the concrete which has just been placed.

Concrete which has partially hardened or has been polluted by foreign matter shall not be placed. Provisional spacers placed in the forms shall be removed when concrete has reached a height where such spacers are no longer needed.

Spacers may remain in the concrete only if they are of metal or concrete and if it has been previously agreed to leave them there.

Concrete shall be placed as it is customary done, avoiding segregation due to handling or spreading.