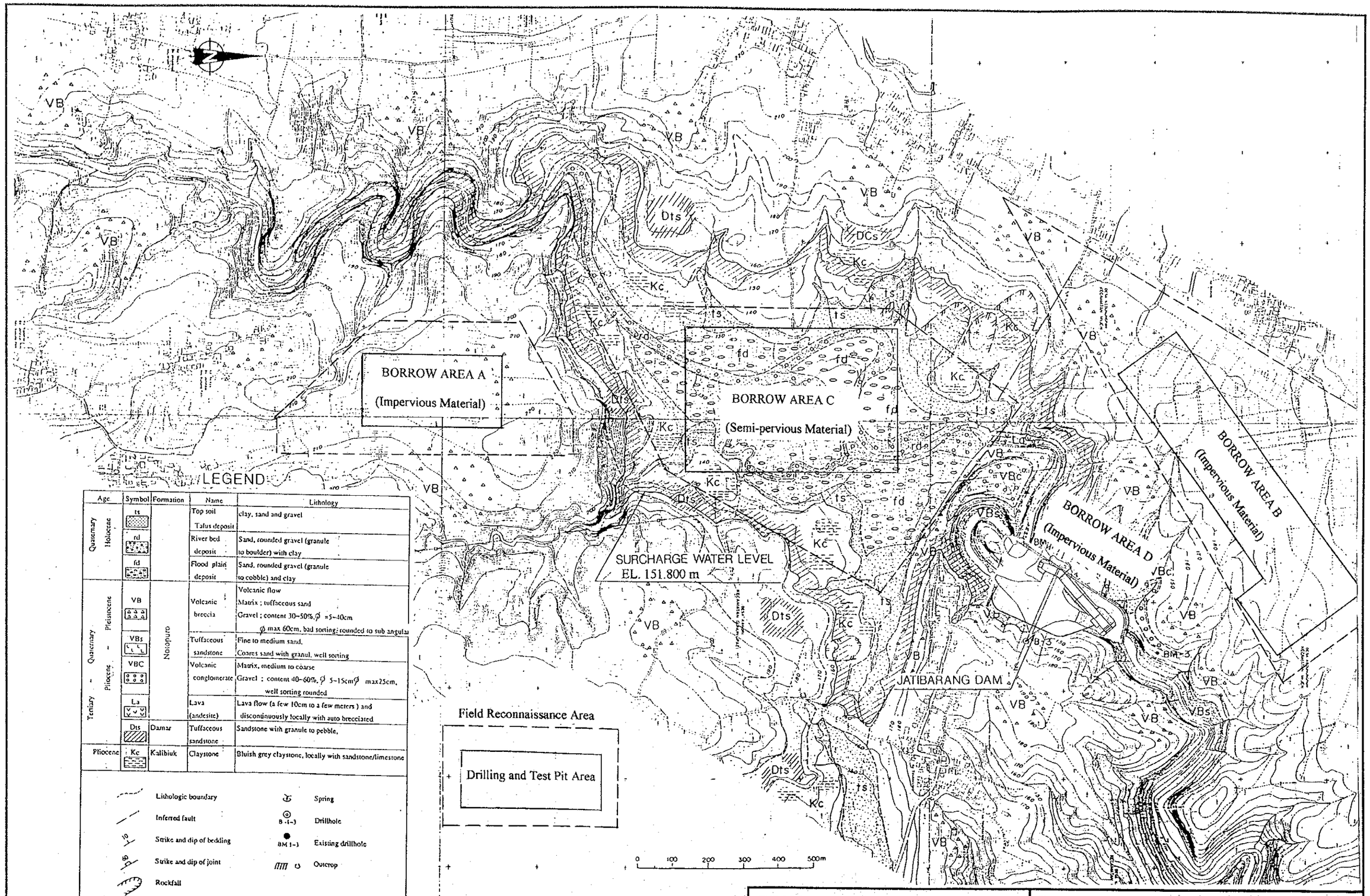
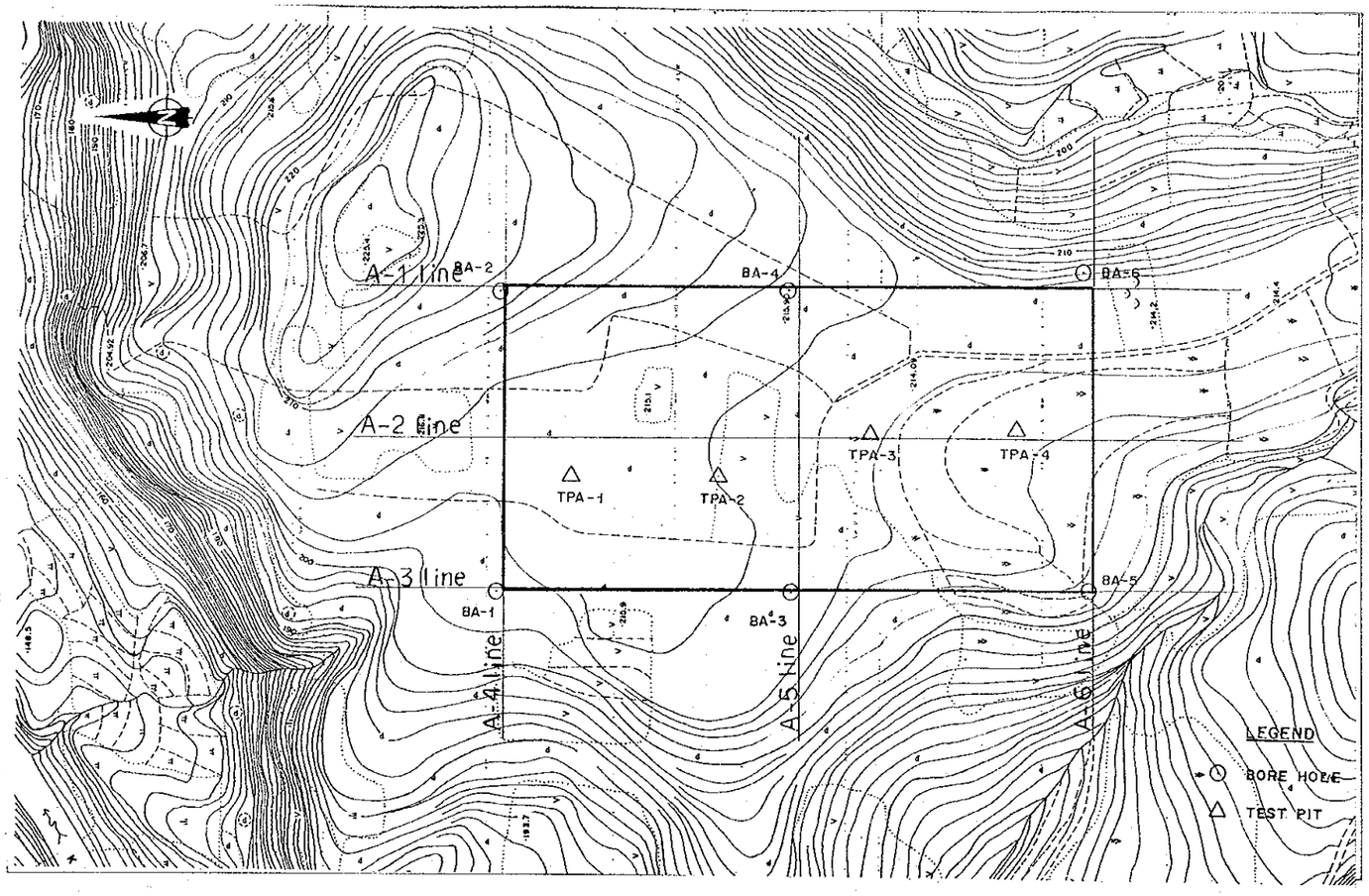
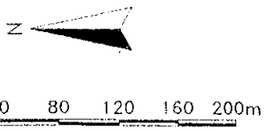


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA	Fig. 5.3.6 LOCATION MAP OF BORROW AREAS
JAPAN INTERNATIONAL COOPERATION AGENCY	

LOCATION MAP OF BORE HOLES AND TEST PITS





LEGEND

HOLE NUMBER(DEPTH)
○ : BORE HOLE

PIT NUMBER
△ : TEST PIT POINT

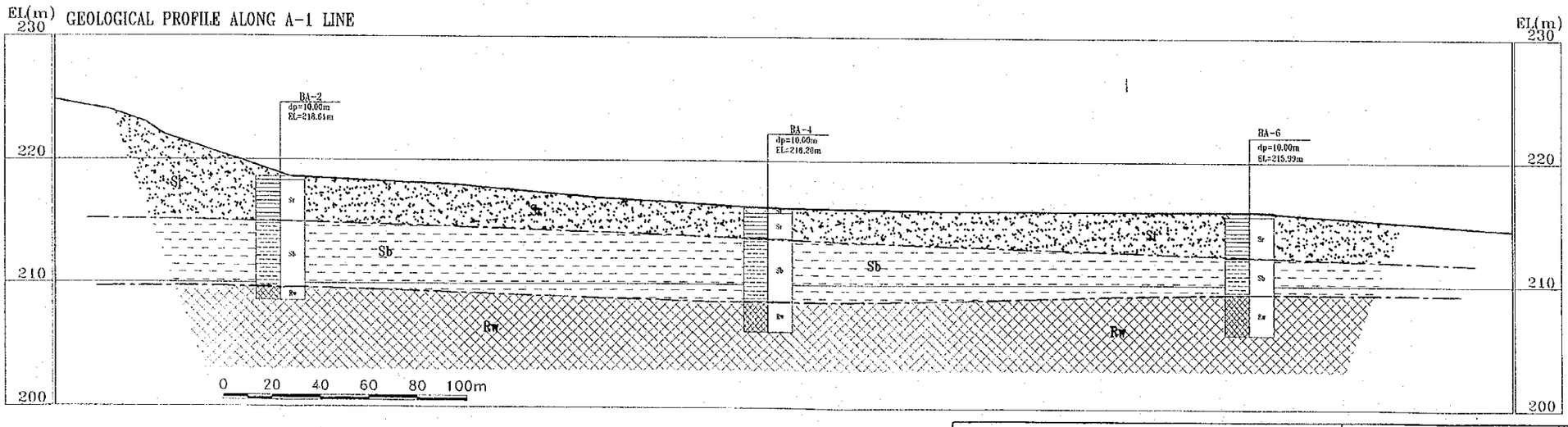
(Soil Division)

Division		Symbol	Description
Weathered Soil Zone	Topsoil	Ts	Topsoil mainly consists of clay and silt, and there is no original structure of mother-rock. The soil has loose condition, and contains roots of plants and organic material.
	Reddish Soil	Sr	Reddish soil mainly consists of clay and silt, and there is no original structure of mother-rock, no fragment which composes rock. Therefore it consists of clay and silt mainly. The soil has high plasticity, but moisture content is not so high.
	Brownish Soil	Sb	Brownish soil mainly consists of clay and silt, and there is no original structure of mother-rock. But the fragments are recognized partly or generally as the mass of clay mineral and the quality of fragments is very soft. The soil has high plasticity like Reddish Soil, but misture content is slightly high.
High Weathered Rock Zone		Rw	About half of the rock material has been weathered to clay minerals, and is converted to soil partly. But it is possible to classify the original rock.

(Note)

Boundary of Soils and Weathered Rock

GEOLOGICAL PROFILE ALONG A-1 LINE

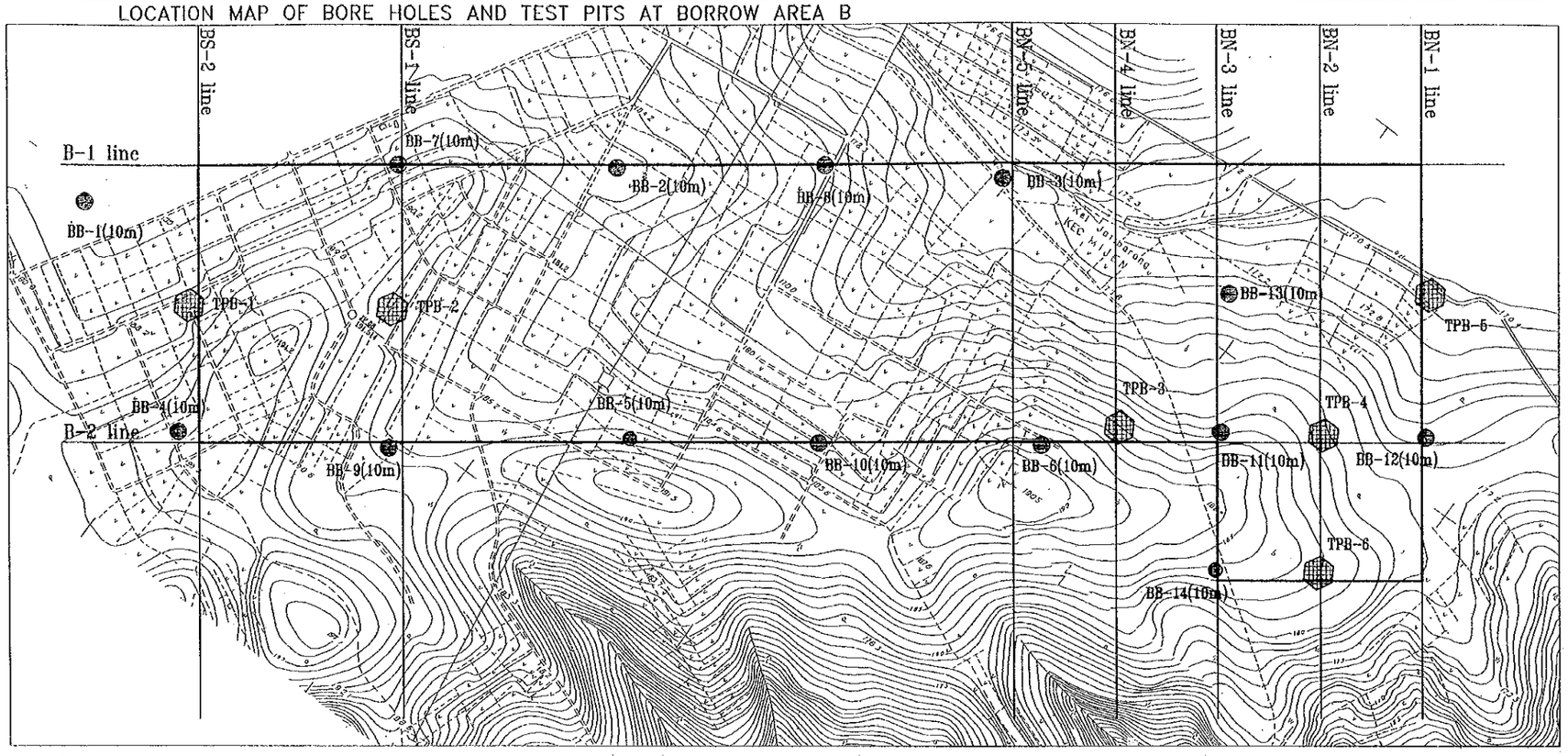


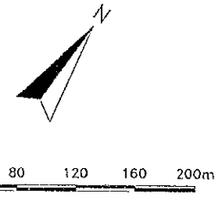
THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 5.3.7
LOCATION MAP OF DRILLING WORKS AND GEOLOGICAL PROFILE AT BORROW AREA A

LOCATION MAP OF BORE HOLES AND TEST PITS AT BORROW AREA B





LEGEND

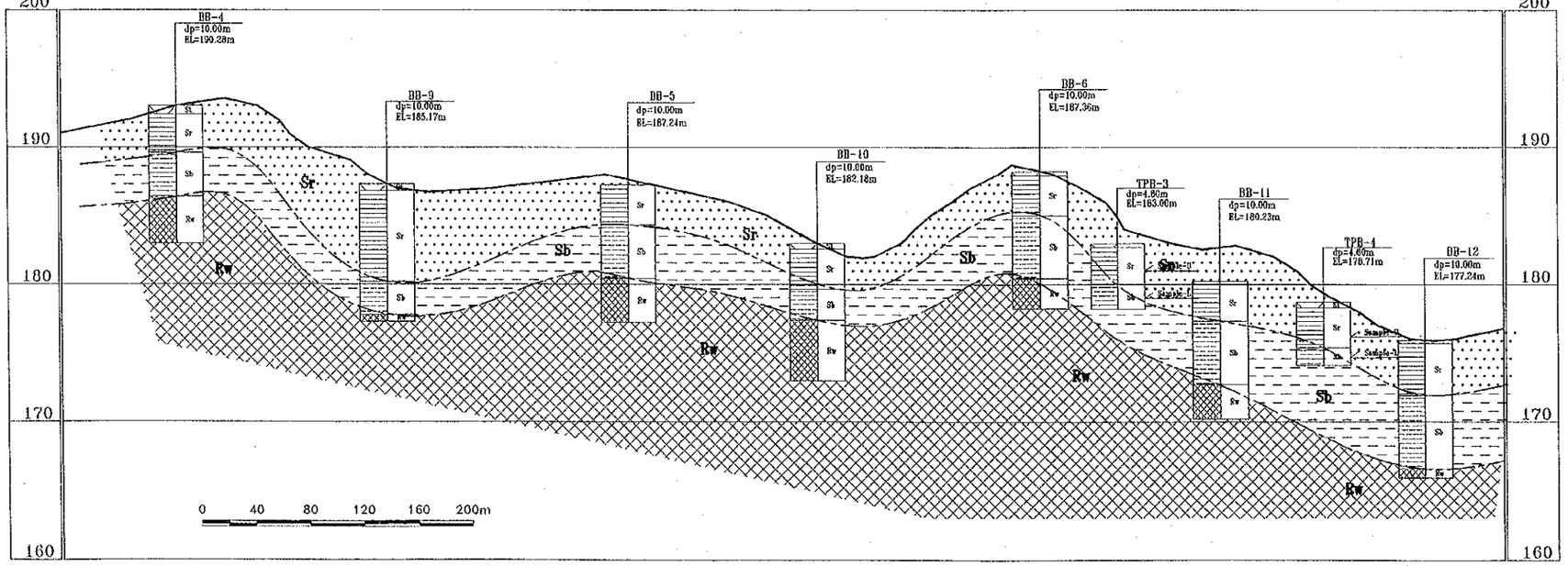
HOLE NUMBER(DEPTH)

: BORE HOLE

PIT NUMBER

: TEST PIT POINT

GEOLOGICAL PROFILE ALONG B-2 LINE



(Soil Division)

Division		Symbol	Description
Weathered Soil Zone	Topsoil	Ts	Topsoil mainly consists of clay and silt, and there is no original structure of mother-rock. The soil has loose condition, and contains roots of plants and organic material.
	Reddish Soil	Sr	Reddish soil mainly consists of clay and silt, and there is no original structure of mother-rock, no fragment which composes rock. Therefore it consists of clay and silt mainly. The soil has high plasticity, but moisture content is not so high.
	Brownish Soil	Sb	Brownish soil mainly consists of clay and silt, and there is no original structure of mother-rock. But the fragments are recognized partly or generally as the mass of clay mineral and the quality of fragments is very soft. The soil has high plasticity like Reddish Soil, but misture content is slightly high.
High Weathered Rock Zone		Rw	About half of the rock material has been weathered to clay minerals, and is converted to soil partly. But it is possible to classify the original rock.

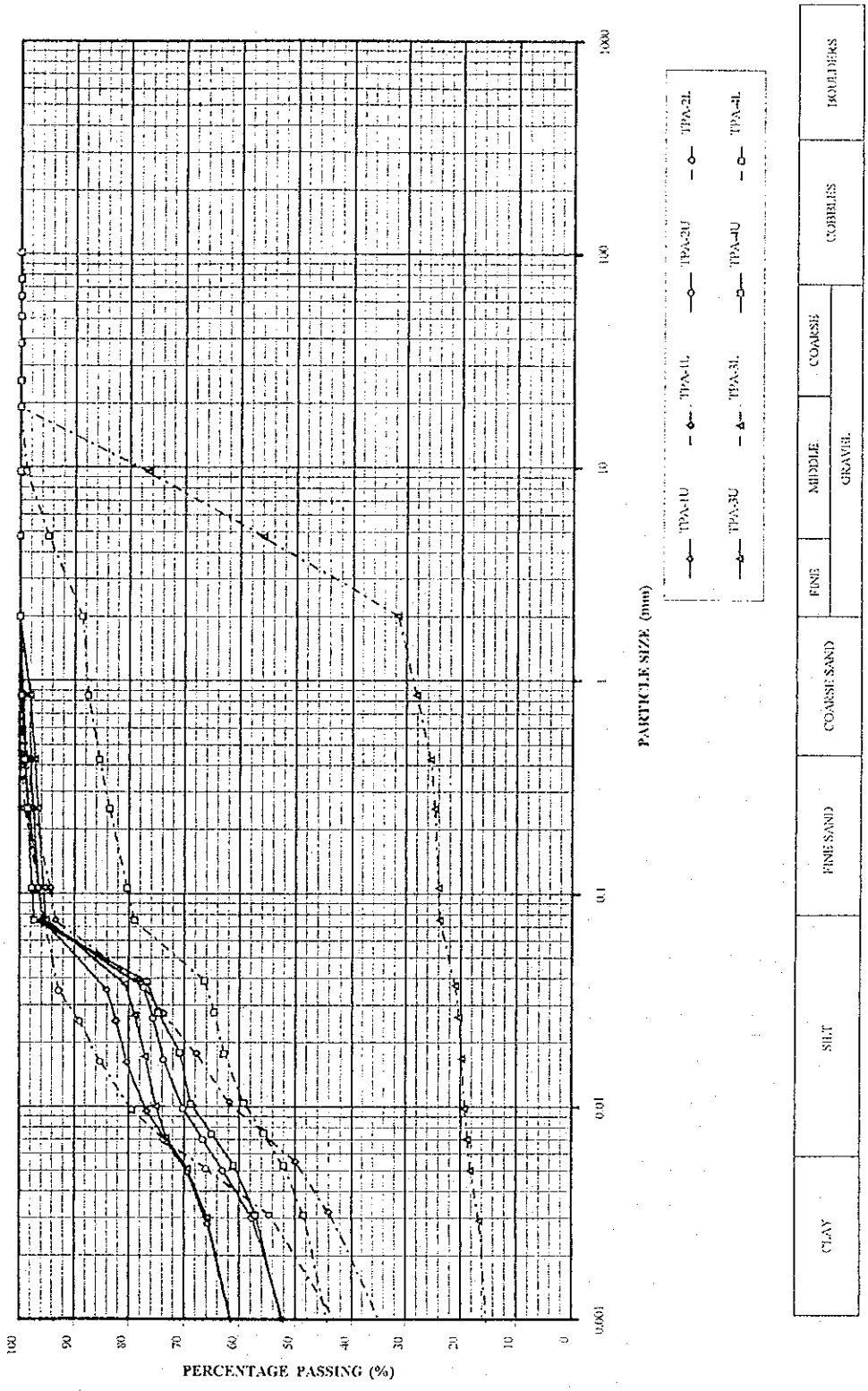
(Note)

Boundary of Soils and Weathered Rock

THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

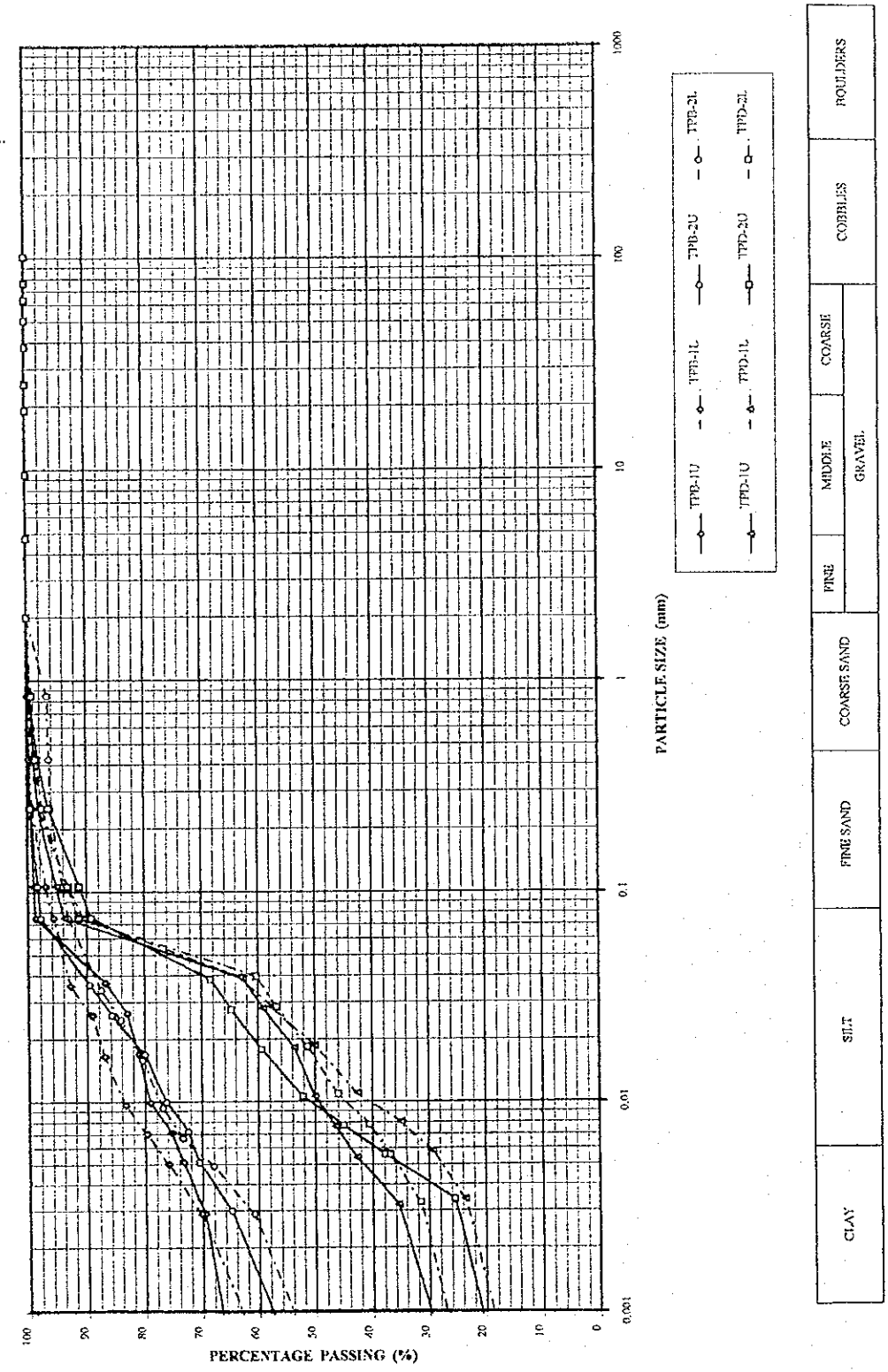
Fig. 5.3.8
LOCATION MAP OF DRILLING WORKS AND GEOLOGICAL PROFILE AT BORROW AREA B



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

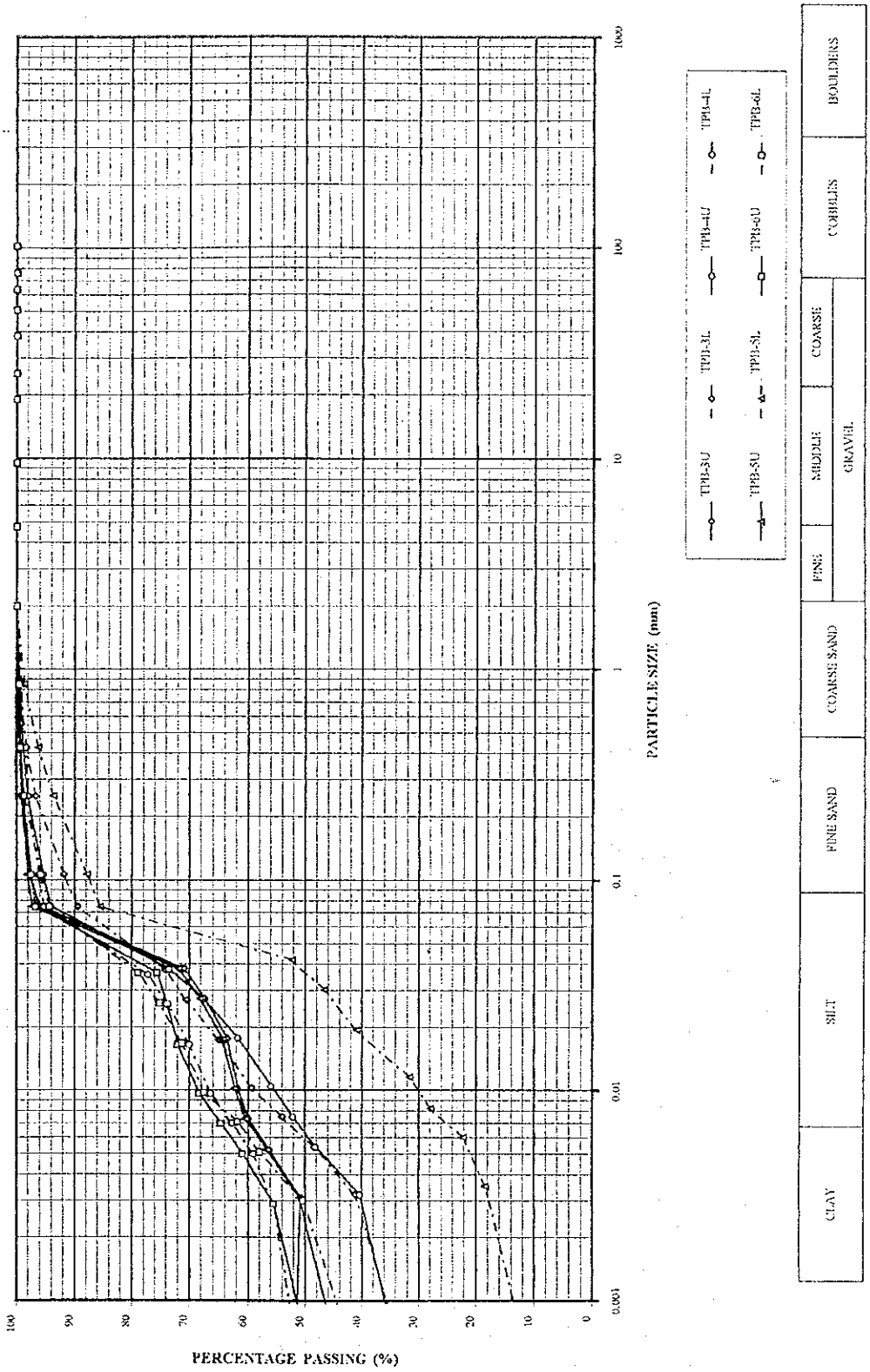
Fig. 5.3.9 (1/3)
GRADATIONS OF NON-MIXED IMPERVIOUS MATERIAL (BORROW AREA A)



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

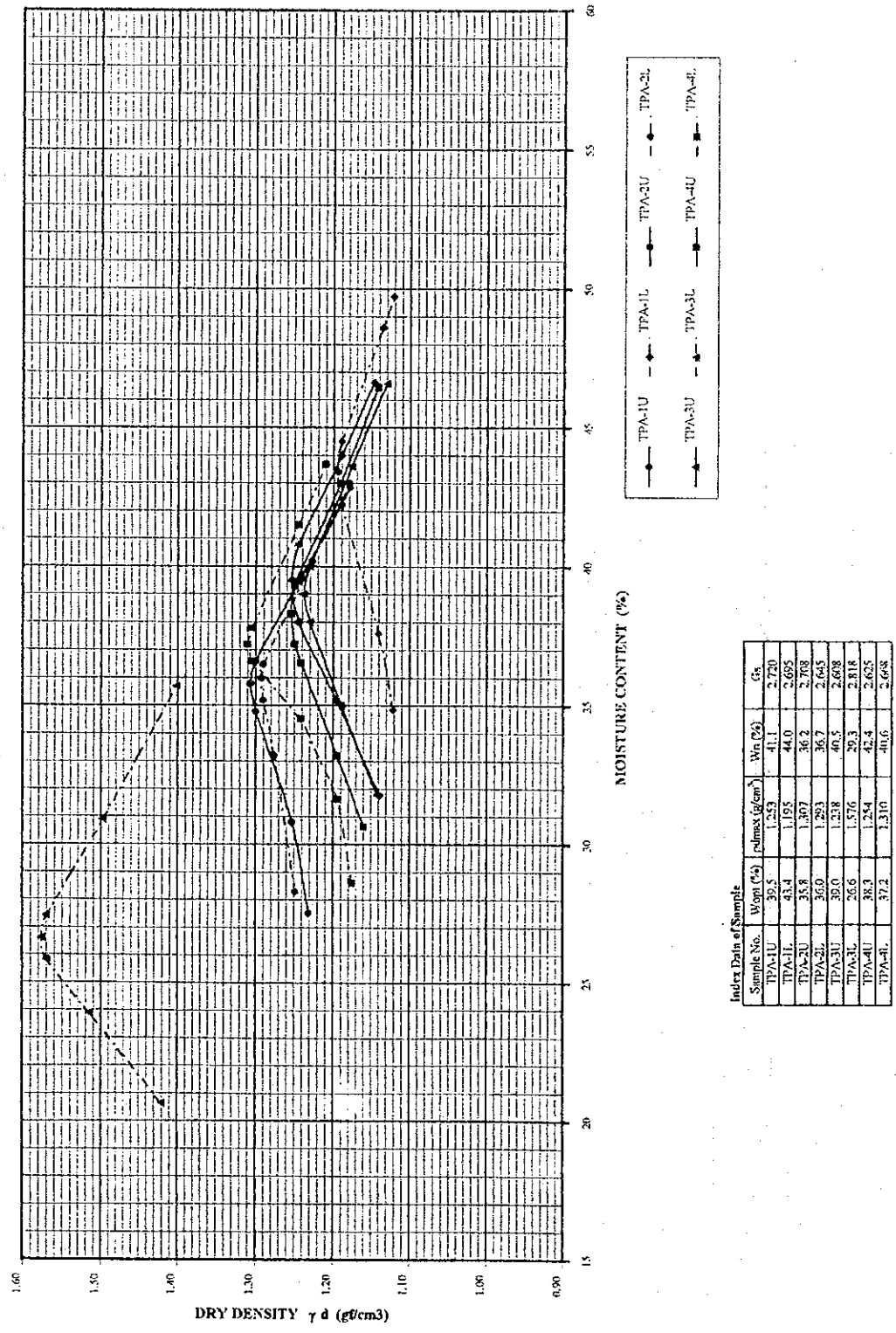
Fig. 5.3.9 (2/3)
GRADATIONS OF NON-MIXED IMPERVIOUS MATERIAL (NORTHERN PART OF BORROW AREA B AND BORROW AREA D



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 5.3.9 (3/3)
GRADATION OF NON-MIXED IMPERVIOUS MATERIAL (SOUTHERN PART OF BORROW AREA B)



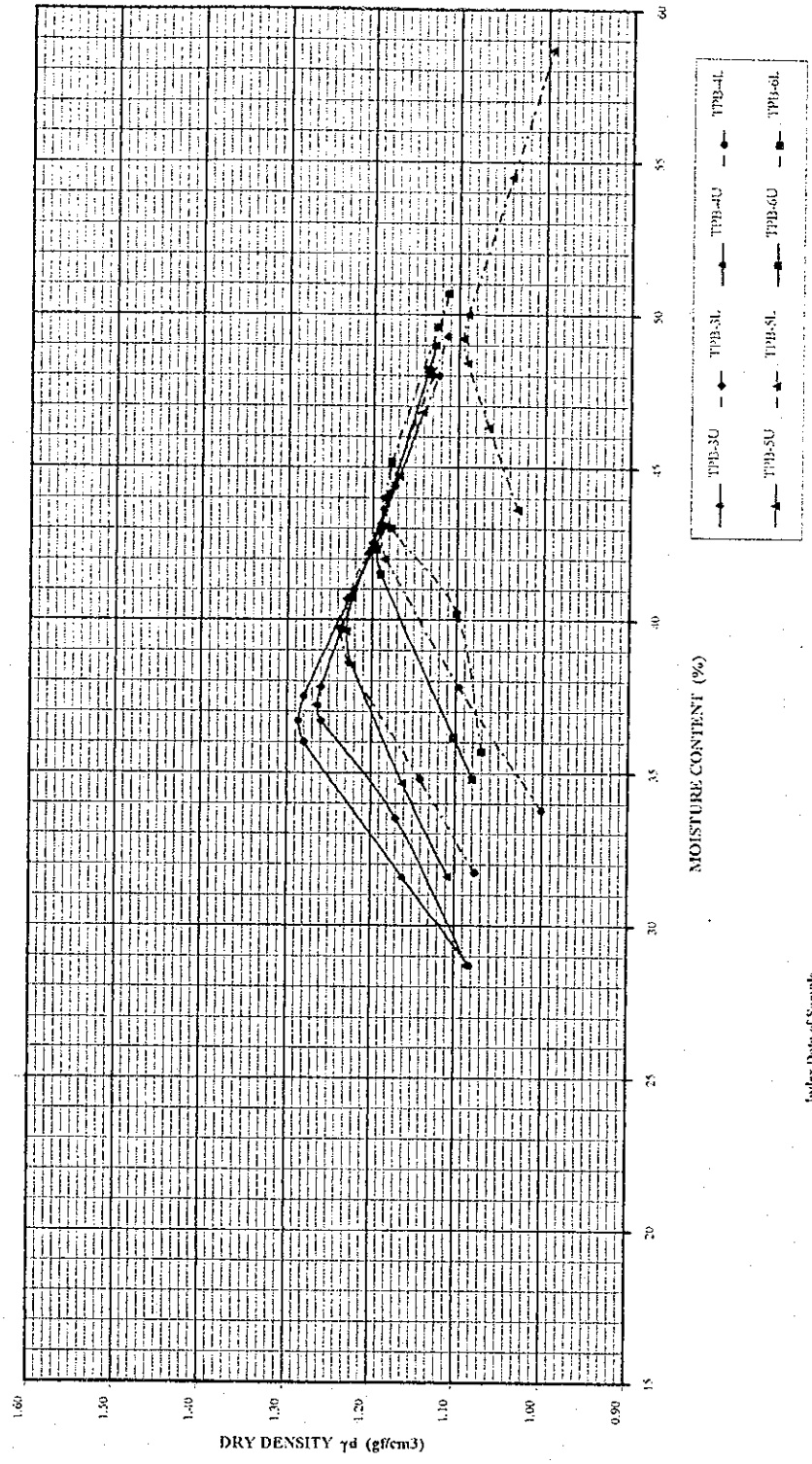
Index Data of Sample

Sample No.	Wopt (%)	ρdmax (g/cm³)	Wn (%)	Gs
TPA-1U	39.5	1.253	41.1	2.720
TPA-1L	43.4	1.195	44.0	2.695
TPA-2U	35.8	1.307	36.2	2.708
TPA-2L	36.0	1.293	36.7	2.645
TPA-3U	39.0	1.238	40.5	2.698
TPA-3L	26.6	1.576	29.3	2.818
TPA-4U	38.3	1.254	42.4	2.625
TPA-4L	37.2	1.310	41.6	2.648

THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 5.3.10 (1/3)
COMPACTION CURVES OF NON-MIXED IMPERVIOUS MATERIAL (BORROW AREA A)



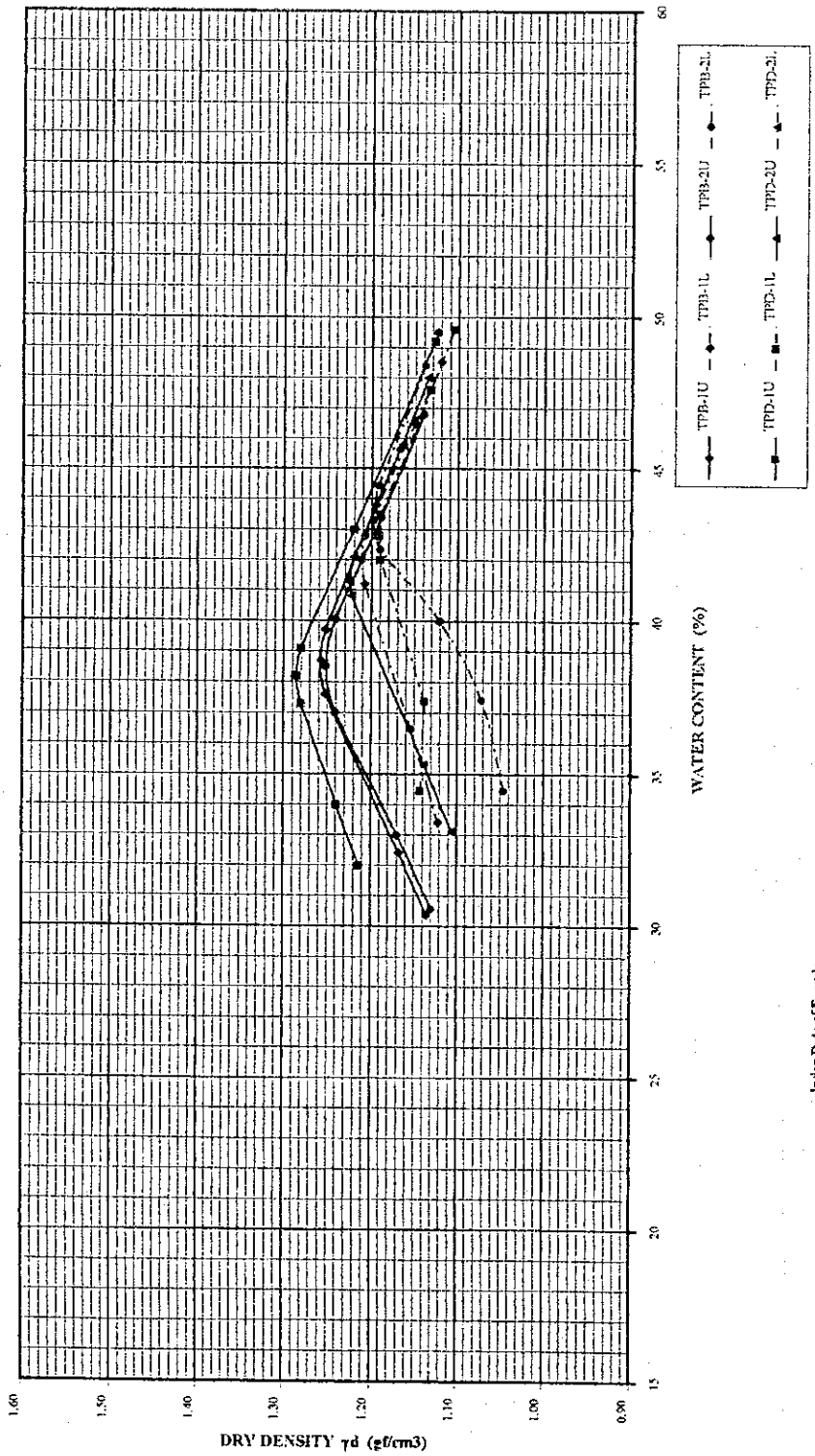
Index Data of Sample

Sample No.	Wopt (%)	ρdmax (g/cm³)	Wn (%)	Gs
TPB-3U	37.3	1.264	34.7	2.681
TPB-3L	39.7	1.236	34.5	2.679
TPB-4U	36.7	1.286	37.6	2.690
TPB-4L	42.9	1.191	43.2	2.750
TPB-5U	39.6	1.23	39.6	2.689
TPB-5L	49.2	1.095	51.1	2.630
TPB-6U	42.3	1.195	42.5	2.761
TPB-6L	44.0	1.184	43.5	2.758

THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 5.3.10 (2/3)
COMPACTION CURVES OF NON-MIXED IMPERVIOUS MATERIAL (NORTHERN PART OF BORROW AREA B)



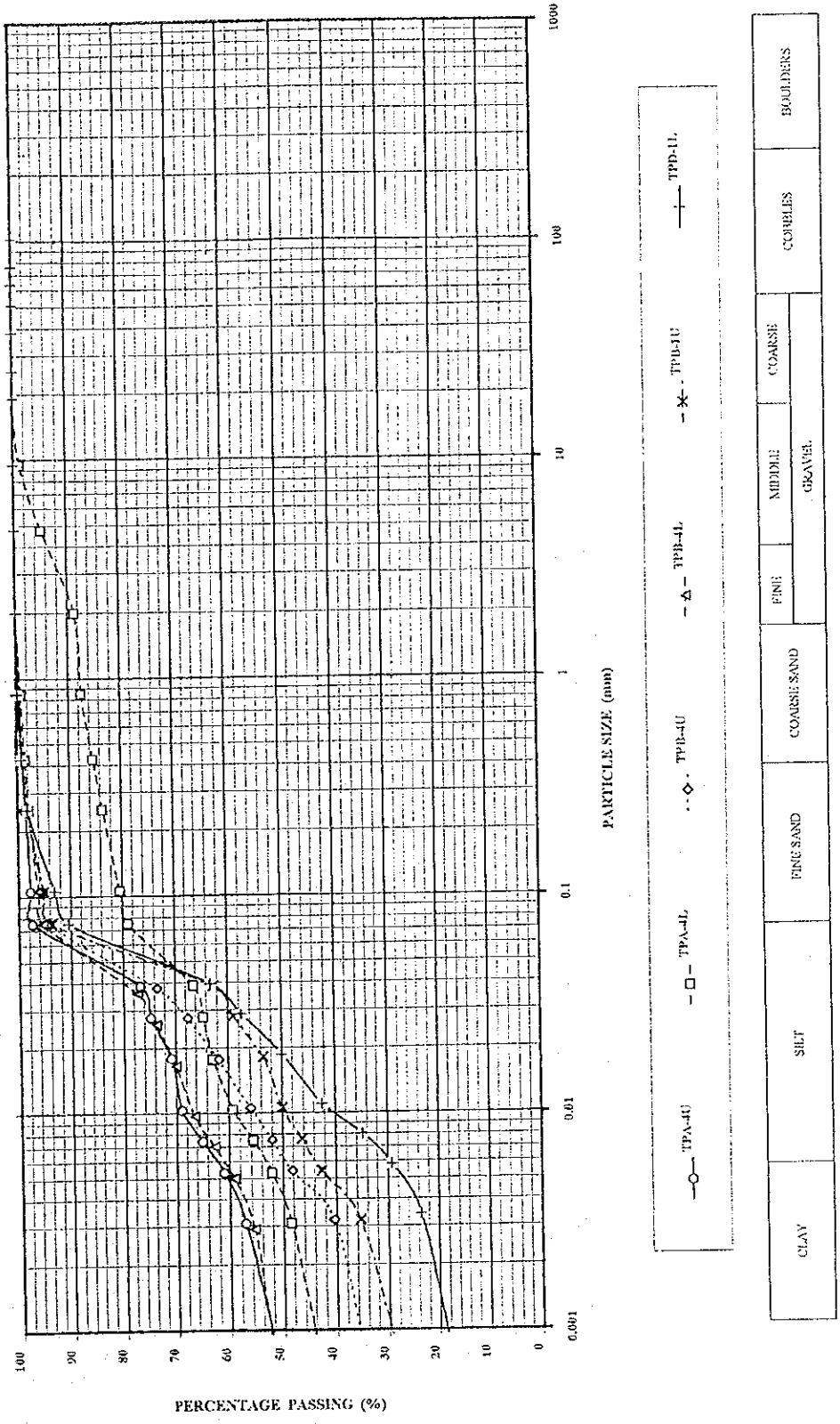
Index Data of Sample

Sample No.	Wopt (%)	ρdmax (g/cm³)	Wn (%)	Gs
TPB-1U	38.7	1.258	42.0	2.612
TPB-1L	42.0	1.212	45.6	2.578
TPB-2U	38.5	1.252	40.7	2.611
TPB-2L	43.3	1.158	45.9	2.722
TPD-1U	38.2	1.285	37.9	2.719
TPD-1L	42.8	1.192	43.7	2.696
TPD-2U	41.3	1.226	41.1	2.686
TPD-2L	39.1	1.266	36.9	2.676

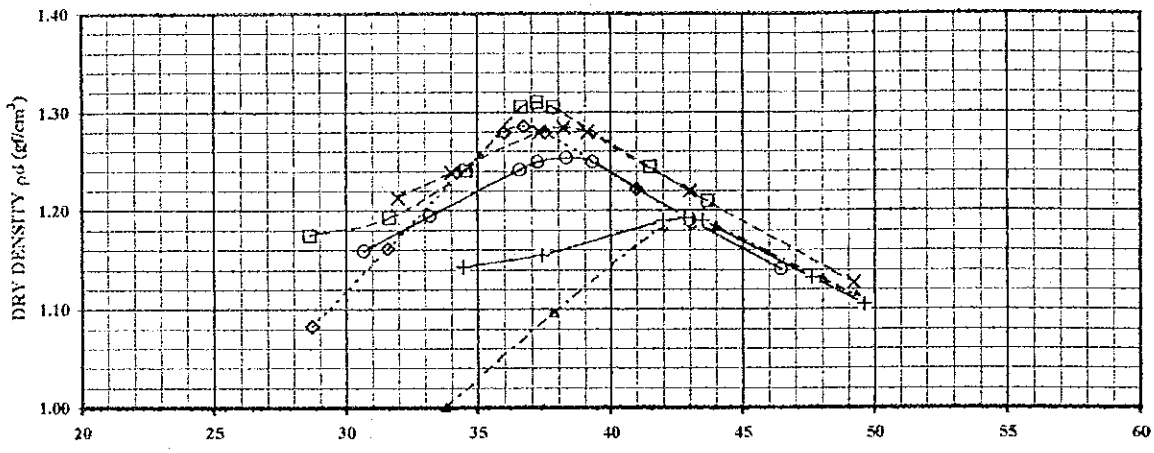
THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

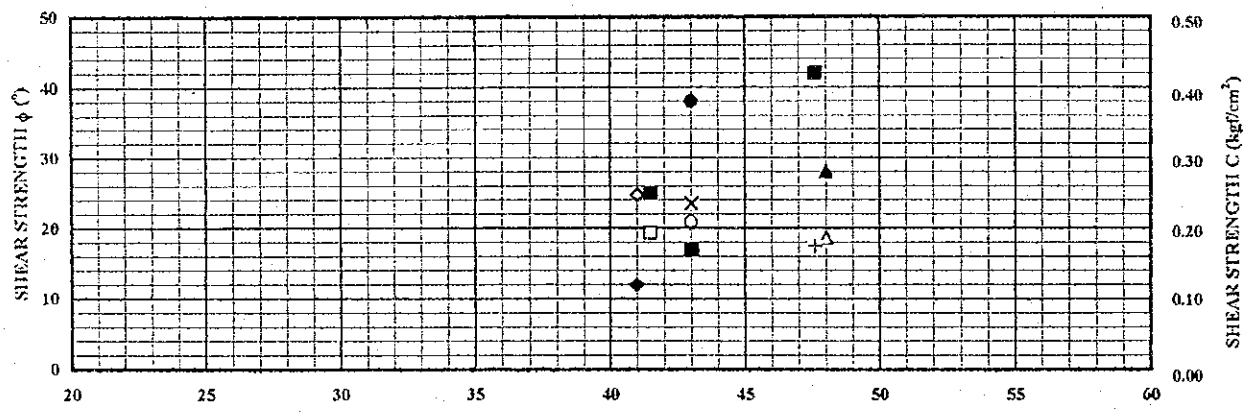
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 5.3.10 (3/3)
COMPACTION CURVES OF NON-MIXED IMPERVIOUS MATERIAL (SOUTHERN PART OF BORROW AREA B AND BORROW AREA D)

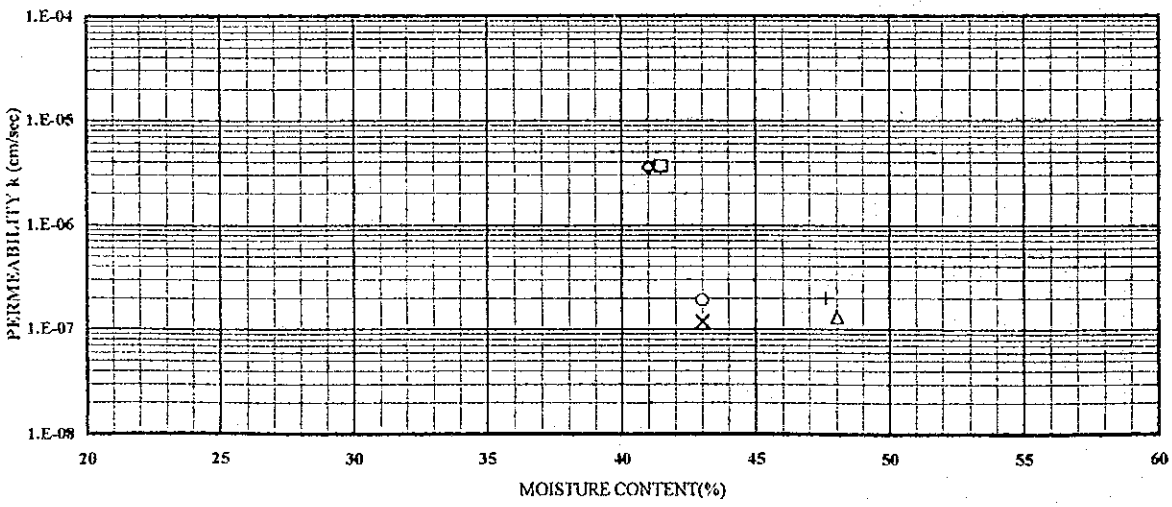


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA	Fig. 5.3.11 GRADATIONS OF NON-MIXED IMPERVIOUS MATERIAL FOR MECHANICAL PROPERTY TEST AT BORROW AREAS A, B AND D
JAPAN INTERNATIONAL COOPERATION AGENCY	





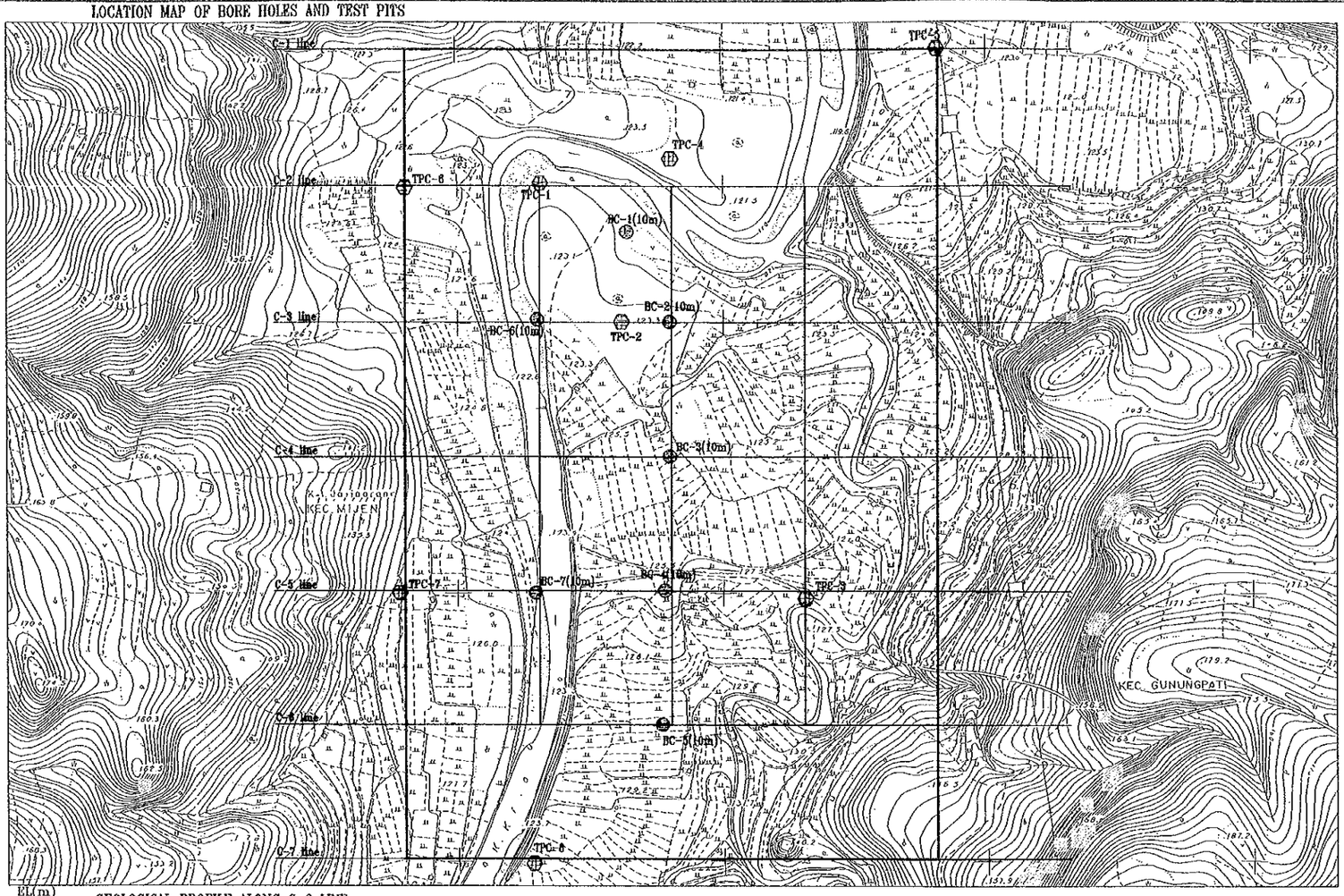
The painted marks show C, and the non-painted marks show φ.



○TPA-4U □TPA-4L ◇TPB-4U △TPB-4L ×TPD-1U +TPD-1L

THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA	Fig. 5.3.12 MECHANICAL PROPERTIES OF NON0MIXED IMPERVIOUS MATERIAL AT BORROW AREAS A, B AND D
JAPAN INTERNATIONAL COOPERATION AGENCY	

LOCATION MAP OF BORE HOLES AND TEST PITS



LEGEND

HOLE NUMBER(DEPTH)

: BORE HOLE

PIT NUMBER

: TEST PIT POINT

N

0 40 80 120 160 200m

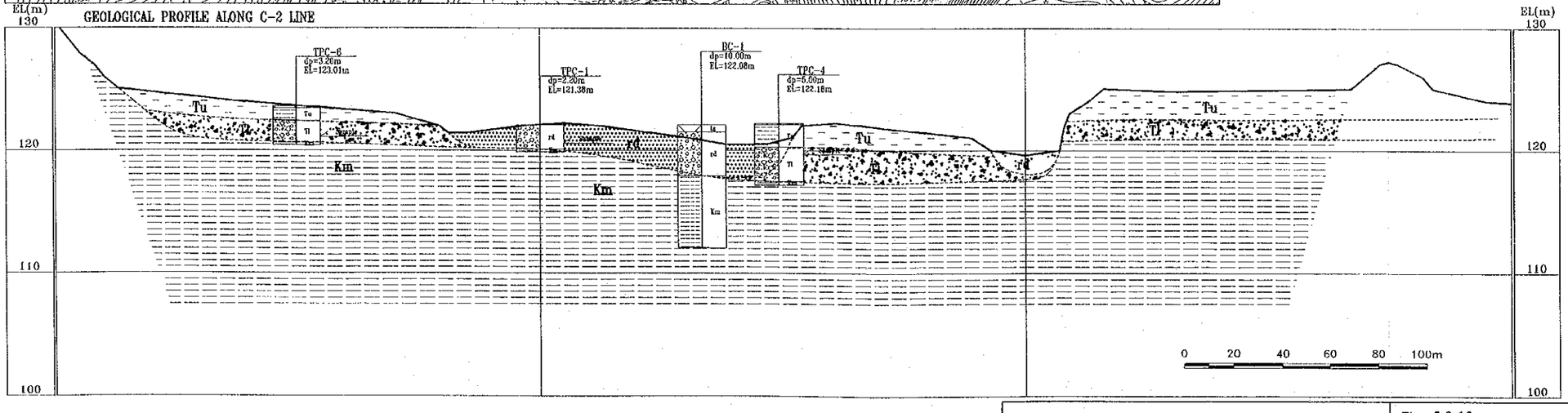
(Geological Strata)

Age			Formation and Strata Name	Symbol	Description
Quaternary	Holocene		Topsoil	Ts	The topsoil is distributed at the surface of terrace deposit. It consists of loose soil, and contains organic material and many roots of plants.
			Riverbed deposit	Rd	The deposit is distributed at the present riverbed and the flood plain. It mainly consists of boulder, cobble, pebble and sand, and it contains silt and clay with small quantity. But the deposit contains the gravel of siltstone, which has soft quality and is crushed easily, the total rate of fine material may be more than 10 % of the deposit.
			Talus deposit	Td	The deposit is distributed at the skirt of the mountainside slope. It consists of failure soil and sand, detritus and fallen rocks, and the total rate of fine material is more than 50 % of the deposit.
		Terrace deposit	Upper Layer	Tu	The deposit forms the terrace plain along the riverbed, and the relative height of the plain is less than 3 m from the riverbed. The upper layer of terrace deposit mainly consists of silt, and contains sand and gravel with small quantity.
			Lower Layer	Tl	The lower layer of terrace deposit mainly consists of boulder, cobble, pebble and sand, and it contains more quantities of silt and clay than riverbed deposit. The deposit contains the gravel of siltstone, which has soft quality and is crushed easily, the total rate of fine material may be more than 20 % of the deposit.
Tertiary	Miocene-Pliocene	Kerek	Siltstone	Km	Kerek formation is distributed under the secondary deposits which include all layers in Quaternary, and it forms the bedrock of this area. It consists of siltstone whose color is greenish dark gray, and partly contains coral limestone. The hardness of siltstone is comparatively low.

(Note)

Boundary of Geological Strata

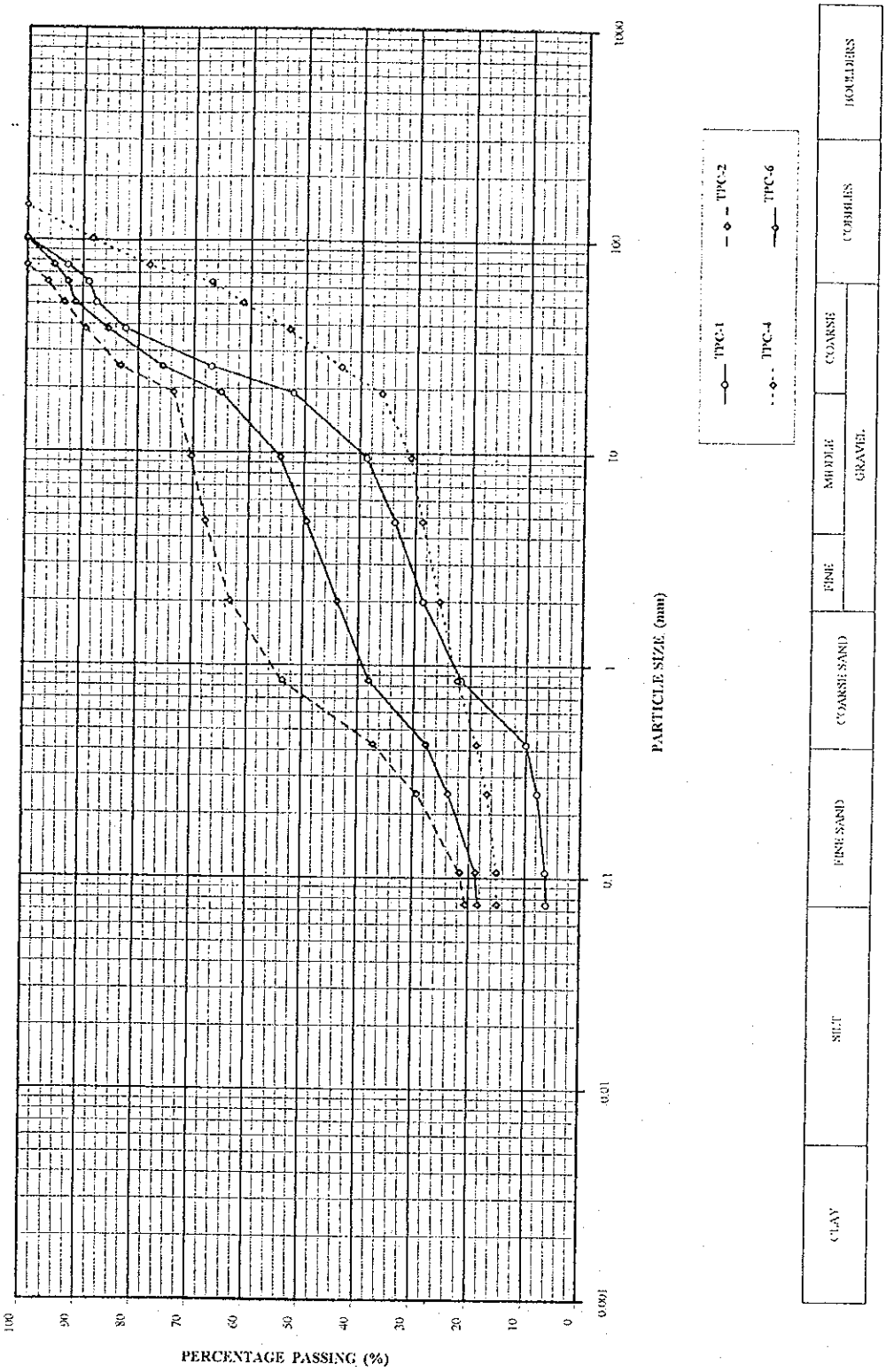
GEOLOGICAL PROFILE ALONG C-2 LINE



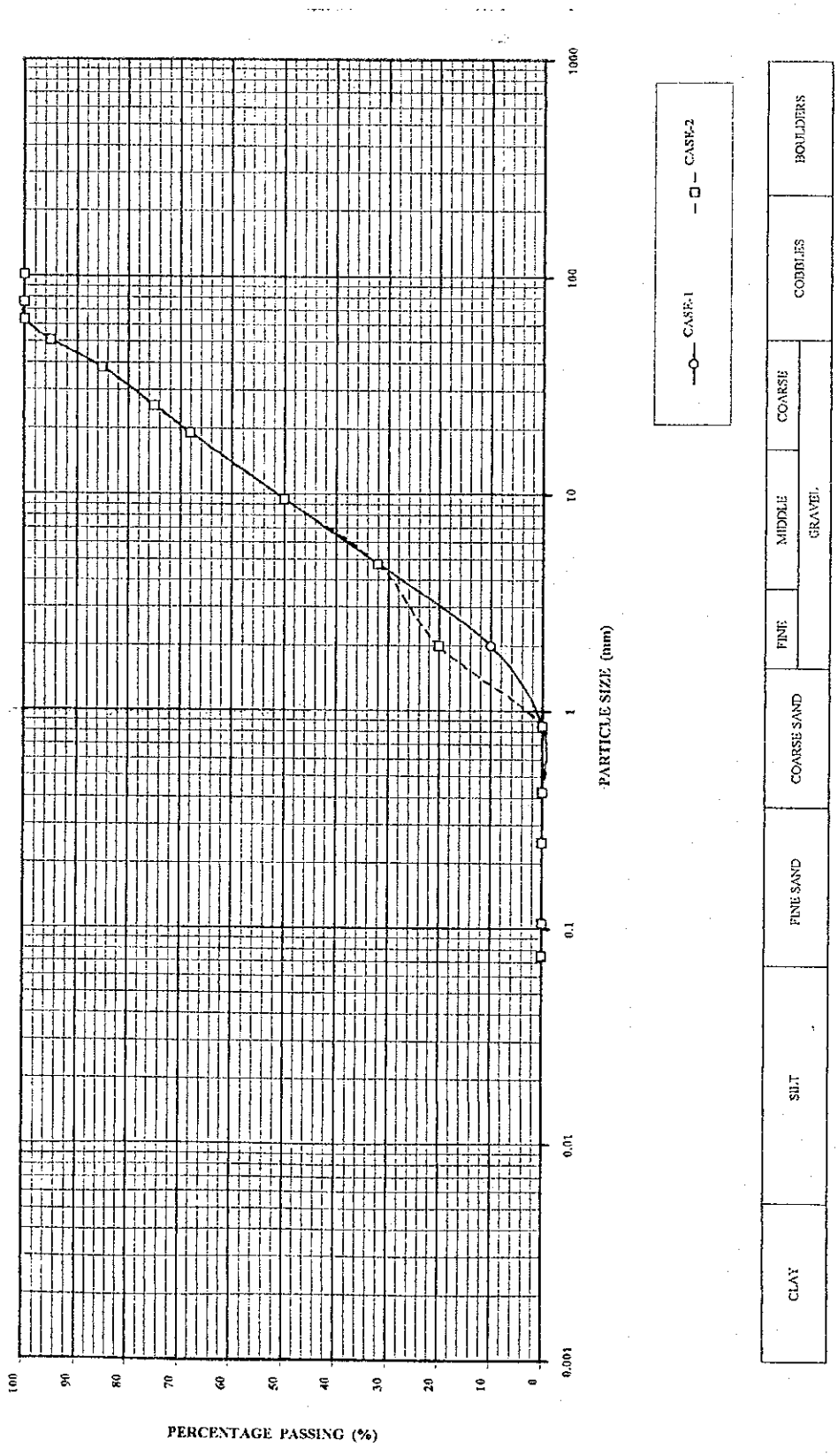
THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

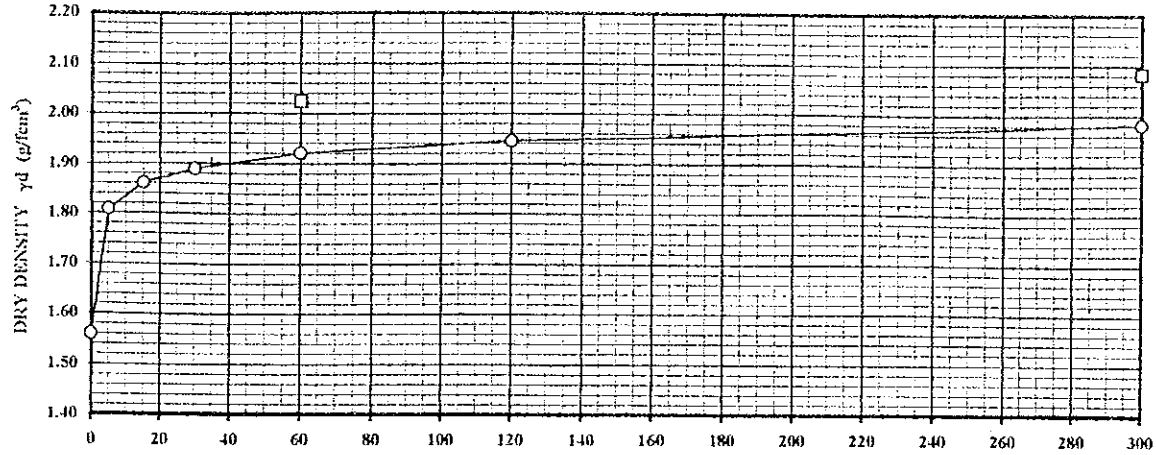
Fig. 5.3.13
LOCATION MAP AND GEOLOGICAL PROFILE AT BORROW AREA C

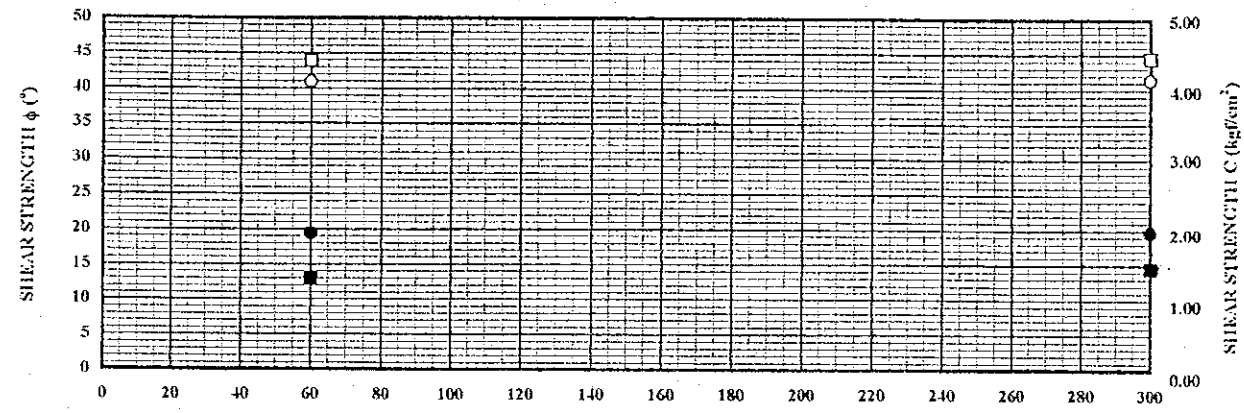


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA	Fig. 5.3.14 GRADATIONS OF NON-MIXED SEMI-PERVIOUS MATERIAL AT BORROW AREA C
JAPAN INTERNATIONAL COOPERATION AGENCY	

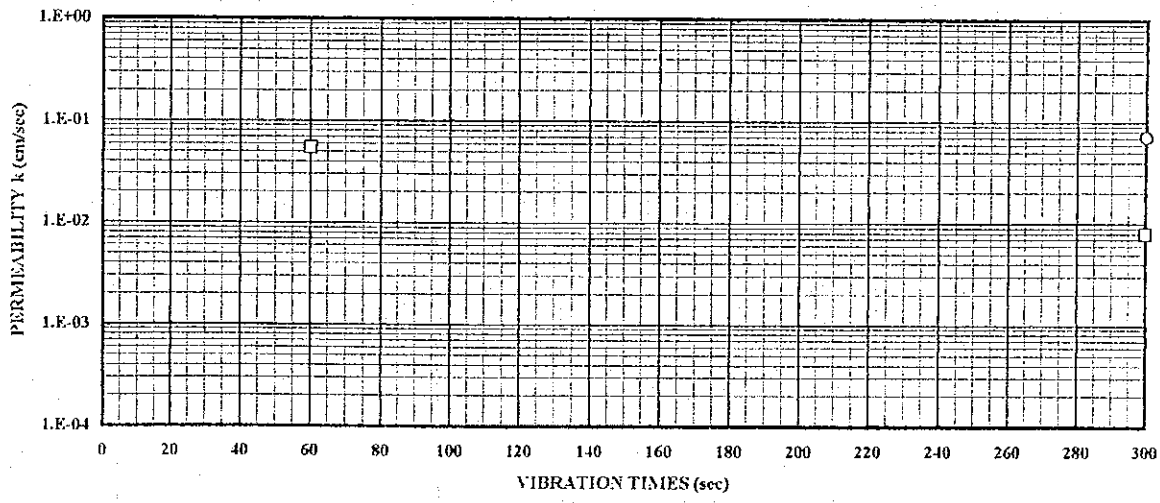


THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA	Fig. 5.3.15 GRADATIONS OF PREVIOUS MATERIAL AT QUARRY SITE
JAPAN INTERNATIONAL COOPERATION AGENCY	



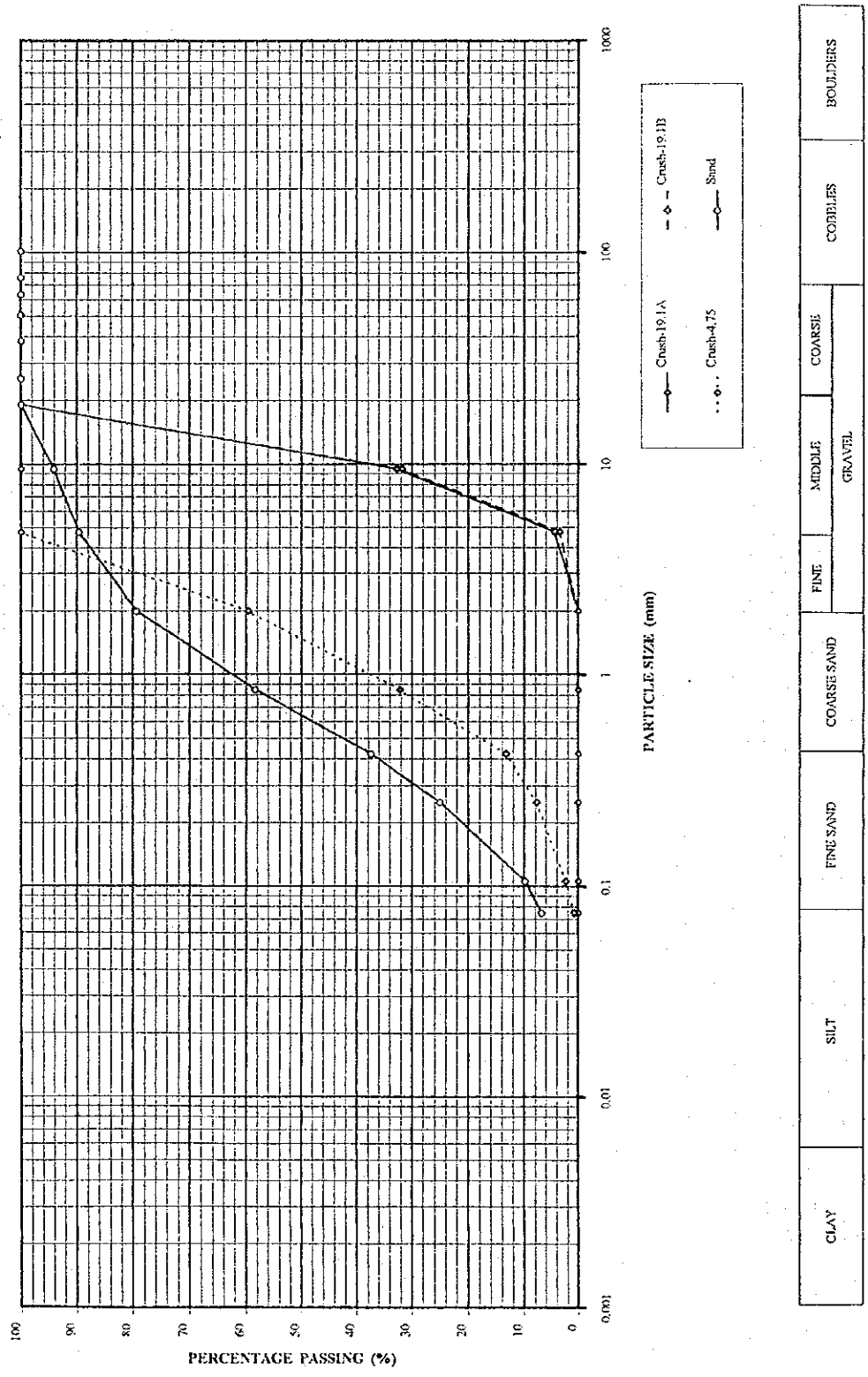


The painted marks show C, and the non-painted marks show φ.



—○— CASE-1 —○— CASE-2 □ CASE-3 □ CASE-4

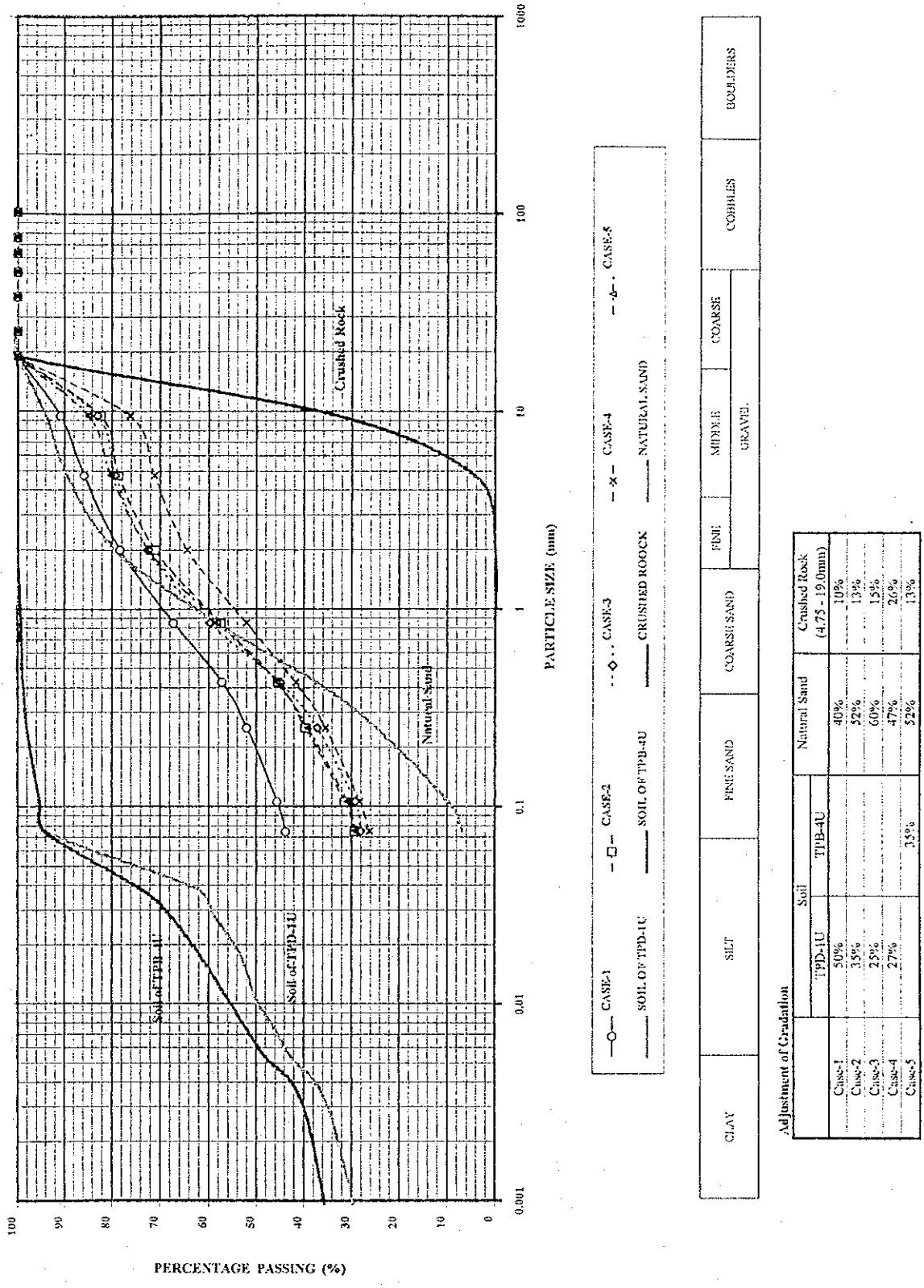
THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA	Fig. 5.3.16 MECHANICAL PROPERTIES OF PERVIOUS MATERIAL AT QUARRY SITE
JAPAN INTERNATIONAL COOPERATION AGENCY	



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 5.3.17
GRADATIONS OF COARSE MATERIAL FOR MIXING AT QUARRY SITE



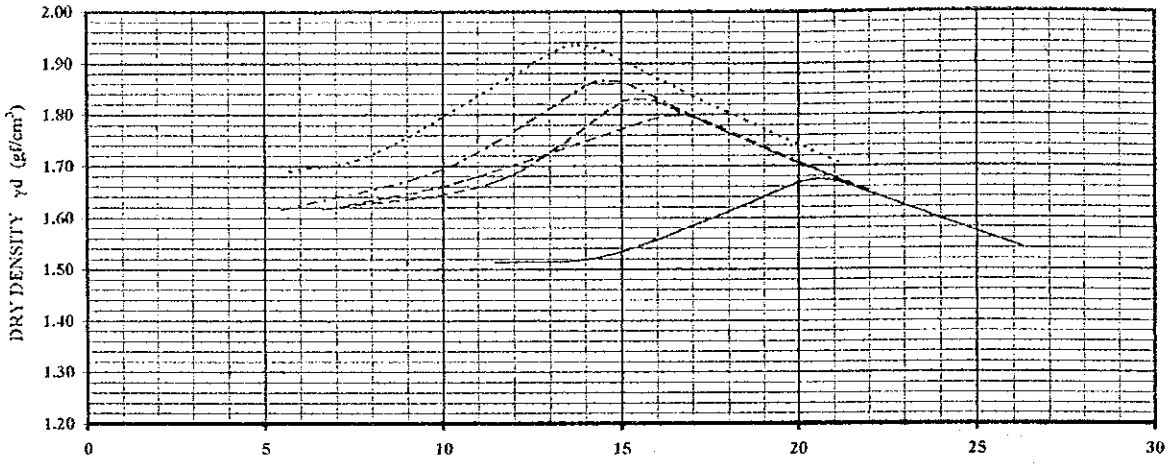
Adjustment of Gradation

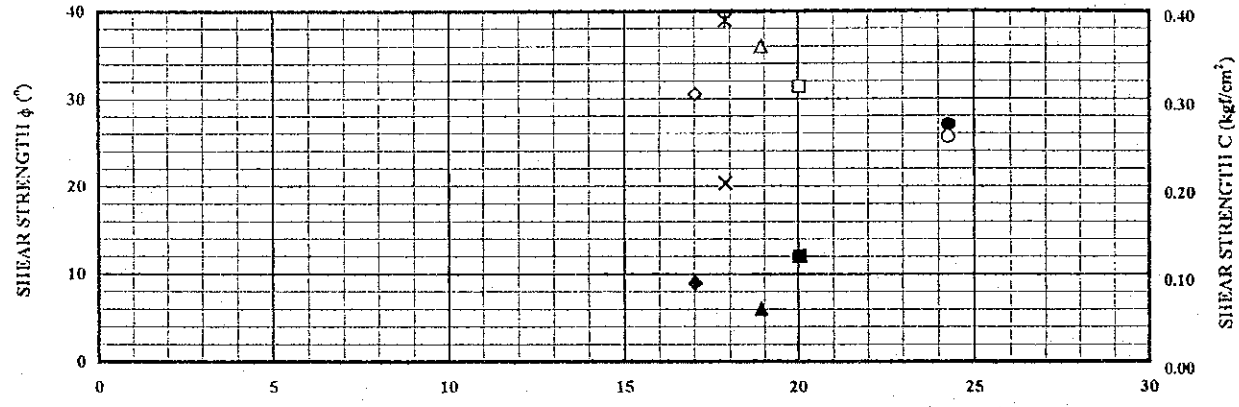
	Soil		Natural Sand	Crushed Rock (4.75 - 19.0mm)
	TPD-1U	TPB-4U		
Case-1	50%		40%	10%
Case-2	35%		52%	13%
Case-3	25%		60%	15%
Case-4	27%		47%	26%
Case-5		35%	52%	13%

THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

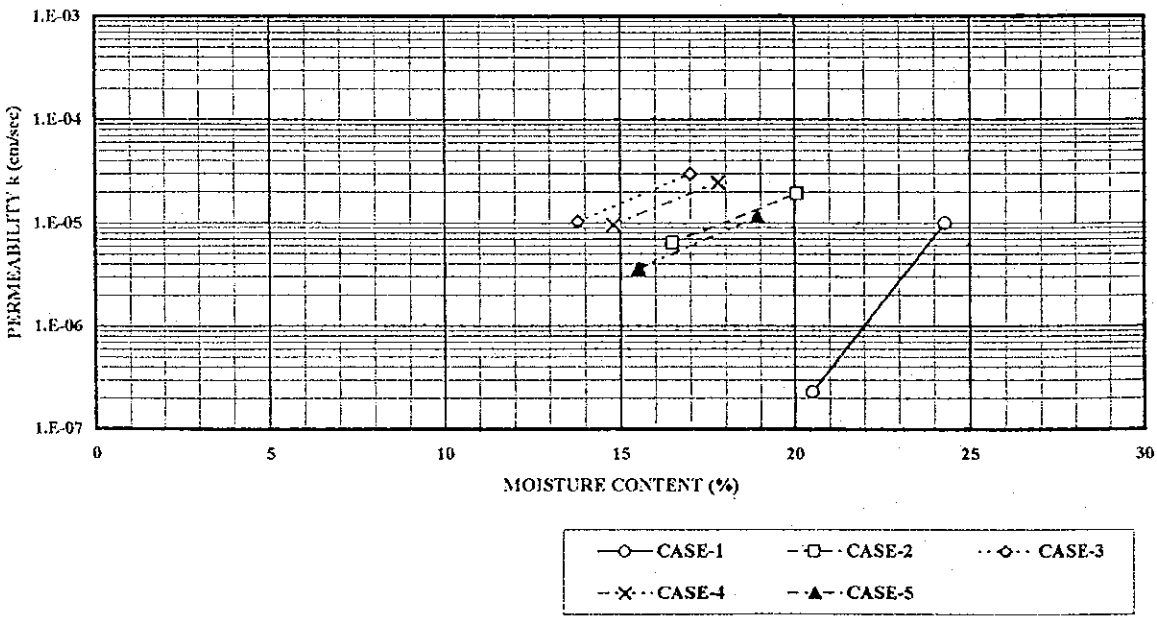
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 5.3.18
GRADATIONS OF MIXED IMPERVIOUS MATERIAL

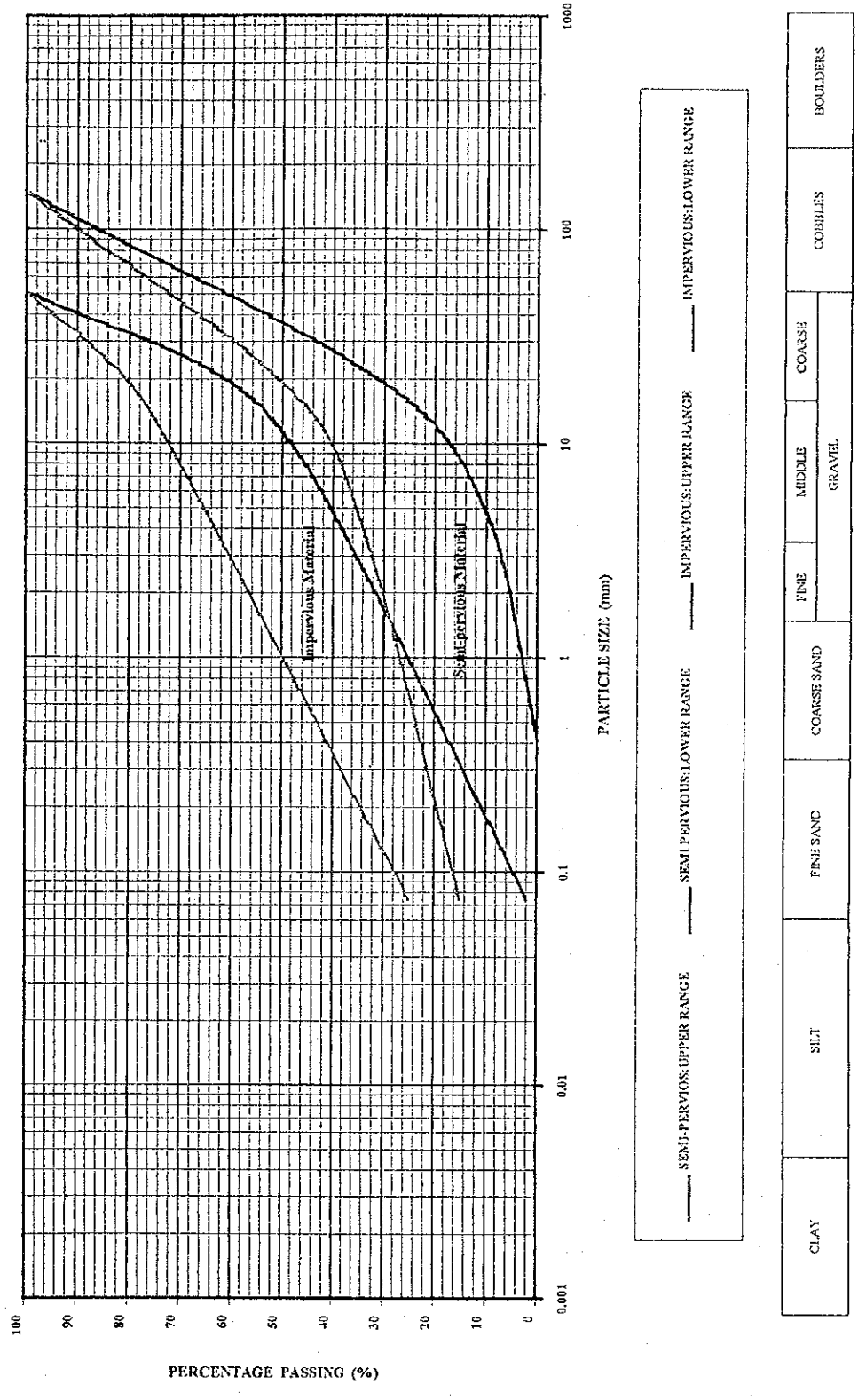




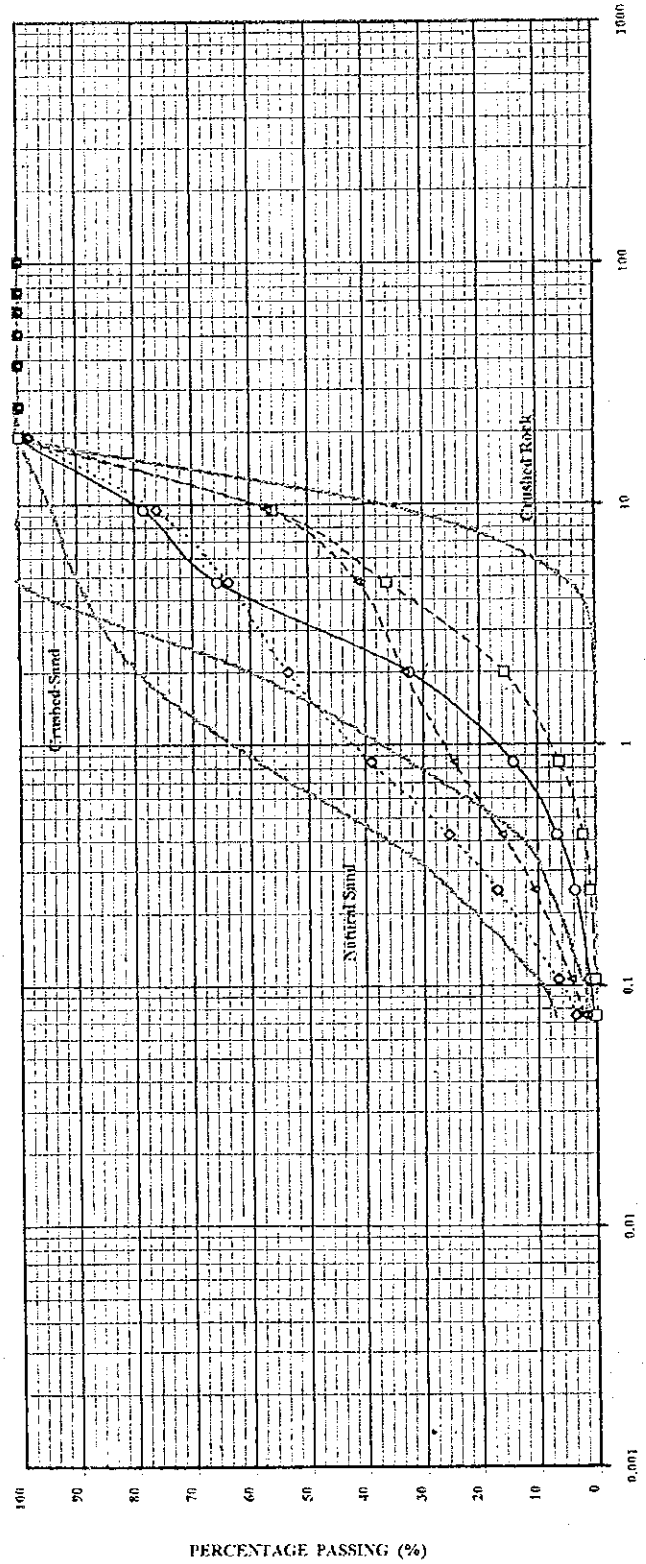
The painted marks show C, and the non-painted marks show φ.



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA	Fig. 5.3.19 MECHANICAL PROPERTIES OF MIXED IMPERVIOUS MATERIAL
JAPAN INTERNATIONAL COOPERATION AGENCY	



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA	Fig. 5.3.20 GRADATION RANGE PROPOSED FOR MIXED IMPERVIOUS AND MIXED SEMI-PERVIOUS MATERIALS
JAPAN INTERNATIONAL COOPERATION AGENCY	



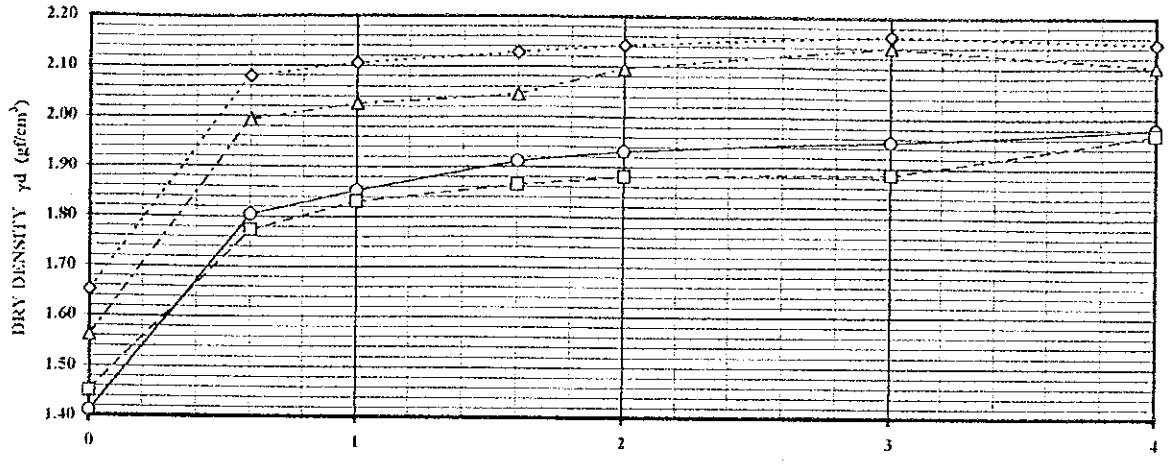
Adjustment of Gradation

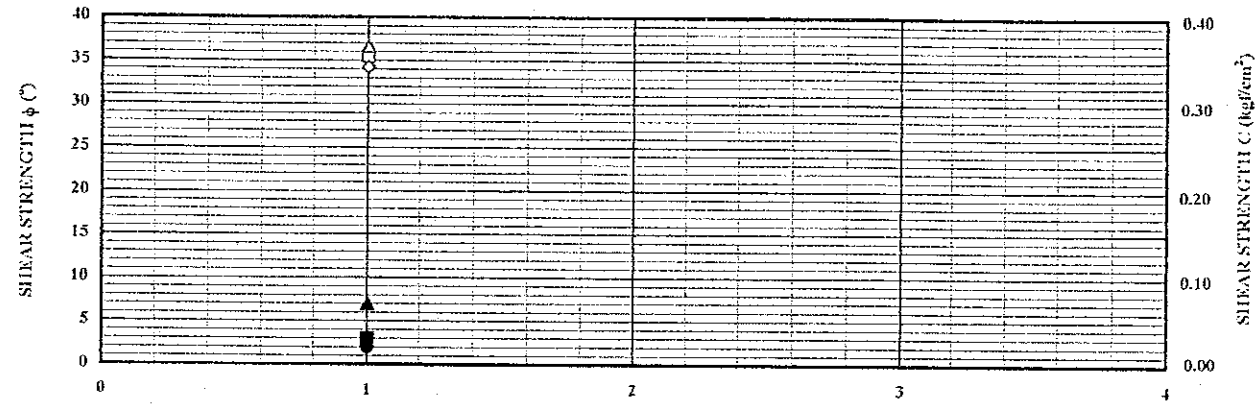
	Gravel	Sand	
	Crushed Rock (4.75 - 19.0mm)	Crushed Rock (4.75mm under)	Natural Sand
Case-1	30%	70%	
Case-2	60%	40%	
Case-3	30%		70%
Case-4	60%		40%

THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

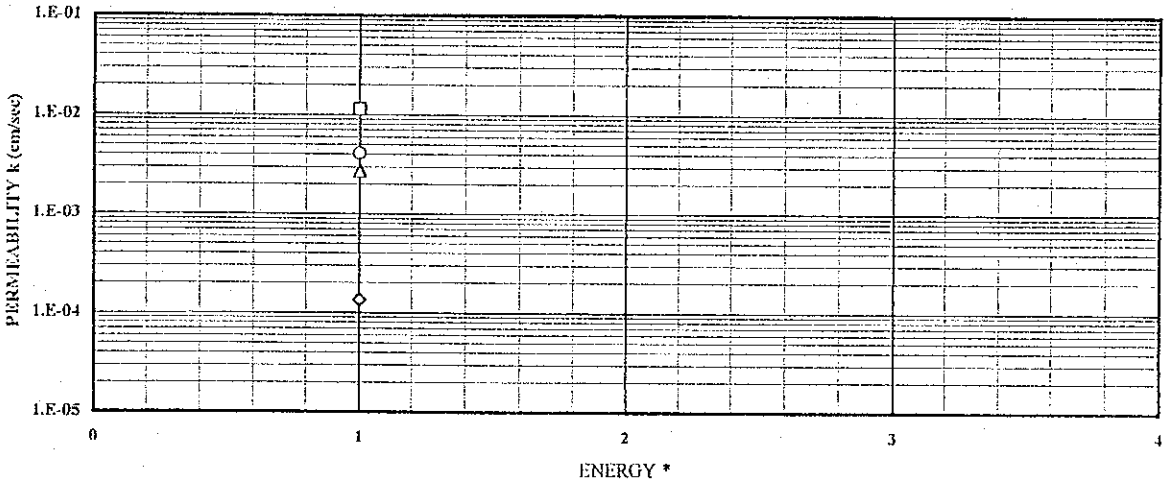
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 5.3.21
GRADATIONS OF MIXED SEMI-PERVIOUS MATERIAL

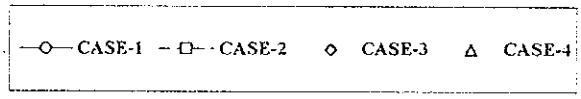




The painted marks show C, and the non-painted marks show φ.



Note * Energy 1 : 5.6 cm·kgf/cm³



THE DETAILED DESIGN OF FLOOD CONTROL, URBAN DRAINAGE AND WATER RESOURCES DEVELOPMENT IN SEMARANG IN THE REPUBLIC OF INDONESIA

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 5.3.22
MECHANICAL PROPERTIES OF MIXED SEMI-PERVIOUS MATERIAL