

Appendix 1

FURNITURE AND EQUIPMENT FOR ENGINEER'S OFFICE

	<u>Quantity</u>
Desk, 'L' shaped (2m x 1.5m x 0.5m)	2
Desk, double pedestal, 1.0m x 1.5m	7
Desk, single pedestal, 1.2m x 0.75m	27
Desk 'L' shaped, secretarial unit	2
Chairs, with arms (lounge type cloth upholstery)	5
Chairs, swivel on castors, with arms (cloth upholstery)	9
Chairs, swivel on castors, without arms (cloth upholstery)	10
Chairs, without arms (cloth upholstery)	40
Chairs, without arms (synthetic upholstery)	35
Stools drafting (cloth upholstery)	2
Table, drafting board with parallel action	2
Table conference, 1.5m x 3.0m	2
Table plan 1.5m x 2.0m	3
Table plan, 1.5m x 0.75m	9
Plan chest, 8 drawer (mm AO size)	3
Storage cabinet, steel, with adjustable shelves 0.75m x 0.45m x 2.0m	5
File cabinet, 4 drawer legal size (lockable)	40
Master file for 1000 No. AO drawings C/W hanging strips	1
Bulletin board 1.2m x 2.5m	15
Bulletin board 1.2m x 3.5m	6
Book shelf, 1.0m x 1.0m, 3 shelves	20
Typewriter, standard office size, electronic plus three daisy wheel heads, self correcting	3
Dry toner photocopying machine desktop with cabinet A3 size	1
Dry toner photocopying machine heavy duty A3 size with ADF and 20 box sorter.	1
Ammonia dyeline plan printing machine, plus air extractor unit	1
Guillotine, with 1.5m width capacity	1
Filing trays, waste paper basket, ashtray	40 sets
General office equipment punch, stapler, sharpener, etc.	40 sets
Drafting equipment 1 meter steel straight edge, scale rules (various scales 4 minimum) compasses, Leroy or similar drawing pens and lettering templates, set squares, protractor, etc., as specified by Engineer	1 set
Planimeter	1
Railway curves, metric	1 set
Anglepoise drawing board lamps	12
Desk calculator, electronic, scientific	3
Desk calculator, electronic, print out and display, Facit-C-340 equivalent	4
Desk calculator, electronic, scientific, programmable with print out (H97 or similar)	1
Adding machine, electronic printout	1

Item	Quantity
Fire extinguisher	6
First aid box	5
Automatic water cooler, electrical/gas single user	2
Plastic 5 liter insulated cooled water container	12
Safety helmet (white or yellow)	80
Orange reflective jacket	30
Traffic cones	80
Metal rack shelving system	100 lin. M
Kitchen floor units C/W work top	8 lin. M
Kitchen wall units	8 lin M
Kitchen equipment	2 sets
Telephones	15
Plain paper fax machine (Group 3) with storage memory and automatic dial	2
Computer. type A	4
Computer. type B	14
Plotter. HP Design Jet 755CM	1
Laser printer. HP Laser Jet 4MV	2
Laser printer. HP Laser Jet 5	6

Note: Computer Specifications

	<u>Hardware</u>	<u>Software</u>
<u>Type-A</u>	<ol style="list-style-type: none"> 1. Pentium Processor with 300MHz speed 2. Harddisk—4.3 GB 3. RAM—64MB 4. VRAM 4MB 5. PCI/EISA Bus 6. CD-ROM 32x 7. FDD3½ .one 8. JAZ Drive 1.0GB 9. Ultra scan 17" monitor, 0.26 dot pitch 	<ol style="list-style-type: none"> 1. Dos 6.2 2. Windows 98 3. AutoCad 14 4. MS Office 97 5. PC Tools,Norton Utility 6. qbackup 7. M'Afee latest anti-virus
<u>Type-B</u>	<ol style="list-style-type: none"> 1. Pentium Processor with 200MHz speed 2. Harddisk—2.1GB 3. RAM-32MB 4. VRAM 4MB 5. PCI/EISA Bus 6. CD ROM 32x 7. FDD 3½ one 8. JAZ Drive, 1.0 GB 9. SVGA 15" monitor, 0.28 dot pitch 	<ol style="list-style-type: none"> 1. Dos 6.2 2. Windows 98 3. MS Office 97 4. PC Tools,Norton Utility 5. Qbackup 6. M'Afee latest anti-virus

APPENDIX 2

SURVEY EQUIPMENT FOR THE ENGINEER

Item	Quantity
1. <u>Total System (Wild or compatible)</u>	
1 piece SET3B electronic total station complete incl. 2 batteries and charger range: 2200m on 1 prism accuracy: 3"	2
1 piece PFW 1 Heavy wooden tripod	2
1 piece SDR33 electronic fieldbook 256kRAM capacity: 2000 pts X, Y, Z rechargeable batteries, charger, cables, mcl, programmes, for - topography - setting out - traversing - resection - area calculation etc.	2
1 piece triple prism system stock complete (3 x AP01, AP31, SEC5100, AP71)	2
2. <u>Additional Traversing Equipment</u>	
2 pieces traversing prism station 2 (exchangeable) consisting of: - PFW 1 heavy wooden tripod - APS33 triple stationary prism set	2
3. <u>Other Survey Equipment</u>	
Aga 116 electronic distance measuring equipment (EDM) each with the following accessories: - 2 Batteries with necessary mounting attachments - 1 Mounting bracket for Wild T2 theodolite - 1 Battery charger - 2 Tilttable targets - 2 Target boxes	2

	Item	Quantity
-	6 AGA prisms	
-	1 Pogo rod (including scale)	
-	2 Tribrach adaptors	
-	1 Single prism holder	
	Unicorn (infra red) voice communicator	2
	Wild T2 theodolite (reading to 1") with tribrach	2
	Wild T16 theodolite (reading to 20") with tribrach	2
	Wild NAK 1 automatic level	3
	Wild NAK 2 automatic level	2
	Tripods (Wild GST 20)	5
	Tripods (Wild OST 10)	6
	Tribrach (Wild GDF 6)	4
	Staffs for leveling	6
	Targets (Wild G 2M1) with tribrach	3
	30 meter steel tape	15
	100 meter steel tape	3
	5m pocket tape	20
	3m pocket tape	20
	30m invar band	1
	Ranging rod	As required
	Surveying pins	As required
	Optical square	6
	Lump hammer (4 lbs)	6
	Sledge hammer (7 lbs)	2
	Portable "surveying" safety sign	12
	Surveying marking materials	As required
	Surveying umbrella	7
	Torch (9 volt)	6
	Plumb bobs and lines	10
	String chalk lines	As required
	Safety harness	4
4	Surveying Software (Sokkia or similar)	
	1 piece SDR Map (copy protected) contains all the job creation, maintenance, data-base handling, data collection, interfaces ASCII reading and writing utilities, feature code processing and plan plotting;	
	SDR Cad (copy protected) specialised CAD system for survey and engineering draughting	
	1 piece SDR Contour (copy protected) 3D ground modeling system for the production of contour plans and 3d views	

- 1 piece **SDR Volume (copy protected)**
Volume calculation software for open cast mines, stockpiles, earthworks and progress volumes on highway construction sites

- 1 piece **SDR Profile (copy protected)**
profile plotting system for the presentation of long and cross-section drawings

- 1 piece **SDR-Calc (copy protected)**
comprehensive survey data reduction and 3D coordinate geometry system for engineering design, cadastral survey calculations and network adjustments

- 1 piece **LOAD-DXF**
Interace-module for DXF-files inch graphic information in SDR-map.

Appendix 3

FURNITURE AND EQUIPMENT FOR LABORATORY**I. Furniture**

Item	Quantity
Desk, double pedestal, 0.8m x 2.0m	1
Desk, single pedestal, 0.8m x 2.0m	5
Table, reference 1.2m x 1.8m	3
Chair, swivel on castors (cloth upholstery)	6
Chair, without arms (cloth upholstery)	3
Filing cabinet, 4 drawer, legal size (lockable)	5
Bulletin board 1.2m x 2.5m	3
Book shelf, 1.0m x 1.0m, 3 shelves	3
Safety helmet (white or yellow)	10
Orange reflective jackets	10
Filing tray, waste paper basket, ashtray	5 sets
General office equipment - punch, stapler, sharpener, etc.	3 set
Desk calculator, electronic scientific with print out	3
First aid box	1
Fire Extinguisher	2
Automatic water cooler	2
5m pocket tape	6
30m steel tape	2
30m cloth / fiberglass tape	4
Wooden laboratory stool	8
Photocopier dry toner, desktop with cabinet, A3 size, heavy duty	1
Telephone	2
Plastic 5 liter insulated water containers	6
Refrigerator/Freezer (combination)	2

II. Fittings

Item	Quantity
Work benches, 900 x 750 deep c/w work top and shelf under	40 lin.m
Cupboards beneath work benches including shelf	20 1mm
Cupboards - wall mounted, 400 deep 900 high with shelf	10 horn
1.2m high bulletin board	20 1mm
Belfast pattern sink c/w plumbing	2 no.
Kitchen Equipment	1 set.
Adjustable Metal rack shelving system (2in height, 6 shelves)	100 horn

Compaction pedestals	3 No.
Special Table/Platform for Balances	3 No.

III. Equipment

The Contractor shall be responsible for providing all equipment, materials, consumables and reagents required to carry out the tests specified in the Contract for the Engineer's Laboratory. The following list gives schedules the main items of laboratory equipment, etc. required to be supplied but is not exhaustive. It is the Bidder's responsibility to check and ensure his price allows for all equipment, etc. that will be reasonably required.

Note that the quality of equipment provided is to be equivalent to that normally manufactured and supplied in Japan, USA and UK.

PART 1- GENERAL EQUIPMENT

<u>Item</u>	<u>Quantity</u>
<u>Balance</u>	
160g x 0.1mg analytical	1
1500g x 0.01g analytical	2
250g x 5mg chain-dial + weights set	2
12kg/1200g dual range top pan	1
7kg x 0.5g semi-auto scoop + weights	2
25kg x 1g semi-auto flat pan + weights	2
100kg x 50g platform	1
2kg x 0.1g twin-beam, flat + scoop and c'weight	2
10kgx 1g sliding weight, scoop	1
20kg x 1g Heavy Duty + scoop + c'weight	1
25kgx 100g compression spring	1
Extra weight sets	1
<u>Drying Ovens</u>	
225 dm ³ capacity (+ thermometer and 4 trays) to 155°C	5
118dm ³ capacity (+ thermometer and 2 trays) to 250°C	2
68dm ³ capacity (+ thermometer) to 300°C	1
<u>Desiccators</u>	
<u>Cabinets</u>	
Non-vacuum 200mm dia	2
Vacuum 250mm dia	1
Safety cage	1

Miscellaneous

Riffle box slot widths - 7mm, 15, 19, 30, 38, 50,64	2 ea
Field inspection vane tester (Geonor H-60)	2
Pocket penetrometer (soil testing)	1
Pocket penetrometer (concrete testing)	1
Electronic soil mixer 5 dm ³	1
Vacuum pump including vacuum oil	1
Warm air dryer	1
Water still	1
Aspirator	3
Electric wax pot	1
Filter pump	2
Filter tubing 2m	4
Water bath, thermostatic control, 430 x 250 x 130mm	3
Water bath, thermostatic control, 460 x 330 x 258mm (each with cover and adjustable tray)	2

Item	Quantity
Water de-ioniser	1
Pack of jumbocans	12
Stopclock	2
Stopwatch	2
Interval finger	2
Thermometer - 10 to + 110°C	5
- 10 to + 50°C	6
- 0 to +250°C	2
max/min.	4
wet and dry bulb	1
Barometer	1
Mortar, 175mm diameter	6
Rubber pestle	8
Mortar and porcelain pestle	2
Filtration apparatus, comprising retort stand clamps, 50ml glass burette with stopcock, 250ml steel bottle and a filter candle with rubber bung and suction tube	1
Pressure filter complete with cutting tools for making a hole in the filter paper	1
Filter funnel to take 200mm diameter sieves	
Meter stick	4
Steel rule -300mm	8
-150mm	4
Flexible steel tape 3m	5
Depth gauge 150mm	1
Calipers - external	1
- internal	1

Vernier calipers 150mm	2
Micrometer 0-2mm	1
Try-square, steel	1
Indiniometer	2
Oven tongs	4
Cheese grater	2
trolley (about 900mm high)	2
Pick	3
Rubber buckets (9 liter)	8
Galvanized bucket (9 liter)	1
Rain gauge	1
Thermograph	1
Charts for above (packs)	1
Whirling hygrometer	1
Hand held anemometer	1
Geological hammer	1
Geological inclinometer	1
Probes for above	1
Pair color standards	1
Copper - Copper sulphate half cell	1
Black and Decker hammer drill (12mm diameter capacity)	1
Set of drill bits (1mm — 12mm)	2
Item	Quantity
12mm masonry bits for drill	6
Initial absorption apparatus	1
Cap for above	1
Sand patch test kit	1
Sand for above 300/150 (10kg)	6
Sand above 150/75(10kg)	6
Trowelling straight edge	1
Scrapers, paint type 100mm	12
Spatula, 100mm stainless steel blade and balanced wooden handle	6
Scoop 1.5 kg	6
Scoop, 2.5 kg approx. capacity, deep galvanized steel with handle	4
Trowel, pointed type (gauging) with steel blade approx. 180mm long and wooden handle	2
Trowels (gardener)	2
Steel float, plasterer's type, with steel blade approx.280x 115mm	3
Universal bunsen burner	2
Rubber tubing for burner, 8mm bore x 12mm O.D. supplied in 6 meter lengths	2
Bottles gas cylinders including tubing and fittings (Refill as instructed by the Engineer)	3
Tripod stand, top external diameter 125mm, height	

approx. 200mm for bunsen burners	2
Iron wire gauge, approx. 150mm square with asbestos center, supplied in pack of 10 for bunsen burners	1
Iron wire triangle, with pipeclay stalks the length of each approx. 65mm supplied in pack of 10	1
Crucible tongs 200mm	2
Crucible tongs, bow type, approx. 400mm long	2

Hand auger with 20mm Φ extension rods suitable for drilling/sampling soils to 3.0m depth with 50mm diameter and 10mm diameter Semi-enclosed bits	1
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Container and Trays

0.5 dm ³ capacity sample container, lever lid, tin steel	20
Sample container 1 dm ³	40
Sample container 2.5 dm ³	40
9.0 dm ³ capacity sample container, lever lid, tin steel	30
Sample tray, steel 306 x 306 x 38mm	15
Sample tray, steel 406 x 406 x 50 mm	10
Sample tray, steel 610 x 305 x 50 mm	2
Sample tray, steel 610 x 610 x 50 mm	2
Sample tray, steel 760 x 760 x 50 mm	3
Sample tray, steel 910 x 910 x 50 mm	3
Quartering tray, steel 1220 x 1220 x 76 mm	2
Sample tray, stainless, 460 mm diameter x 50mm depth	2

Item	Quantity
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Test Tools

Test recording/reporting forms for all test required by the Engineer (quantity as required by the Engineer).

Small Tools

Trimming knife	2
Wire saw	2
Wire brush	5
Paint brushes - 25mm, 50mm	5 ea
Test tube brush	5
Glass cutter	1
Shovel	2
Ball-pen hammer -0,5, 1 kg	2 ea
Pliers - flat, pointed, electrical	2 ea
Pincers	2
Screwdrivers - slot-head, various sizes (set)	2
- cross-head various sizes (set)	2

Files - half- round; round; triangular; second-cut	2
Engineers' vice	2
Adjustable spanners (set)	2
Allen keys (set)	2

Consumables (quantities as required by the Engineer)

- Distilled water
- Paraffin wax (micro-crystalline)
- Silicone grease
- Rubber grease
- Vacuum grease
- Plasticine
- Plastic adhesive tape
- Drafting tape
- Felt-tip markers : spirit base black, red, blue
: water base black, red, blue
- Labels : tie-on
: stick
- Glass sample jars with screw-top lids (air tight)

Cleaning Materials (quantities as required by the Engineer)

- Bottle brushes
- Washing-up brushes
- Sponges
- Pan-scourers (nylon)
- Brillo
- Steel wool
- Teepol

Item

Quantity

- Wood polish
- Metal polish
- Vim powder
- Slaked lime
- Flowers of sulphur
- Dusters
- Jay-cloths
- Teak oil
- Emery Paper

PART 2- SOILS

<u>Item</u>	<u>Quantity</u>
<u>Moisture, Plasticity Shrinkage</u>	
Moisture content container 65 mm dia	50
50 mm dia	50
Weighing bottles, glass 50mm dia x 30 mm	6
40 80	6
25 50	6
Glass plate 500mm square x 10mm	2
Cone penetrometer for liquid limit and 3 spare cones	4
- Test gauge	2
- Penetration test cup	8
 Linear shrinkage mould	 6
 <u>Density and Specific Gravity</u>	
<u>Laboratory</u>	
Gas jar with cover and stopper	4
End-over end shaker	1
Density bottle 50ml	12
100ml	6
Pyenometer jar with cone and seal	4
Chattaway spatula	4
Water displacement vessel 150mm dia	1
Water displacement vessel 300mm dia	1
 <u>In-situ (AASHTO T191)</u>	
Sand-pouring cylinder 100mm	2
Calibrating container	2
Tray	3
Sand-pouring cylinder 200mm	6
Calibration container	6
Tray	9
 <u>Item</u>	
Test sand 100kg	4
Density spoon	12
Mallet	12
Club hammer	12
Chisel	12

Dibber	12
Scraper	12
Hand pick	12
Pointed rod	12
Core cutter 100mm dia	12
Driving dolly	4
Rammer	4
Core cutter 150mm	4
Driving dolly	2
Rammer	2
Speedy moisture tester G2	2
Calcium carbide 400g	20

Particle Size (AASHTO T11, T27)

Sieving

Test sieves

200mm dia :	lid	4
	receiver	4
	receiver separator	2
	Sieve aperture size	
	63 micron	5
	75 micron (reinforced)	5
	150 micron	5
	212 micron	5
	300 micron	5
	425 micron	4
	600 micron	4
	850 micron	4
	1.18mm	4
	1.7mm	4
	2.0mm	4
	2.36mm	4
	3.35mm	4
300mm dia :	lid	2
	receiver	2
	receiver separator	2
	Sieve aperture size	
	63 micron	5
	150 micron	3
	212 micron	3
	300 micron	3
	425 micron	3

Item	Quantity
600 micron	3
1.18mm	3
2.0mm	3
3.35mm	3
4.0mm	3
4.75mm	3
5.0mm	4
6.3mm	4
10.0mm	4
14.0mm	4
20.0mm	4
28.0mm	2
37.5mm	2
450mm dia : lid	2
receiver	2
receiver separator	2
Sieve aperture size 63 micron	2
425 micron	2
2mm	2
20mm	1
28mm	1
37.5mm	1
50mm	1
63mm	1
75mm	1
106mm	1
Sieve brush brass & nylon	6
Sieve brush nylon	6
Sieve brush hair	6
Sieve shakers : Inclyno No. 1	1
Inclyno No.3	2
Endecott EFL1 with spares	1
Wet sieving attachment	1
Sedimentation (AASHTO T88)	
Constant temperature bath	1
High-speed stirrer with spares	1
Soil hydrometer	4
Glass cylinder 1000ml, one mark, with bung	16
Nomographic chart	1

Compaction and CBR (AASHTO T99, T180, T193)

Compaction mould		6
Rammer	2.5 kg	2
	4.5 kg	4

Item	Quantity
CBR mould by	24
Extension	12
Perforated base	16
Solid base	24
Cutting collar	4
C-spanner set	3
Baseplate tool	3
Tamping bar	4
Compaction plug	2
Swell plate	8
Spacer discs	2
Tripod	8
Soaking tank (1m x 1m x 0.2m depth)	3
Penetration Piston	2
Dial gauge 25mm travel x 0.01mm diversions	12
Bracket	2
Annular surcharges weight	10
Split surcharge weight	20
Stabilising bar (to suit load frame)	2
Datum bar assembly	2
28KN load ring	2
CBR, Marshall gap tester with spares Kit (2)	2
Dynamic Cone Penetrometer, including hammer assembly (8kg), extension rod, measuring rule and reader	4
Spare cones (60 degree) for Dynamic Cone Penetrometer	8

Sand Equivalent Test (AASHTO T176)

Plastic measuring cylinder for sand equivalent test	4
Irrigator tube - for sand equivalent test	1
Weighted foot assembly - for sand equivalent test	1
Rubber tubing for sand equivalent test	1
Plastic funnel for sand equivalent	1
Syphon assembly for sand equivalent test	1
Wooden carrying case for sand equivalent test	1
Test form for sand equivalent test (Pads of 500)	5
Calcium chloride for sand equivalent test	1
Glycerol analar for sand equivalent test	1

Formaldehyde for sand equivalent test	1
Sand equivalent mechanical shaker	1

PART 3- CHEMICAL

<u>Item</u>	<u>Quantity</u>
Miscellaneous	
Ion exchange column and constant head device	2
Resin	4
pH meter with spares	1
Spare electrode	2
Magnetic stirrer and spares	2
Muffle furnace	1
Silica crucible	8
Porcelain crucible	8
Lid	8
Tongs	2
Gloves	2
BDH soil testing outfit (pH) with spares	1
Test papers: pH	10
red litmus	5
blue litmus	5
Quantab chloride titrator	5
Quantab sulphate titrator	5
Test-tube rack	2
Cork borer	1
Burette stand	2
Funnel stand	2
Retort stand	2
Asbestos cement mat (pkt)	1
Scoop	1

<u>Item</u>	<u>Quantity</u>
Glass and Plastic Ware	
Polythene beakers :	
250 ml	4
600 ml	6
1000ml	6
200 ml	2
Plastic measuring cylinders :	
250 ml	4
1000 ml	2
2000 ml	2
Plastic funnels :	
115mm dia	2
200mm dia	4
Plastic storage bottles :	
1 litre	6
2 litre	6
Dustbin	2

Plastic syringe 50ml	2
Glass pycnometer incl. Airtight glass stopper, capacity 25 ml	2
Beakers, Pyrex brand, borosilicate glass, squat form:-	
50ml capacity	5
100ml capacity	5
250ml capacity	10
400ml capacity	10
600ml capacity	10
1000ml capacity	10
Beaker cover, watch glass, Pyrex brand borosilicate glass:1000 mm dia	12
150mm dia	4
Measuring cylinder, soda glass, spouted calibrated up end down:	
10ml capacity	5
25ml capacity	5
50ml capacity	5
100ml capacity	5
250ml capacity	5
500ml capacity	12
1000ml capacity	12
2000ml capacity	5
Volumetric flasks, soda glass, stoppered:	
100ml capacity	5
250ml capacity	5
50ml capacity	5
1000ml capacity	5
Conical flasks (Erlenmeyer), borosilicate glass, wide mouth,	
Graduated, 500ml nominal capacity, 100 ml. Sub-divisions	8
Graduated pipette 10ml	3
Graduated pipette, 25ml capacity, 0.20ml sub-divisions	4
Graduate pipette, 1ml capacity	2
conical flasks: 1000ml	12
600mb 250ml	6 ea
Bulb pipette, 50ml capacity	4
Bulb pipette, 100ml capacity	3
Burette, soda glass with single-bore stopcock 50 ml capacity,	

<u>Item</u>	<u>Quantity</u>
0.10ml sub-divisions	3
Similar burettes 25ml and 100ml capacity, pack of 10	3 ea
Evaporating dishes, Royal Worcester porcelain	
shallow form with spout: 109mm diameter x 45mm depth	10
157mm diameter x 55mm depth	30
200mm diameter x 65mm depth	20
Buchner funnel, Royal Worcester porcelain, size no. 5, to take	
110mm diameter filter paper supplied with no. 37 rubber bung	3
Glass funnel, 100mm diameter with 600 angled side	9
Filter flask, 500ml capacity, conical type with integral side arm	2

Filter flask, 1000ml capacity, conical type with integral side arm	4
Glass stirring rod, approx. 7mm diameter x 200mm long, pack of 10	2
Glass stirring rod, approx 3mm diameter x 150mm long, pack of 10	1
Reagent bottles 50ml	20
Extraction flasks, 100ml capacity, borosilicate glass, pack of 12	1
Polythene wash bottles, 500ml capacity	5
Polythene storage bottles, narrow mouth, 500ml pack of 12	1
Polythene bag, 380 x 254mm heavy duty 500 gauge (0.1mm thick)	1000
Polythene bag, 760 x 506mm heavy duty 500 gauge (0.1mm thick)	1000
Dropping bottle 125 ml	4

Chemicals

Hydrochloric acid (concentrated) SG 1.18	10 litre
Hydrogen peroxide (20 vol.)	2.5 litre
Silical gel 1mm/500mm	2500gm
Sodium chloride	2 kg
Sodium hexametaphosphate	5 kg
Sodium hydroxide pellets	1 kg ylated spirit
Methylated spirit	10 litre
Barium Chloride	2 kg
Ammonia SG 0.880	2.5 litre
Silver nitrate	0.5 kg
Liquid bromine	250 ml
Cationic exchange	2 kg
Screened methyl orange	1 litre
Nitric acid	5 litre
Potassium chloride	0.5 kg
Tannic acid	1 litre
Sulphuric acid SG 1.84	5 litre
Potassium thiocyanate	2 kg
Potassium dichromate	250 gm
Ferric alum indicator	500ml
Toluence	2 litre
Ammonium thiocyanate	0.5 kg
Benzyl alcohol	1 litre
Volhard indicator solution	1 litre
Benzene	1 lire

Item**Quantity**

Trichloroethane	1 litre
Sodium sulphate	5 kg
Magnesium sulphate	10 kg
3,5,5, Trimethyhexone -1-02	500 ml
Ferrous sulphate	1 kg
Orthophosphoric acid (5G. 1.70)	500 ml
Sodium diphenylamine sulphate	50 gm

Methyl red indicator	50 ml
Litmus paper neutral (1 reel)	
Sodium carbonate	2 kg
Sodium oxalate	500 gm
Sodium acetate trihydrate	500 gm
Tartaric acid	500 gm
Ammonium ferric sulphate	500 gm

Filter Papers

Whatman No.44 x 110mm diameter, box of 100	4
Whatman No.54 x 110mm diameter, box of 100	4
Whatman No.40 x 110mm diameter, box of 100	2
Whatman No. 50 x 110mm diameter, box of 100	10
Whatman No. 1 x 110mm diameter, box of 100	5
Whatman No. 5 x 270mm diameter, box of 10	2

PART 4- CONCRETE

Item	Quantity
Compression Testing (AASHTO T22)	
2000kN capacity powered compression testing machine complete as ELE Set 31045 including 3 distance pieces, upper and lower platens, guards and debris hopper	2 sets
Fresh Concrete Testing	
Slump cone (AASHTO T119)	5
Tamping rod, steel, 600mm long x 16mm diameter, round at one end	5
Steel rule, rustless grade, 300mm long, machine divided into millimetres	4
Basic plate, plastic sheet nominally 455mm square x 10mm thick	5
Compacting factor apparatus	1
Compacting rod, steel, 25mm diameter x 480mm long	2
Bulk density measure, 1 ft ³ (28.3 dm ³) capacity	1
Bulk density measure, 0.5 ft ³ (14.1 dm ³) capacity	1
Concrete penetrometer	1
Set of needle points	1
10dm ³ bulk density measure	1
Item	
Straight edge 455mm	3
Protected thermometer - 15 to +60°C	8
Spare mercury thermometer	18

Air entrainment meter, complete with air pump	
tamping rod and calibrating cylinder	2
Set of sealing rings	2

Bleeding Testing

Vibrating platform as required for testing ASTM C232 Method B	1
Timer for regulating vibrating platform	1
Steel container as specified in above test	1

Preparation, Moulding and Curing (AASHTO T23, T126, T231)

Multiflow mixer 56 dm ³ (2 ft ³) capacity	1
Spanners for above	8
Concrete cylinder moulds (6" x 12")	50
Mould oil 25 litre drums	8
Wire brush	12
Tamping rods	8
Cylinder capping frame, for capping cylindrical specimens	1
Capping plate, made from precision ground steel	1
Capping compound having a compressive strength of 70MNm ² (10,000 lbf/in ²)	25 kg
Melting pot	1
Masonry/concrete saw	1
Blades for above	12
Vibrating table, 305mm x 610mm table top	1
Standard curing tank, complete with circulation pump and heater/thermostatic unit (36 x 150mm cylinders)	4
Steel stand for standard curing tank	4
Removable lower rack for standard curing tank	4
Set of eight upper racks for standard curing tank	4
Small curing tank complete with stand, immersion heater thermostat and internal tray	1

Non-destructive Testing In-Situ

Cover meter	1
Mechanical strain gauge length 2000mm (Demec)	1
Stainless steel locating discs	100
Crack detection microscope	1
Microstand conversion unit	1
Schmidt Rebound Hammer (calibrated)	1

Test on Hardened Concrete

Portable core drill, petrol or electric drive, 930 W. motor	1
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Item	Quantity
Horizontal brace with bracket and pin assembly for use with electric driven core drill	1
Expander coupling, 100mm nominal core diameter	1
Expander coupling, 150mm nominal core diameter	1
Impregnated drill barrel for 100mm diameter cores	4
Impregnated drill barrel for 150mm diameter cores	4
Portable generator	1
Cutter shank for concrete breaking	3
Cutter blades for above	50
Concrete / masonry saw (electric)	1
Cutter blades for above	5

PART 5- CEMENT, LIME PLASTER AND MORTAR

Item	Quantity
<u>General Tests of Cement and/or Lime Mixes Fineness</u>	
Rigidens flow meter	1
U-tube	1
Calibration powder (30g each)	2
Lea and Nurse cell	1
Filter papers (box)	2
Manometer fluid (500 ml)	1
<u>Setting Time</u>	
Vicat frame	1
Initial needle	4
Final needle	4
Vicat mould	2
<u>Soundness</u>	
Le chatelier mould	1
Le chatelier water tank	1
<u>Flow and Workability</u>	
Flow table top	1
Flow table tripod	1
Flow table mould	1
Baseplate	1
Calipers	1
Plastic tamper	2

Compressive Strength

100mm cube moulds	6
Vibrating machine for above	1

<u>Item</u>	<u>Quantity</u>
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Standard sand as agreed with the Engineer (45 kg)	8
50mm distance piece	1

Strength Determination

Three-gang mould for 2 inch (50mm) mortar cubes	4
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Air Content

Brass measure, 500ml, 76mm diam dia	1
Glass plate 100mm square, 6.4mm thick	1
Plastic tamper, 37.5mm dia, 250g	1
Straight-edge, 100mm long	1

Driving, Shrinkage and Moisture Movement

Steel frame, adjustable height beam and dial gauge (12mm travel, 0.003mm div)	1
Invar rods, 205mm, 230mm, 298mm 305mm long	1 ea
Two-gang prism mould with steel inserts	1

PART 6- SAND, AGGREGATES AND FILLER

<u>Item</u>	<u>Quantity</u>
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Preparation and Classification

Glass jar, approx. 1kg capacity, complete with screwed lid and seal, approx 90mm diameter x 180mm long	5
Bottle roller, single pattern, rotate glassjar about its longitudinal axis. Speed of rotation is 80 ± 20 r.p.m	1
Andreason pipette, 25ml. capacity	2
Pipette stand	2
Measuring cylinder 500ml	4
Evaporation dish	2
Sodium oxalate, supplied in 250g containers	2
Thickness gauge (metres) constructed of heavy gauge sheet steel	1

Flakiness sieves :	<u>Slot width (mm)</u>	<u>Slot length (mm)</u>	
	4.9	30	1
	7.2	40	1
	10.2	50	1
	14.4	60	1
	19.7	80	1
	26.3	90	1
	33.9	100	1

Item	Quantity
Length gauge (metric), steel mounted on a hardwood base	1
Angularity	
1.4 dm ³ cylindrical measure (0.05 ft ³) made of heavy gauge steel, for use with aggregate smaller than 5mm.	1
2.8 dm ³ cylindrical measure (0.01 ft ³), for use with aggregate smaller than 19mm.	1
Semi-automatic balance 5 kg capacity x 0.5g sensitivity, complete with wire basket approx. 200mm diameter x 200mm high, made of brass mesh-1	1
Set of weights for semi-automatic balance	1
Water container, galvanized steel	1
Air tight container of similar dimensions to wire basket	1
Adsorbent cloths, in packs of 3	2
Gas jar, 75mm diameter x 300mm high, complete with glass cover	1
Sand absorption cone	2
Tamping rod, for use with cone. Tamping face is 1 inch diameter	2
Voids and Density	
Bulk density measure, 7dm ³ (¼ ft ³) capacity, made of steel, complete with carrying handles	1
Siphon can	1
Bulk density measures 15 dm ³	1
Bulk density measures 30 dm ³	1
Organic Content	
Glass bottle, 12 ounce (350ml approx.) capacity with graduation marks at 2,4 and 7 ounce positions complete with screw on cap	5
Sodium hydroxide pellets, supplied in 1kg. Container	2
Color standard with five organic color glasses moulded in a plaster holder	2
Sulphate Soundness and Content	

Nepelometer (SO ₃ determination)	1 set
Wire basket, brass, 4 litre capacity (complete)	1

Alkali Reactivity

Spectrophotometer	1
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Item	Quantity
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Reaction container	1
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Aggregate Crushing Value

Aggregate Crushing Value apparatus, comprising 150mm nominal diameter steel cylinder, plunger and base plate	1
Metal measure, 114mm diameter x 178 deep x 16 swg thick	1

Pipe Bedding Compaction Fraction

Open-ended mild steel cylinder, 150mm dia. 250mm long	1
Rammer - 40mm face dia, 1 kg wt.	1

PART 7- ASPHALT AND BITUMINOUS MIXTURES

Item	Quantity
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Extraction of Bitumen (AASHTO T164)

Hotplate, electric, with adjustable heating rate	1
Ignition dish, 125ml capacity	1
Dessicator	2
Centrifuge extractor apparatus, 3kg capacity, to requirements of AASHTO T1 64-2	
Filter rings for apparatus	500
I, I, I Trichlorethane solvent (2.5 Litre bottles)	200
Extraction hood and exhaust system	1

Asphalt Samplina

Sampling trays with cables	6
400 x 400 x 20mm with 3m wire rope 10mm diameter	8
Asphalt sampling scoop - long handle	3
Shovel size 6	3
Hand shovel (Household - metal)	3
Spatula 200mm blade	3
Spatula 150mm blade	6
Sample bags, kraft paper 4 ply 760 x 508mm	1000
Sample bags, kraft paper 4 ply 380 x 254mm	1000

<u>Item</u>	<u>Quantity</u>
Marshall Stability Test (AASHTO T245)	
Thermometer lab type 50-250°C	5
Pocket thermometer dial type 50-250°C	5
Electronic thermometer	2
Probes for above	4
Extension lead	2
Surface thermometer	1
Bench-mounting mixer 11.4 dm ³ (0.4 ft ³) capacity with fittings	1
Isomantle electric heater for use with 11.4 dm ³ bowl	1
30 KN Marshall load frame, platen speed rate 50.88mm/min.	1
Stabilising bar for above	1
Breaking head stability mould, supplied complete with gauge disc and flow meter pedestal	2
Flow meter (dial gauge) graduated 0.01 mm x 25mm travel, fitted with a stem brake unit to indicate maximum deflection	4
Compaction mould, comprising filling collar, mould body and base plate	1
Compaction pedestal comprising a 300mm square x 25mm thick steel plate fitted with securing eyes on its under side; a mould clamp and hammer guide are fitted to the top surface of the plate	1
Compaction hammer, designed for use with the compaction pedestal and mould; the hammer has a 4.5 kg. weight which has a free fall of 457 mm.	2
Sample extruder	1
Extraction collar and plunger	1
Oven 300° fan circulated	2
Hot plate with thermostal	1
Extractor	1
Water bath 44 litre	1
Water bath cover	1
Sample trays 306 x 38mm	5
Bitumen tins: 1 litre	10
Asbestos gloves (pairs)	6
Extractor collars	2
Adjustable trays for water bath	2
Constant level device	1
Cooling coil	1
Thermometer for water bath	6
<u>Tests on Bitumen</u>	
<u>Penetration</u>	
Standard penetrometer	1

Penetration needles, made of hardened steel, packet of 3	4
Penetration needle verified	1
Automatic controlled for standard penetrometer	1
Transfer dish, complete with perforated internal specimen support	2
Penetration tin, disposable, approx. 55mm diameter x 50mm deep.	100
Gooch crucible, as specified in AASHTO T 44-70	1
Displacement ring	2
Asbestos, long fibre (amphibote) selected, acid wash	1 kg
Cover	2
Filter flask, heavy wall, with side tube, 250 or 500 ml capacity	1
Thermometer, range 19°-27°C, 0.1° divisions	1

Item**Quantity**

Thermometer, range 34°-42°C, 0.1° divisions	1
Thermometer, range 49°-57°C, 0.1° divisions	1
Thermometer, range 57°-65°C, 0.1° divisions	1
Thermometer, range 79°-87°C, 0.1° divisions	1
Thermometer, range 19°-103°C, 0.1° divisions	1
Filter tube, 40 to 42mm inside diameter	1
Trichloroethylene, reagent grade, 2.5 litre bottle	2

Rubber tubing for adaptor for holding Gooch
Crucible onto the filter tube.

Testing In Situ

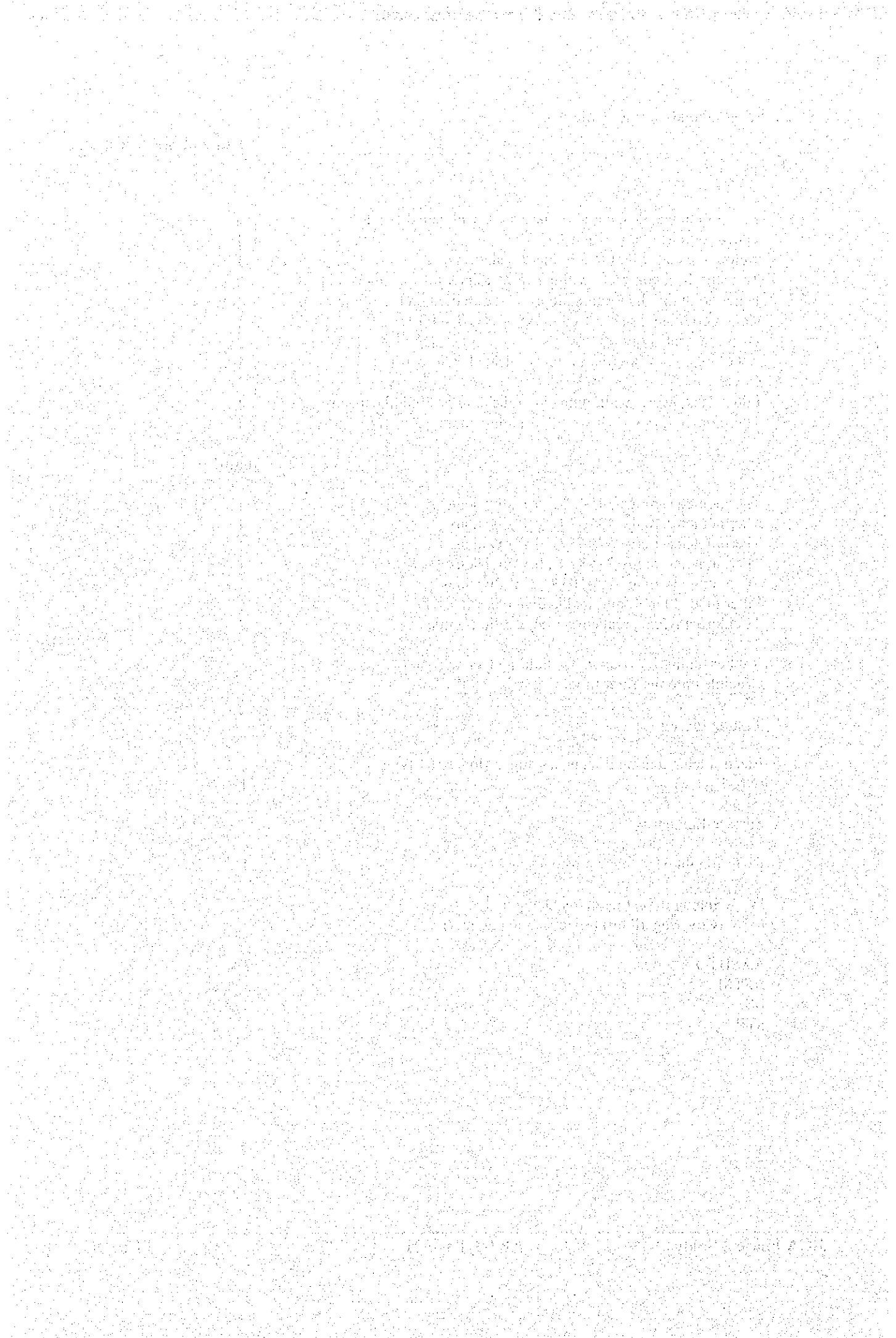
Electrometer coating thickness gauge, Model 101 type A (No. 1 scale)	1
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Surface Regularity

DoT straight edge, metric wedges and case	1
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IV Standard Test methods Documents
(Covering all tests specified in contract)

AASHTO	3 sets
ASTM	3 sets
BS	3 sets
STP	3 sets

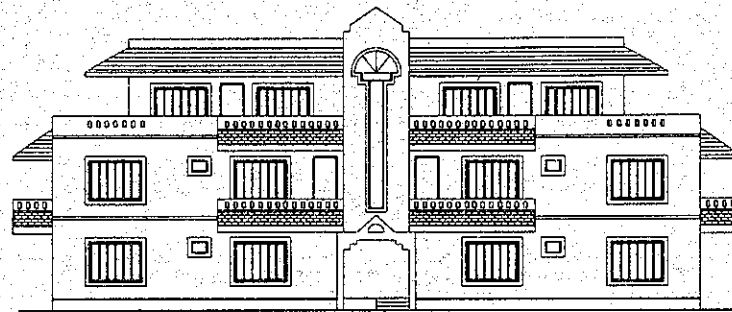


THE STUDY ON CONSTRUCTION OF THE BRIDGE
OVER THE RIVER RUPSA IN KHULNA (PHASE 2)

ENGINEERS OFFICE

SCALE SHEET NO.

AS SHOWN A4-01

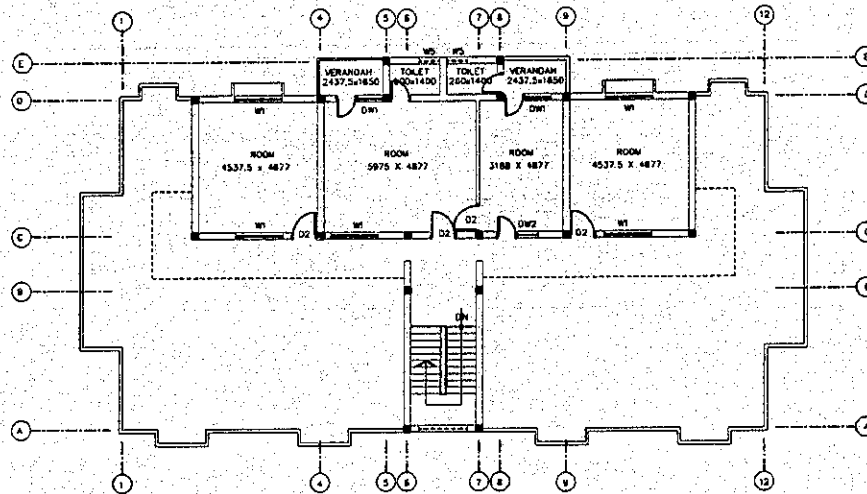


1 FRONT ELEVATION
A4-01 SCALE N75

THE STUDY ON CONSTRUCTION OF THE BRIDGE
OVER THE RIVER RUPSA IN KHULNA (PHASE 2)

ENGINEERS OFFICE

SCALE	SHEET NO.
AS SHOWN	A4-02

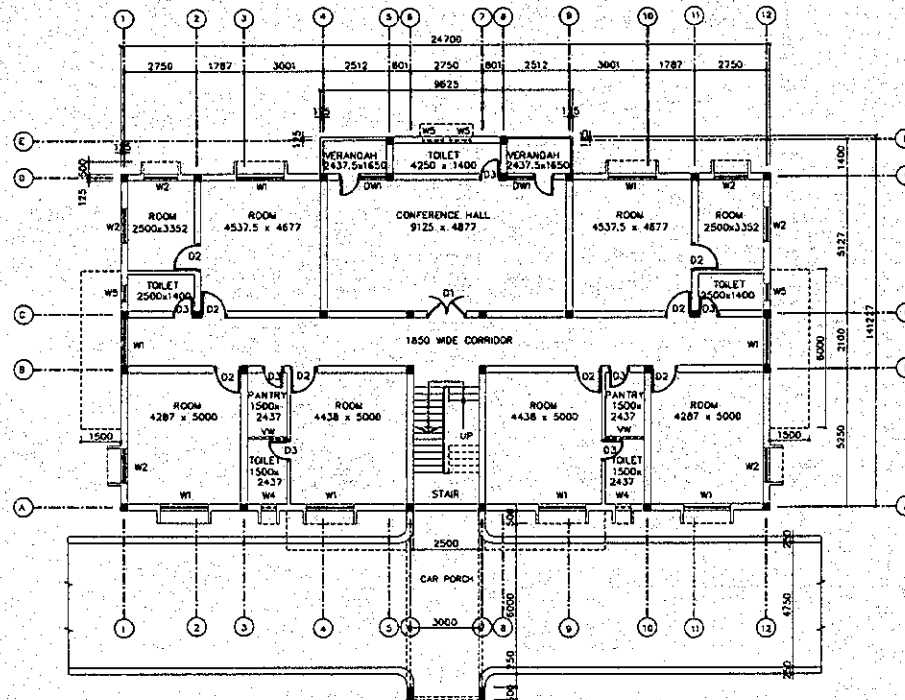


1 PLAN: 2ND FLOOR
SCALE NTS

THE STUDY ON CONSTRUCTION OF THE BRIDGE
OVER THE RIVER RUPSA IN KHULNA (PHASE 2)

ENGINEERS OFFICE

SCALE	SHEET NO.
AS SHOWN	A4-03



1 PLAN: GROUND FLOOR
SCALE NTS

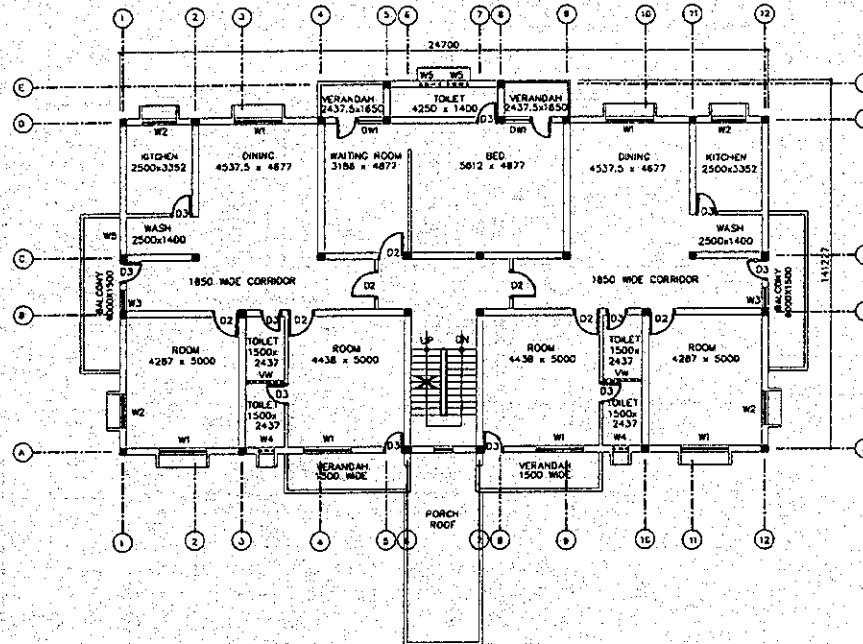
SCHEDULE OF DOORS & WINDOWS

1. DOOR:	D1	DOUBLE LEAF	1500 x 2130
2.	D2	SINGLE LEAF	1000 x 2130
3.	D3		600 x 2130
4. DOOR & WINDOW COMBINED			
(a)	DW1:	800 x 2130 + 1000 x 1370	
(b)	DW2:	800 x 2130 + 750 x 1370	
5. WINDOW	W1/W1		1820 x 1370
6.	W2		1300 x 1370
7.	W3		750 x 1370
8.	W4		600 x 300
9.	W5		750 x 600
10. VENT	VW		1500 x 350

THE STUDY ON CONSTRUCTION OF THE BRIDGE
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ENGINEERS OFFICE

SCALE	SHEET NO.
AS SHOWN	A4-04

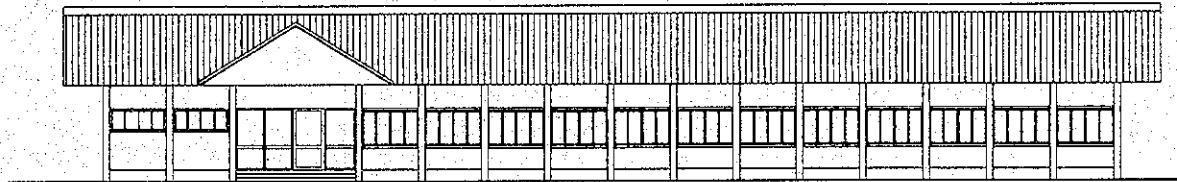


1 PLAN: FIRST FLOOR
SCALE NTS

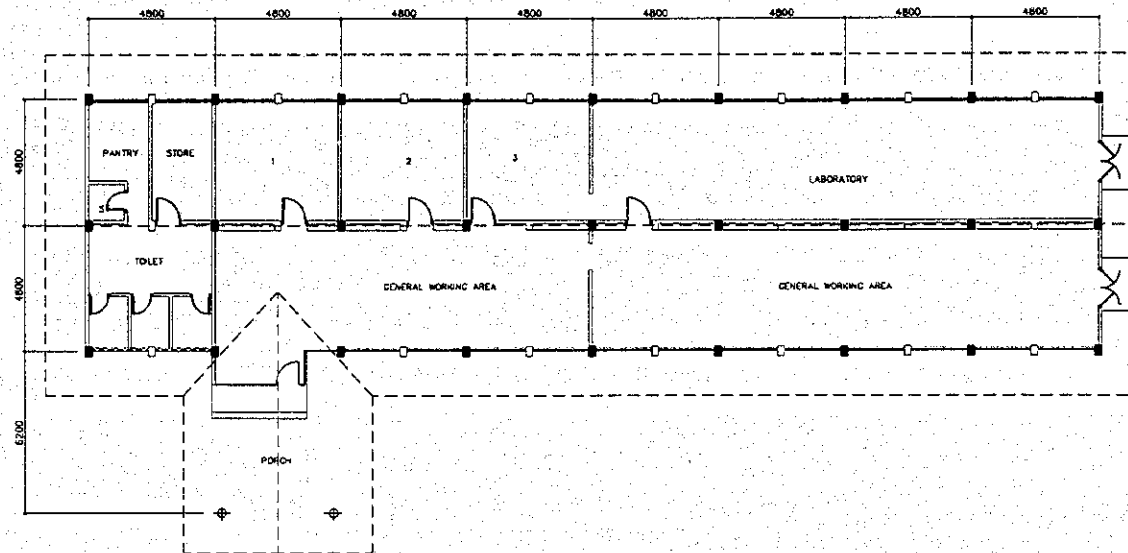
THE STUDY ON CONSTRUCTION OF THE BRIDGE
OVER THE RIVER RUPSA IN KHULNA (PHASE 2)

ENGINEERS LABORATORY

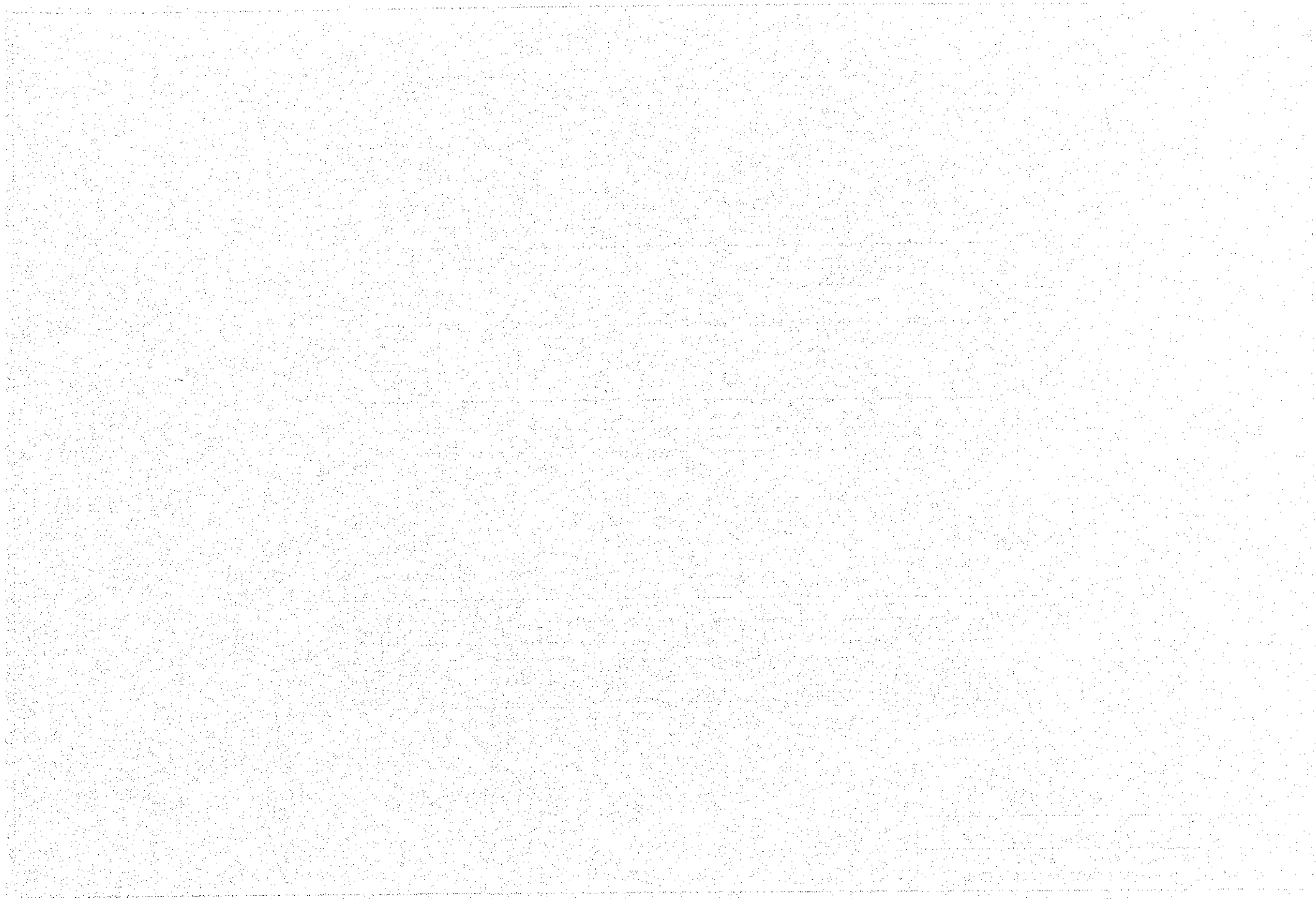
SCALE	SHEET NO.
AS SHOWN	A5-01



2 FRONT ELEVATION
AS-01 SCALE NTS



1 PLAN
AS-01 SCALE NTS



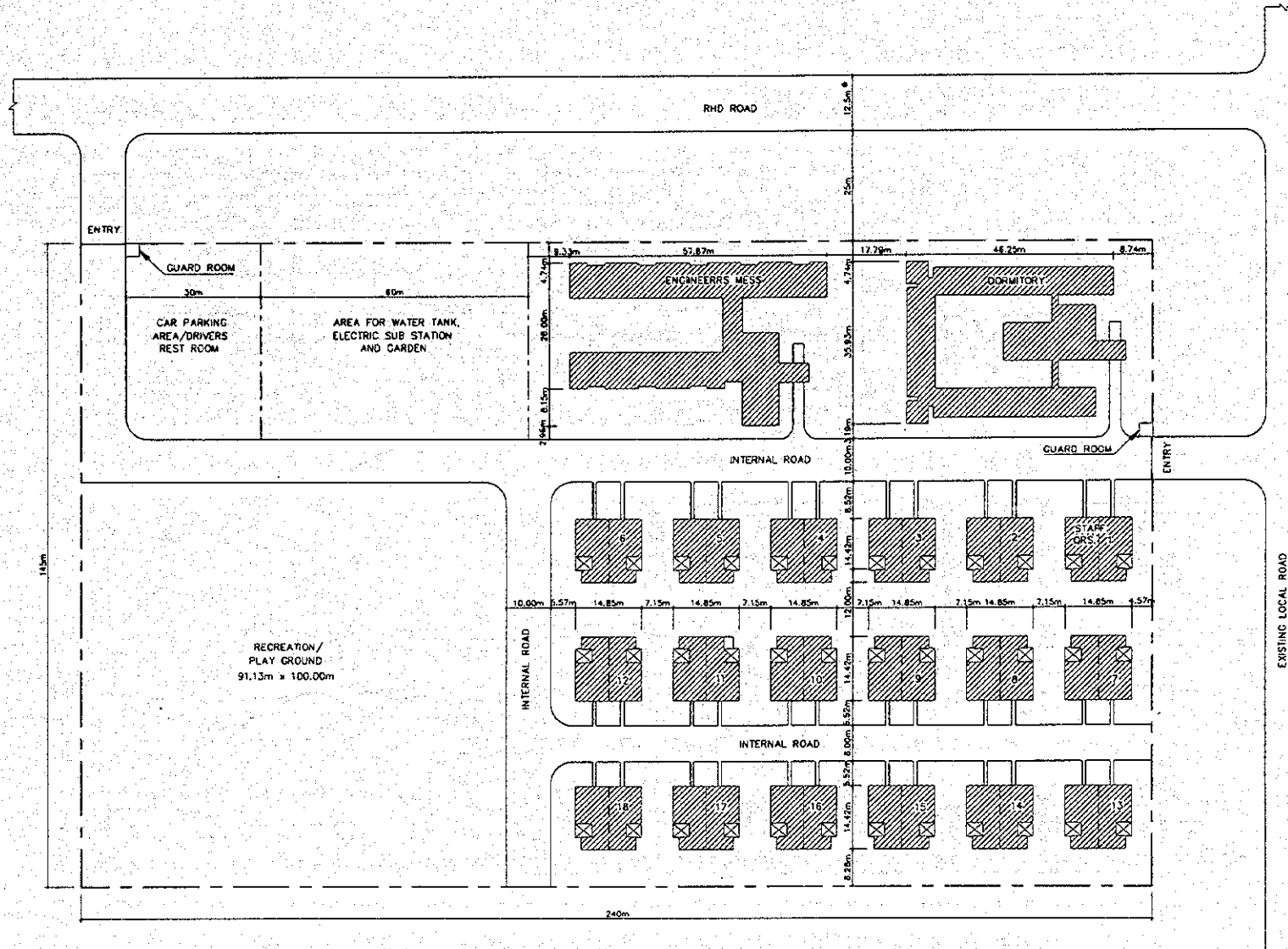
THE STUDY ON CONSTRUCTION OF THE BRIDGE
OVER THE RIVER RUPSA IN KHULNA (PHASE 2)

ENGINEERS ACCOMODATION

SCALE	SHEET NO.
AS SHOWN	A6-01

LEGEND:

UNIT NO.6 OF STAFF QUARTERS PROVISIONALLY TO BE USED
AS RESTAURANT FOR SENIOR AND PROFESSIONAL STAFFS

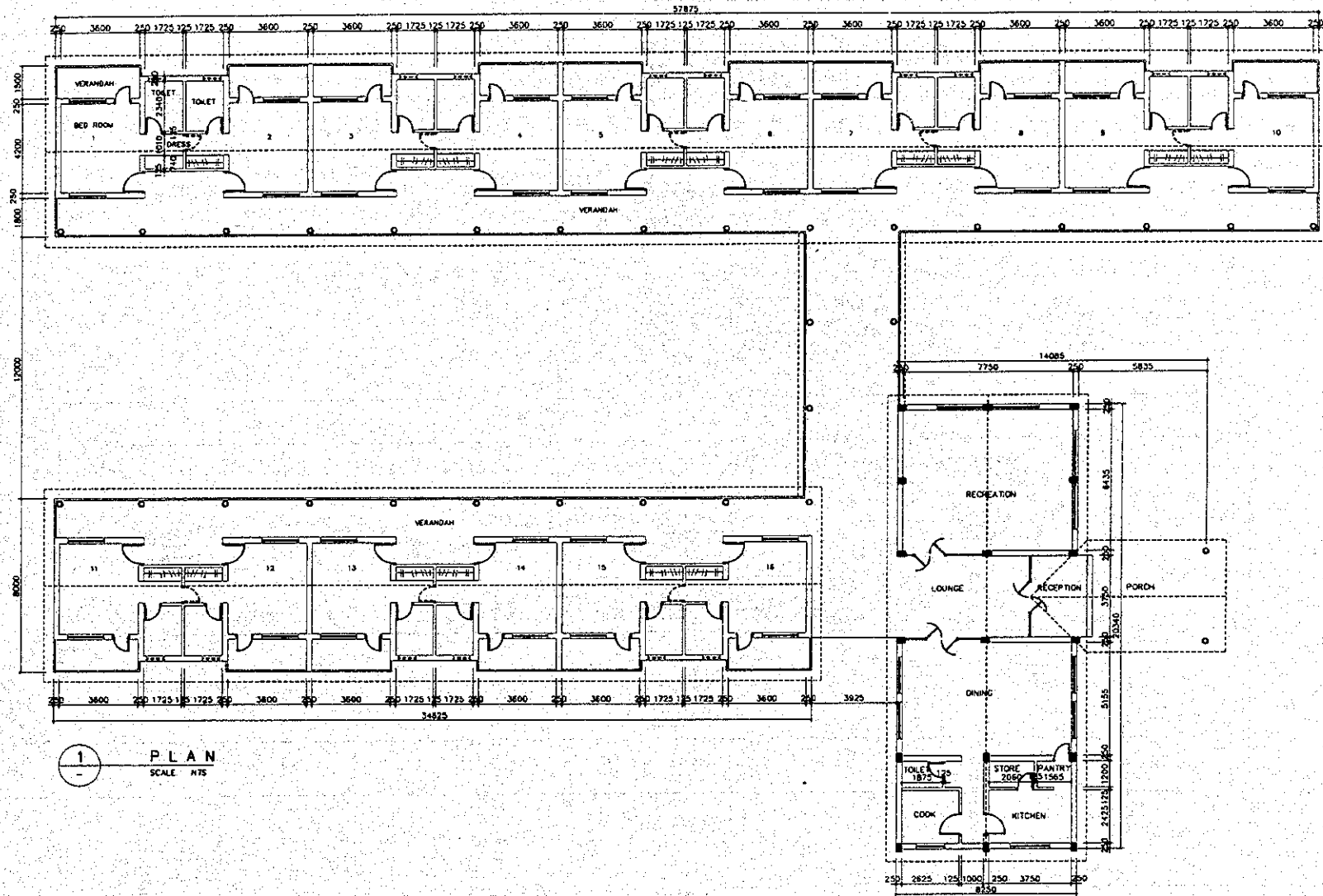


1 LAYOUT PLAN
SCALE: NTS

THE STUDY ON CONSTRUCTION OF THE BRIDGE
OVER THE RIVER RUPSA IN KHULNA (PHASE 2)

ENGINEERS ACCOMODATION
ENGINEERS MESS

SCALE	SHEET NO.
AS SHOWN	A6-02



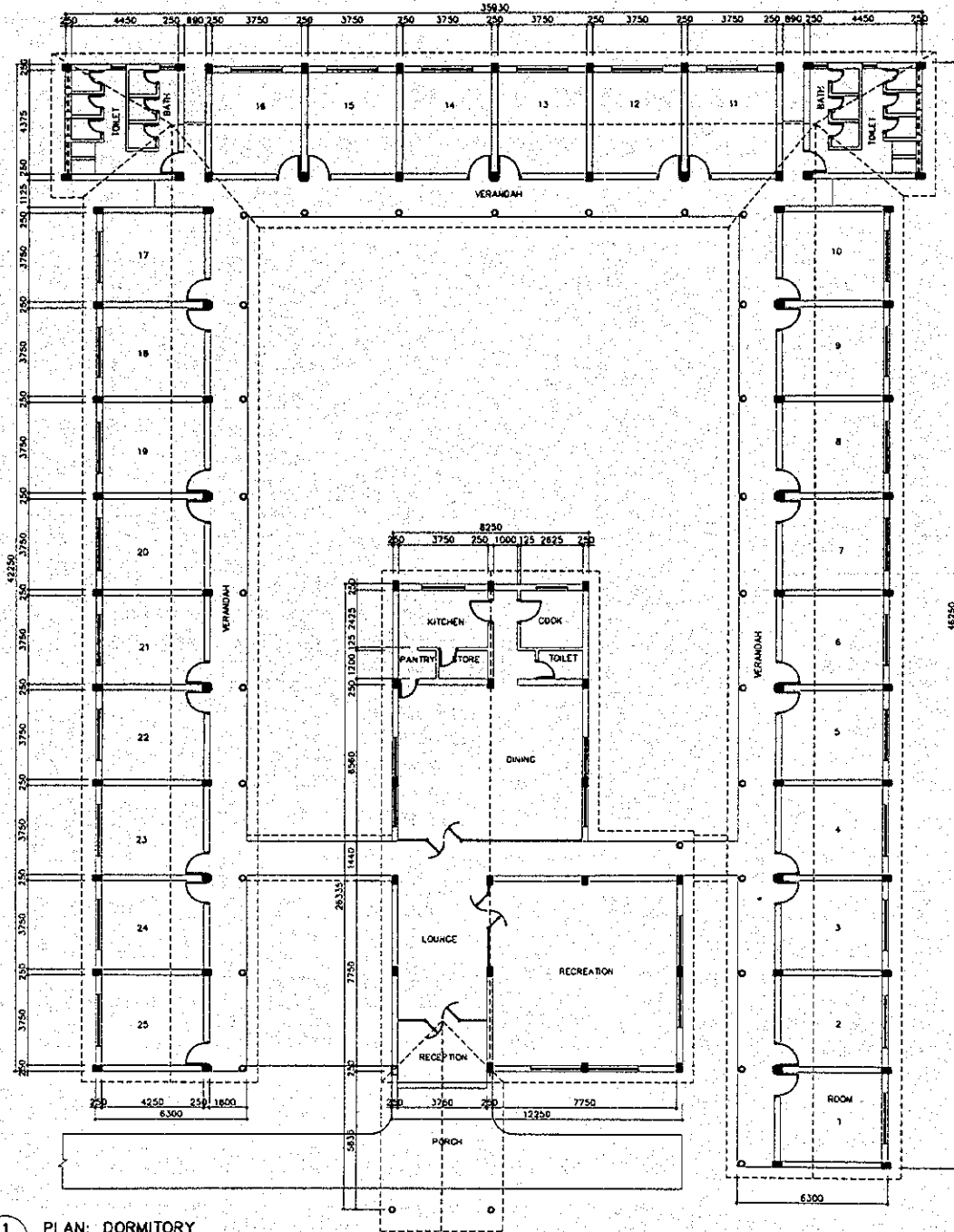
1 PLAN
SCALE HTS

THE STUDY ON CONSTRUCTION OF THE BRIDGE
OVER THE RIVER RUPSA IN KHULNA (PHASE 2)

ENGINEERS ACCOMODATION
STAFF QUARTERS

SCALE
AS SHOWN

SHEET NO.
A6-03

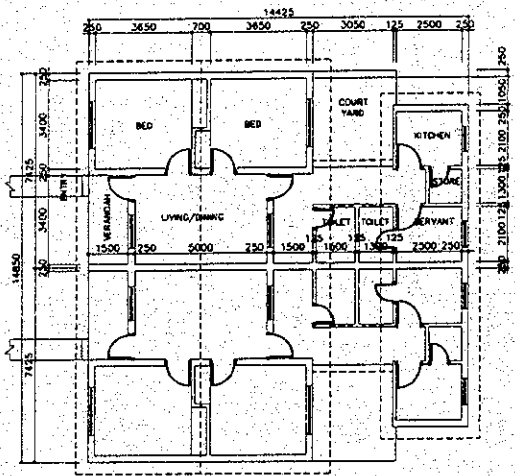


1 PLAN: DORMITORY
SCALE NTS

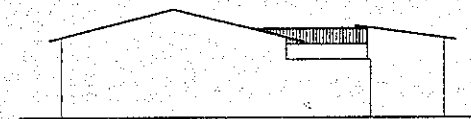
THE STUDY ON CONSTRUCTION OF THE BRIDGE
OVER THE RIVER RUPSA IN KHULNA (PHASE 2)

ENGINEERS ACCOMODATION
STAFF QUARTERS

SCALE	SHEET NO.
AS SHOWN	A6-04



2 PLAN: STAFF QUARTERS
SCALE: NTS



3 ELEVATION: STAFF QUARTERS
SCALE: NTS

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