

**S-8-4 Cost Breakdown of the Major Equipment  
for the Follow-up Cooperation**

**Cost Breakdown of the Major Equipment for the Follow-up Cooperation**

SITE: WHITE RIVER

No.	Name of Equipment and Materials	Major Specifications	Q'ty	unit	Unit Price US\$	Price US\$	Amount US\$		
1	Submersible pumping system								
1-1	Submersible pump	Capacity: 600 liters/min., Head: 80m	4	sets	12,293.21	49,172.84	105,030.82		
1-2	Raiser pipe with elbow	Size & material: 3" Stainless steel pipe (5.5m length/pc x 10 pcs per set)	4	sets	3,010.37	12,041.48			
1-3	Non-return valve	Type: 4" Swing type, Flange end	4	sets	704.58	2,818.32			
1-4	Gate valve	Type: 4" Flange end type	4	sets	493.08	1,972.32			
1-5	Flow meter	Capacity: Flow 0 - 800 liters/min.	4	sets	2,050.17	8,200.68			
1-6	Air release valve	Type: 1" Automatic air release type	4	pcs	493.08	1,972.32			
1-7	Pressure gauge	Range: 0 - 1 Mpa (0 - 10 kg/cm <sup>2</sup> f)	4	pcs	573.53	2,294.12			
1-8	Level switch for bores	Type: Electrode, 3 contacts (B contact)	4	pcs	493.08	1,972.32			
1-9	Submersible pump local control panel	Type: Self standing, indoor installation	1	set	24,586.42	24,586.42			
2	Booster pump system								
2-1	Booster pump	Capacity: 1,220 liters/min., Head: 60m	3	sets	4,177.08	12,531.24	50,083.22		
2-2	Reducer for pump suction	Type: 4"x 3" flanged end	3	sets	19,896.59				
2-3	Gate valve for pump suction	Type: 4" Flanged end	3	sets					
2-4	Expansion joint for pump suction	Type: 4" Rubber type flanged end	3	sets					
2-5	Reducer for pump discharge	Type: 4"x 2" flanged end	3	sets					
2-6	Flexible joint for pump discharge	Type: 4" Stainless type flanged end	3	sets					
2-7	Non-return valve for pump discharge	Type: 4" Flanged end	3	sets					
2-8	Gate valve for pump discharge	Type: 4" Flanged end	3	sets					
2-9	Pressure gauge for pump discharge	Range: 0 - 1 Mpa (0 - 10 kg/cm <sup>2</sup> f)	3	pcs					
2-10	Level switch for receiving tank	Type: Electrode, 4 contacts (B contact)	1	set				170.12	170.12
2-11	Level switch for reservoir tank	Type: Electrode, 3 contacts (B contact)	1	set				170.12	170.12
2-12	Booster pump control panel	Type: Self standing, indoor installation	1	set	17,315.15	17,315.15			
3	Disinfection system								
3-1	Agitate tank	Capacity: 1,200 liters tank capacity	1	set	1,640.14	1,640.14	8,684.10		
3-2	Mixer	Type: Portable type, dual impeller, Indoor installation	1	set	2,048.87	2,048.87			
3-3	Dosing pump	Type: Diaphragm type	2	set	819.41	1,638.82			
3-4	Piping for water supply	Material: 1" x 5.5m Galvanized steel pipe	1	pc	73.96	73.96			
		Material: 1/2" x 5.5m Galvanized steel pipe	1	pc	53.20	53.20			
3-5	Water hose for water supply	Material: 1/2" Polypropylene tube	10	m	4.93	49.30			
3-6	Stop valve for water supply	Material: 1/2" Braze	3	pcs	49.31	147.93			
3-7	Disinfection pipe with accessories	Material: 1/2" Vinyl tube	20	m	8.18	163.60			
3-8	Disinfection system control panel	Type: Wall mount or self standing type, Indoor installation	1	set	2,868.28	2,868.28			
4	Power distribution panel	Type: Self standing, indoor installation	1	set	8,200.66	8,200.66	8,200.66		
5	Cable and cable supports		1	lot	18,012.02	18,012.02	18,012.02		
6	Electric pole facilities		1	lot	5,190.29	5,190.29	5,190.29		
	Total						195,201.11		

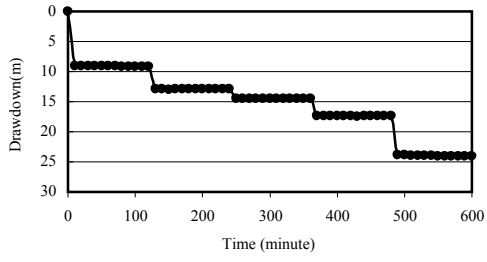
SITE: MATANIKO AND KOMBITO

No.	Name of Equipment and Materials	Major Specifications	Q'ty	unit	Unit Price US\$	Price US\$	Amount US\$
MATANIKO							
1	Submersible pumping system						
1-2	Raiser pipe with elbow	Size & material: 3" Stainless steel pipe (5.5m length/pc x 10 pcs per set)	4	sets	3,762.96	15,051.84	15,051.84
KOMBITO							
1	Submersible pumping system						
1-2	Raiser pipe with elbow	Size & material: 3" Stainless steel pipe (5.5m length/pc x 10 pcs per set)	2	sets	3,762.96	7,525.92	7,525.92
	Total						22,577.76

## **S-8-5 Results of Pumping Test**

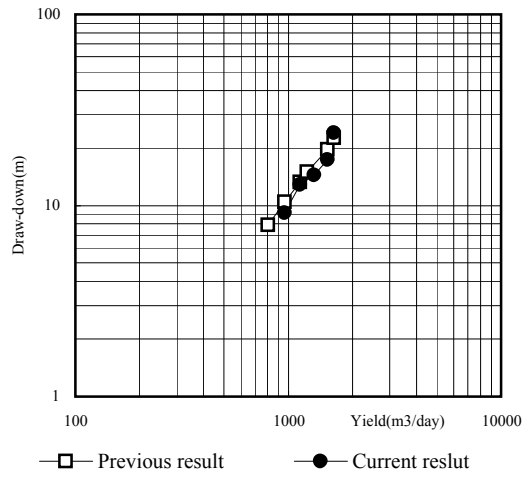
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Step Draw-down Test

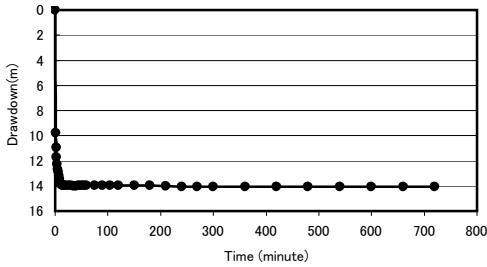


Yield (m <sup>3</sup> /day)	Static water level (GL-m)	Draw-down (m)	Specific capacity (m <sup>2</sup> /day)
960	15.27	9.14	105
1133	19.00	12.87	88
1323	20.62	14.47	91
1531	23.52	17.39	88
1642	30.18	24.05	68

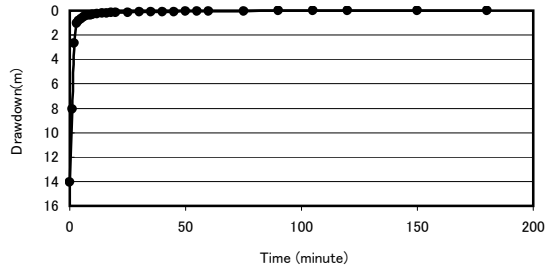
Step Draw-down Test



Constant pumping test

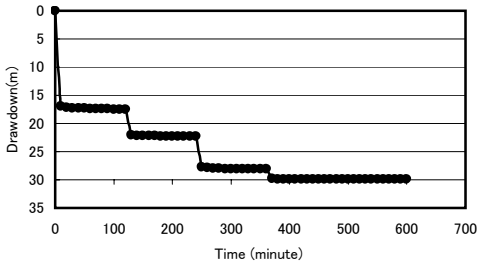


Recovery Test



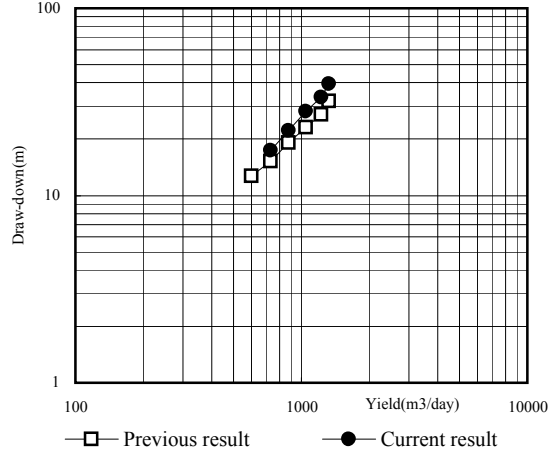
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Step Draw-down Test

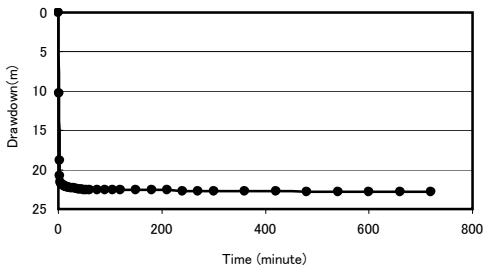


Yield (m <sup>3</sup> /day)	Static water level (GL-m)	Draw-down (m)	Specific capacity (m <sup>2</sup> /day)
732	19.97	17.44	42
880	24.82	22.29	39
1044	30.65	28.12	37
1225	36.03	33.50	37
1323	43.50	39.60	33

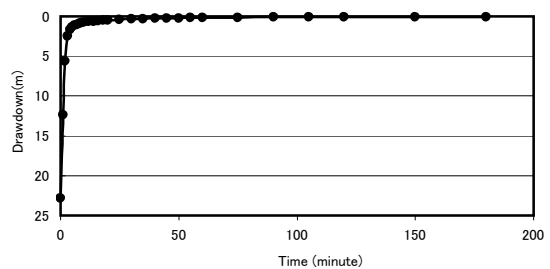
Step Draw-down Test



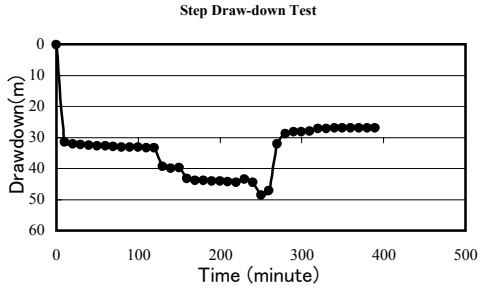
Constant Pumping Test



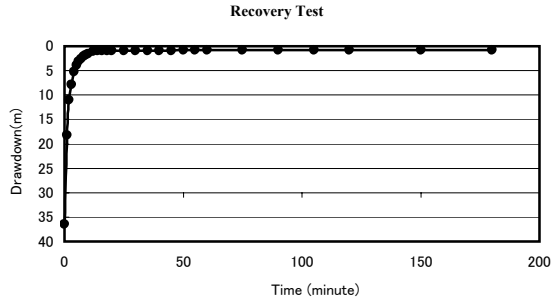
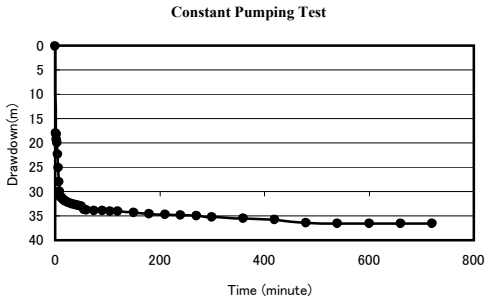
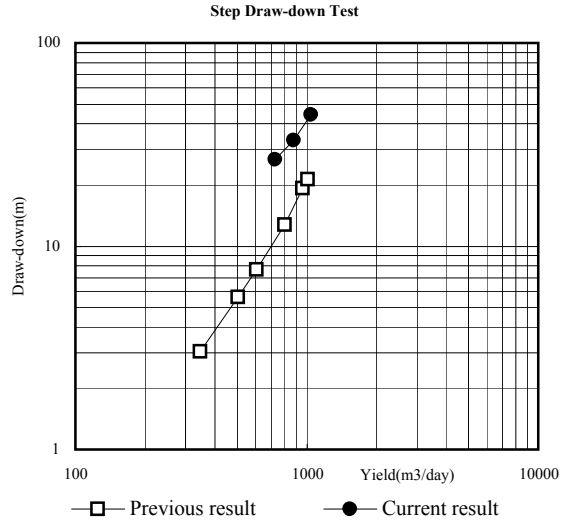
Recovery Test



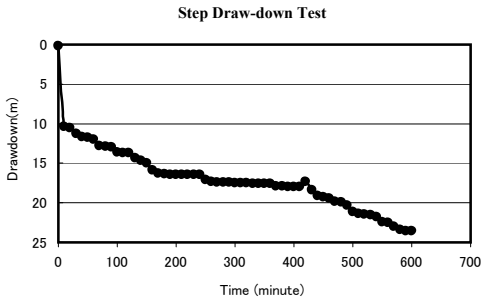
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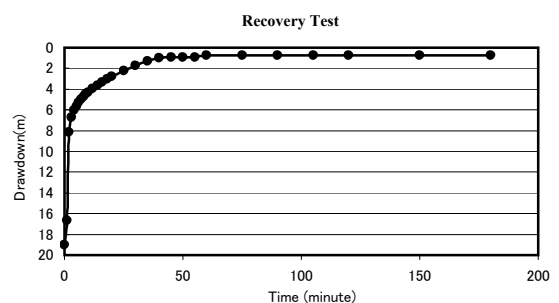
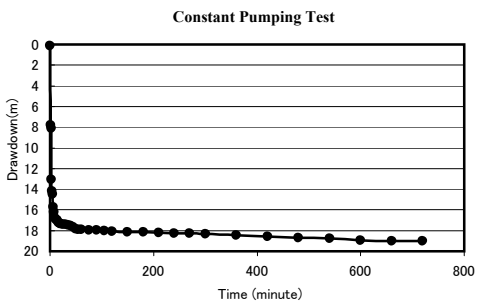
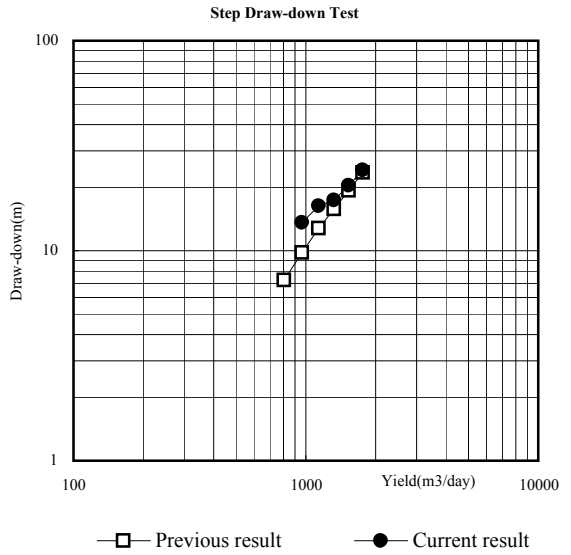
Yield (m <sup>3</sup> /day)	Static water level (GL-m)	Draw-down (m)	Specific capacity (m <sup>2</sup> /day)
732		26.78	27
880		33.30	26
1044		44.50	23



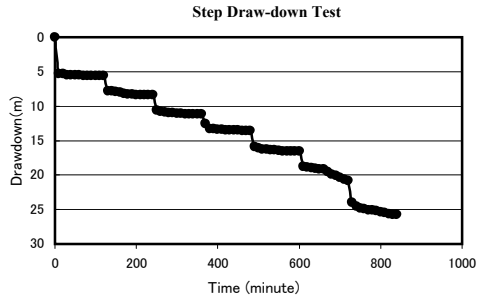
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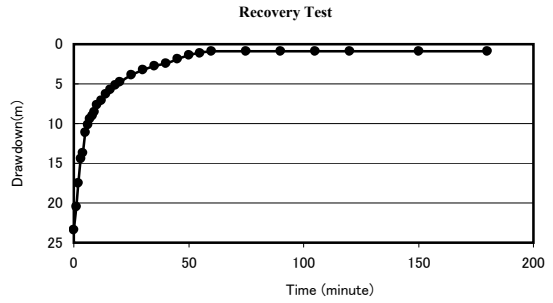
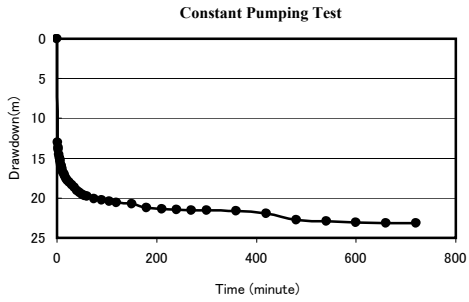
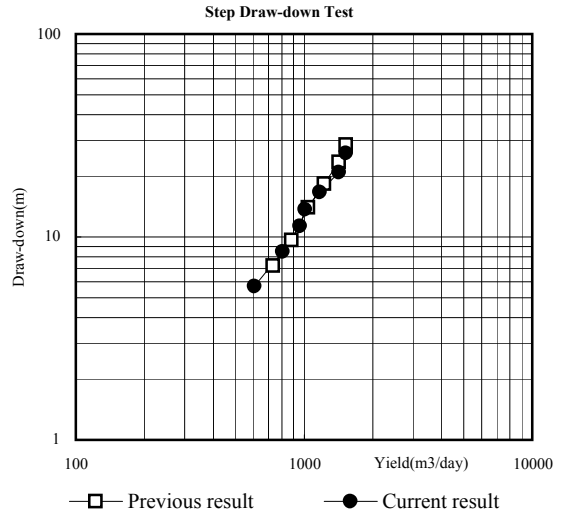
Yield (m <sup>3</sup> /day)	Static water level (GL-m)	Draw-down (m)	Specific capacity (m <sup>2</sup> /day)
960	13.53	13.63	70
1133	16.27	16.40	69
1322	17.45	17.40	76
1531	19.73	20.50	75
1757	23.43	24.20	73



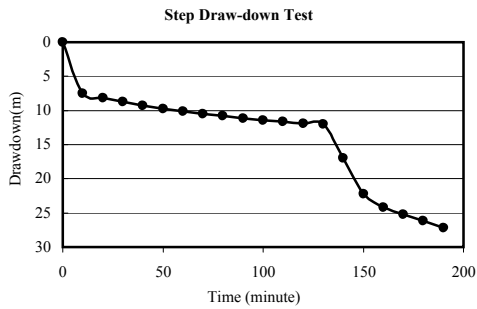
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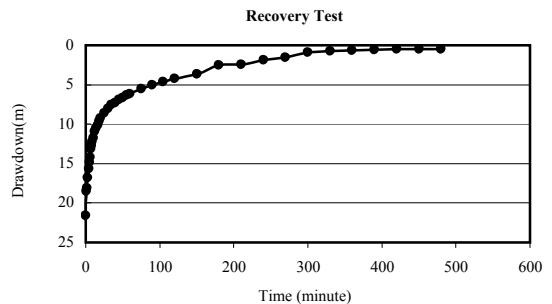
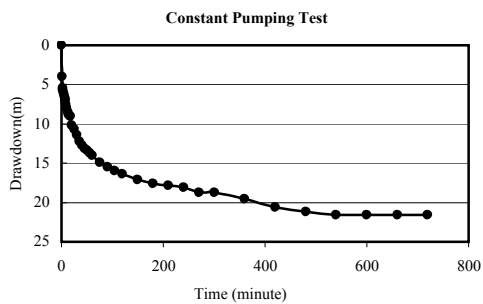
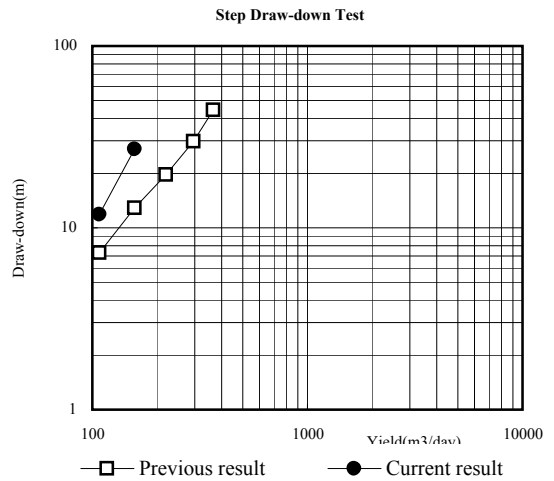
Yield (m <sup>3</sup> /day)	Static water level (GL-m)	Draw-down (m)	Specific capacity (m <sup>2</sup> /day)
605	5.58	5.70	106
805	8.35	8.47	95
960	11.17	11.29	85
1009	13.55	13.67	74
1169	16.55	16.67	70
1424	20.75	20.87	68
1531	35.72	25.84	59



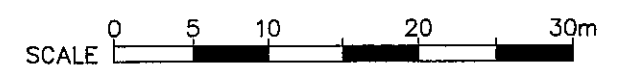
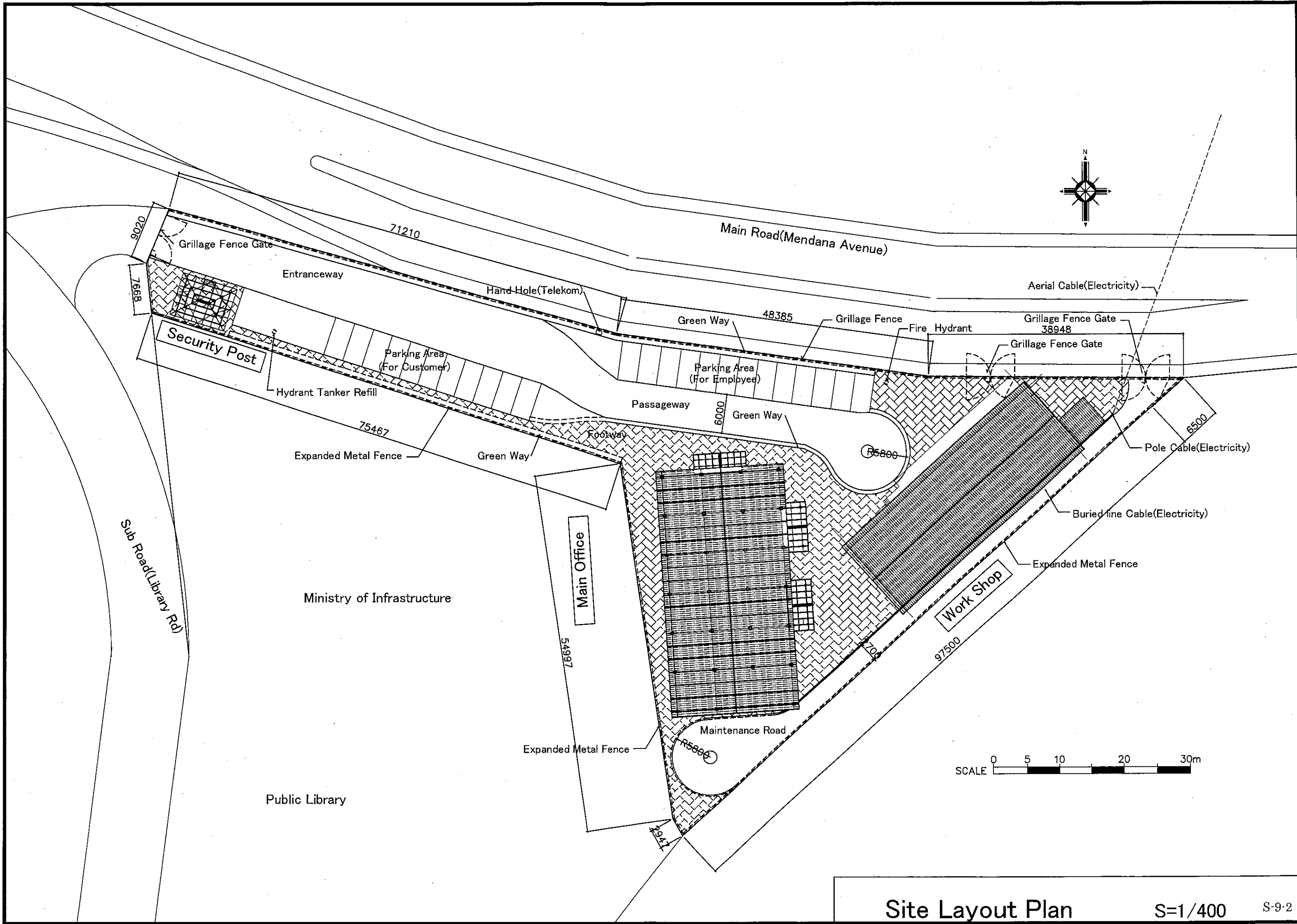
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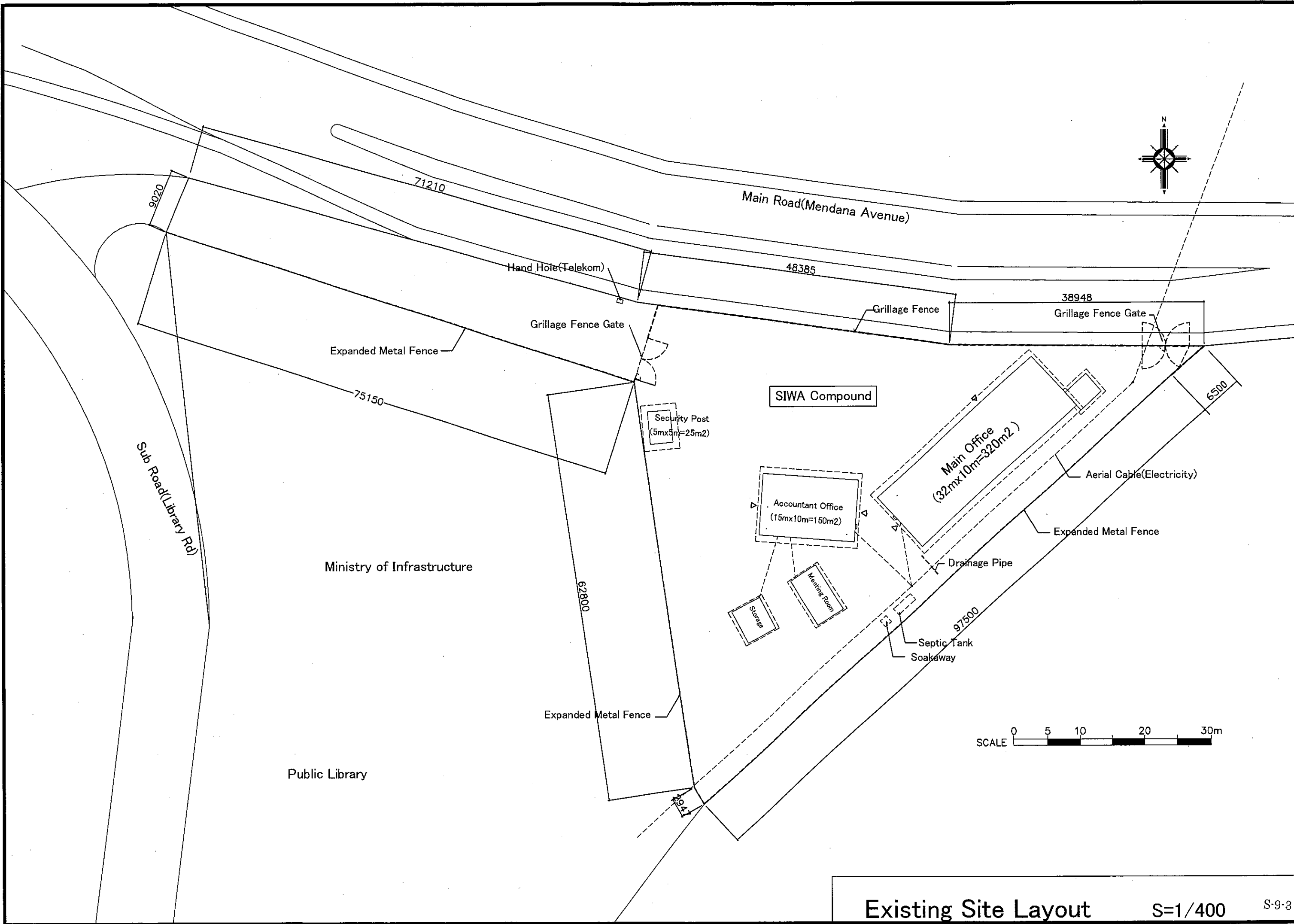
Yield (m <sup>3</sup> /day)	Static water level (GL-m)	Draw-down (m)	Specific capacity (m <sup>2</sup> /day)
108	23.18	11.88	9
157	38.46	27.16	6

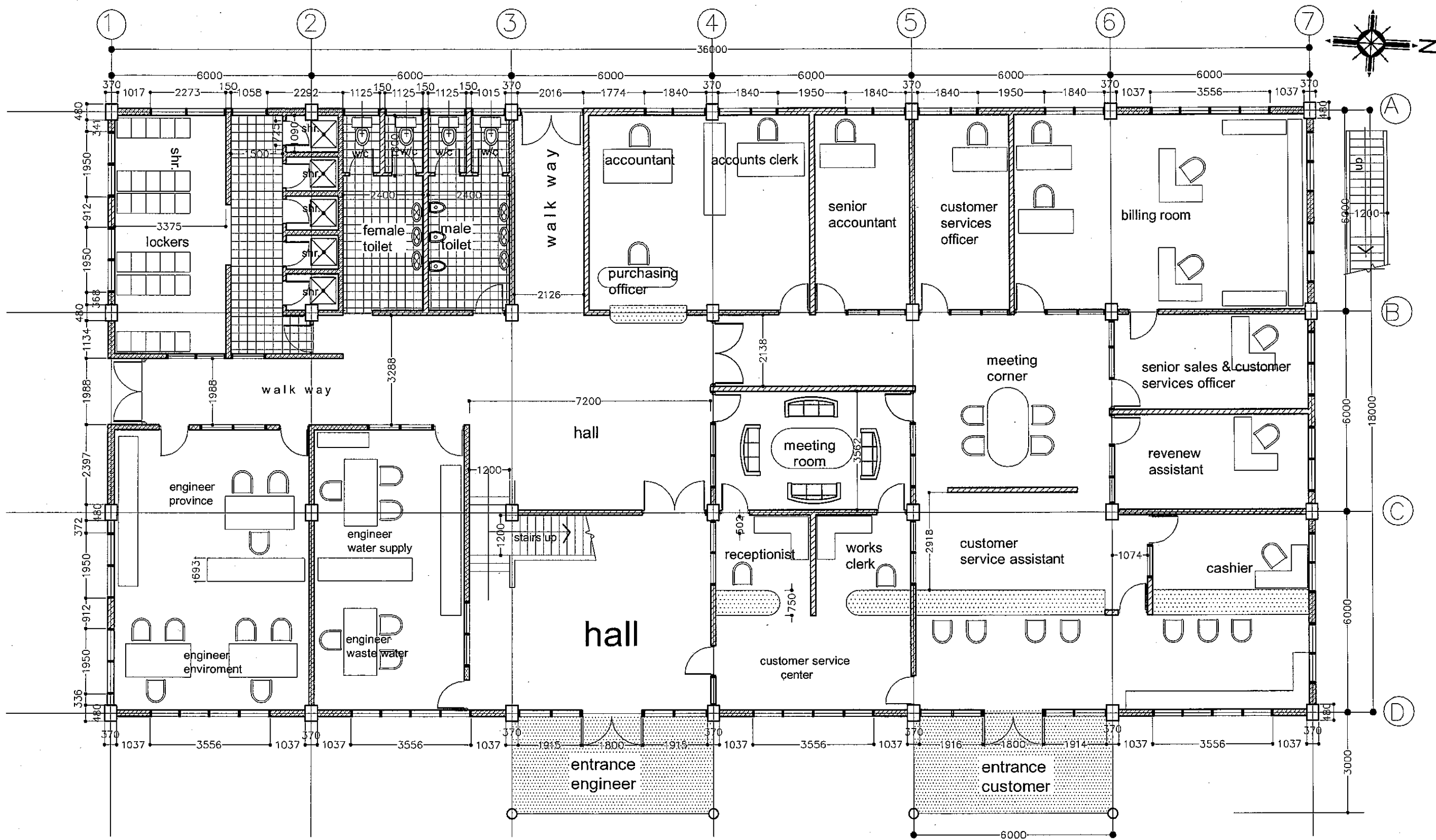


**SUPPORTING      BUILDING    PLAN    FOR**  
**REPORT   S-9    INSTITUTIONAL**  
**STRENGTHENING**

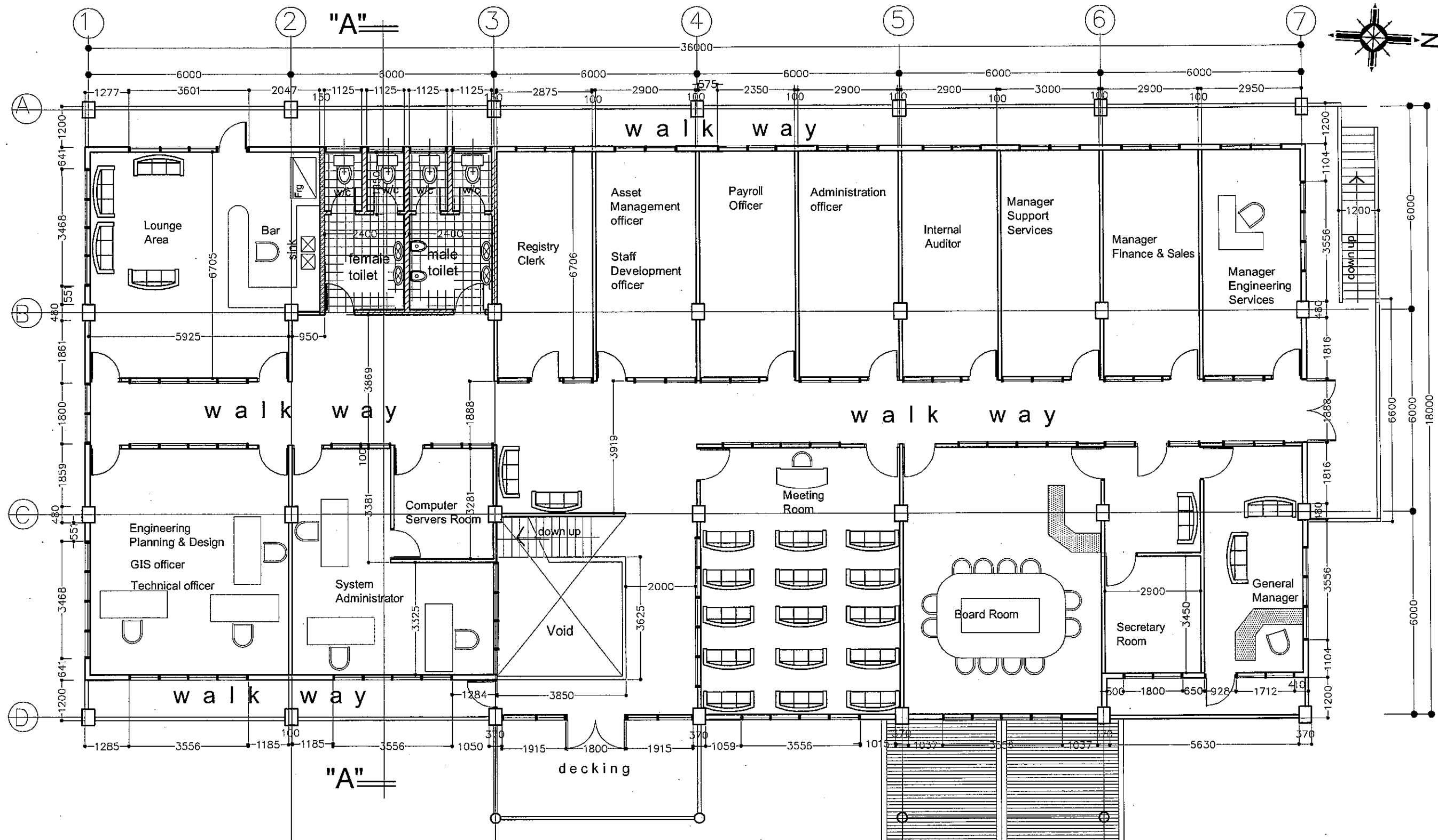
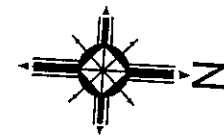




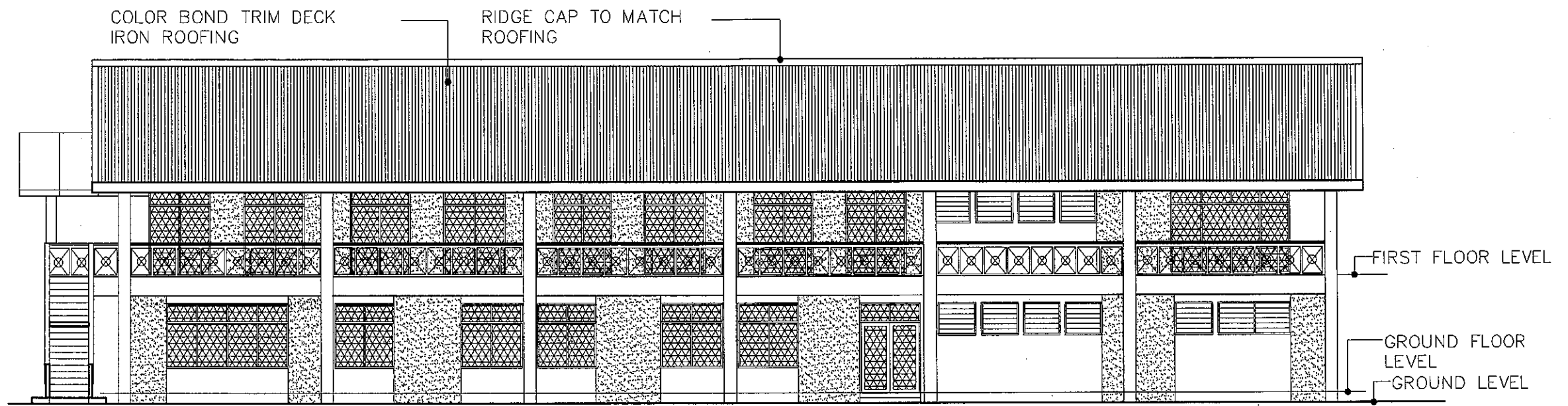




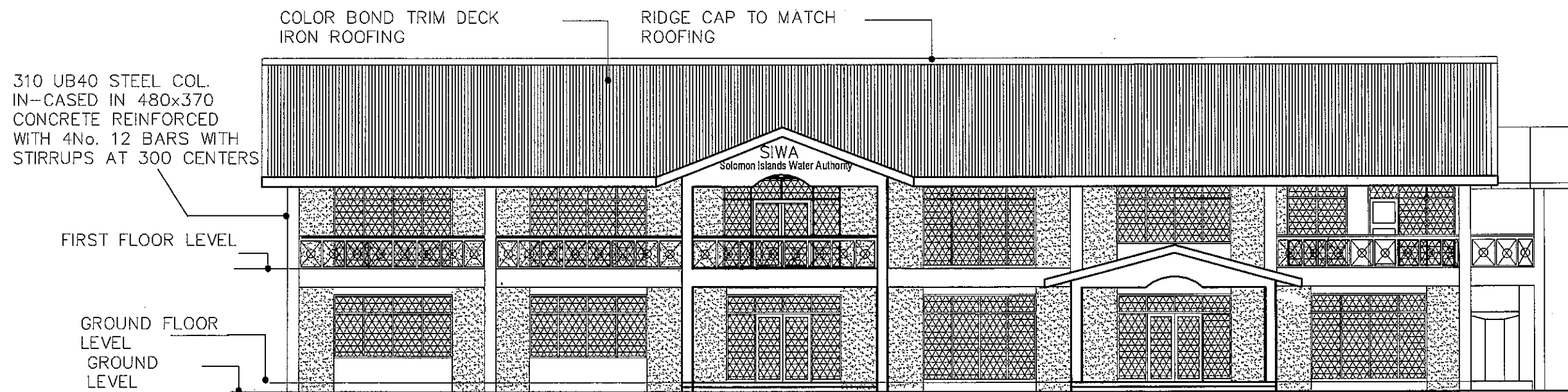
Main Office  
Ground Floor Plan



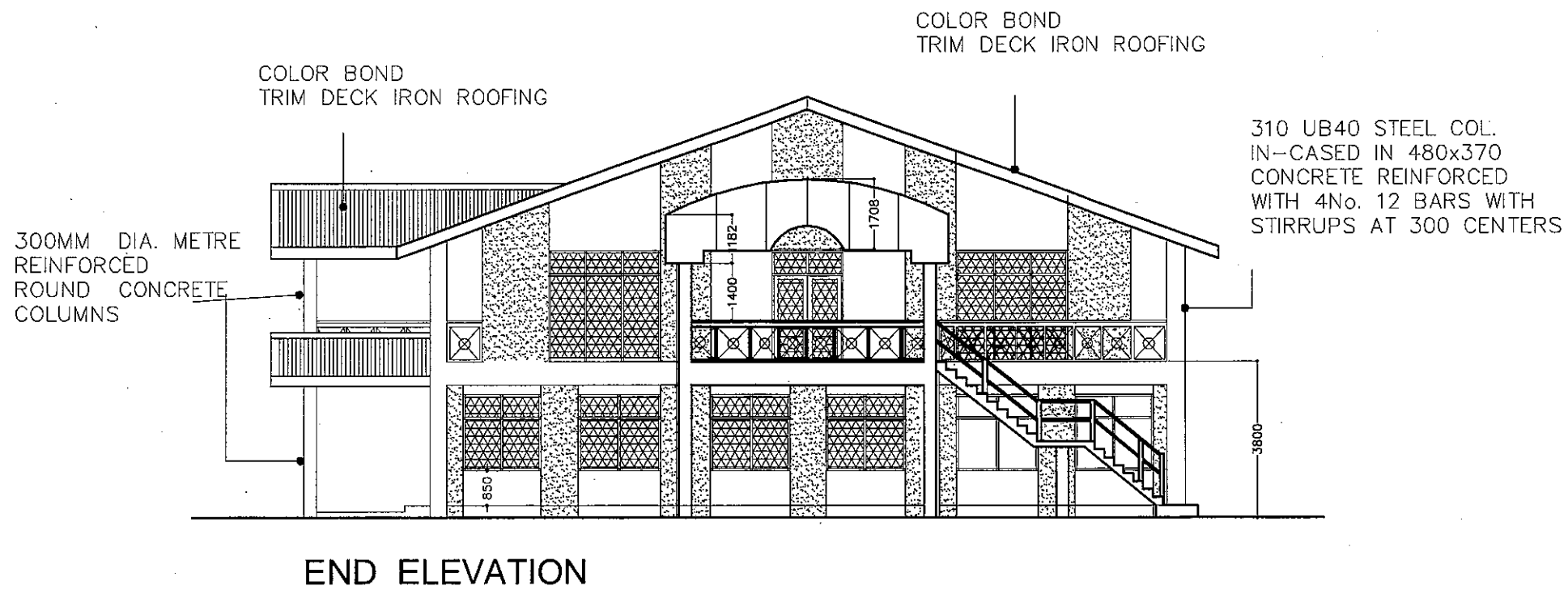
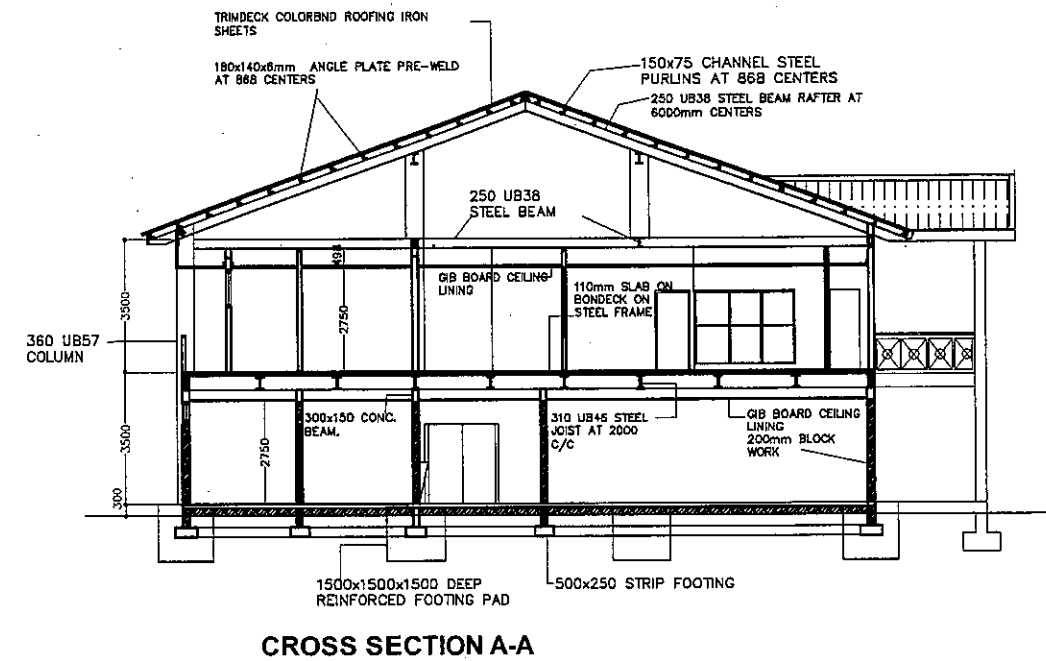
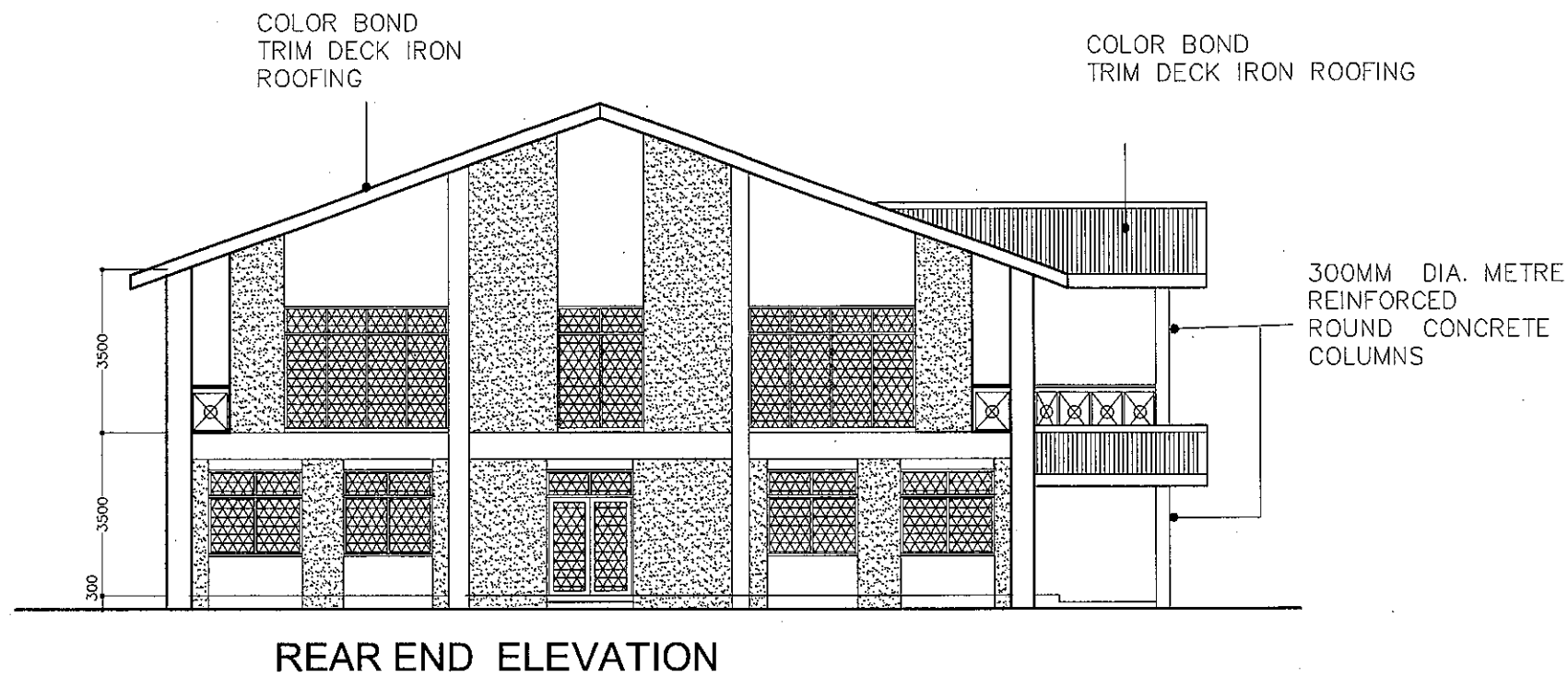
Main Office  
Top Floor Plan



BACK ELEVATION



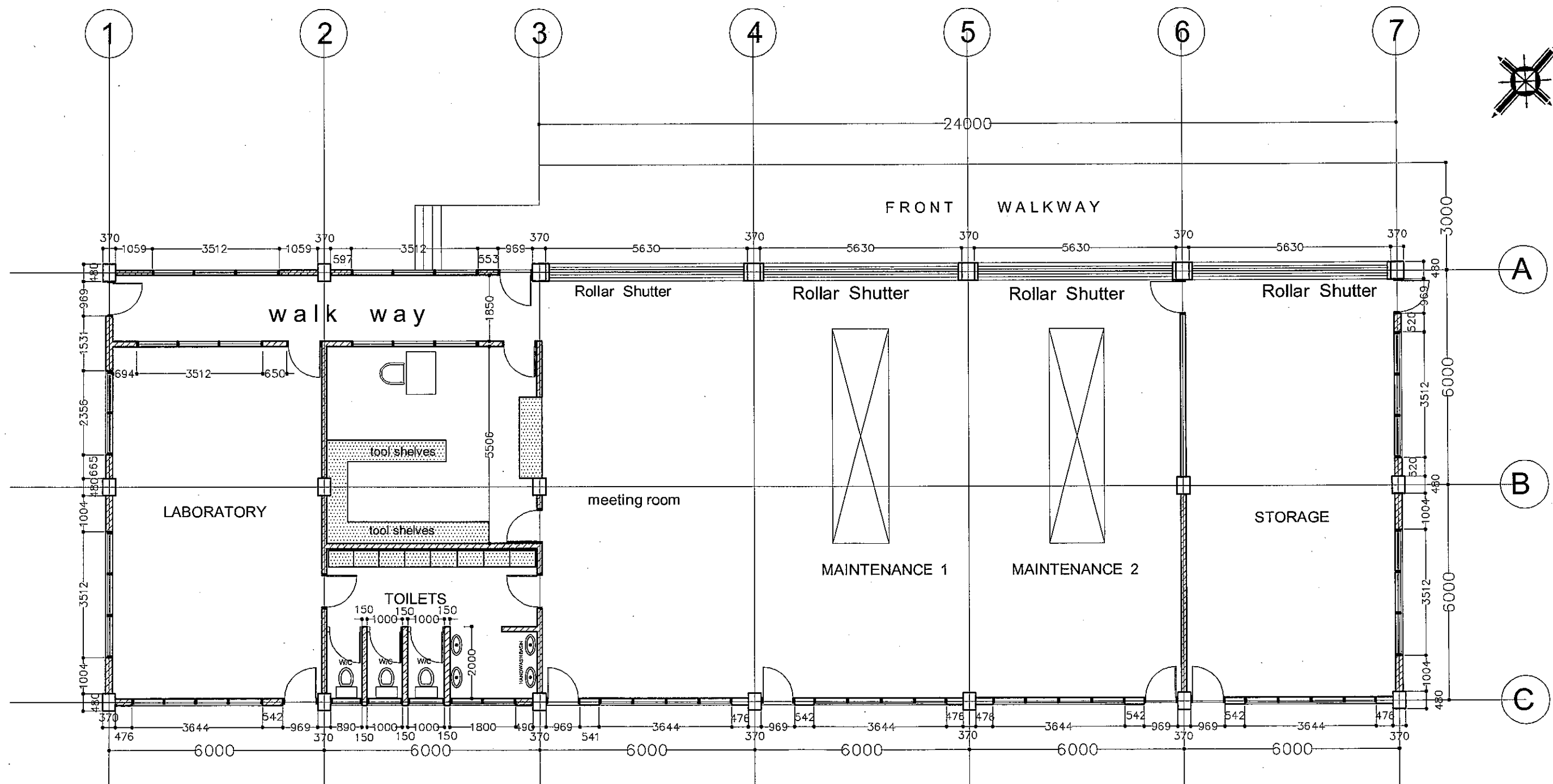
FRONT ELEVATION



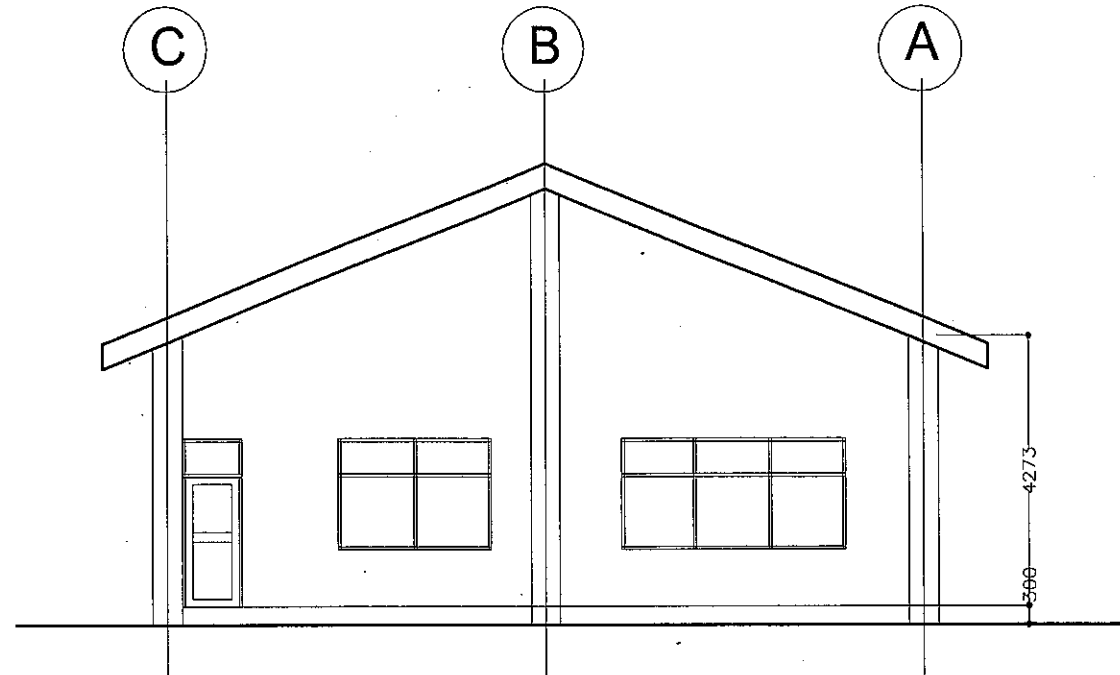
Main Office  
Elevation (2)  
Section

S=1/150  
S=1/200

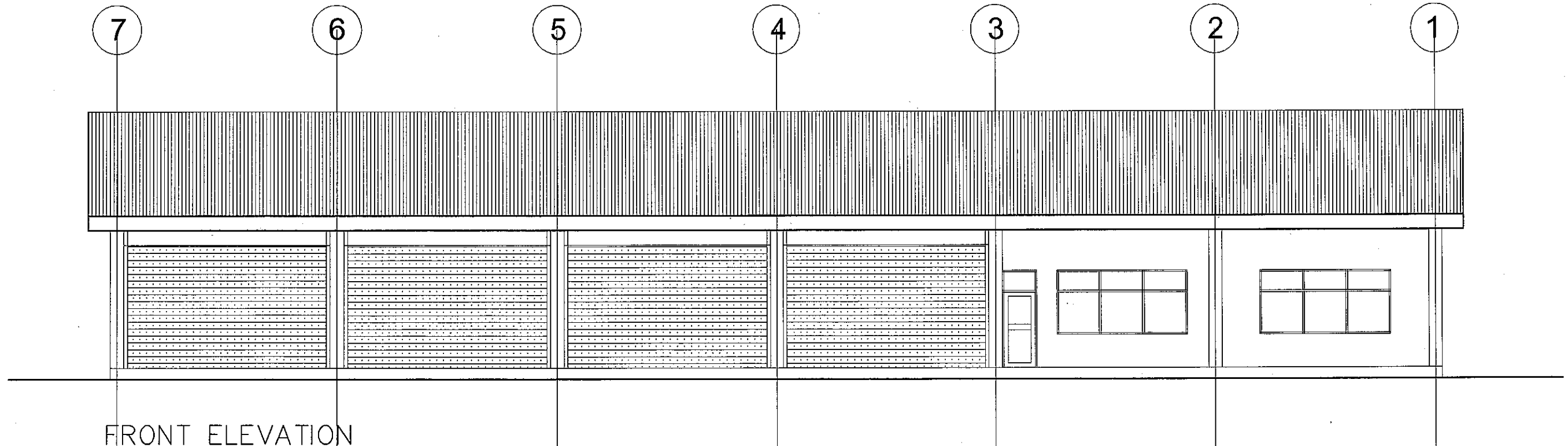
S-9-7



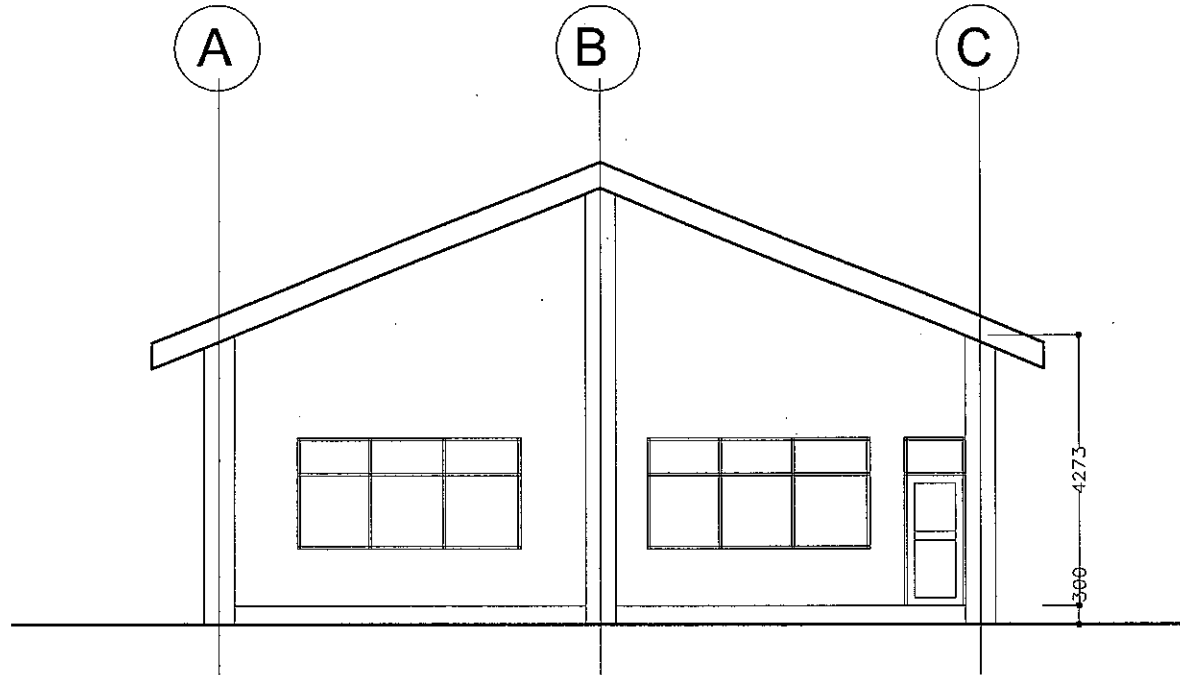
FLOOR PLAN LAYOUT



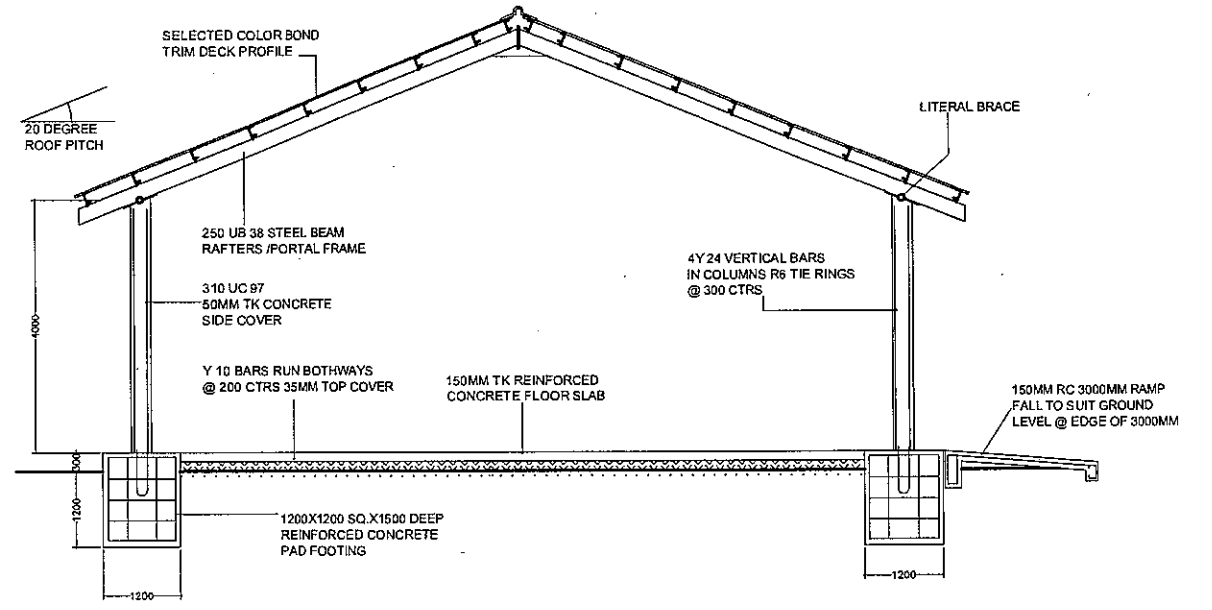
END ELEVATION



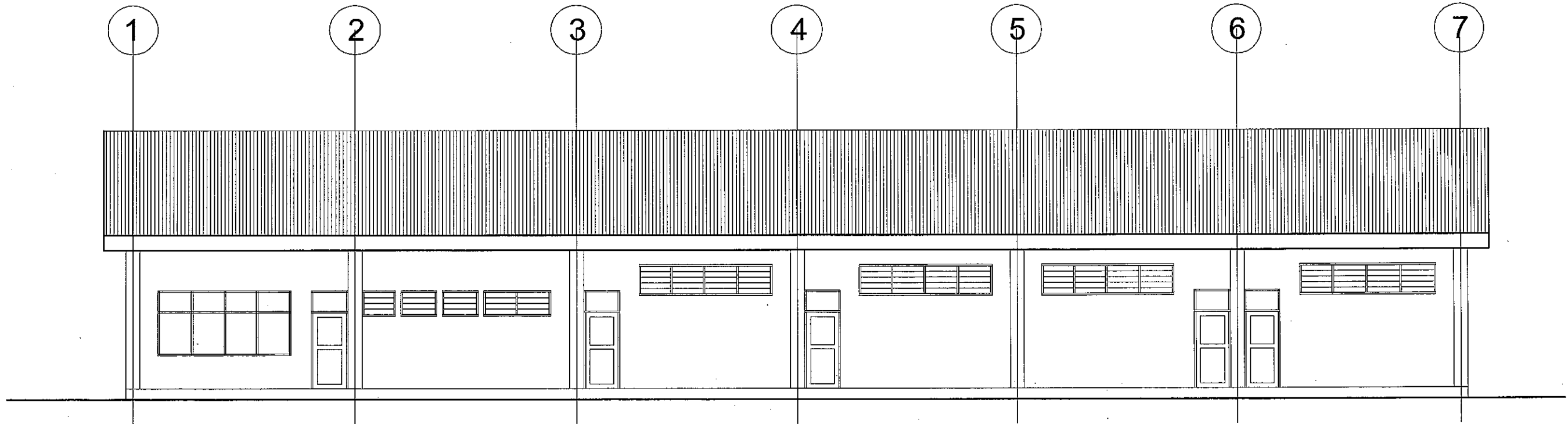
FRONT ELEVATION



REAR END ELEVATION



SECTION



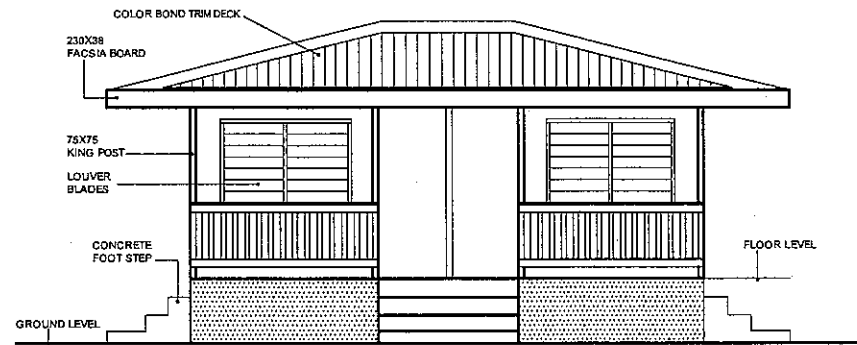
BACK ELEVATION

Work Shop  
Elevation (2)  
Section

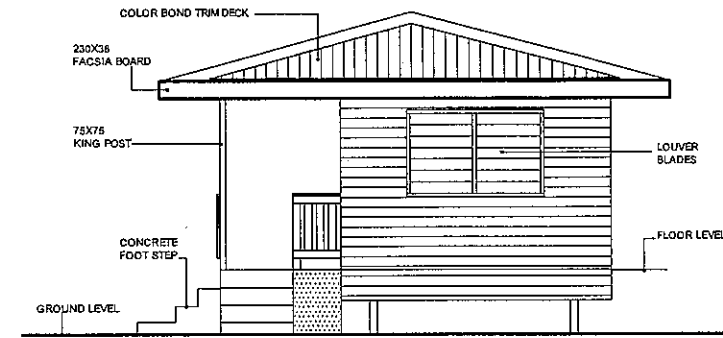
S=1/120  
S=1/120

S-9-10

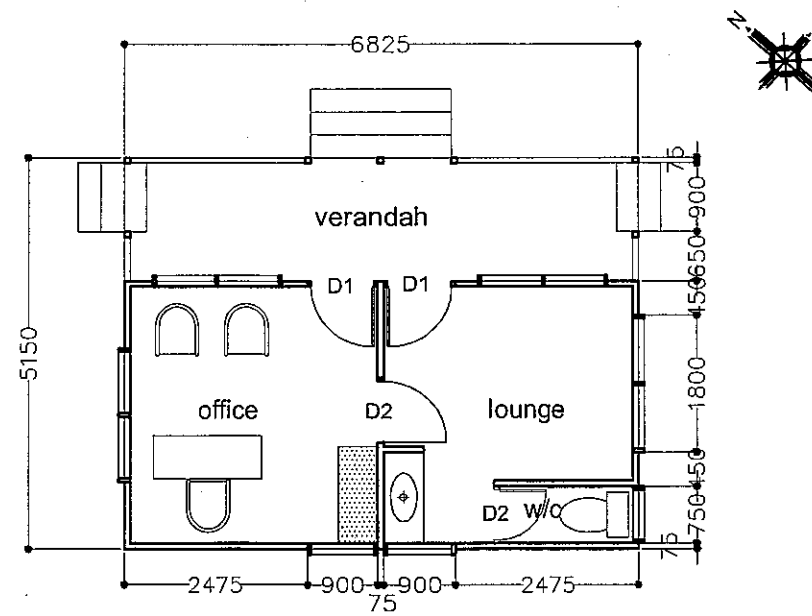




FRONT ELEVATION



SIDE ELEVATION



FLOOR PLAN LAYOUT

Security Post  
Plan  
Elevation

S=1/100

S=1/100

S-9-11

**SUPPORTING  
REPORT S-10**

**DATA FOR INTERMEDIATE  
WATER TREATMENT  
FACILITY**

**S-10-1 Toveko CX Sand Filter**

**S-10-2 TEKLEEN Automatic Filters**

# The Toveko

## CX sand filter



Easy to install — Only 2,3 m high — Easy to operate  
Minimum wash water — Gravity feed — Treats oily waste

Ecologically Clean

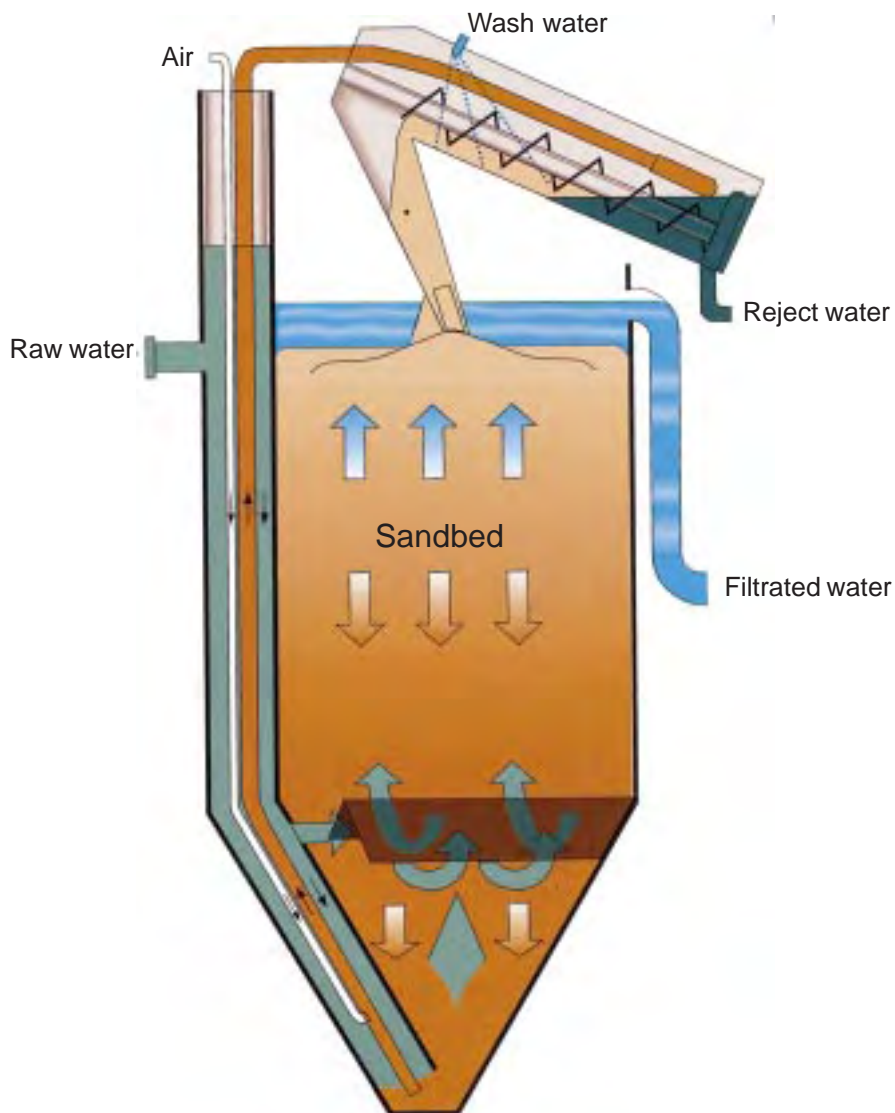


# The Toveko CX sand filter

The TOVEKO CX continuous filter is a novel method of suspended solids removal using sand filtration. It may be used with or without chemical precipitation according to the application, and is well suited for tertiary filtration in both sewage and industrial waste water treatment applications. The Toveko CX sand filter continuously cleans

itself whilst in service, and the sand bed is therefore continuously moving. The compact nature of its modular construction provides significant advantages to the user in both space requirements and investment cost.

It is delivered to site largely pre-assembled and tested, thereby minimising set-up costs.



The unique sand washer is particularly efficient, making the filter suitable for particularly arduous duties. The dirty sand is cleaned by both active rubbing and simultaneous rinsing. As the sand washer moves back and forth, the cleaned

sand is re-distributed **evenly** across the surface of the sand bed. This eliminates problems of varying pressure drop and short-cutting, thereby providing stable operation, whilst using only a small volume of water for cleaning.

## INSTALLATION MADE EFFORTLESS

Constructed in a rectangular, modular design, the Toveko CX sand filter is easy to install, minimising the space requirements. Reduced pump energy consumption is a result. Some installations operate under gravity feed.

## SAND TURNOVER IS AUTOMATIC

The Toveko CX filter is designed to automatically adjust to compensate for a wide variety of loading profiles and does not require a minimum flow. The filter bed remains submerged at all times.

## STABLE FILTRATION

The even surface of the sand layer gives a stable filtration with no risk of short circuits. The cleaned sand is returned to the top of the sand bed and is levelled out. This makes uniform sand bed and filter resistance all over the filter.

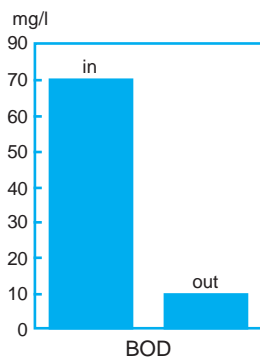
## EFFICIENT PURIFICATION

The Toveko CX filter provides efficient purification even at very low flow rates. This is made possible by the special positioning of the air lift at the inlet shaft.

## YES, IT IS AS EASY AS IT APPEARS

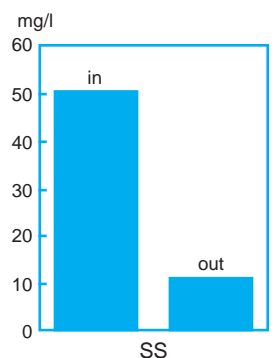
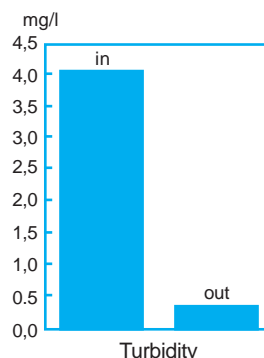
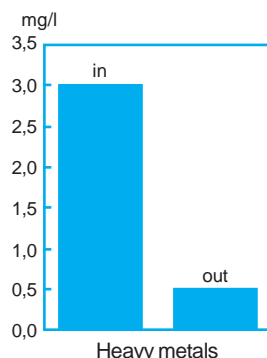
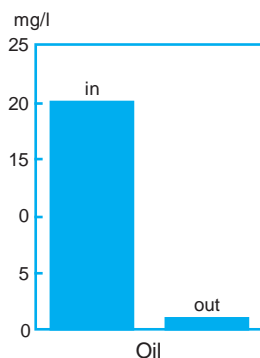
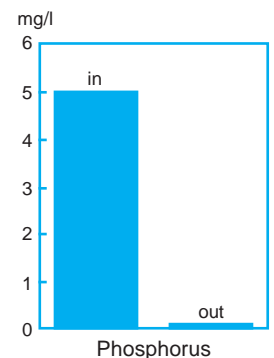
In simple terms, this is how the Toveko CX filter works. Efficiently. The incoming water is channelled to a longitudinal inlet shaft, injected into and spread evenly through the bed, solid impurities are filtered off from the water and will remain in the sand. The filtered water is led away from the surface by means of V-notch openings along the entire length of filter. The polluted sand is transported continuously using an airlift from the bottom of the filter to an open

sand washer placed above the filter. The sand wash is of the leaning screw type, where the grains of sand are rubbed against each other in a counter stream of water. The washer speed is adjusted automatically according to the headloss across the filter. The maximum flow through the filter varies depending on the actual SS-content of influent. It can vary between 5 – 15 m/h. Loadings up to 15 m<sup>3</sup>/m<sup>2</sup>/hr can be treated.



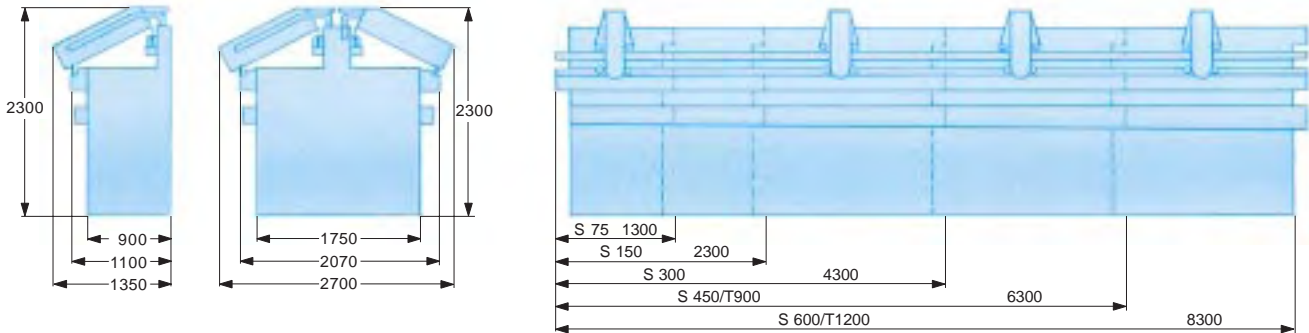
## Before and after Toveko CX filtration

Typical values before and after putting the TOVEKO sand filter to work.



# Technical details

	S75	S150	S300	S450	S600	T900	T1200
Hydraulic max. capacity;							
Raw water cleaning, approx. m <sup>3</sup> /twenty-four hours.	270	540	1080	1620	2160	3240	4320
Waste water cleaning, approx. m <sup>3</sup> /twenty-four hours.	180	360	720	1080	1440	2160	2880
Filter surface, m <sup>2</sup>	0.75	1.5	3.0	4.5	6.0	9.0	12.0
Weight, excluding sand, kg.	350	600	1150	1700	2200	3100	4000
Weight, including sand (0,8-1,2mm) and water, kg.	1850	3700	7200	10700	14200	21100	28000
Power installed, W. (230/400 V A.C.)	360	360	540	720	900	1440	1800
Max. compressed air consumption, normal l/min.	30	50	100	150	200	300	400
Wash water (l/min)	3-6	5-10	10-20	15-30	20-40	30-60	40-80



## About Organo Corporation

In the field of water treatment, expert knowledge and design at the leading edge of technology are essential. With over 50 years' experience and a turnover in excess of £ 350m, Organo Corporation is considered one of the world leaders.

Organo Toveko was set up in Sweden during the late 1990s. The Company operates as a wholly owned subsidiary of the parent organisation from which it gains much strength and support.

### The Organo Commitment A Stable Business Relationship

We believe in building long-term vendor relationships, based on openness and trust. Our track record proves this point.

### Long-term Service

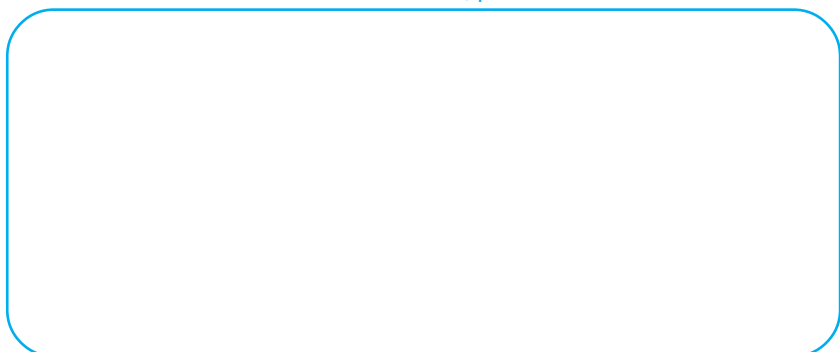
We will provide the service and back-up you require throughout the lifetime of the products we deliver.

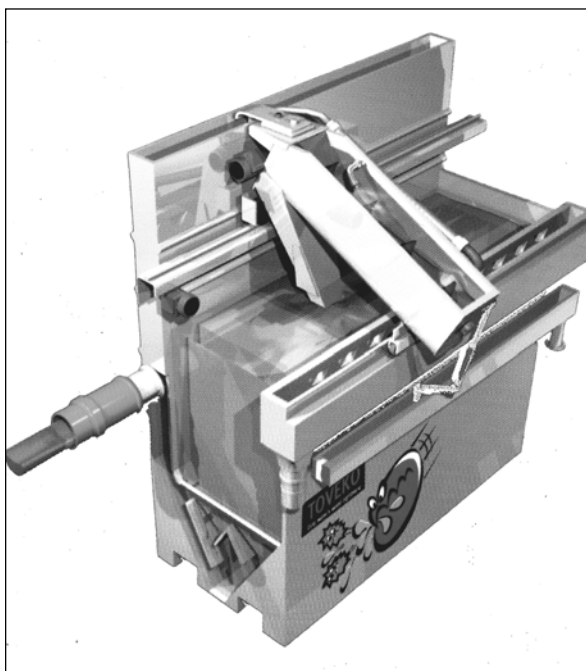
Ecologically Clean



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For further information on TOVEKO CX, please contact:





## **TOVEKO ® SAND FILTRATION, THE NEXT GENERATION**

### Introduction

The consequences of EC Legislation and general Environmental awareness world-wide has resulted in a significant tightening of water and wastewater treatment standards for potable, municipal and industrial applications.

This is resulting in a generally increased need for sand filtration equipment capable of operating at high efficiency at all times and with a minimum attention and maintenance.

With costs of treatment rising generally, the running costs of treatment systems are also under the spotlight. The TOVEKO continuously back washed gravity sand filter represents the next generation of highly efficient systems, with low operating costs.

### **CONTINUOUS BACKWASH GRAVITY SAND FILTERS**

The concept of a gravity sand filter which continuously backwashes itself whilst in service is not new, several types have been available for many years.

In general, they have a number of significant advantages over conventional pressure or rapid gravity sand filters:

1. The filter remains in service at all times, continuously removing a quantity of contaminated sand from the filter bed, back washing it and returning the cleaned sand again. This ensures that, given a more or less constant influent quality, the filter bed is maintained in clean condition at all times, resulting in constant filtration efficiency. With a pressure filter, the increasing quantity of removed solids

throughout the service cycle increases the pressure drop across the bed, requiring greater power consumption by the feed pumps to maintain a constant flow.

2. Since the filter is continuously back washed, it needs no standby unit. This factor is perhaps more important for instances where a single filter is sufficient for the whole service flow and a standby unit therefore represents a full 100% spare capacity, but in any case, it can offer a significant reduction in capital outlay.
3. It does not require a separate back washing facility. This eliminates the high capital cost and space requirement for Filtered Water Storage Tank, Backwash Supply Pumps, Dirty Backwash Water Storage Tank and all the associated ancillary equipment.
4. Continuous backwash filters operate in up flow mode and the most highly contaminated sand is therefore at the base of the bed. It is from here that the airlift pump removes the sand for back washing prior to returning it to the top of the bed. This maintains the high filtration efficiency and also allows relatively high concentrations of suspended solids to be handled without problems.

### **TOVEKO® ADVANTAGES**

The ORGANO TOVEKO filter is the latest development in gravity sand filter technology and has successfully tackled some of the more obvious disadvantages of older designs.

1. It has a maximum height of 2,3 m, and an inlet height of 2 m. Older style designs typically require a 5 - 6 m inlet head pressure. This low height enables gravity feed to the unit in the majority of the cases, which eliminates both capital and running costs associated with transfer pump systems. The particle size of the suspended solids in the feed is relatively large since they are not broken up in the pump. This also results in greater filtration efficiency. In some cases it eliminates the need for additional polyelectrolyte dosing immediately prior to the filter, again reducing capital and operating costs.
2. Since the filter is quite low (2.3 m), it can fit comfortably inside a normal room height and is designed to pass through a standard double door (S-Type) or 3 m wide doors (T-Type).
3. The filter is provided with an inlet launder along its length. This allows the filter to cope with large variations in both flow and pressure drop across the unit.
4. Changes in the liquid level in the inlet launder are detected by proximity switches which automatically adjust the speed of sand washing in 2 stages, +25% and +100%. The doubling of speed also activates an alarm. This makes the unit particularly useful for applications where either the influent solids loads is variable, or the location is remote, with minimal operator attendance, such as small potable water treatment plants.
5. The filter is supplied with one or more mechanical sand washers that move to and fro across the sand bed therefore ensuring that all the sand is cleaned on a regular basis, therefore maintaining the high filtration efficiency. Whilst moving across the bed, the washer also rakes the sand bed level unlike other types in which it is left to "pipe up". This minimises the tendency for "short-cutting" through the bed.

### **TYPICAL APPLICATIONS:**

The TOVEKO filter has been successfully installed on a variety of applications including:

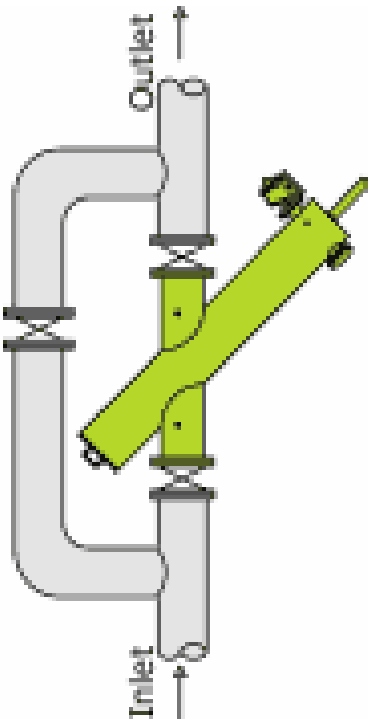
- Potable Water, Final Filtration.
- Sewage, Tertiary Treatment.
- Metal Finishing/Plating and General Industrial Effluent's.
- Oily Waste Treatment.

In addition to its obvious advantages in running costs and low space requirements, it has been shown to out-perform other filter types, and is now finding wide acceptance world-wide.

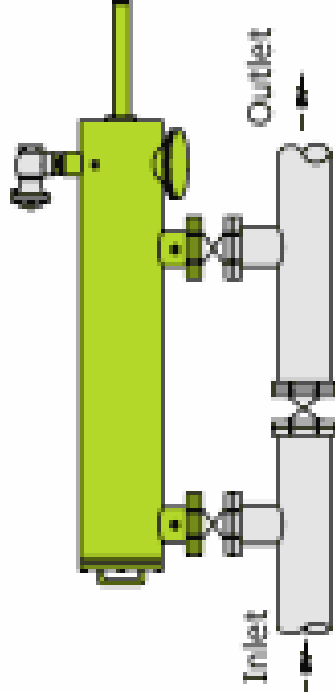


Automatic Filter's TEKLEEN line of filters can be fitted in a wide variety of configurations to meet all your filtration needs. Filters can be installed inline, online, in parallel, or in skid configurations. Additionally, our electronic and hydraulic controllers make installation and day-to-day operation even easier.

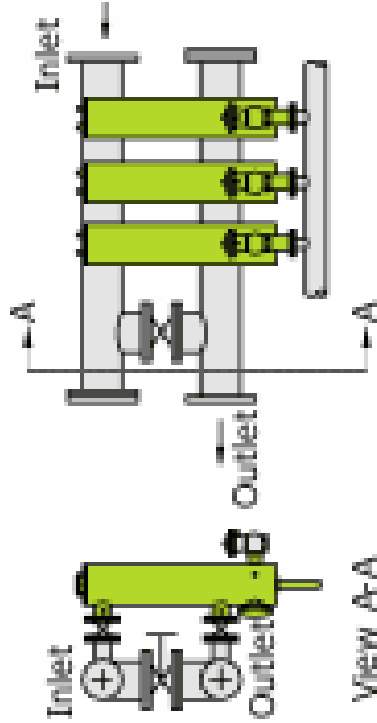
Inline Configuration



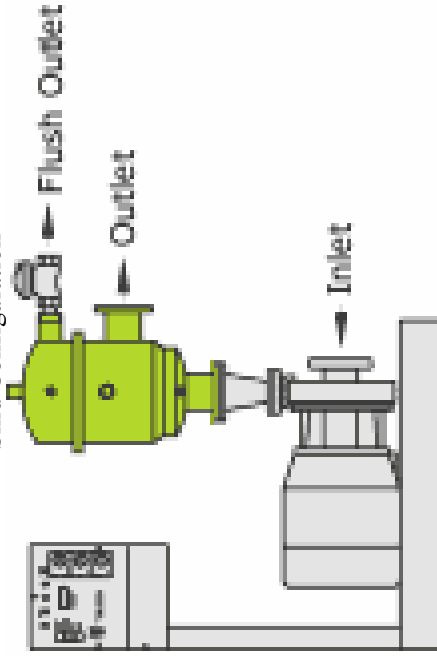
Online Configuration

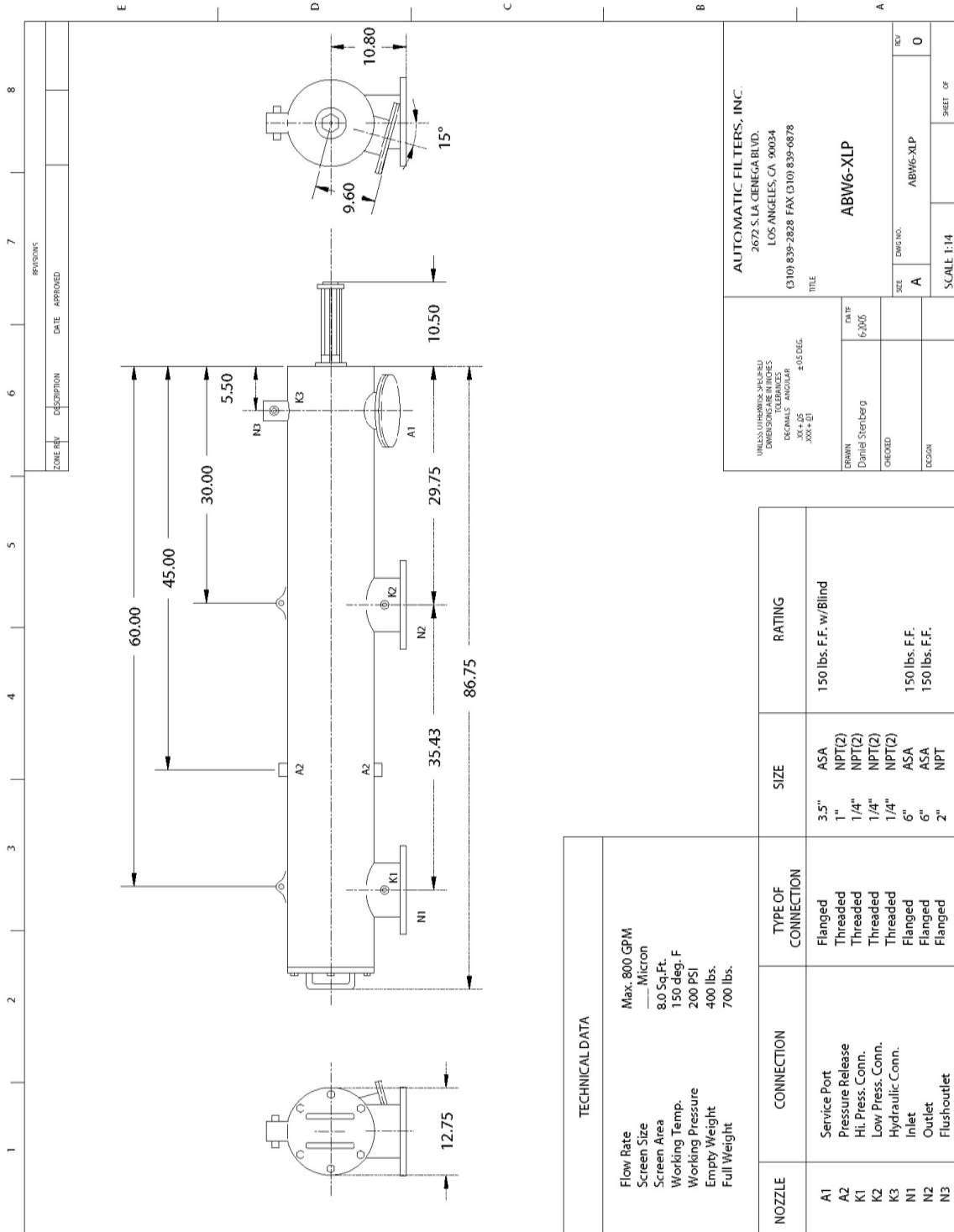


Parallel Configuration



Skid Configuration





ZONE REV		DESCRIPTION		DATE		APPROVED		REVISIONS	

**TECHNICAL DATA**

Flow Rate Max. 800 GPM  
 Screen Size \_\_\_\_\_ Micron  
 Screen Area 8.0 Sq.Ft.  
 Working Temp. 150 deg. F  
 Working Pressure 200 PSI  
 Empty Weight 400 lbs.  
 Full Weight 700 lbs.

NOZZLE	CONNECTION	TYPE OF CONNECTION	SIZE	RATING
A1	Service Port	Flanged	3.5"	150 lbs. F.F. w/Blind
A2	Pressure Release	Threaded	1" NPT(2)	
K1	Hi. Press. Conn.	Threaded	1/4" NPT(2)	
K2	Low Press. Conn.	Threaded	1/4" NPT(2)	
K3	Hydraulic Conn.	Threaded	1/4" NPT(2)	
N1	Inlet	Flanged	6" ASA	150 lbs. F.F.
N2	Outlet	Flanged	6" ASA	150 lbs. F.F.
N3	Flushoutlet	Flanged	2" NPT	

UNLESS OTHERWISE SPECIFIED  
 DIMENSIONS ARE IN INCHES  
 DECIMALS ANGULAR  
 .XXX .05 .0004 .01  
 # 0.5 DEG.

**AUTOMATIC FILTERS, INC.**  
 2672 S. LA CIENEGA BLVD.  
 LOS ANGELES, CA 90034  
 (310) 839-2828 FAX (310) 839-6878

TITLE  
**ABW6-XLP**

DATE  
 6-2006

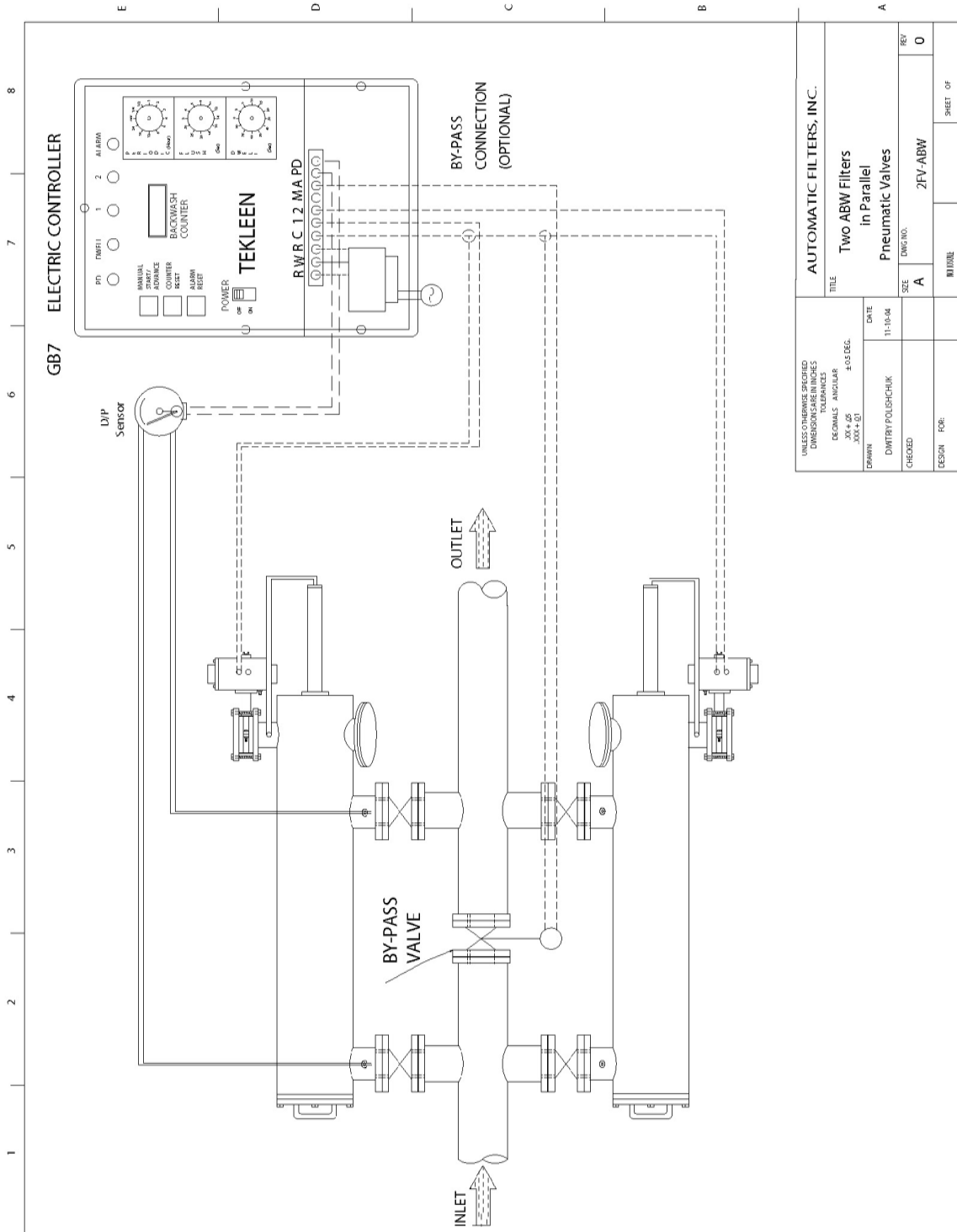
DRAWN  
 Daniel Stenberg

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DESIGN

SIZE	ENG. NO.	REV
A	ABW6-XLP	0

SCALE: 1:14 SHEET OF



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES		AUTOMATIC FILTERS, INC.	
DECIMALS	ANGULAR	TITLE	
±.05	±.05 DEG.	Two ABW Filters in Parallel	
.001	.001	Pneumatic Valves	
DESIGN	FOR	DATE	REV
DIMITRY POLICHUK		11-10-94	0
CHECKED		SIZE	DWG. NO.
		A	2EV-ABW
DESIGN	FOR	SCALE	SHEET OF
			1