POOL, JACUZZI, AND CASCADE DESIGNS

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03/394500

01/885625


Les rêves peuvent prendre toutes
les formes, toutes les profondeurs,
toutes les couleurs. Nos piscines,
elles, auront toujours la dimension
de vos rêves. C'est pour cela
qu'il y aura toujours une Piscine
Pierre Alessandra conçue pour vous.

Swimming Pool Design

I. Historical View
II. Types of Pools
III. Pool treatment Plant equipment
IV. Pool fittings and accessories
V. Pool design
VI. Jacuzzi (Spa) design
VII. Cascade & Fountain designs

Historical View

The ancient Greeks and Egyptians had their own bathing tubs with preliminary water treatment and acceptable open circulation system. The need for a pool with good water quality and comfortable conditions have always been the target of man for relaxing, fun, and healthy reasons. Pools were incurved into stones or even constructed bricks. Hot water was added and cascades were introduced to enhance the decorative factor. Incomplete systems were always utilized concerning the desired water purification quality and condition. Until nowadays, we have what is called controlled water quality that satisfies the bather and also architectural view with safety regulations being applied.

Types of Pools

1. *Skimmer Type.*
2. *Gutter Type.*
3. *Overflow Type.*
4. *No edge / Infinity type.*
5. *Biological fish / Lilly type.*

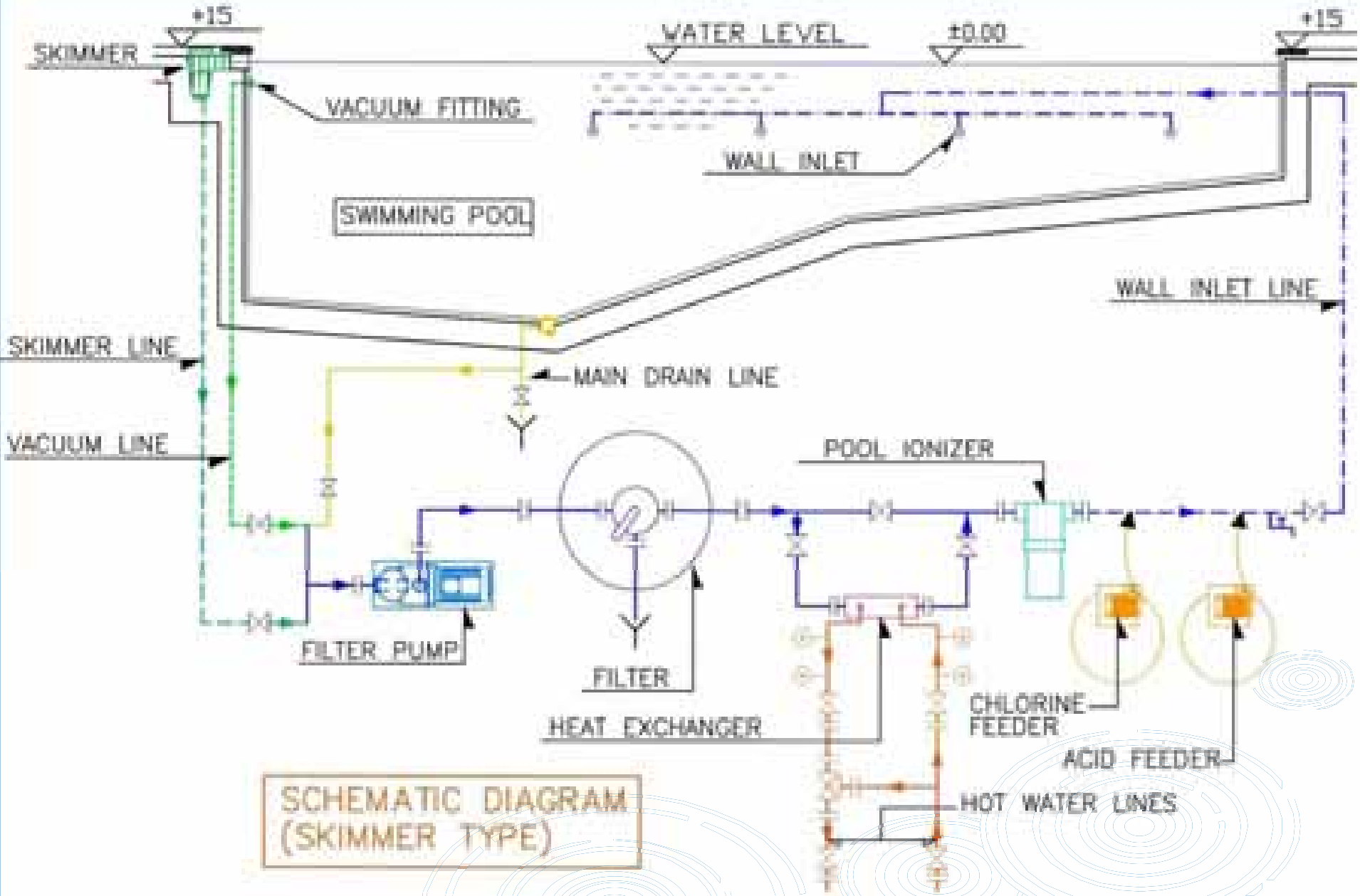
1. SKIMMER TYPE.

- Closed circuit filtration process is being used through the three types.
- This type is named after skimmer which skims water surface.
- This type utilizes skimmer, bottom drain, and wall inlet to circulate the water.
- Limit of pool area 200 m2 .
- A free board is left for the variation of water level where water is about half to 2/3 of the skimmer opening.

Types of Pools (Continue)

1. SKIMMER TYPE.

Water is being drawn or sucked from skimmers at certain location in pool (Wind direction is taken into consideration) and also from main drain pool deepest point and then returned to pool through wall inlets (Inlets are opposite to skimmer) and that upon passing through the treatment plant.


+15
SKIMMER
WATER LEVEL
±0.00
+15
VACUUM FITTING
WALL INLET
SWIMMING POOL
WALL INLET LINE
SKIMMER LINE
MAIN DRAIN LINE
VACUUM LINE
POOL IONIZER
FILTER PUMP
FILTER
HEAT EXCHANGER
CHLORINE FEEDER
ACID FEEDER
HOT WATER LINES
SCHEMATIC DIAGRAM
(SKIMMER TYPE)

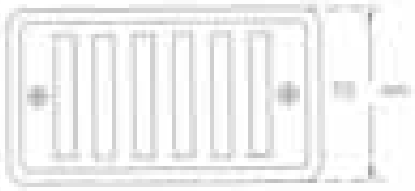
Types of Pools (Continue)

- ***2. Gutter Type:***

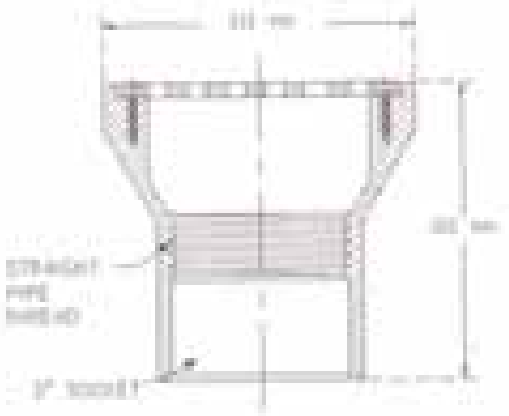
- **Due to imperfection of total surface skimming and also problem of floating or trapped debris on water surface, gutter type pool was introduced.**

- **This system introduces a compensation tank where water now is being sucked from pool bottom, and compensation tank and then returned through the wall inlets.**

GUTTER DRAIN



TOP VIEW



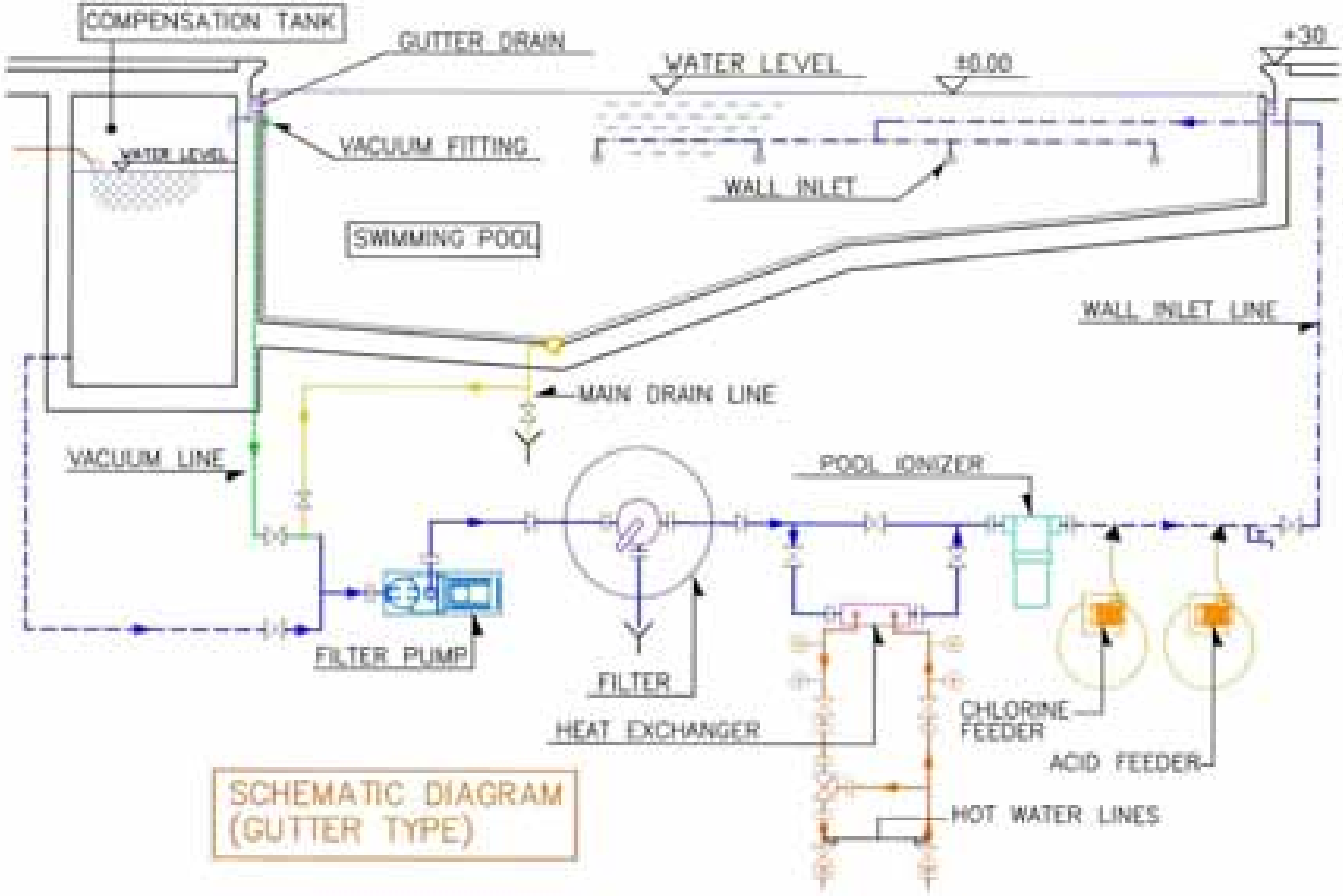
SECTION

Types of Pools (Continue)

2. Gutter Type (Cont.):

Gutters are installed in a wall recessed channel where water overflows all around the pool and then collected by these gutter drains and sent to the compensation tank.

- **This screen channel situated inside the pool, approximately 30cm below pool surround.**
- **The principle advantage is also the good wave-breaking action due to the slopping tile, also good hold and support for swimmers at the channel lip..**


COMPENSATION TANK
GUTTER DRAIN
WATER LEVEL
±0.00
+30
VACUUM FITTING
WALL INLET
SWIMMING POOL
WALL INLET LINE
MAIN DRAIN LINE
VACUUM LINE
POOL IONIZER
FILTER PUMP
FILTER
HEAT EXCHANGER
CHLORINE FEEDER
ACID FEEDER
HOT WATER LINES
SCHEMATIC DIAGRAM (GUTTER TYPE)

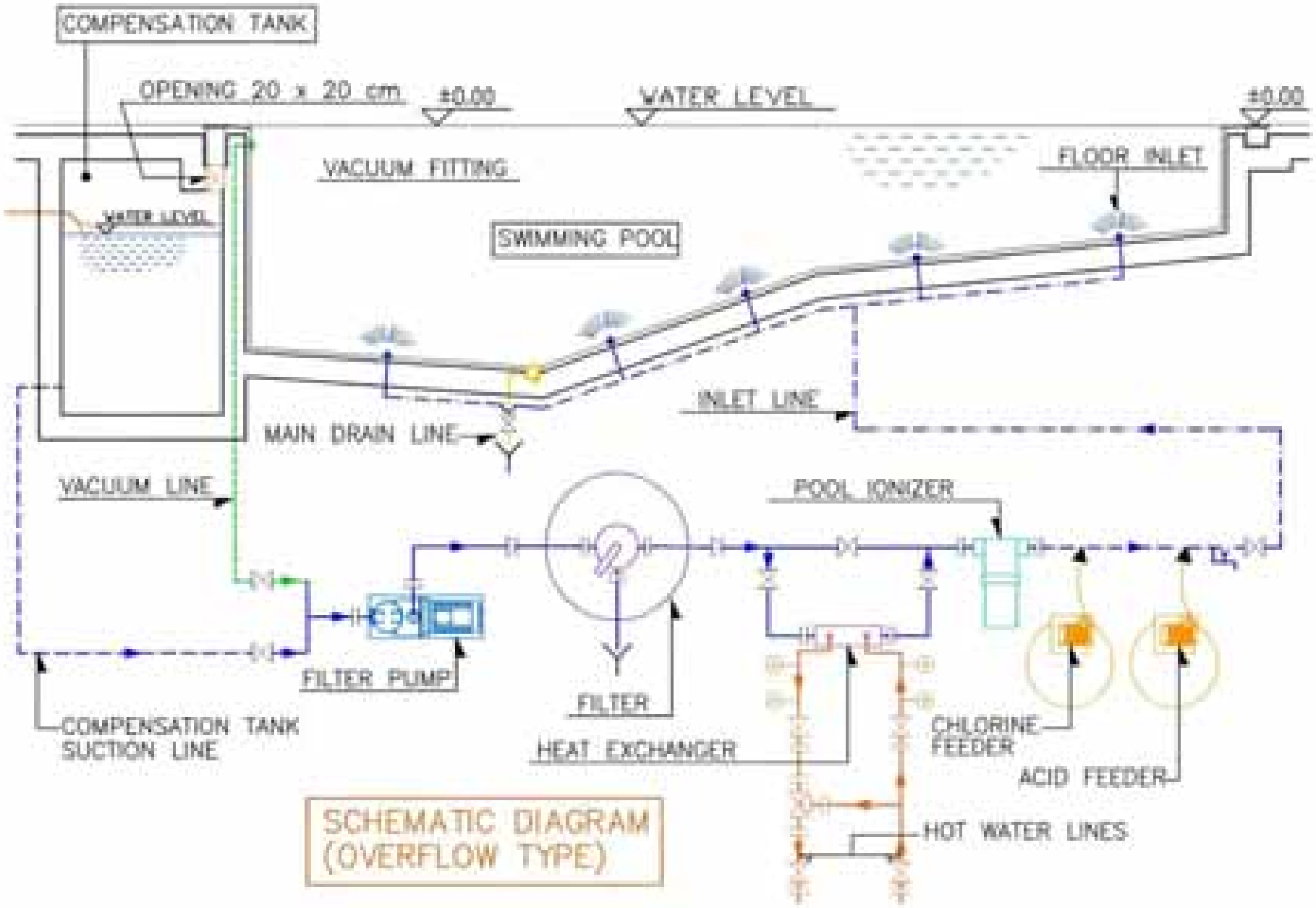
This system is advantageous over the skimmer due to its complete surface cleaning all around the pool periphery.

Types of Pools (Continue)

3. Overflow Type:

- It is the newest type by far. Also due to imperfection of water circulation through the pool volume in the gutter type, this overflow design is introduced.

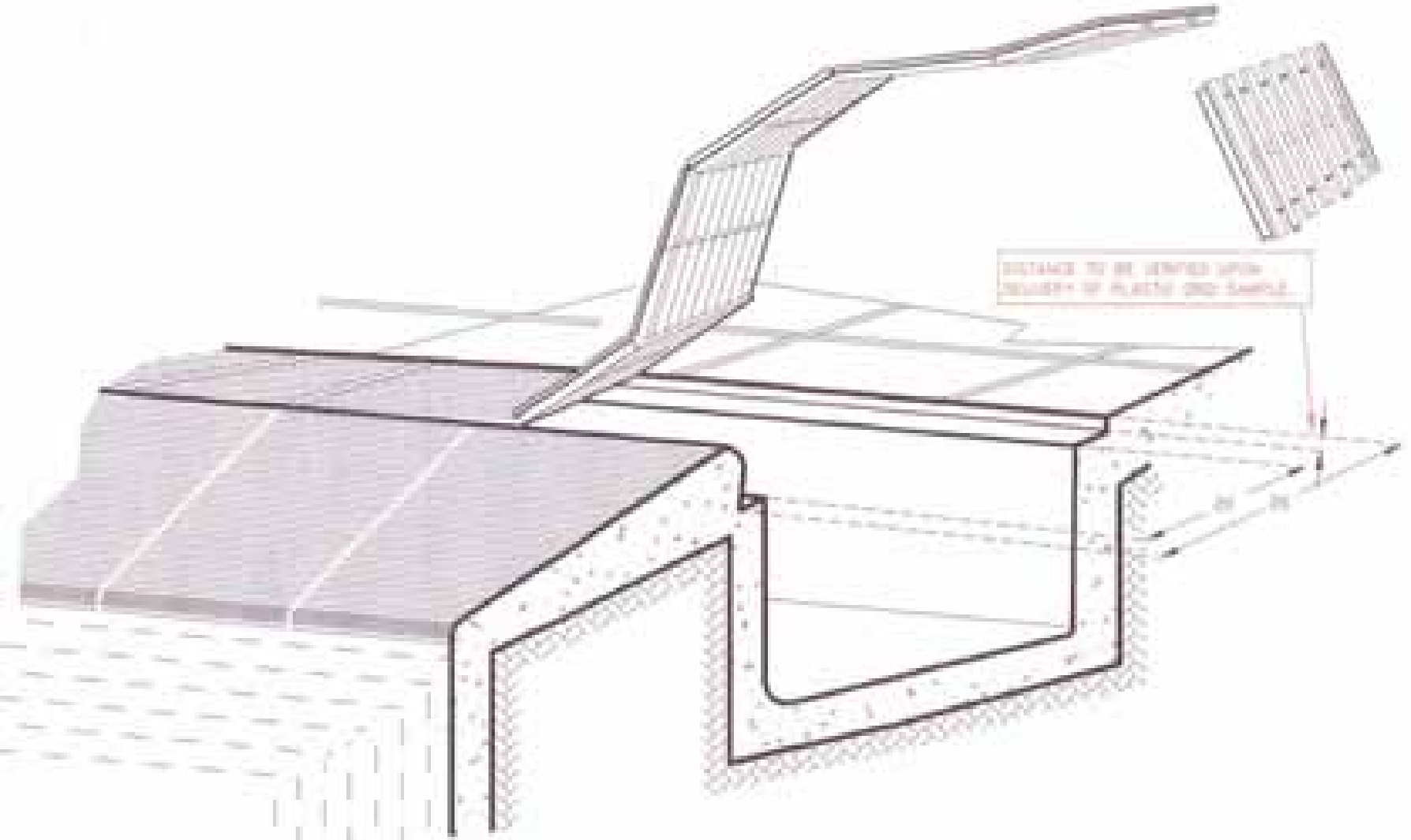
- It has the same overflow channel all around the pool periphery (Different shape), but it draws water only from compensation tank and send it back to pool through *floor* inlets only.


COMPENSATION TANK
OPENING 20 x 20 cm
±0.00
WATER LEVEL
±0.00
VACUUM FITTING
FLOOR INLET
WATER LEVEL
SWIMMING POOL
INLET LINE
MAIN DRAIN LINE
VACUUM LINE
POOL IONIZER
FILTER PUMP
FILTER
COMPENSATION TANK
SUCTION LINE
HEAT EXCHANGER
CHLORINE
FEEDER
ACID FEEDER
HOT WATER LINES
SCHEMATIC DIAGRAM
(OVERFLOW TYPE)

Types of Pools (Continue)

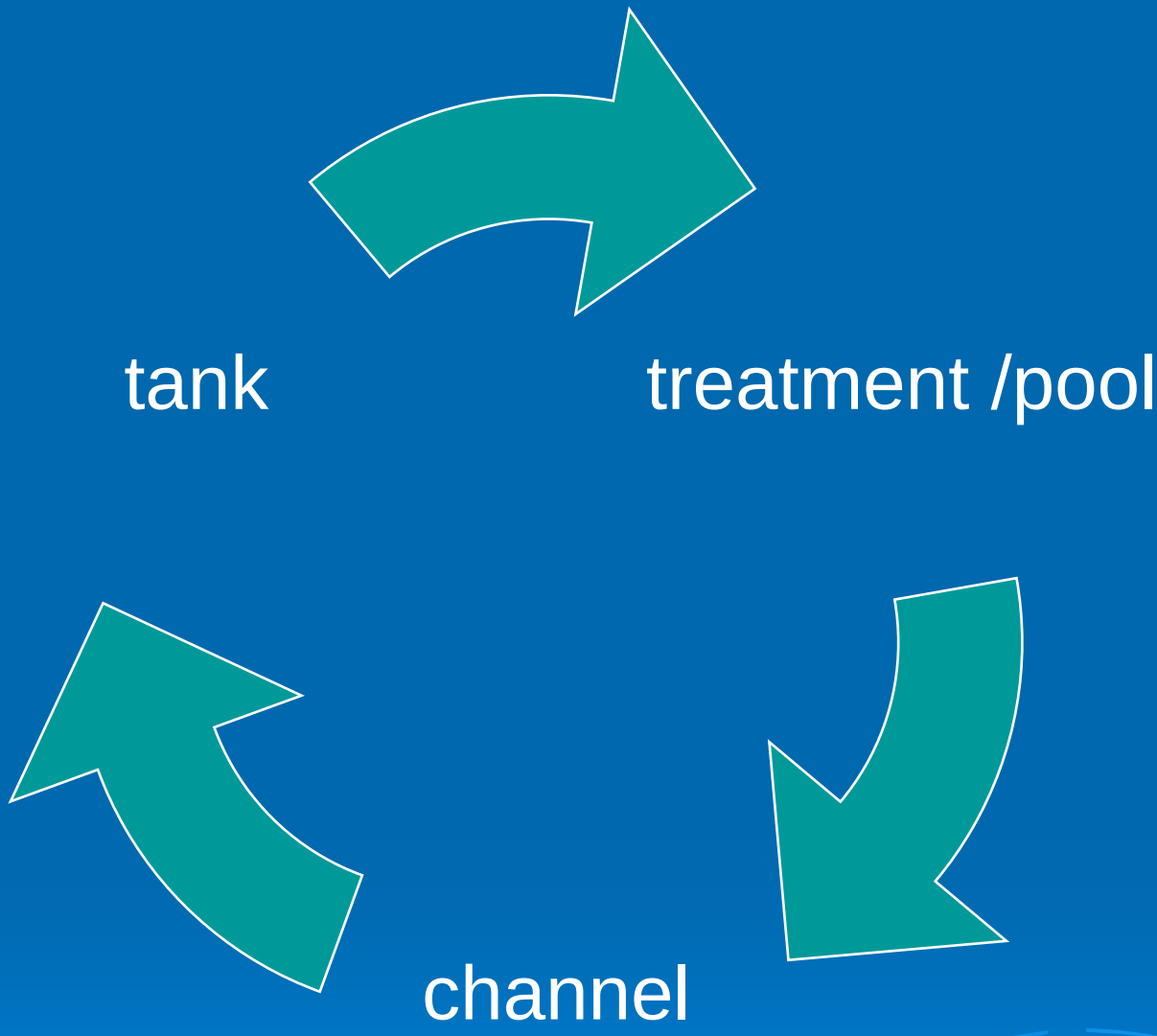
3. Overflow Type:

- It has no free board. It is favored by architects due to the zero water level with respect to pool shoulders or deck.
- A plastic grid is used to capture any floating object. Or a tile cover with 1 cm opening on both sides can be used.
- The water comes up here as on a beach and the water level rapidly calms down. Excellent visibility over the pool for users and the swimming pool attendant. No chlorine "Blanket" and therefore no trouble from fumes.
- Cleaning the discharge channel from pool surround. Also, economy of concrete in comparison with gutter type due to the raise of compensation tank.
- A much better water circulation is achieved due to a good water passage from bottom to top ,leaving almost no dead water pockets untreated.



PLASTIC GRID-INSTALLATION DETAIL

SCALE: NONE


tank
treatment /pool
channel

Types of Pools (Continue)

4. No edge/Infinity type:

- The no edge pool is similar to overflow type swimming pool but having one side of the overflow channel being lower than the swimming pool water level. This helps to visiualize an infinity edge as if water is going to unkown location.

- Same compensation tank is used, but top of tank should be at lowest point of the lower no edge channel.

- Better view but, more heat losses and lowered plant room and compensation tank are incurred.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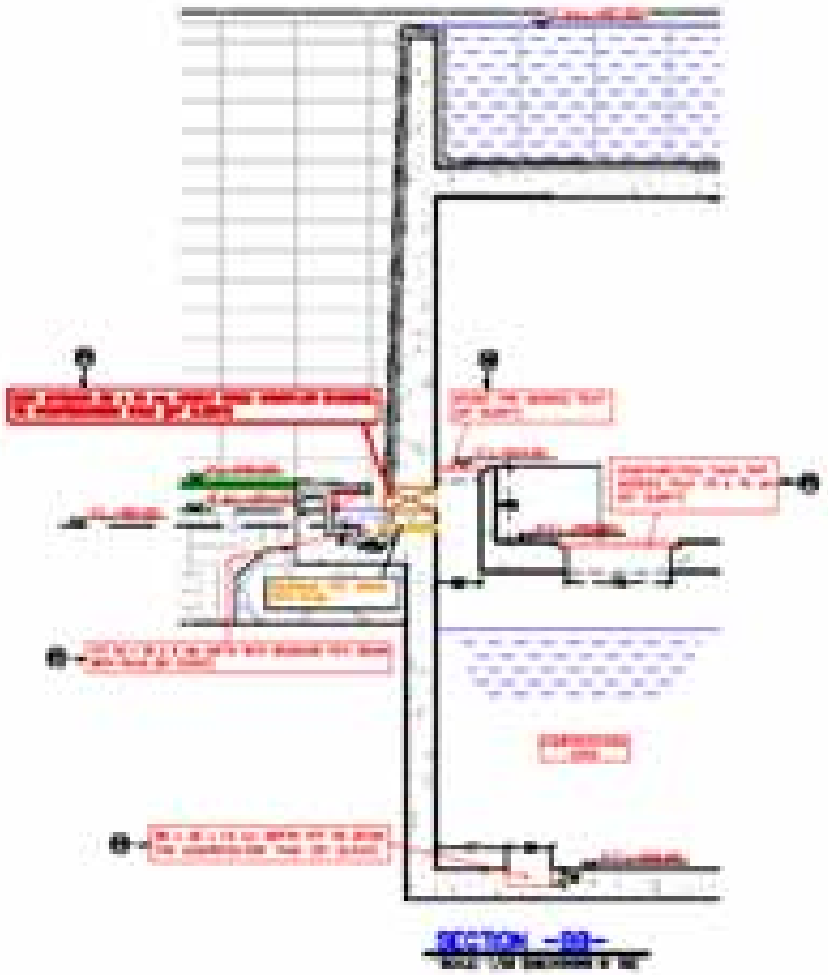


Types of Pools (Continue)

5. Biological Fish/Lilly pool:

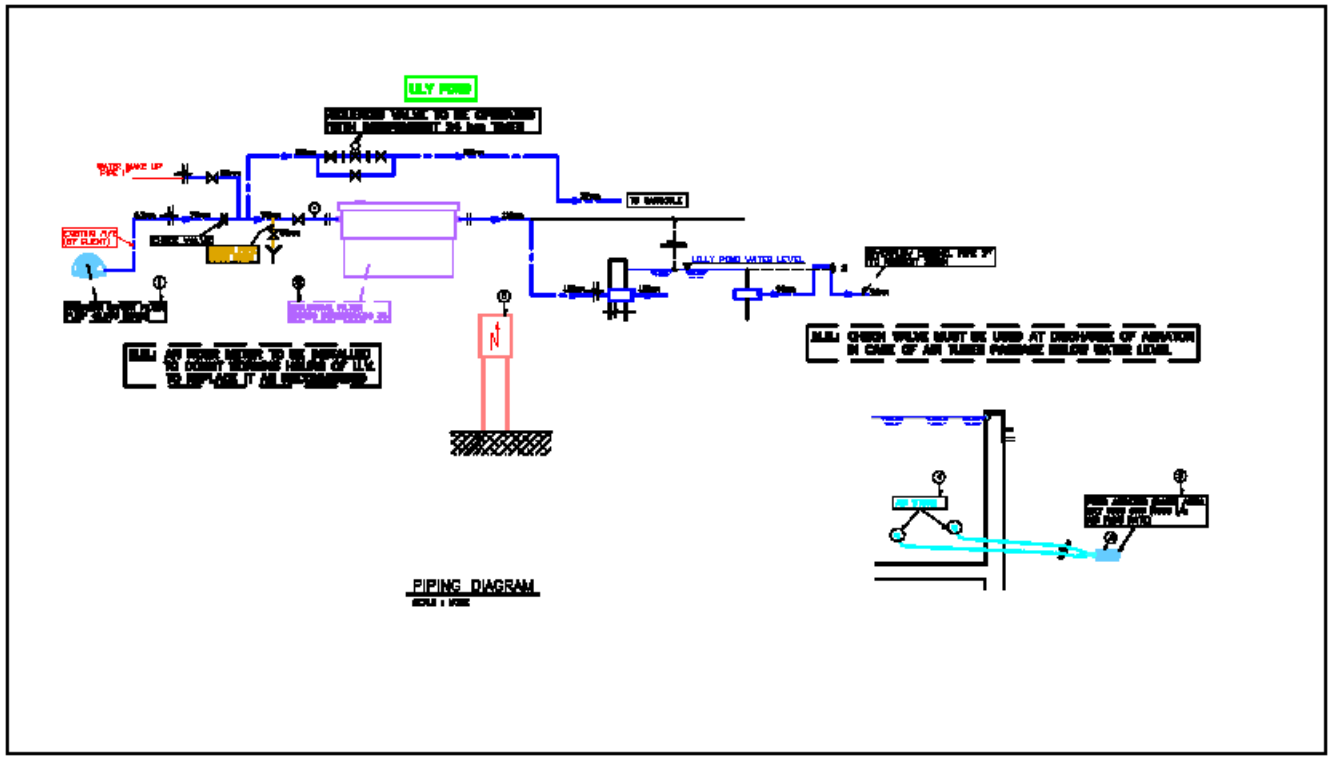
- **Biological filter performs a biological – mechanical filtering function together with coarse debris elimination.**
- **The polluted water is fed into the filter system with the help of the submersible pump into the pond.**
- **The filter surfaces trap the pollution particles and thus clean the pond mechanically.**
- **Additionally, the filter develops the important biological environment to enable the nitrification in oxygen rich conditions.**
- **So, the nitrosomonas and nitrobacter bacteria settle and multiply on the surfaces of the respective filter media in the oxygen rich and oxygen poor zones of the filter.**

→

- This is where the bacteria ensure conversion of the toxic ammonium/ammonia via the nitrite into nitrate, and then into gaseous nitrogen in various reaction processes.

- Moreover, the ultraviolet clarifier, effectively fights algae with UVC technology. Pathogens and bacteria are safely reduced through this UVC radiation.

- On the other hand, oxygen is supplied via the air compressor for flora and fauna to keep a healthy pond, since oxygen is vital for pond water and its inhabitants i.e. fish and Lilly.


LILY POND
TO MANHOLE
LILY POND WATER LEVEL
PIPING DIAGRAM

Treatment Plant (Equipment Used)

The following water treatment equipment is used to clean, heat and sterilize pool water as well as create a hygiene, comfortable and chemically balanced water:

1. ***Pre Filter:***

   That is basket strainer type (Opening 3 to 5 mm)

   It is used in order to catch all floating leaves, hair, debris, etc…

   It could be attached to the pump or separated.

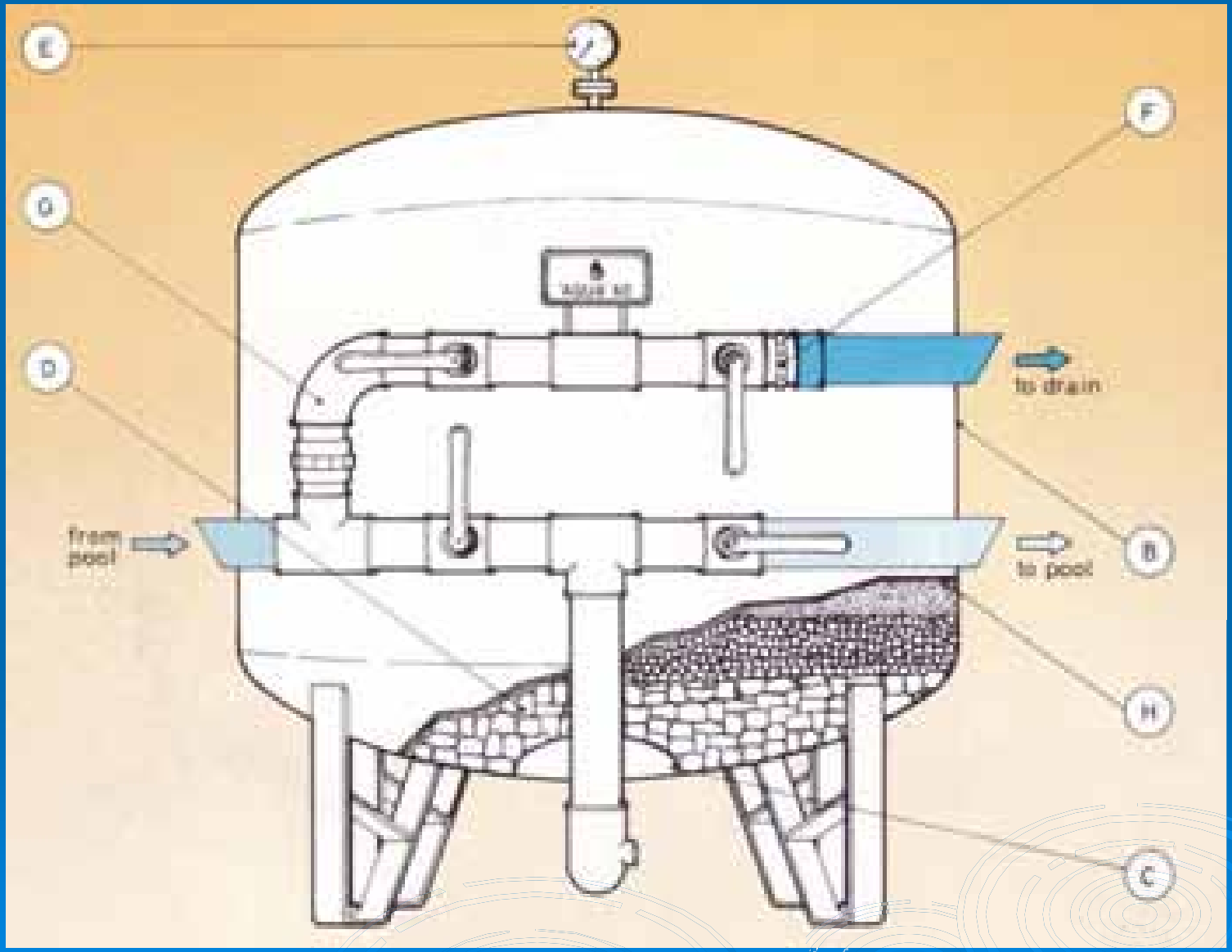
Treatment Plant (Equipment Used)

- **2. *Filter pump (s)***
- To draw water from pool, or compensation tank or vacuum line and pump it through the treatment plant back into the pool.
- **3. *Filter***
- D.E. Diatomaceous earth. (Using Diatomite powder). (5m/hr of effective area) (USPSHT code).

  Sand filter (Up to 40 m/hr).
- Multimedia sand filter (Dual Media) with high side shell.
- (Used for public pools with high turbidity level). (40m/hr velocity of filtration). (USPSHT code).
- High speed filtration may go up to 50m/hr velocity of filtration.
- Backwash rate 30 to 40 m/hr.
- Purpose of filter is to reduce turbidity in the water.
- USPSHTC = Uniform Swimming Pool, Spa, Hot Tub Code, USA).


GAUGE
AIR RELIEF VALVE
TOP MANIFOLD COLLECTOR
HEAVY-DUTY FILTER TANK
FILTER ELEMENT
VARI-FLO CONTROL VALVE
FLANGE CLAMP
UNION LOCKNUTS
FILTER ELEMENT LOCATOR
DRAIN
INLET DIFFUSER ELBOW
INTEGRAL BASE


ATIKA


E
F
G
D
B
H
C
to drain
from pool
to pool

Treatment Plant (Equipment Used)

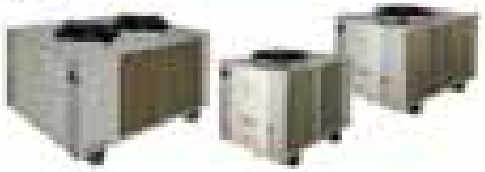
4. Heater, heat exchanger, or heat / cool pump

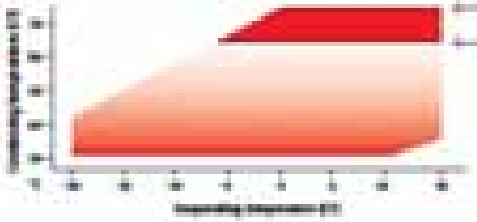
To heat up the pool water to the desired temperature or sometimes to cool it down in places where hot whether is dominant.


Bowman Cupro Nickel Heat Exchangers
will replace and normally will outlast
Stainless Steel Heat Exchangers

Type Type Typ	Boiler water flow Débit d'eau de chaudière Kesselwasser-durchflussmenge		Head loss Perte de charge Druckhöhen-verlust		Pool water flow Débit d'eau de piscine Beckenwasser-durchflussmenge		Head loss Perte de charge Druckhöhen-verlust		Heat transfer Transfert thermique Wärmeabgabe			Pool capacity Volume de piscine Beckenvolumen	
	m³/h	gal/h	kPa	ft/in²	m³/h	gal/h	kPa	ft/in²	kcal/h	kw	Btu/h	m³	gal
ETI05-3	0.72	156	1	0.15	2.90	625	1	0.15	129 00	15	50 000	23	5 000
ETI05-3	1.44	312	3	0.45	5.64	1 250	2	0.30	24 950	29	100 000	46	10 000
ETI05-3	2.16	468	7	1.04	8.52	1 875	5	0.75	37 900	44	150 000	68	15 000
ETI05-3	2.88	625	13	1.95	11.40	2 500	8	1.12	50 800	59	200 000	91	20 000
ETI06-2	3.60	782	2	0.30	14.16	3 125	5	0.75	62 800	73	250 000	114	25 000
ETI06-2	4.20	938	3	0.45	17.00	3 750	7	1.04	75 700	88	300 000	137	30 000
ETI07-2	5.70	1 250	2	0.30	22.80	5 000	7	1.04	100 700	117	400 000	182	40 000
ETI07-2	7.30	1 562	4	0.60	28.44	6 250	11	1.65	125 600	146	500 000	228	50 000
ETI08-2	9.90	2 188	4	0.60	39.60	8 750	8	1.12	176 400	205	700 000	319	70 000
ETI09-3	12.50	2 812	5	0.75	51.00	11 250	7	1.04	226 300	263	900 000	410	90 000
ETI09-3	15.80	3 438	7	1.04	62.40	13 750	10	1.50	279 600	325	1 100 000	500	110 000
ETI11-3	21.60	4 688	4	0.60	85.20	18 750	9	1.35	376 800	438	1 500 000	683	150 000
ETI11-3	28.50	6 250	7	1.04	114.00	25 000	15	2.25	503 300	585	2 000 000	910	200 000
ETI10-3	35.40	7 812	4	0.60	142.20	31 250	10	1.50	628 000	730	2 500 000	1138	250 000

PRO-PAC RANGE





SPECIFICATION:
34 Range

Treatment Plant (Equipment Used)

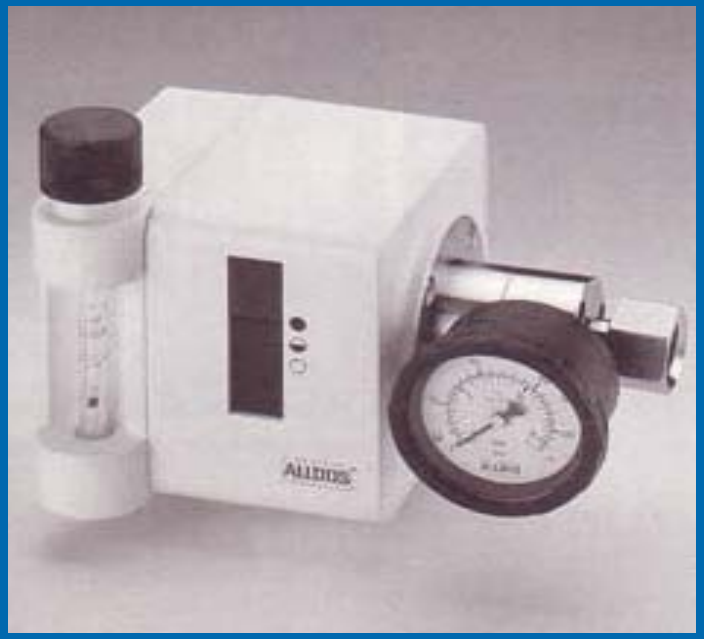
5. *Disinfections Techniques*

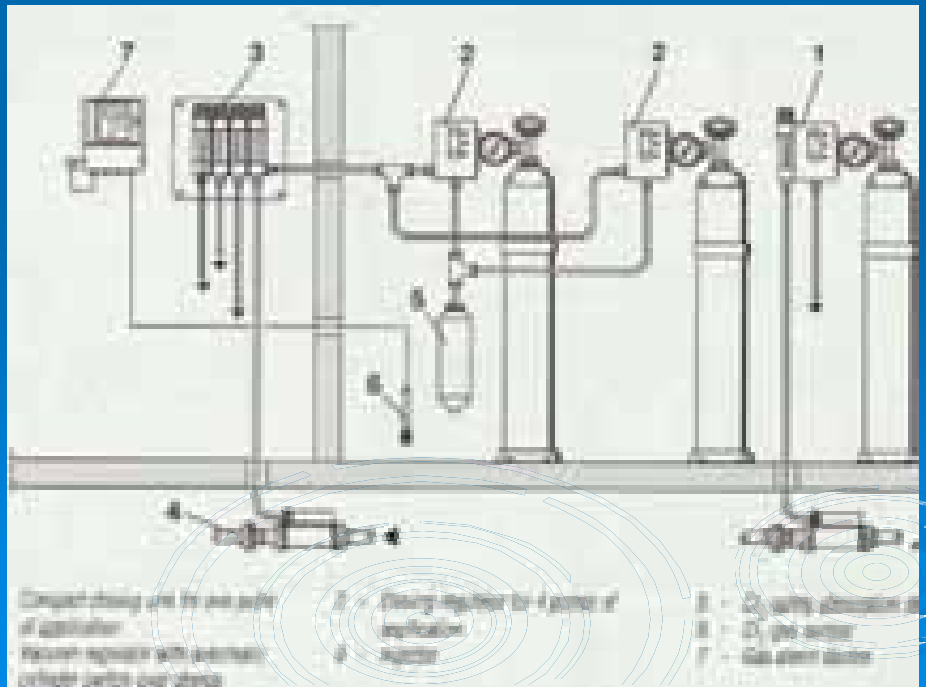
- 1. Chlorine (Powder, liquid, or gas form). Dosing pump or gas chlorinator can be used to dispense chlorine chemical into the pool.
- 2. Bromine (Same way as chlorine could be used to inject it).
- 3. Ozone generator (Oxygen is transformed to ozone upon passing through the arc chamber or ultraviolet lamp (Corona tube type or UV type) (Limitation of TDS ≤ 700 ppm). Safety hazards for using ozone , should be considered for installation as well as bathers. New regulations prohibit sending O_3 to swimming pool water.

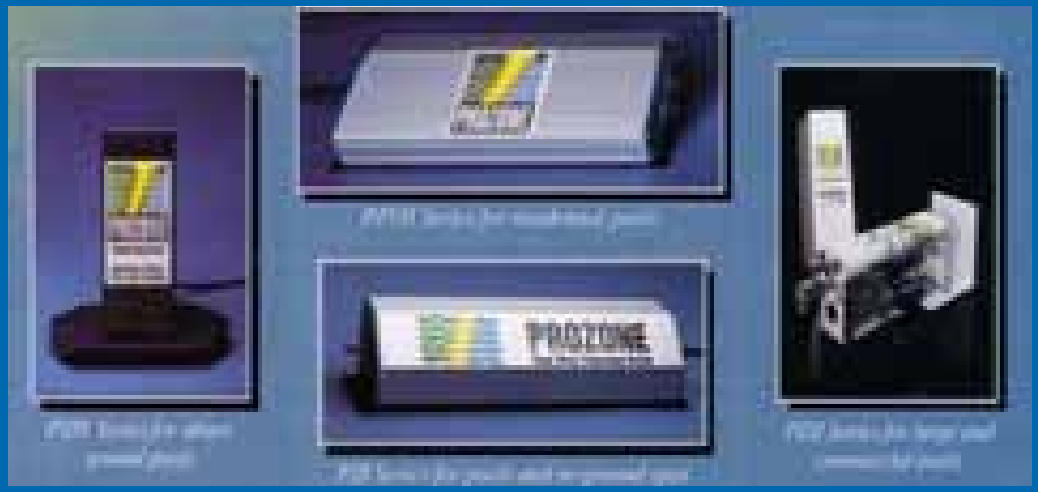
  O_3 must be removed in plant room before sending to swimming pool, in addition to necessity of having residual chlorine at all times along with O_3 .
- 4. Ionizer (Copper-ions in water will inhabit algae growth, while silver ions kill bacteria and viruses. DC in mA current is used to produce metal ions from the copper and silver electrodes).

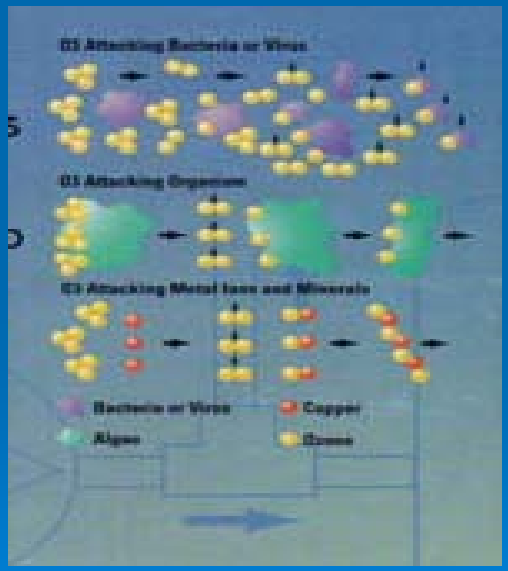
NB: A residual disinfectant in pool water 24 hr a day as mandatory whatever is the sterilization system.

- 5. The target of the above mentioned chemicals and disinfections techniques offers high standards of health and hygiene for the pool water to be safely used by swimmers.








(1) Attacking Bacteria or Virus
(2) Attacking Organism
(3) Attacking Metal Ions and Minerals
Bacteria or Virus
Copper
Algae

Treatment Plant (Equipment Used)

6. Pool Chemistry

- pH adjustment chemical to keep pH 7.2 to 7.6 (Using chemical dosing pumps needed for swimmers safety and chemicals efficiency).
- Algae treatment chemical.
- Coagulation or Alum. (To help filtration through the coagulation of colloidal suspended solids)(Better filtration and lower consumption of chlorine is achieved).
- Alkalinity balance (80 to 100ppm)
- (Add sodium bicarbonate to raise)
- (Add Muriatic Acid to lower).
- Chlorine residual 1ppm to 1.5ppm with pH 7.0→7.8
- Bromine content 1ppm to 2ppm with pH 7.5→8.2
- This is why bromine still subject to discussion.

Other chemical compounds could be monitored and adjusted.

Treatment Plant (Equipment Used)

7. Control & Pool Lighting

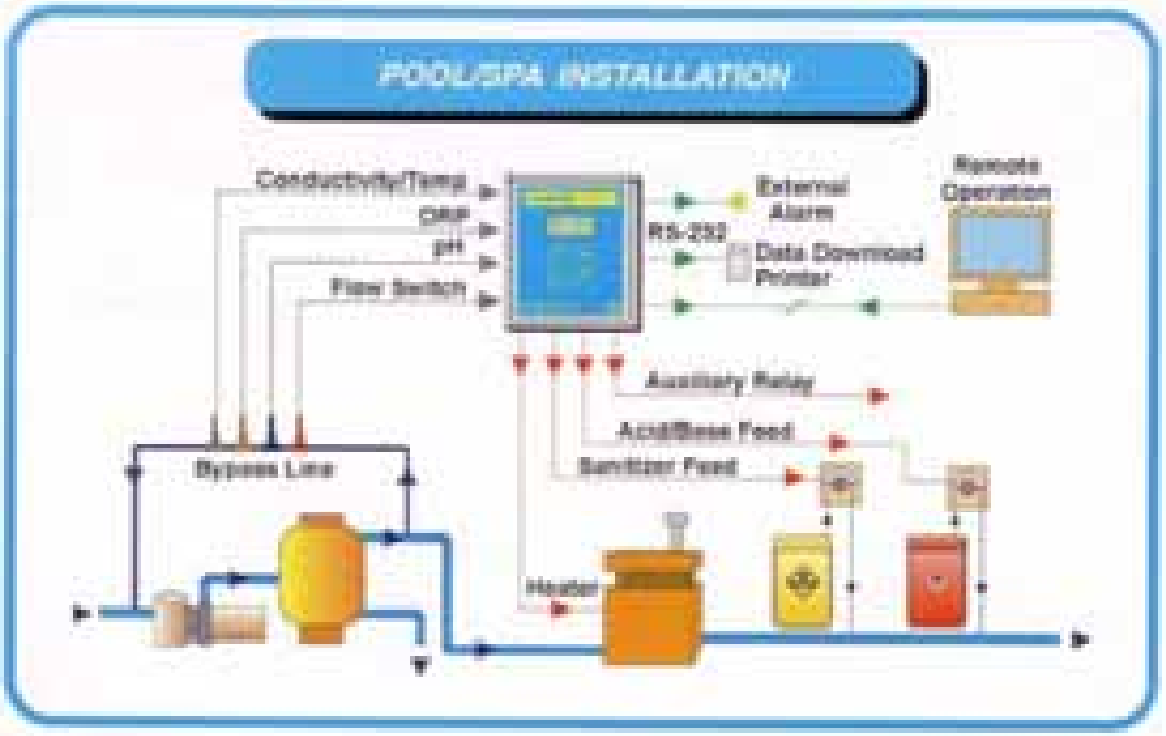
- pH controller
- Chlorine or ozone controller (ORP) (Oxidant reduction potential in mV).
- ORP is used to test the effectiveness of chemicals in the swimming pool.

Treatment Plant (Equipment Used)

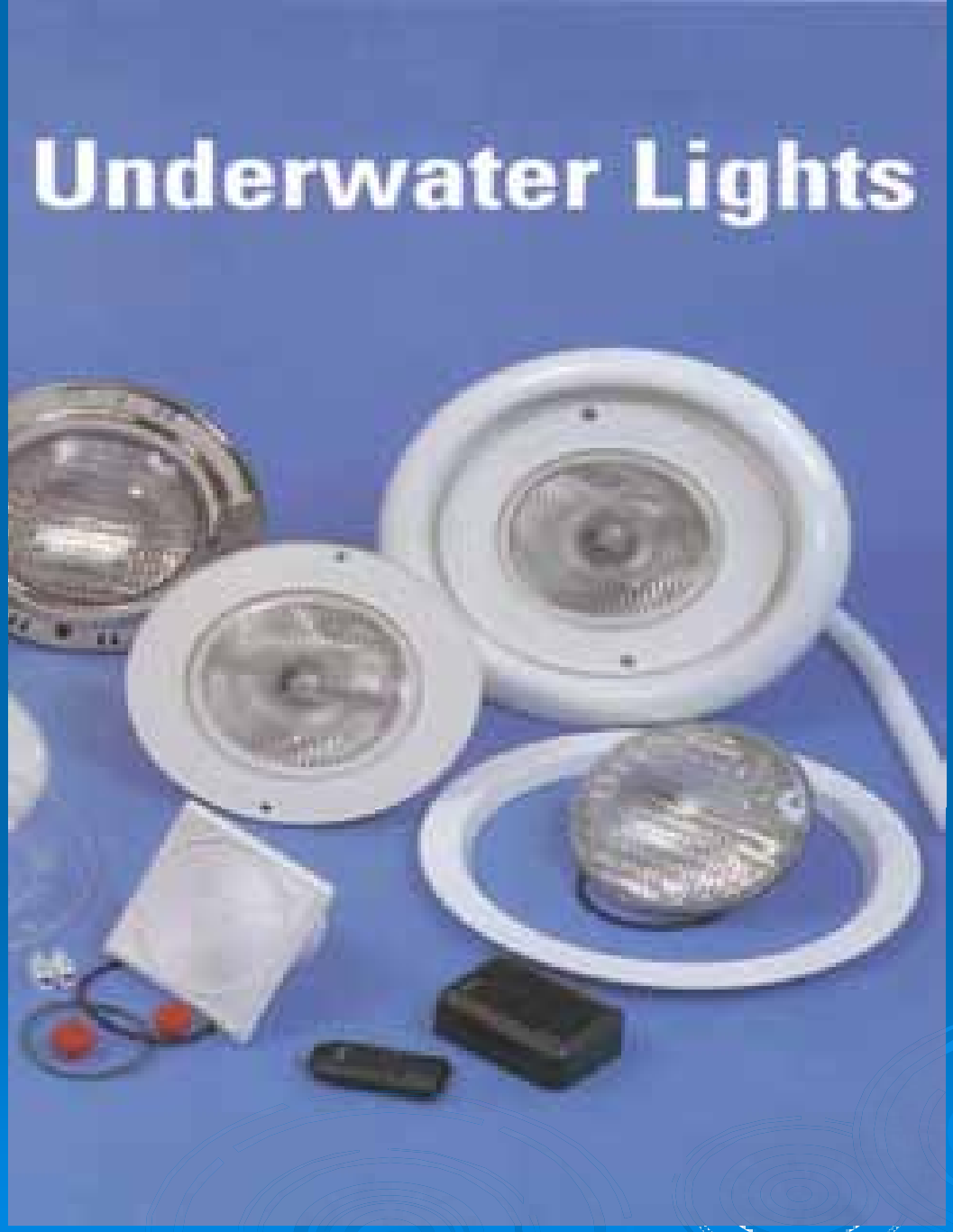
7. Control & Pool Lighting (Continue)

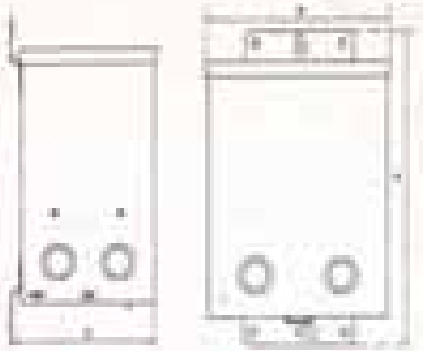
- Monitoring equipment of filter, Automatic system & Automatic cleaning.
- Pool tank status, BMS, temperature control through 3-way- motorized valve, etc..
- Measuring devices for filters pressure, chlorine, Bromine, Ozone, Ionizer, etc…
- Kits or professional Analog or Digital recording or manual reading instrument.
- Pool under water lights,12 V,AC for safety, with special safety transformer, isolated type.
- According to DIN 67526-For swimming pools in sports centers, an illuminance of 1000 lumen/m² at the water surface area is recommended.
  For private pools, 500 lumen/m² is adequate.


TR111
Pool Test Kits
HD72 Swap
Thermometer
HD72 F Floating
Thermometer
CR52
Chrome Plated
Thermometer


POOL/SPA INSTALLATION
Conductivity/Temp
ORP
pH
Flow Switch
RS-232
External Alarm
Data Download Printer
Remote Operation
Auxiliary Relay
Acid/Base Feed
Sanitizer Feed
Bypass Line
Heater

Underwater Lights





MEDIDAS - MEASURES - DIMENSION (...)

MOD.	A	B	C
	mm.	mm.	mm.
630 VA.	330	111	134
400 VA.	270	170	140

ESPECIFICACIONES ELECTRICAS - ELECTRICAL SPECIFICATIONS - SPECIFICATIONS ELECTRIQUES

POTENCIA POWER PUISSANCE	COD.	TENSION PRIMARIO PRIMARY VOLTAGE VOLTAGE PRIMAIRE	TENSION SECUNDARIA SECONDARY VOLTAGE TENSION SECONDAIRE	INTENSIDAD SECUNDARIA SECONDARY CURRENT CURRENT SECONDAIRE	KG.
630 VA.	TR-630	127 V.	12 V.	52 A.	8,40
400 VA.	TR-400	220 V.	12 V.	33 A.	5,60
630 VA.	TR-630	127 V.	0-3-6-9-12 V.	25 A.	8,40
400 VA.	TR-400	220 V.	0-3-6-9-12 V.	33 A.	5,60
630 VA.	TR-630	127 V.	24 V.	26 A.	11,70
400 VA.	TR-400	220 V.	24 V.	16 A.	11,70
630 VA.	TR-630	127 V.	0-1-2-24 V.	26 A.	14,00
400 VA.	TR-400	220 V.	0-1-2-24 V.	16 A.	14,00

Pool Fittings and Accessories

The following fittings and accessories are used in pool as finishing components and for the safety of swimmers:

- ***Ladders*** (Standard & wide)

- Recommended for easy access in deep and shallow area.
- A rest ledge between 100 cm and 135 cm below water level,12 cm width (BS code, 5.6.3.2) would help beginners.
- in swimming to rest and helps tired swimmers in case of medical reasons.

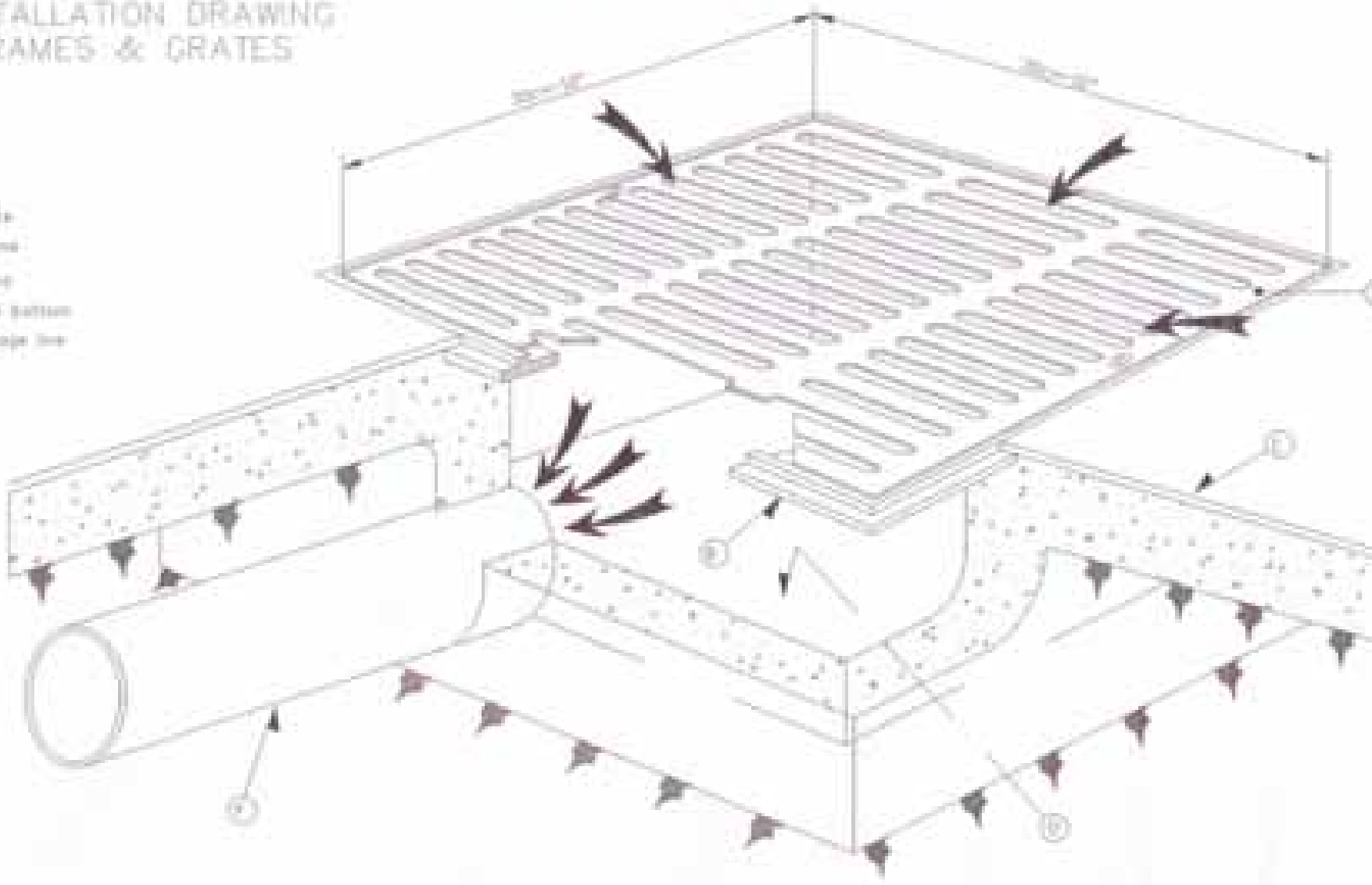
Pool Fittings and Accessories

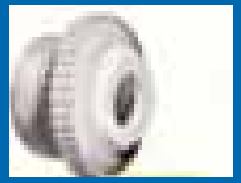
- *Wall inlet, vacuum fitting, floor inlet, Main drain or frame & grate*

N.B.: FLOOR THICKNESS MUST BE 30 cm.
WHEREVER THERE IS MAIN DRAIN LINE.

INSTALLATION DRAWING
FRAMES & GRATES

A : Grate
B : Frame
D : Jutty
E : Pipe bottom
F : Drainage line





Pool Fittings and Accessories

- *Skimmers, overflow channel plastic grid, floats for racing lanes or bordering deep area, diving board, jumping board, extra feature like slides, jet stream and equipment for counter swimming, hand rails (Safety and comfort), etc… vacuum cleaner, cleaning kit. (Manual or robot).*

- *Pool cover for winter as safety and pool cover for thermal insulation (Isothermal characteristics).*

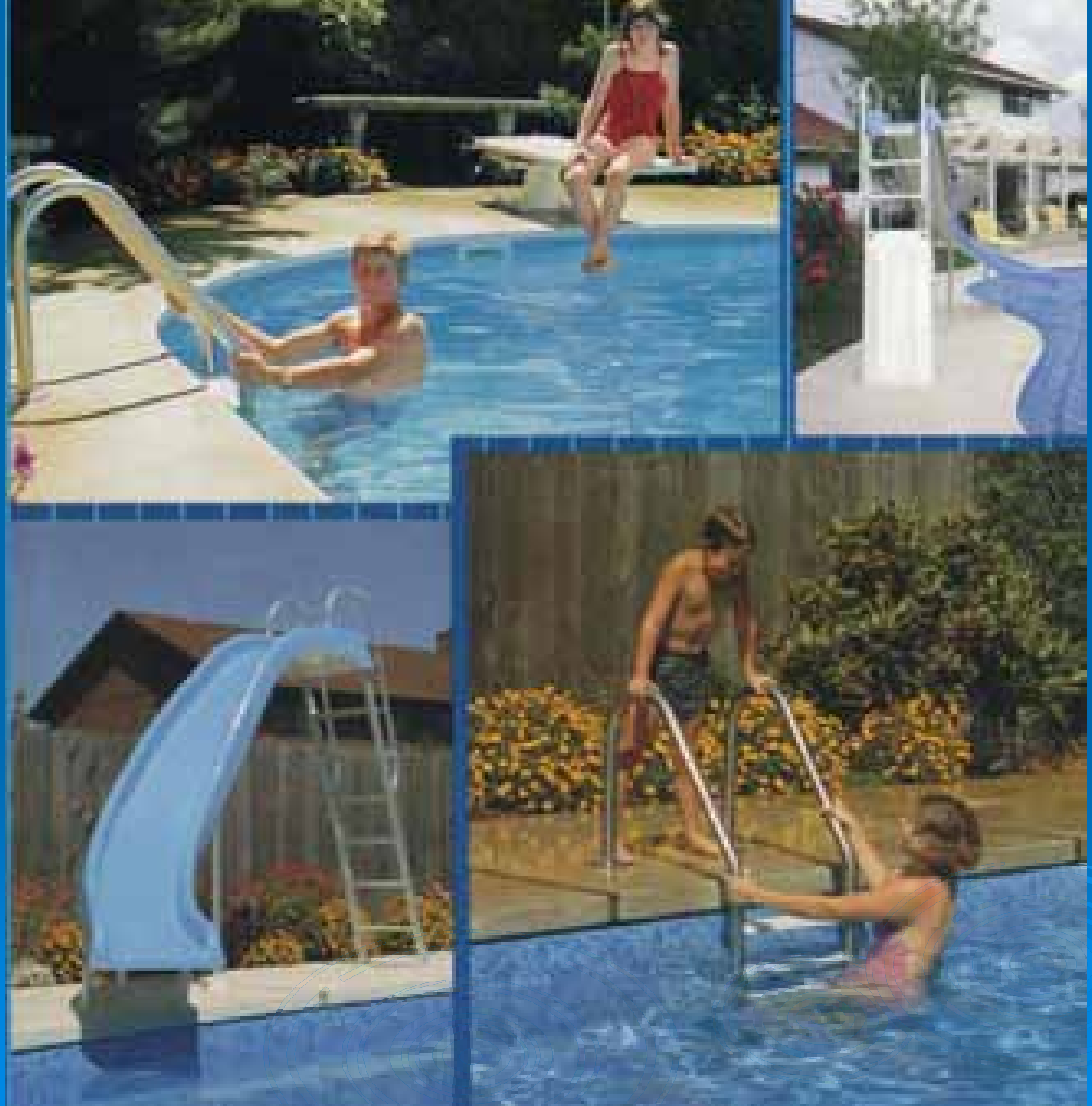
- *All these fittings and accessories must be used to enhance the performance of the pool operational usage and to offer safe bathing with comfort according to international standards.*


HDK
Pool Brush
HDB
Algae Brush

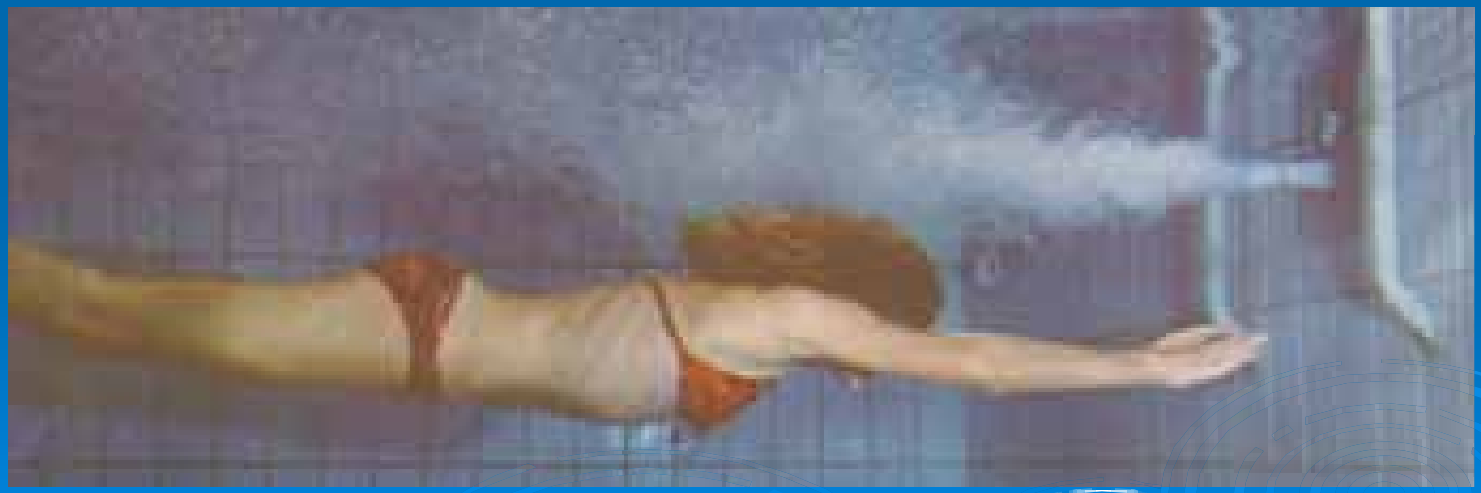

HD 101
HD 102L
HD 101L


HD 100 (L)
HD 105
HD 106
HD 102


HD 33
HD 33L
HD 34
CK 34
HD 31
CK 33
HD 36




Swerdy



Free available chlorine (FAC) – Spas.
A minimum free available chlorine residual of 2.0 ppm shall be maintained at all times and in all areas of the spa. A maximum of 5.0 ppm shall not be exceeded when the spa is open to the public.

Note: The U.S. Environmental Protection Agency (EPA) has established a maximum chlorine level of 4.0 ppm for re-entry of swimmers or bathers into pool water based on drinking water limits. The maximum they have set for spas is 5.0 ppm. However, state or local health codes may allow or require the use of chlorine levels above 4.0 ppm for pools and 5.0 ppm for spas.

5. Pool to be heated as well as air as follows:

ASPE (American Society for Plumbing Engineers):

- Minimum acceptable 24°C.
- Competitive swimming pool and diving (25.6°C – 27.5°C).
- Commercial (club, motel, Apartment (27.8°C – 32.2°C).
- Residential (24°C – 26.7°C).

Pool Design

1. REGULATIONS

1. Pool water must be transparent in such a way a Secchi Disk 15 cm in diameter placed on the bottom of the deepest part of the water body, to be visible when viewed from the concourse at a distance of 9 meters. (Other standards allow 30x30, or 15x15cm object visibility).
2. pH must be 7.2 to 7.8 to avoid eye and skin irritation and also higher efficiency of chemicals.
3. Al least 40% of pool water must be collected from surface if not 100%.
4. Water must be disinfected for the hygienic and aesthetic purposes. A residual chlorine of 1 to 1.5 ppm must be kept & 1 to 2 ppm content of Bromine.

(American National standard for water quality in Public Pools and Spas).

Free available chlorine (FAC) – Pools.

A minimum free available chlorine residual of 1.0 ppm shall be maintained at all times and in all areas of the pool. A maximum of 4.0 ppm shall not be exceeded when the pool is open to the public.

2003 ASHRAE Applications Handbook (SI)

Table 1 Typical Natatorium Design Conditions

Type of Pool	Air Temperature, °C	Water Temperature, °C	Relative Humidity, %
Recreational	24 to 29	24 to 29	50 to 60
Therapeutic	27 to 29	29 to 35	50 to 60
Competition	26 to 29	24 to 28	50 to 60
Diving	27 to 29	27 to 32	50 to 60
Elderly swimmers	29 to 29	29 to 32	50 to 60
Hotel	28 to 29	28 to 30	50 to 60
Whirlpool/spa	27 to 29	36 to 40	50 to 60

Pool Design

1. REGULATIONS (Cont.)

6. A specified turnover should be performed according to pool type of usage and also size.

- 7. Pool (Especially public) must be completely emptied at least twice a year.
- 8. The water should be renewed at least 30 lit per swimmer daily, to avoid continuous raise of organic and non-organic substances in the pool water. Hence, one complete exchange of the whole pool water should be done monthly (Public pool).
- 9. Turn over should be respected depending on pool classification.
- 10. Strong chlorine dosage (Breakdown chlorination) up to 20ppm with low pH is recommended to be done periodically. Swimmers should not be allowed into the pool until chlorine level is back to normal. (This is used to eliminate chloramines and other chlorine compounds).
- In addition to other regulations that vary from one country to another.

Pool Design

2. SHAPE

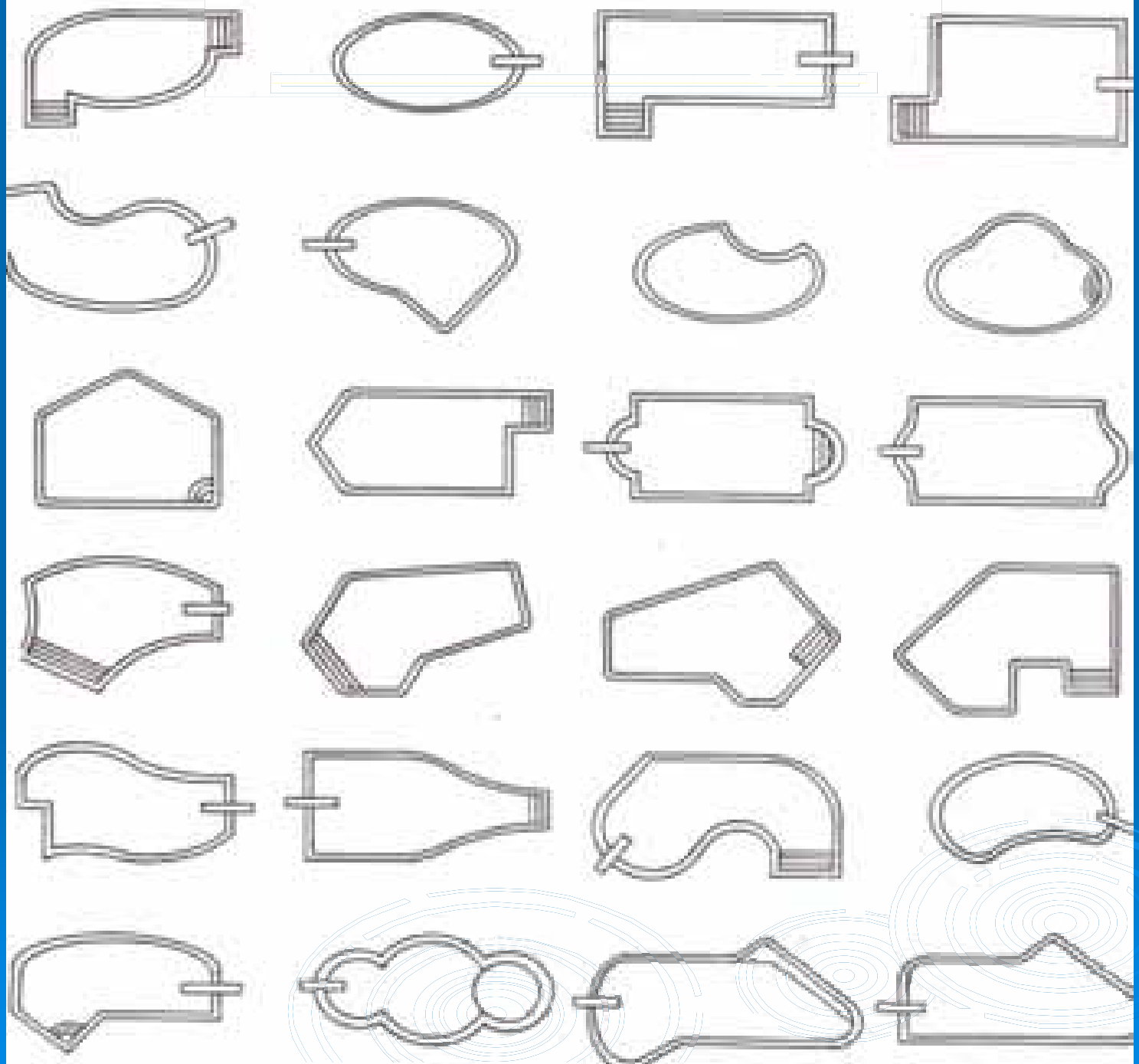
- Pool shapes are not governed by any regulation unless its purpose is intended for certain sportive targets in public usage. i.e. FINA code for national and international competition.

- Pool must have shallow area about 60%, deep area about 40%.

- Shallow area varies from 0.80 m to 1.5 m depth.

- Deep area ranges from 1.5m depth to a minimum of 2.3m depth which is the minimum recommended depth for the smallest diving board.

Safety anti-slip tiles are recommended for safety of swimming and bathers.



Pool Design

3. DESIGN PARAMETERS:

* ***Selection of pool type.***

- Skimmer, gutter, or overflow type.

* ***Data about the pool:***

1. Shape
2. Volume
3. Height above sea level (Concern about heating capacity)
4. Machine room & compensation tank location and size.
5. Special water features required.(No edge side or adjacent cascade or fountain).
6. Any restriction or constraint regarding such as no edge side, civil Info (Beams, columns, steel rod grid too tight, room for pipes passage).

Pool Design

**** Requirements:***

- 1. Machine room enough area, accessible & safe & level to be lower than pool deepest point (Avoid dangerous access with safety if roof pool or valley side, etc …). Take care about huge and heavy filters.

- 2. Compensation tank size and access trap (Modification to smaller + auxiliary tank for backwash may be a solution when not enough space is available). Recommendation to have it leveled with pool water level & bottom same as machine room (Check tank design).

- 3. Power supply, drainage facility (Gravity or sump pit pump for backwash), also propose solution to reuse for irrigation at end of season if no freezing during winter.
  Ventilation, lighting, floor drain, and control lines.

- 4. Access door and access passage to enter & remove equipment. (Especially big filters for future maintenance).

- 5. Water supply (Fill pool within 10-15hrs) ,hot water lines supply (One day for heat up) & control of it. (3 days cycle empty +fill +(filtration) (Fresh water supply when sea water is used.)

Filter Model	Design Flow Rate GPM	Design Flow Rate m³/h	Tank diam. cm	Filter height cm	Pipe connect. inches	Motor power H.P	Oper. weight Kgs.
AQUA 10	44	10	50	155	1½	1	900
AQUA 25	110	25	80	165	2	2	1,600
AQUA 40	175	40	100	175	2½	4	2,400
AQUA 60	265	60	125	185	3	5	3,600
AQUA 90	395	90	150	195	4	7.5	6,000
AQUA 130	570	130	185	200	4	10	9,000
AQUA 170	748	170	210	210	5	15	12,000
AQUA 210	925	210	235	215	6	20	15,000
AQUA 240	1,050	240	250	220	6	20	18,000
AQUA 350	1,540	350	300	230	8	25	25,000

Pool Design

**** Requirements: (Cont.)***

- 6. Walls and floor thickness to house piping & concrete components sizes. (Check if pipes are big, then propose technical gallery or drop beam in slab)
- 7. Overflow channel detail, skimmer detail, or gutter detail to be considered with civil & architectural design and their apparent parts.
- 8. Space of pool shoulders for deck accessories installation (Diving board, slide, ladders).
- 9. Technical gallery around the pool to access piping & electrical installation.
- 10. U.P.V.C. pipes are used (Withstands chemicals & even sea water) (Higher standards like PPR may be requested) – Avoid using galvanized piping.
- 11. Acoustic requirements: Concrete slab with anti-vibration pads and sound proofing if necessary (40 db (A) near living facility).
- 12. Dehumidifier for indoor pool with air sheet on glass windows to avoid mist and condensation on glass (Keep 40→60% relative humidity).

Pool Design

4. POOL DESIGN CALCULATIONS and EQUIPMENT SELECTION

* Pool Turn Over

- It is meant by this term the time during which the whole pool volume is circulated through the filtration system. i.e. If pool volume is 100 m3 , and turn-over is 5 hours, then filtration flow rate = 100m3/5hr = 20m3/ hr.

- As a good practice 4 full turn-over should be performed daily with public pools.

Hence : Filter m3/hr = Pool volume m3 / turn- over in hr.

As a general turn over guide.

Pool Design

• Type I	– Turn-over about 1 hour	CHILDREN POOL
• Type II	– Turn-over about 2 hours	BEGINNERS POOL and PUBLIC INDOOR POOL
• Type III	– Turn-over less than 4 hours	PUBLIC OUTDOOR POOL and SEMI-PUBLIC INDOOR POOL
• Type IV	– Turn-over less than 6 hours	SEMI-PUBLIC OUTDOOR POOL and RESIDENTIAL INDOOR POOL
• Type V	– Turn-over less than 8 hours	RESIDENTIAL OUTDOOR POOL

Pool Design

- Other parameters will surely affect this turn-over.

- As we know the nature of environment around the pool, power availability (24 hr ? Per day), set up time required, special client requests to clean pool quickly, high load of bathers.
- These factors will decrease the turn-over, a 20% safety factor is always favorable in our design.
- Here follows minimum turnover according to US standard (USPSHTC):

1. Private pools – twelve (12) hours or less.
2. Public pools – six (6) hours or less.
3. Wading pools – two (2) hours or less.
4. Private spas and hot tubs – one (1) hour or less.
5. Public spas and hot tubs – one-half (1/2) hour or less.

Pool Design

- *__Basic Equipment:__ *(Refer to treatment plant list)*

- Basket strainer & filter pump
- Filter, if semi-public or public pool always select filter with high side shell and coagulation treatment.
- (Two separate filters are recommended or at least standby pump. They are favored for more reliable system, and economy in tank size).
- Heat exchanger.
- Chlorine feeder or gas chlorinator.
- pH adjustment feeder.
- Ionizer is recommended for indoor pool to avoid smell.
- Main drains, floor inlets (or wall), vacuum fitting, etc…, refer to treatment plant. Also add maintenance kit.
- Electro – mechanical installation.

Pool Design

- ** Sizing of equipment*

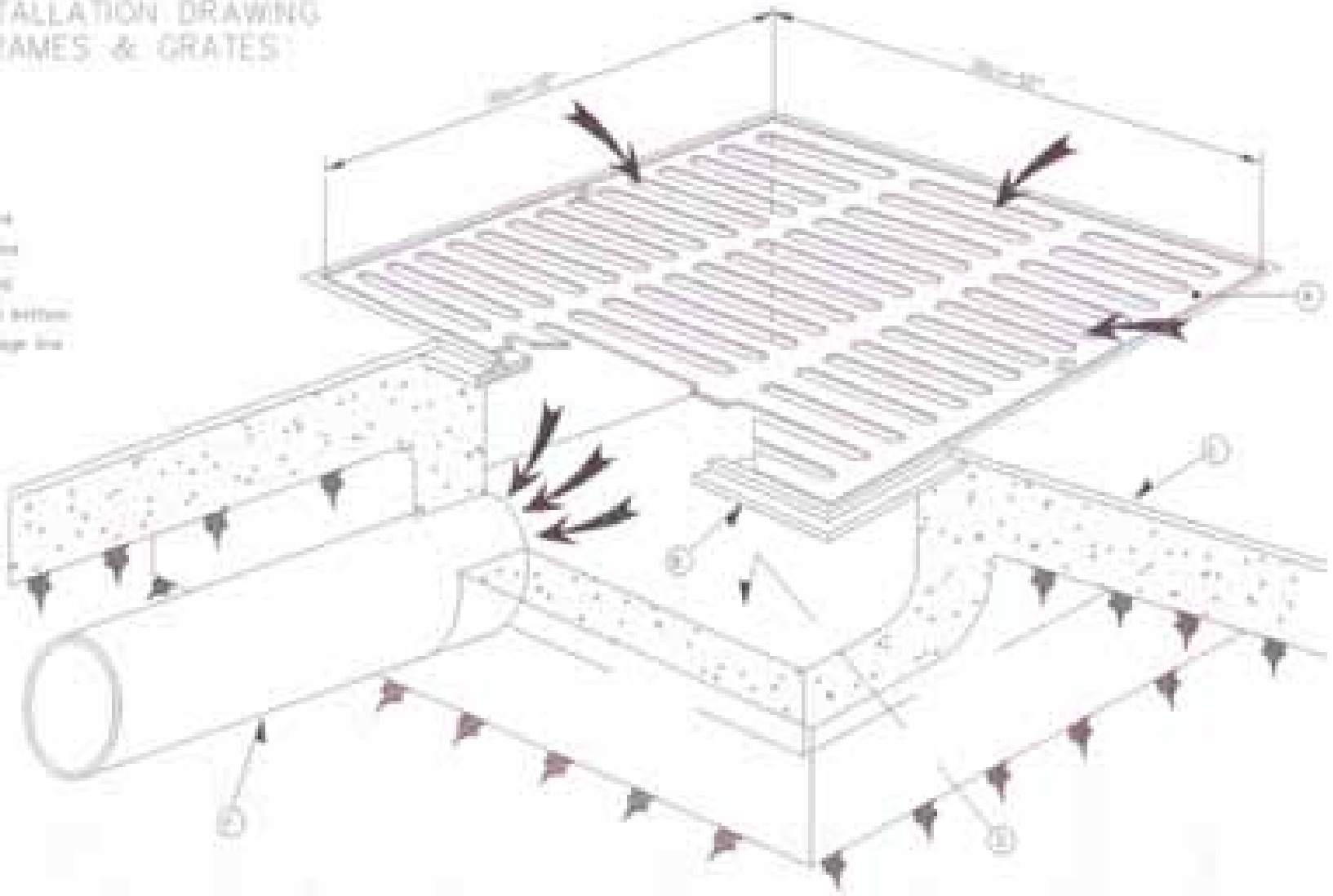
- Filter as per turn-over.
- Filter pump as per filter size.
- Heat exchanger (Always add 20% to boiler size & 20% to heat exchanger size). Check if fast heating is required. Caution about fast heating not to destroy tiles & joints, 1°C / hr is acceptable.
- Calculations of heat exchanger are based on 24 hrs set up time (Special design to be considered if faster heating is required).
- (Pool cover is recommended to save energy). (If over sizing of heat exchanger is required, we must check if filter pump can supply the needed water to be heated on its secondary i.e. pool side).
- Dosing pump with flow rate 1→4 lit /hr with solution tank 300 lit (Weekly fill of solution tank) depending on chlorine concentration. (Higher flow rate of dosing pump for bigger pool)
- pH adjustment, same for chlorine dosing pump .(Coagulant feeder also)
- Ionizer selected as per pool volume.
- Main drain or F & G rate selection

ED MAXIMUM FLOW RATES

Nominal Size	Flow Area (mm^2)	Max Flow (m^3/h)
6" Ø	16818	18
6" Ø	9069	10
6" Ø	11312	12
8" x 8"	25620	28
12" x 12"	53870	48
18" x 18"	113548	122
24" x 24"	139200	150

N.B.: FLOOR THICKNESS MUST BE 30 cm WHEREVER THERE IS MAIN DRAIN LINE.

INSTALLATION DRAWING FRAMES & GRATES



Pool Design

* ***Sizing of equipment (Continue)***

- We should drain the pool within 10→15 hrs.
  (Over size drainage pipe is not recommended to avoid excess flow to sump pit and consequent flooding).
- Each floor inlet 2” connection may deliver up to 10m3/hr. (5m3/hr is acceptable).
  due to lower head loss.
- Each wall inlet ½” opening ,but 2” connection may deliver up to 7 m3/hr (5 m3/hr is acceptable).
- Each vacuum fitting will cover around 80 m2 depending on vacuum hose length (A 10 meters hose covers 80 m2).
- Each UWL 300 Watt, 12V, will cover from 15 m2 to 25m2 surface area of the pool. DIN code limits area to 12 m^2.
- Each skimmer will take up to 7 m3/hr and maximum area coverage of 25m2 but we must cover all dead corners (Wind direction and pool shape affect this number).

Pool Design

* ***Sizing of equipment (Continue)***

N.B.: For skimmer pool

≅ 1/3 of filter flow rate to be drawn from surface

≅ 2/3 of filter flow rate to be drawn from bottom

Each gutter drain may take up to 5m3/hr with 2” connection. (Refer to manufacturer technical data for any of the above figures concerning all these fitting).

Pool Design Exercises:

Design exercise (Skimmer Pool)

Rectangular shape 12mx6m, Indoor pool, residential, depth 0.9m to 2.5m. Approximately 110m3 volume ,consider 6 hours turn over.

1. Filter flow rate 110/6 =18.3
   Add 20% ➔ 18.3 x 1.2 = 21.9 m3/hr ≅ 22 m3/hr.
   N.B.: Always take into consideration the weight of filter especially when we deal with slab not on ground i.e. Roof pool. (Big filters weigh 10 or 20 tons).

2. Filter pump as per filter flow rate @ 15 meter head based on the following calculations:
   Pres. drop in filter ≅ pressure drop 0.4 bar + (ΔP) 0.2 bar when dirty = 0.7 bar
   Pressure drop through heat exchanger ≅ 0.2 bar
   Static pressure ≅ 0 bar
   Pressure drop through piping network ≅ 0.3 bar
   Total pressure drop = 1.2 bar = 12 meter.
   Hence, select a pump 22m3/hr @ 15 meters head.

3. 1/3 of the flow through skimmer
   Then 22x1/3 = 7.3m3/hr ➔ select 2 skimmer

4. 2/3 of the flow through main drain. (For safety reason always assure that all the flow may be drawn from main drain) Then 22x2/3 = 14.6 m3/hr, then select 8”x8” frame & grate (Check main drain to empty the pool within 10→15 hrs). In our case 10 m3/hr is enough. So, we are covered.

5. 22m3/hr, (5 m3/hr each wall inlet) then 22/5 = 4.4. Then select 5 wall inlets.

6. One vacuum fitting with cover the whole pool area which is 72m2. Remember that each vacuum fitting can cover up to 80m2.

7. Area 20 m2 then 72 / 20 ≅ 3.6 so, select 4 underwater lights.

8. Optional 6’ diving board.

9. Two ladders. One with 2 steps at shallow area and another one at deep area with 4 steps.

10. Heat exchanger sizing

According to 1999 **ASHRAE** applications handbook. The following is an effective method for heating outdoor pools (Additional equations can be found in chapter 4.6 **ASHRAE** applications handbook).

The required heat exchanger out put qt can be determined by the following equations:

$q1 = p\ c\ p\ V\ (tf-ti) / Ø$

Where

q1 = pool heat-up rate. Btu/h.
p = density of water = 8.33 lb/gal
Cp = specific heat of water = 1.00 Btu/lb° F
V = pool volume, gal
tf = desired temperature (usually 80°F) ≅ 27°C
ti = initial temperature of pool. °F
Ø = pool heat –up time .h

$q2 = UA\ (tp-ta)$

Where

q2 = heat loss from pool surface. Btu/h
U = surface heat transfer coefficient = 10.5 Btu/h.ft2 °F
A = pool surface area. ft2
t p = pool temperature °F
t a = ambiant temperature . °F

$qt = q1+q2$

Hence, a volume of 110m3 ≅ 29000 gal.
If pool water temperature is 66°F ≅ 19°C.
Then q1 = 8.33x1x29000 (80-66)/24 ≅ 141000 Btus/hr.
q2 = 10.5x720 (80-71)/24 = 68000 Btus/hr.
qt = q1+ q2 = 141000+68000 = 209000 Btus/hr.

qtx1.2 = 209000x1.2 ≅ 251000 Btus/hr.

A heat exchanger with **251000 Btus/hr** should be selected .
A boiler with ≅ **300,000 Btus/hr** should be selected.
N.B.: After pool is heated, only losses are compensated. The heat exchanger will work at almost 40% of its capacity.

Type Type Typ	Boiler water flow Débit d'eau de chaudière Kesselwasser-durchflussmenge		Head loss Perte de charge Druckhöhen-verlust		Pool water flow Débit d'eau de piscine Beckenwasser-durchflussmenge		Head loss Perte de charge Druckhöhen-verlust		Heat transfer Transfert thermique Wärmeabgabe			Pool capacity Volume de piscine Beckenvolumen	
	m³/h	gal/h	kPa	lb/in²	m³/h	gal/h	kPa	lb/in²	kcal/h	kw	Btu/h	m³	gal
3705-3	0.72	156	1	0.15	2.90	625	1	0.15	129 00	15	50 000	23	5 000
3705-3	1.44	312	3	0.45	5.64	1 250	2	0.30	24 950	29	100 000	46	10 000
3705-3	2.16	468	7	1.04	8.52	1 875	5	0.75	37 900	44	150 000	68	15 000
3705-3	2.88	625	13	1.95	11.40	2 500	8	1.12	50 800	59	200 000	91	20 000
3706-2	3.60	782	2	0.30	14.16	3 125	5	0.75	62 800	73	250 000	114	25 000
3706-2	4.20	938	3	0.45	17.00	3 750	7	1.04	75 700	88	300 000	137	30 000
3707-2	5.70	1 250	2	0.30	22.80	5 000	7	1.04	100 700	117	400 000	182	40 000
3707-2	7.20	1 562	4	0.60	28.44	6 250	11	1.65	125 600	146	500 000	228	50 000
3708-2	9.90	2 188	4	0.60	39.60	8 750	8	1.12	176 400	205	700 000	319	70 000
3709-3	12.60	2 812	5	0.75	51.00	11 250	7	1.04	226 300	263	900 000	410	90 000
3709-3	15.60	3 438	7	1.04	62.40	13 750	10	1.50	279 600	325	1 100 000	500	110 000
3711-3	21.60	4 688	4	0.60	85.20	18 750	5	1.35	376 800	438	1 500 000	683	150 000
3711-3	28.50	6 250	7	1.04	114.00	25 000	15	2.25	503 300	585	2 000 000	910	200 000
3710-3	35.40	7 812	4	0.60	142.20	31 250	10	1.50	628 000	730	2 500 000	1138	250 000

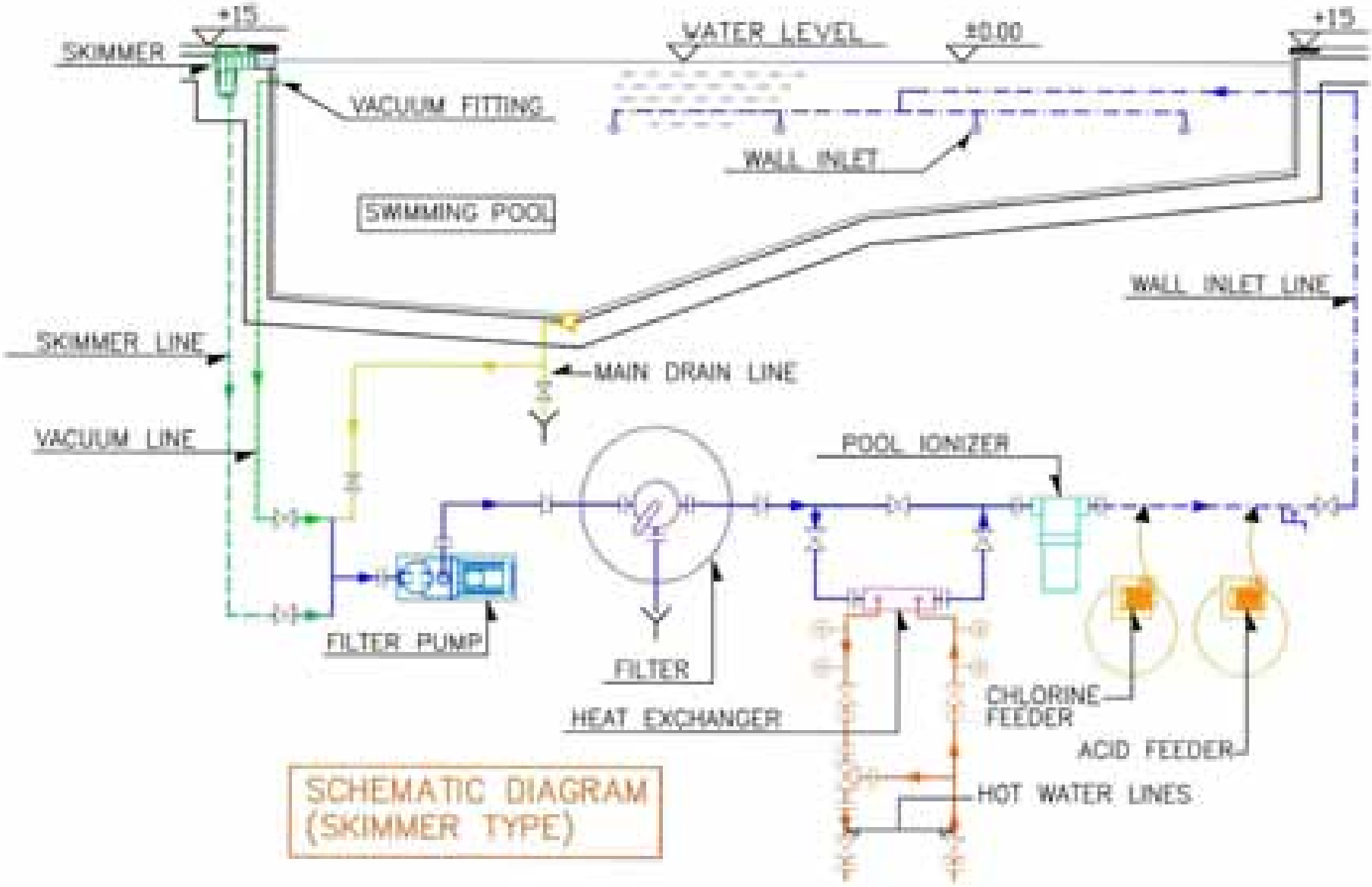
11. Select chlorine dosing pump 4 lit/hr and 300lit solution tank.

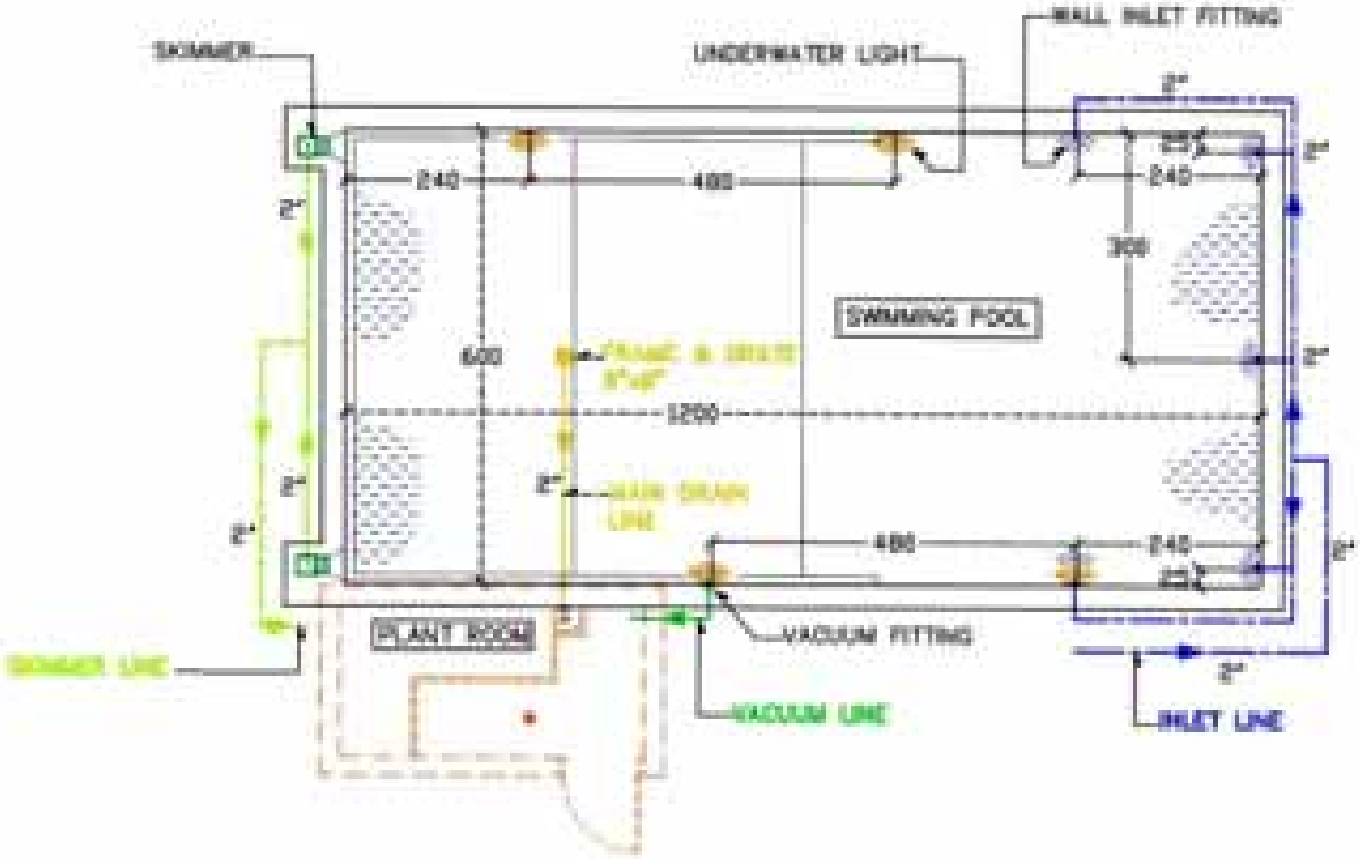
12. Ionizer may be optional matching the 110m3/hr volume.

13. Add up the space required by these equipment with all the requirements listed before.

14. 22m3/hr flow. Hence, 4" drainage pipe with sump pit is needed.

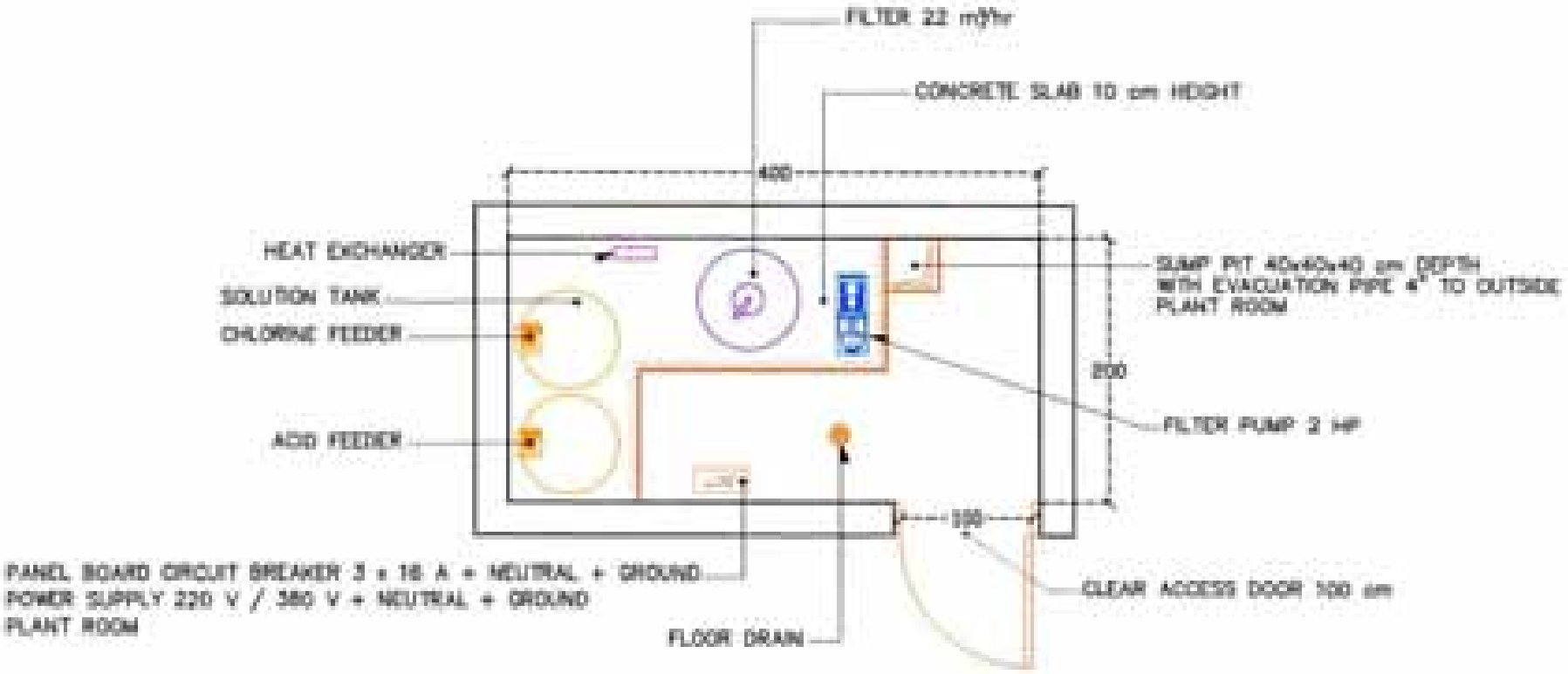
    The following layout of walls & floor network with pump room:


+15
SKIMMER
WATER LEVEL
±0.00
+15
VACUUM FITTING
WALL INLET
SWIMMING POOL
WALL INLET LINE
SKIMMER LINE
MAIN DRAIN LINE
VACUUM LINE
POOL IONIZER
FILTER PUMP
FILTER
HEAT EXCHANGER
CHLORINE FEEDER
ACID FEEDER
HOT WATER LINES
SCHEMATIC DIAGRAM (SKIMMER TYPE)



DECK POOL PLAN (SKIMMER TYPE)

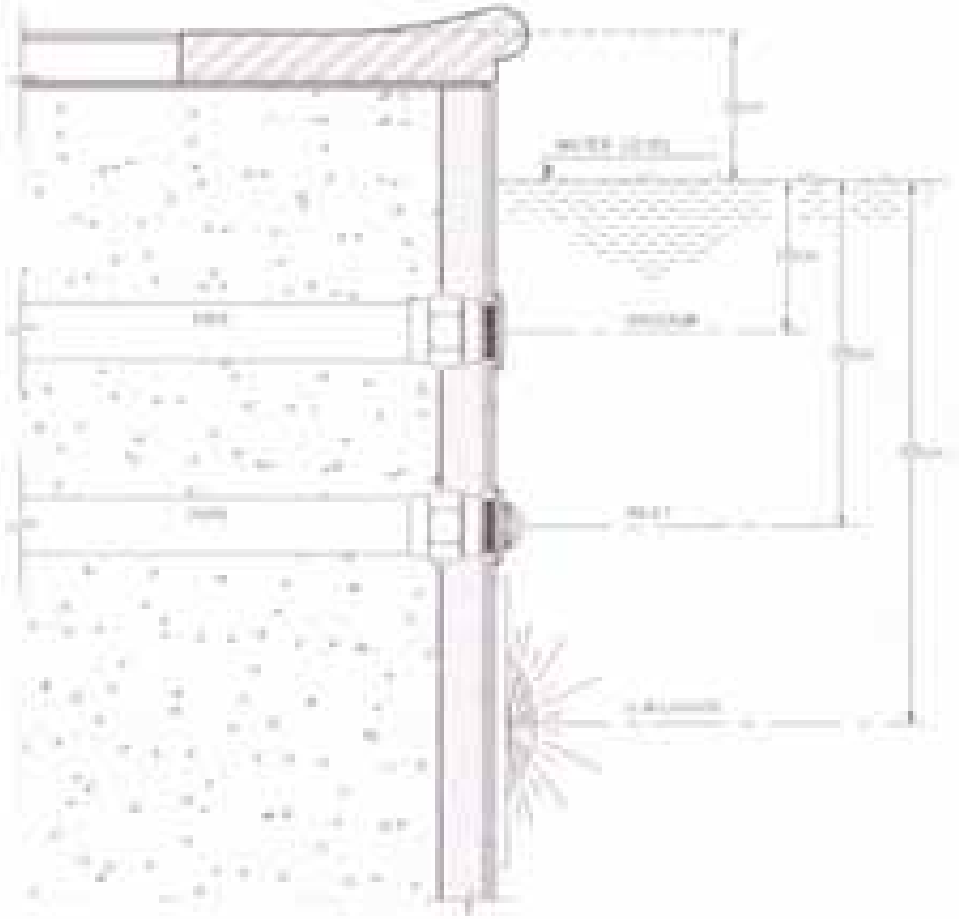
SCALE : 1/100 (DIMENSIONS IN CM)



PLANT ROOM PLAN (SKIMMER TYPE)

EQUIPMENT POSITIONING

SCALE : 1/50 (DIMENSIONS IN cm)



ACCESSORIES LEVEL

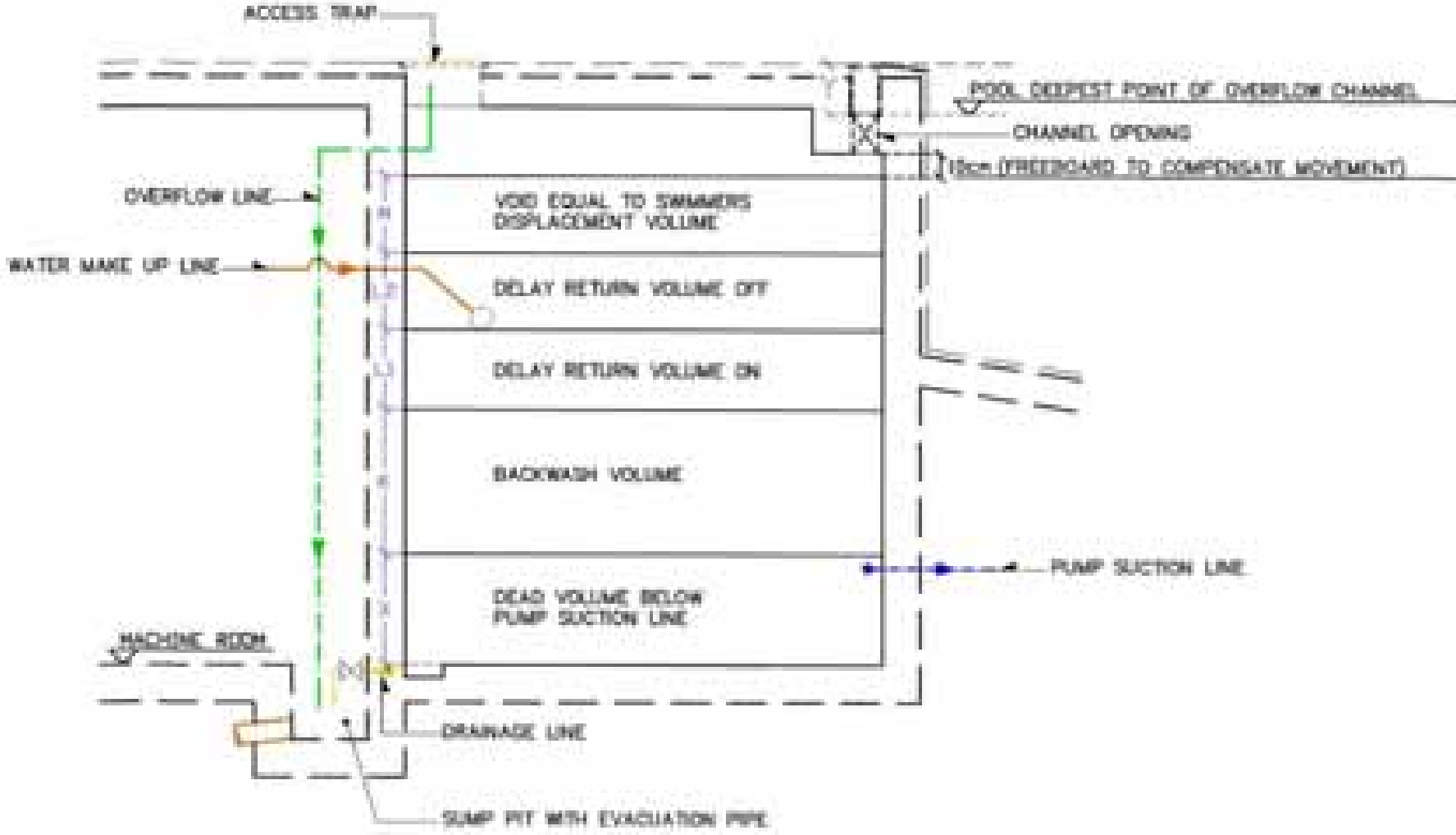
DESIGN EXERCISE (OVERFLOW TYPE POOL) (RESIDENTIAL 12X6M)

- **** Compensation tank sizing :***

The roll of compensation tank is to perform a buffer in the closed circuit of the treatment cycle.

This tank should have an effective volume equal to the following parameters:

1. Backwash water for the filter = 10 minutes of the filter service flow rate.
2. Displacement of the swimmers volume.
3. Delay return volume during ON-OFF of filter pump.
4. Free board and unused volume i.e. dead volume.



COMPENSATION TANK CALCULATION

Minimum height of **X** is 20cm to avoid sucking dirt precipitated at the tank bottom.

X : Is decided on with respect to the height of the pump and basket strainers. It may reach 90cm when we install 8" strainer. This is why the tank bottom should be at the same level as the machine room and never be lower, since we will be increasing the dead volume.

The sump pit should be lower than the bottom of this tank to completely drain the tank. A small pit inside this tank is recommended for better drainage and cleaning.

K : Consider a filter with 22m3/hr flow rate, then the backwash volume is 22 ÷ 6 ≅ 3700lit (10 min duration for backwash and rinse)

(If two filters are used we consider only one filter backwash to save volume). In some critical cases where area on roof is not available we can use an auxiliary higher tank for backwash.

L1: Delay return volume ON. When filter pump is ON the mechanical float is lowered and this delay return volume is sent to the pool. During operation, this float will fill this empty volume. Upon stopping the pump, this volume is returned back to tank above the mechanical float level.

This volume is calculated by estimating the travel time spent until water starts to reach back the compensation tank after overflowing into the overflow channel.

A rough figure of about 1 to 3 minutes of the filter flow rate could be considered. If we deal with 22m3/hr. Then 22m3/hr ÷ 60 minutes = 0.37 m3 ⇒ in 2 minutes.

A volume of 0.37x2 = 0.74 m3 is the delay return volume.
Note that **L1 = L2**

M : Void equal to swimmers displacement volume.
Calculate the area of the pool where depth is less than 1.5m then divide by 1.5m2. (The maximum bathing load in the shallow area of the pool is 1 swimmer per 1.5m2).
Then consider that 75% of the swimmer volume is submerged, where the volume of each swimmer is about 60 lit.
As a result, multiply the number of swimmers x 75% x 60lit = volume displaced in shallow area.

Then calculate the area deeper than 1.5 meter and divide by 2.5 m2 (The maximum bathing load in deep area is 2.5m2 per swimmer).
Consider 90% submerged of each swimmer.

Hence, multiply number of swimmers x 90% x 60 lit = displaced volume in deep area. Add both displacement volumes to get the total displacement volume. These calculations are run for public pool, since in residential small pool this volume is not considerable.

Example: 50mx25m pool (Olympic pool).

- 50 x 12.5 = 625 m2 shallow area.
  625 ÷ 1.5 ≅ 417 swimmers.
  417 x 0.75 x 60 lit = 18,765 lit ≅ 19m3 displaced volume

- 50 x 12.5 = 625 m2 deep area
  625 ÷ 2.5 = 250 swimmers.
  250 x 0.9 x 60 = 13,500 lit ≅ 14m3 displaced volume

Hence, displaced volume is 19+14 = 33m3

Y : Pool channel deepest point. It varies between 20 to 70 cm depending on the pool size and slope of channel.

* Over Flow Channel Sizing :

Standard plastic grid is 25 cm width. Then 20cm width of the overflow channel is considered.
A slope 0.5% to 1% is recommended.

Even if we enlarge the size of channel width, the slope should be respected to avoid precipitation of dirt and stagnant water in this channel.

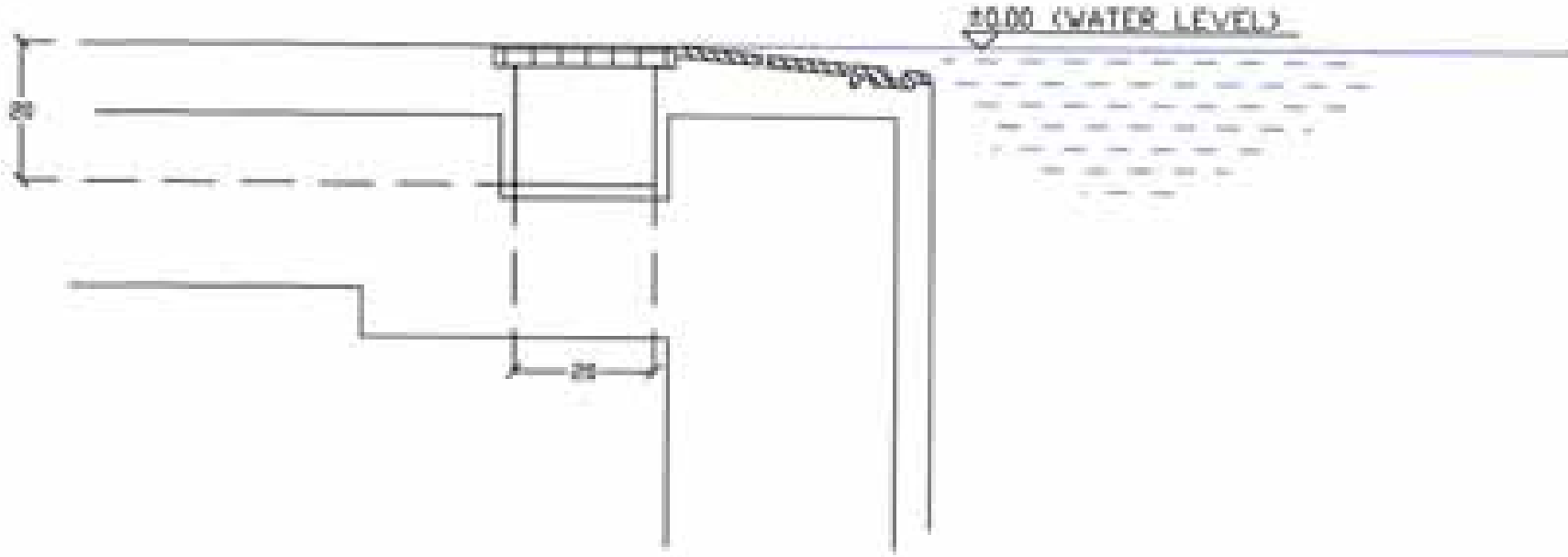
The channel is divided into two parts and sloping for each side from the shallowest point towards the compensation tank.

To avoid flooding of this channel during wave movement of swimmers, always start with 20cm deep in the shallowest point and apply 0.5% to 1% slope.

Openings in channel directly into the compensation tank are recommended to avoid using pipes , where friction loss in channel may apply **Manning formula** where square shape channel mainly used for sewage with ½ filled pipes, while **William Hazen** formula is applied with pipes. (Avoid vertical drop pipe into compensation tank to avoid Vortex, always install side drain pipes).

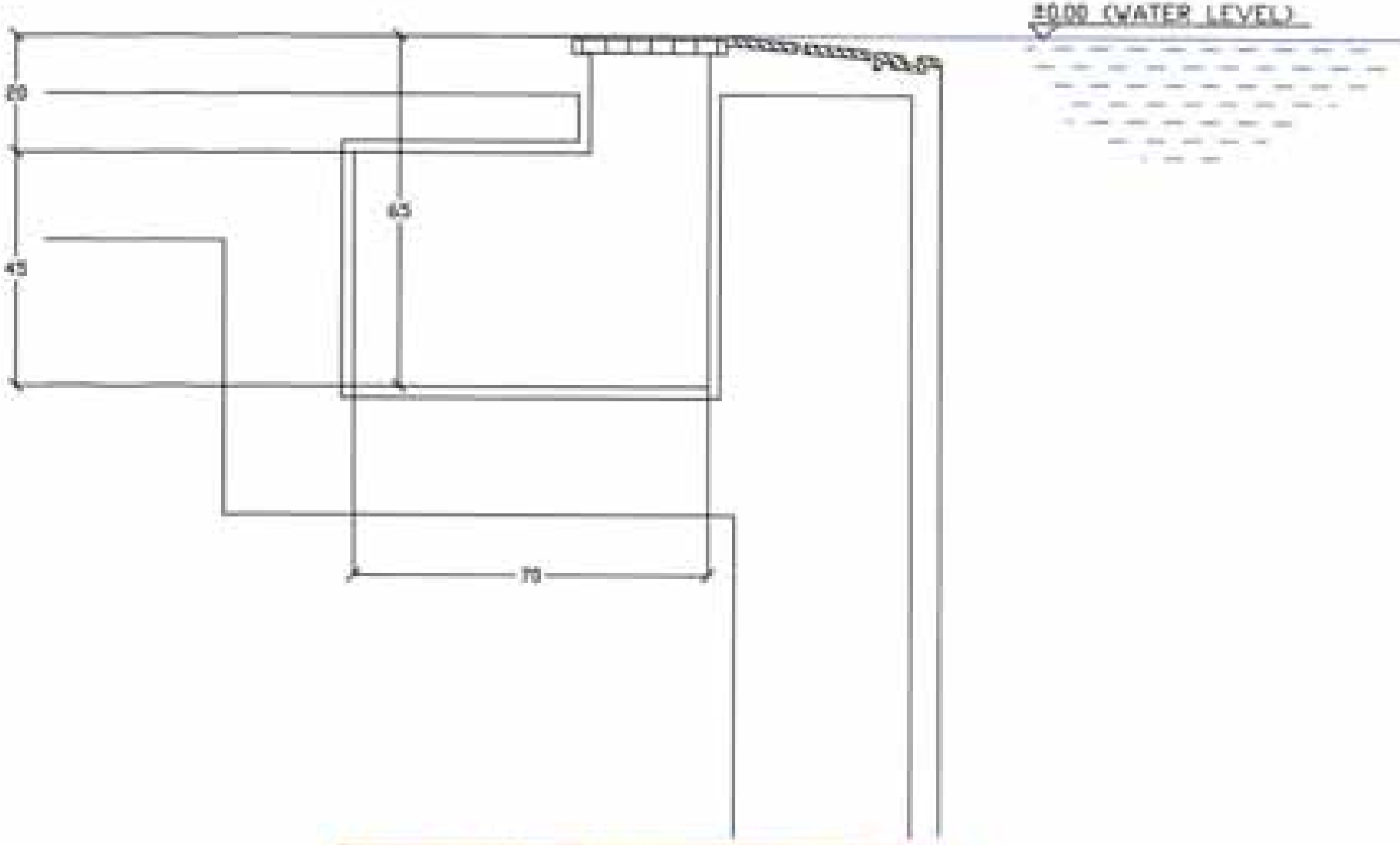
Although the flow overflowing into the channel is divided into ½, we must consider almost all the full flow on each side due to irregularities and error in tiling edge and also due to wind factor which may direct all the flow into one section of the channel.
An approximate rough figure 0.15 → 0.2m3/hr*cm2 could be considered.

Hence, for residential pool up to 160 m2 area apply one depth pattern.



OVERFLOW CHANNEL (SECTION)
NORMAL PATTERN

Where in public pool, due to more flow because of lower turn - over apply wider Pattern overflow channel.



OVERFLOW CHANNEL (SECTION)
WIDE PATTERN

Example #1 : If we have 22m3/hr filter, and we apply 1% slope.

Our pool is 12x6, each running length of the channel is 12+6 = 18 meters, then 18 cm slope is needed. So, 20cm (Start depth) +18cm (Slope depth) = 38cm at its deepest point.

If we check flow rate and apply 0.15m3/cm2* hr.

We have 20 cm channel width, i.e. 18x20=360 cm2
Thus, this channel can accept on each side 360cm2 x 0.15m3/cm2xhr = 54m3/hr

.

We only have 22m3/hr maximum flow.

Our design is OK (Due to 1% slope we have enough depth).

The big size of channel width as 20cm is also needed for easy cleaning

Example #2: Olympic pool, 50x25cm, filtration rate 600 m3/hr.

Each side of channel is 75 meters.

If we start with 20cm depth & apply 0.7% slope, then the deepest point is 75x0.6+20 ≅ 65 cm depth.
(Recommended slope is 1 to 2 % USPSHTC).

But, if we only consider 20cm width, then available area is 45cmx20 = 900cm2 (We cannot use the first 20cm to avoid flooding)

900cm2 x 0.2 m3/cm2xhr = 180m3/hr.
But we have 600m3/hr.

So, we have to use the wide pattern overflow channel. Consider 70cm wide channel.
We have an available area of channel 70cm (Width) x 45cm (Depth) = 3150 cm2.

So, 3150 cm2 x 0.2 m3/ cm2xhr = 630 m3/hr.

Then, our channel can take all the flow rate which is 600m3/hr in one side only.

Hence, our design for the ***overflow pool 12x6m*** will be as follows:

1. Filter flow rate 22 m3/hr (Same as skimmer type) & pump (Same as skimmer type).

2. Tank size:

Backwash volume : (22 ÷ 60 min) x 10 min = 3700 lit

Displaced volume of swimmers ≅ 600 lit
(Since residential, 10 people ≅ 600 lit).

Volume of delay ON-OFF
2 minutes, (22 ÷ 60) x 2 ≅ 700 lit
700lit x 2 = 1400 lit.

Then, a utility volume of 3700+600+1400=5700 lit.
If the tank height is 3 meters.
We loose 40cm dead height and 60+10cm from overflow channel.
So, we loose 40+70=110cm of the 300cm height.

A net utility height of **1.9m** is left.
5.7m3 ÷ 1.9m ≅ 3m2 area of the tank is needed.
A 3x1.5 m2 tank in our design is more than enough.
(More reserve in residential pool compensation tank is favored during summer time & water shortage where immediate refill is not always available) .

3. Floor inlets: 22 ÷ 5 ≅ 5 inlets.

4. One vacuum fitting.

5. 4 Underwater lights.

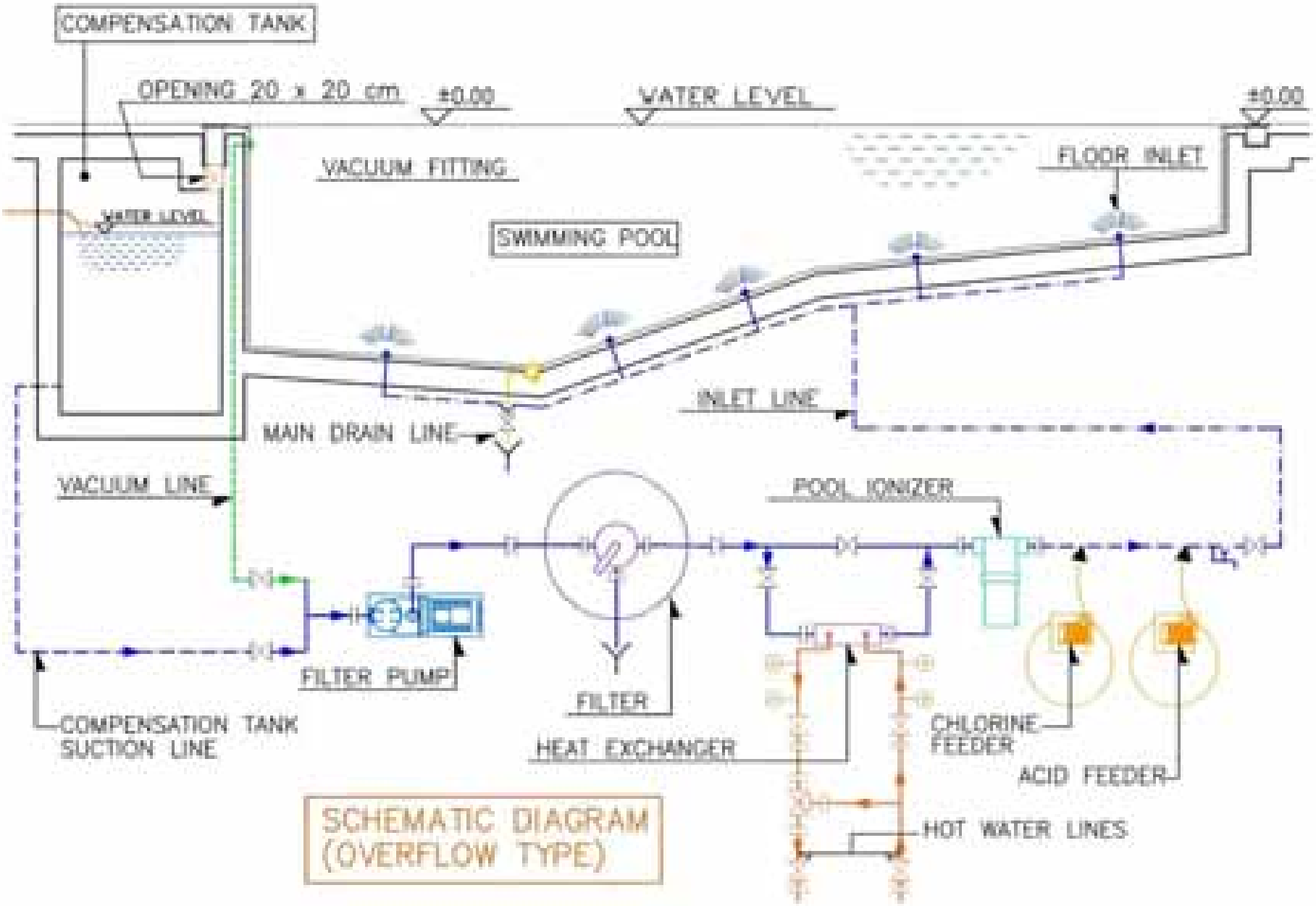
6. Optional 6’ diving board.

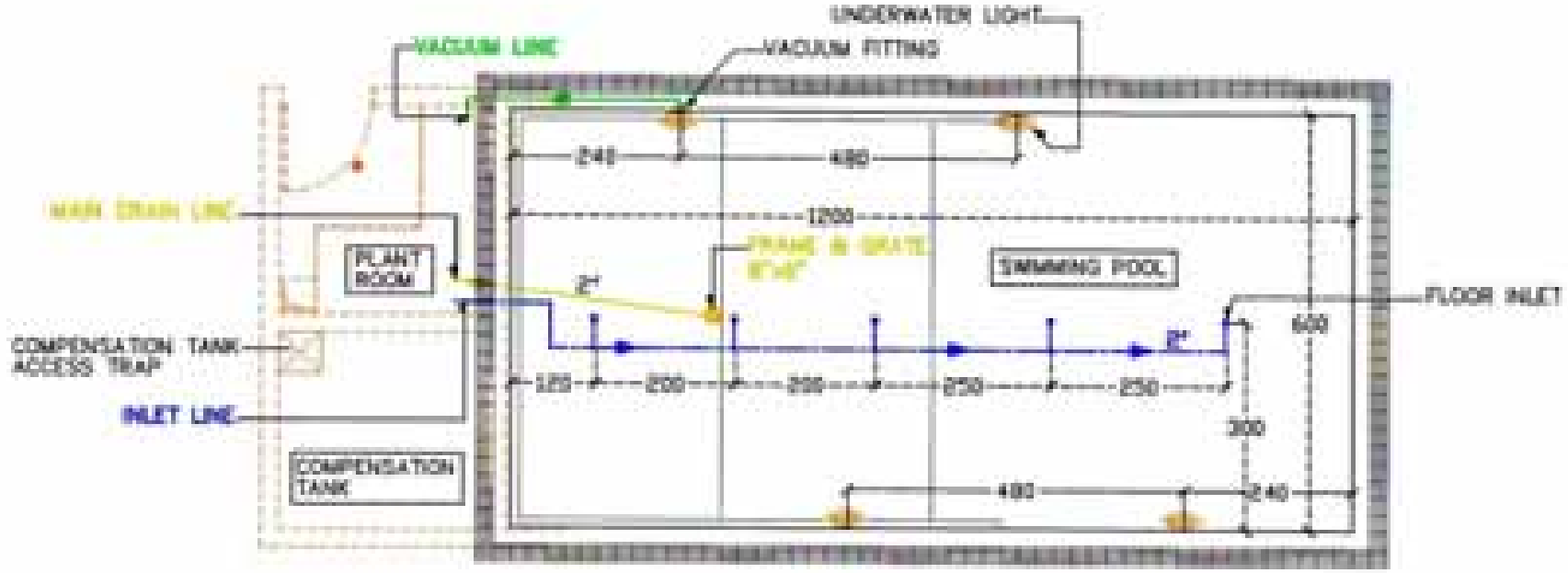
7. Two ladders : 4 steps, 2 steps wide type to cross the channel.

8. Heat exchanger, same calculation as skimmer type.

Accordingly, here is the final layout of our design.

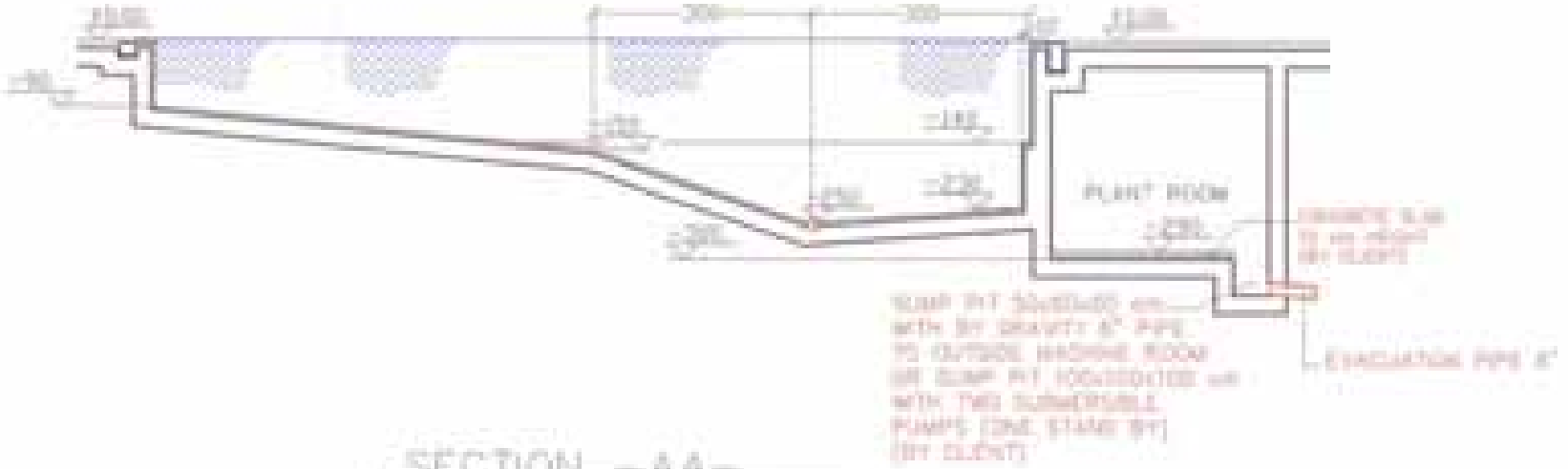
NB: Heat pump can also be considered if boiler system is not installed or existing with limited capacity.


COMPENSATION TANK
OPENING 20 x 20 cm
±0.00
WATER LEVEL
±0.00
VACUUM FITTING
FLOOR INLET
WATER LEVEL
SWIMMING POOL
INLET LINE
MAIN DRAIN LINE
VACUUM LINE
POOL IONIZER
FILTER PUMP
FILTER
COMPENSATION TANK
SUCTION LINE
HEAT EXCHANGER
CHLORINE
FEEDER
ACID FEEDER
HOT WATER LINES
SCHEMATIC DIAGRAM
(OVERFLOW TYPE)



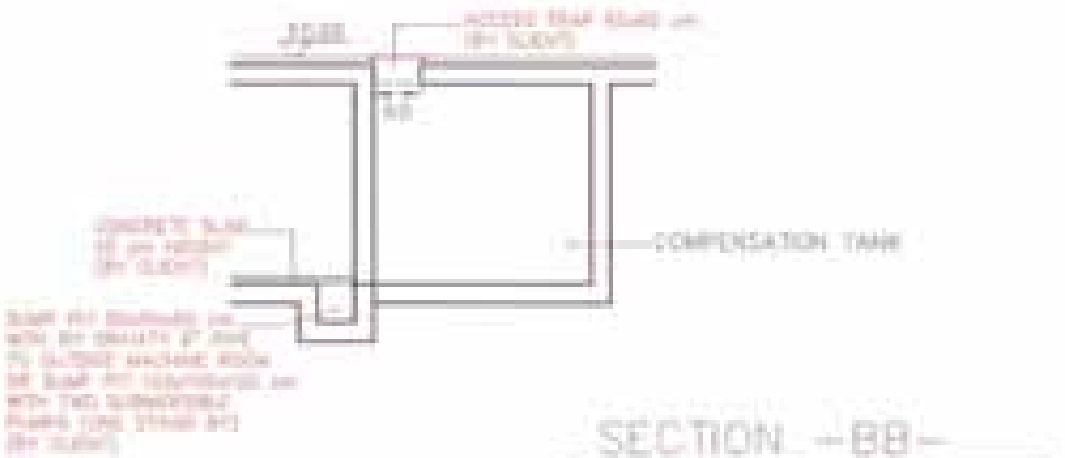
DECK POOL PLAN (OVERFLOW TYPE)

SCALE : 1/100 (DIMENSIONS IN CM)



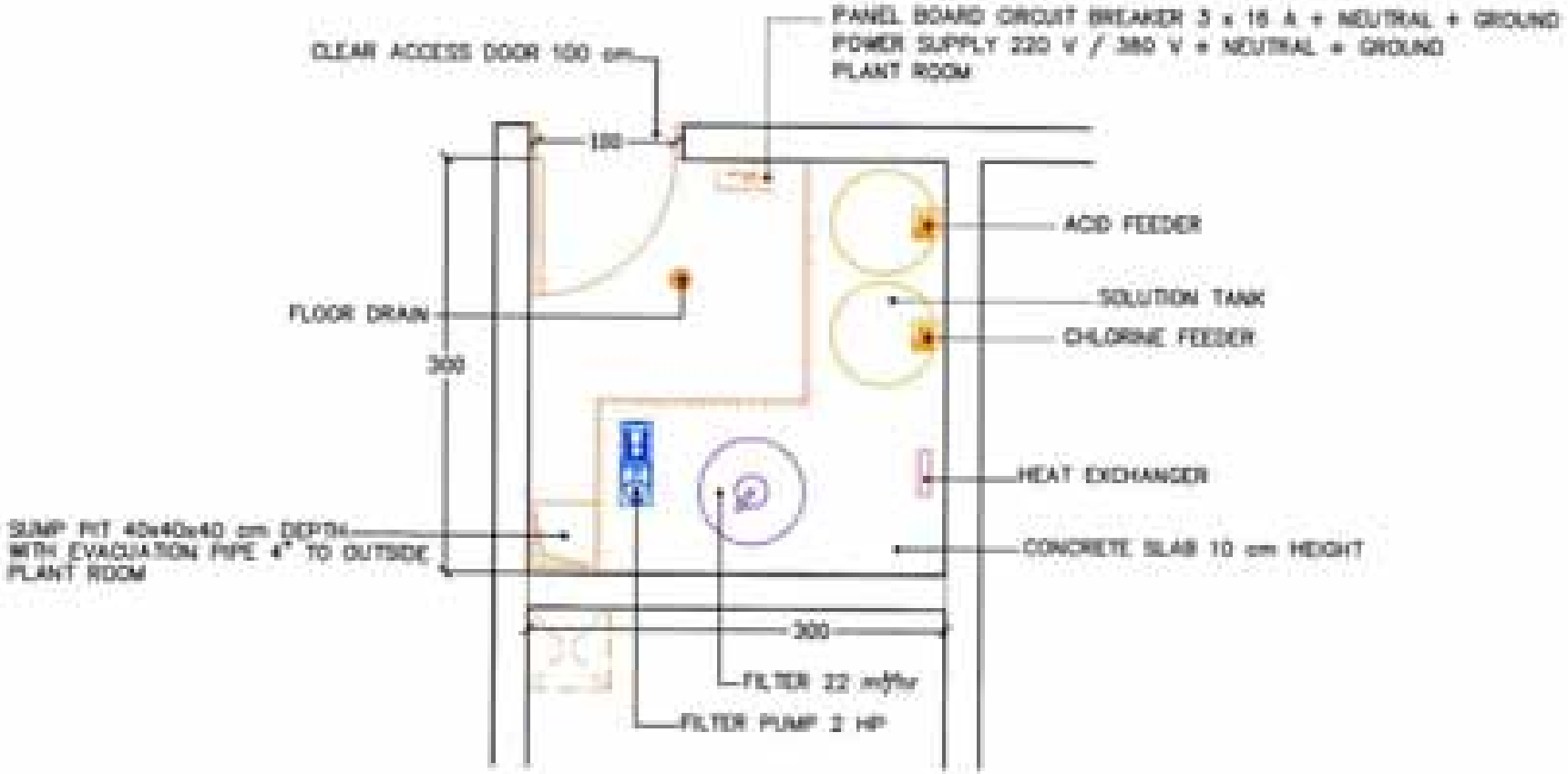
SECTION –AA–

SCALE : 1/100 (DIMENSIONS IN CM)



SECTION –BB–

SCALE : 1/100 (DIMENSIONS IN CM)

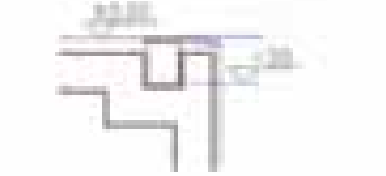


PLANT ROOM PLAN (OVERFLOW TYPE)

EQUIPMENT POSITIONING

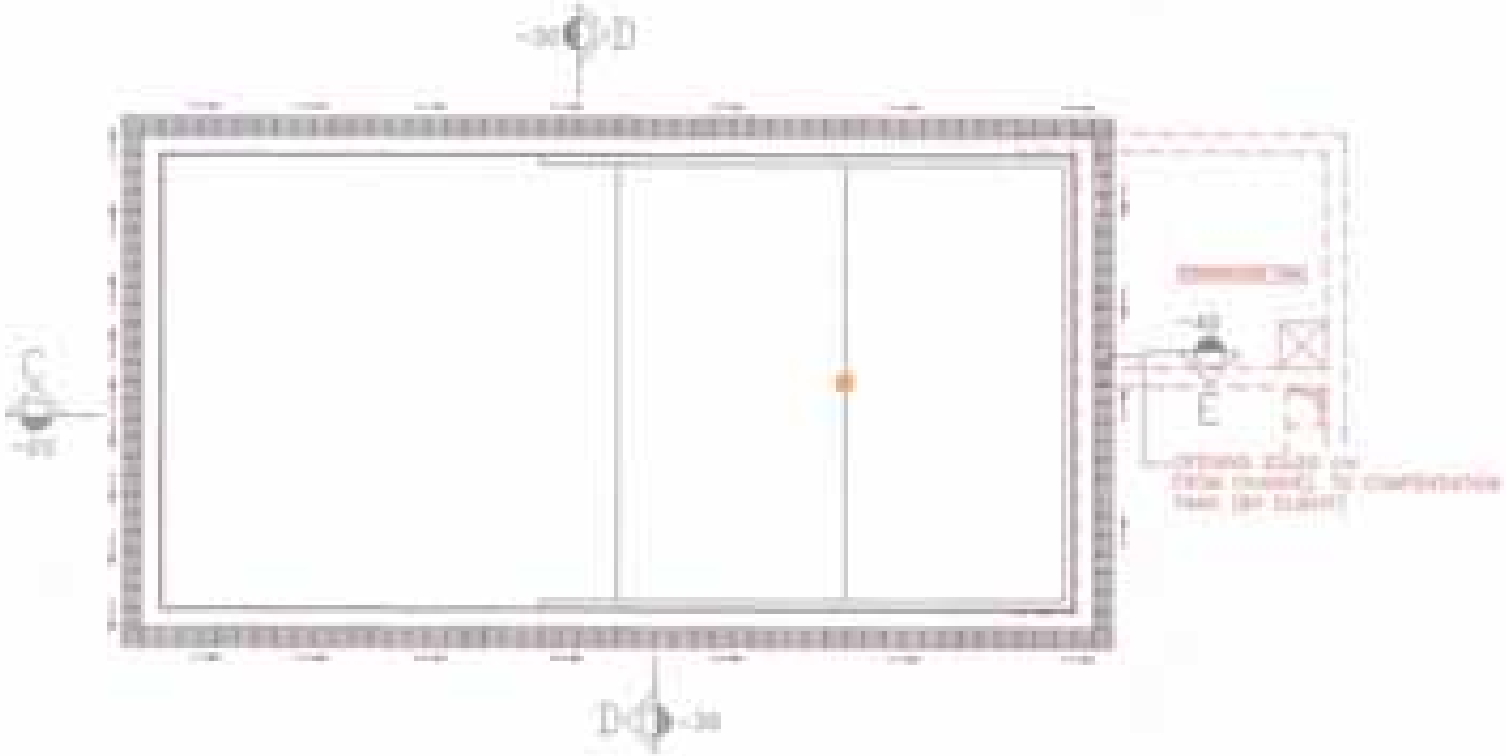
SCALE : 1/50 (DIMENSIONS IN CM)

SECTION -C-

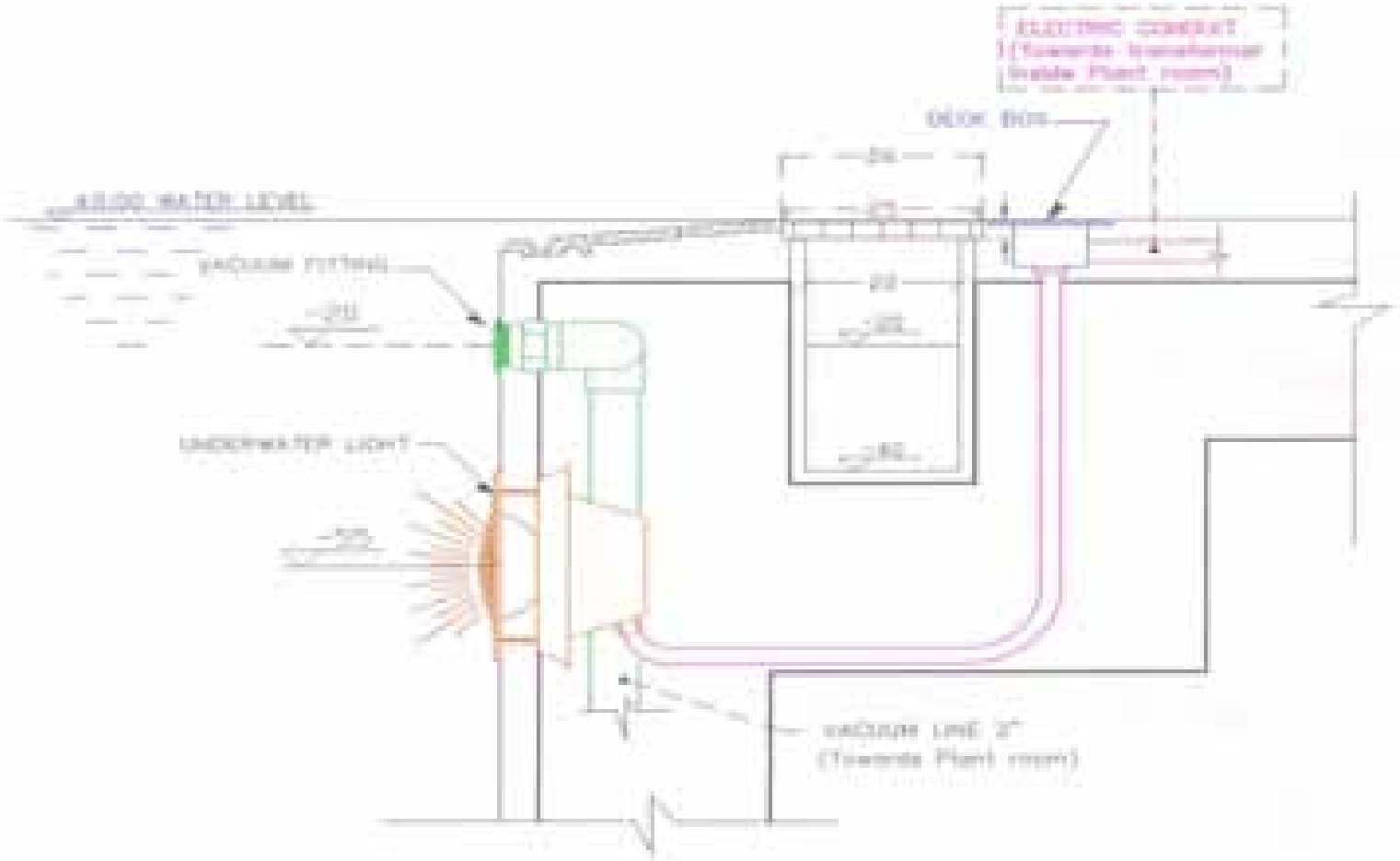


SECTION -D-

SECTION -E-



OVERFLOW CHANNEL



ACCESSORIES LEVEL

(SECTION)

VACUUM FITTING

UNDERWATER LIGHT

SCALE: 1/10 (DIMENSIONS IN CM)

P.33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tour d'horizo
diverses tech
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construire une p
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sant le béton armé
frage extérieur perdu.
étapes d'un chantier o
mené par la société Martin Pis


WE MAKE WATER FUN!

JACUZZI (SPA) DESIGN

Originating from the Japanese bathing where air mixed with water creates a velocity turbulent stream of tingling, oxygen rich water, invigorating, relaxing, healthful and fun . It is some times called hydro-therapy when used to treat some patients cases.

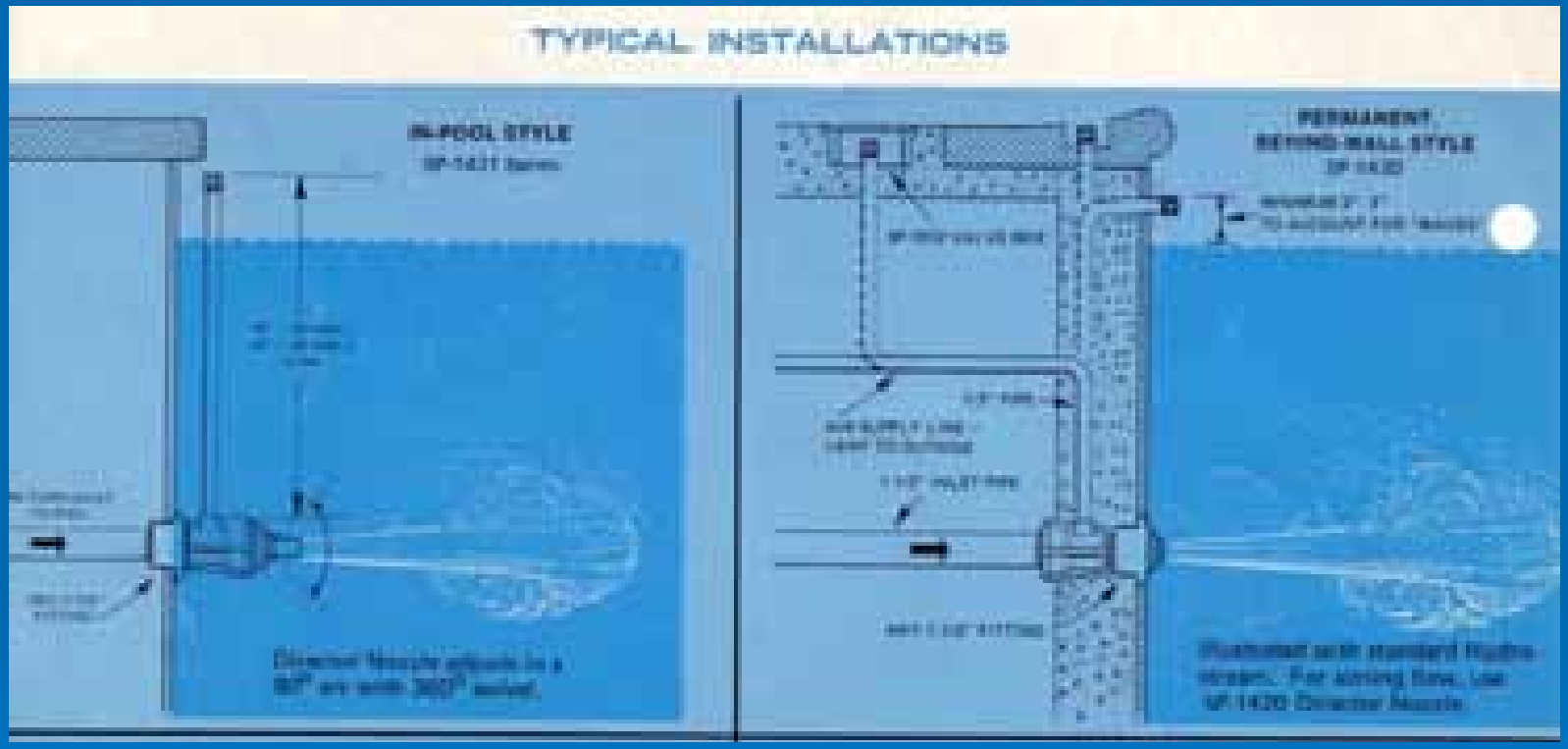
First we have to treat the water same as we do in normal pool but with ***turn-over 20 minutes***, due to the heavy bathers load in a very small volume.

Jacuzzi is normally heated 32°C → 35°C (Maximum 40°C) for a better relaxing water.

An independent pump is used to circulate the water and send it through a jet air fitting where water is mixed inside this piece before entering the Jacuzzi.

Normally, we use such a fitting one on our back and one on our feet level.

The depth of the Jacuzzi tub is 90cm water depth. 50cm for upper bench part and 40cm for the lower part creating or simulating normal seat use.


TYPICAL INSTALLATIONS
IN-POOL STYLE
PERMANENT
BEHIND-WALL STYLE

In designing a Jacuzzi we should allow 80cm distance space between bathers. Also, consider a way in through stairs or through a ladder.

Each jet air fitting needs about 5.7m3/hr (25GPM) at 1.5 bar at its entry so increase to 3.5 bar to compensate the losses in network and air controller. (Especially when dealing with concrete poured Jacuzzi where there are too many elbows and losses due to deviation from typical correct installation).

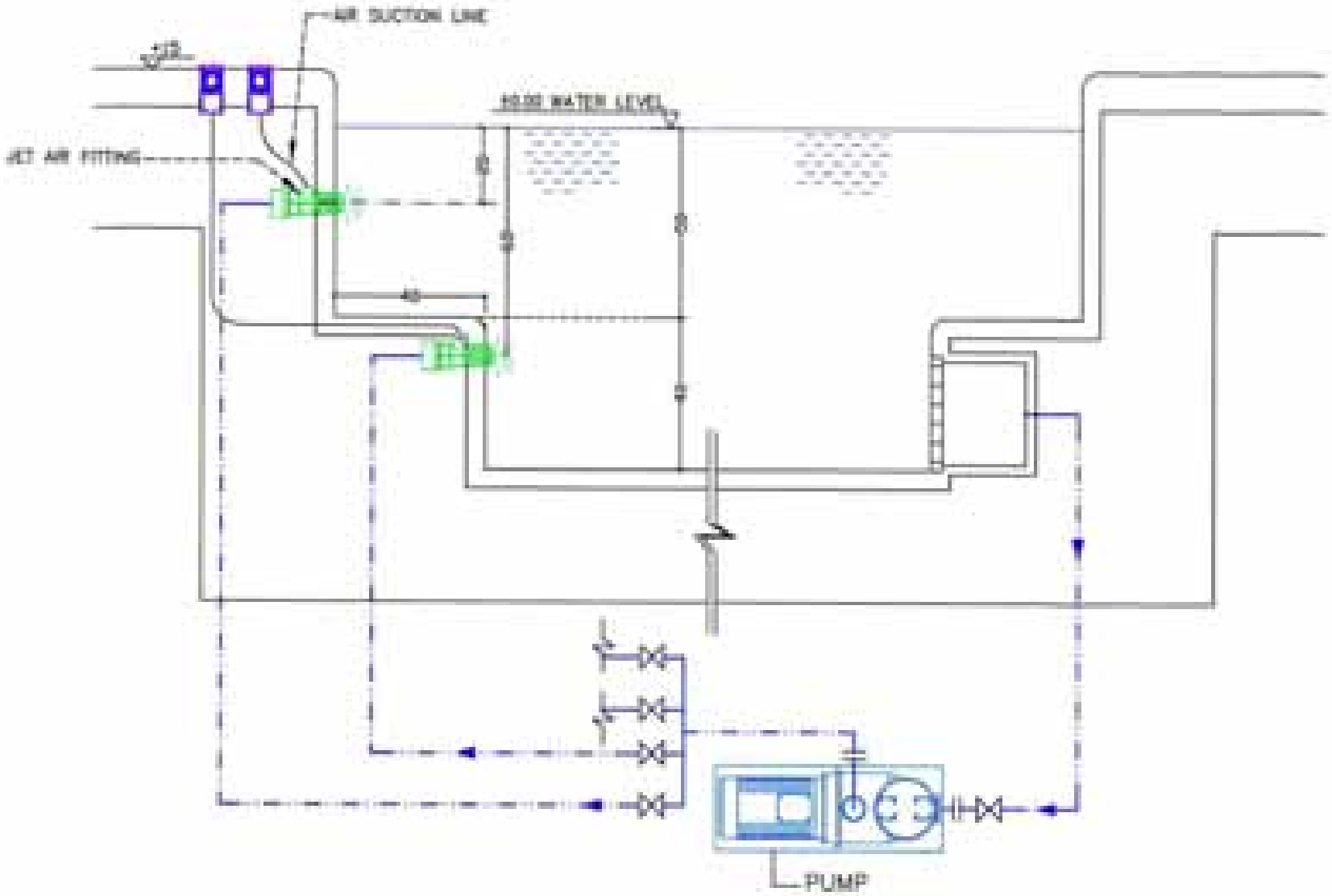
Hence, each bather needs 2 jets one for back, one for leg.
The jet air fitting also has an air controller to reduce noise of air being sucked and also to control the quantity of air to be pushed and mixed with water in such a way lower or higher impact massage is achieved.
This bubbling effect being created by these jets reduces the tension of the bather and relieves any aching muscles.

In other word, we can benefit from Jacuzzi in many different ways. In some residential pools, the Jacuzzi is built as part of the pool body where cost of extra filtration plant is saved.

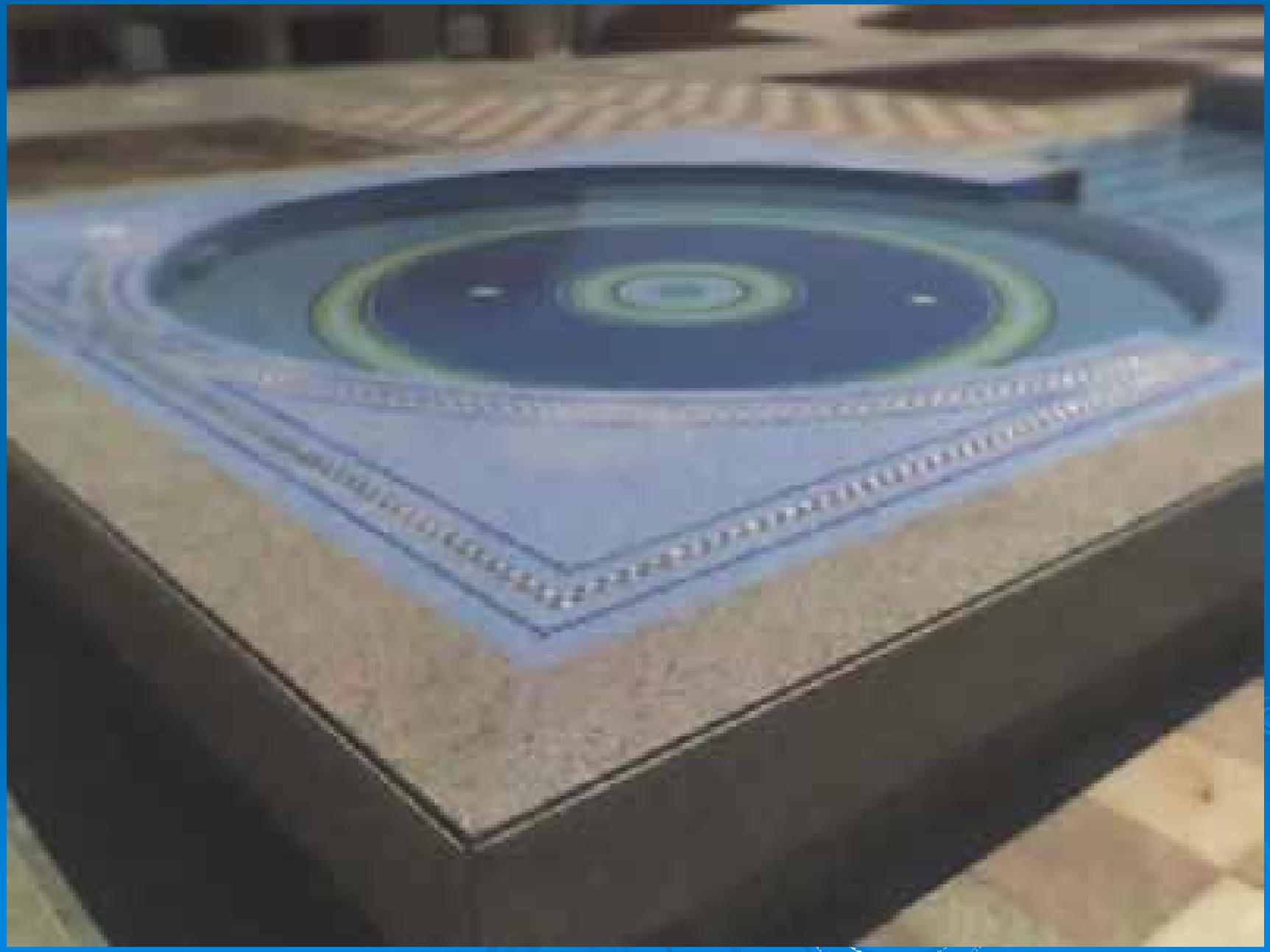
In public use, it is always recommended to built Jacuzzi independent from other pools.

As for water quality, Jacuzzi is recommended to be emptied much more frequent than public pool. Once a week is a good practice depending on the load of bathers where the operator of this Jacuzzi can decide on that accordingly.

Once we have big Jacuzzi where bathers are 6 or more, it is better to use two pumps instead of one to supply water for jets (Economy of power and more reliable). Especially when bathers number is fluctuating during the service hours.



JACUZZI SCHEMATIC DIAGRAM



EXERCISE JACUZZI DESIGN (SKIMMER TYPE)

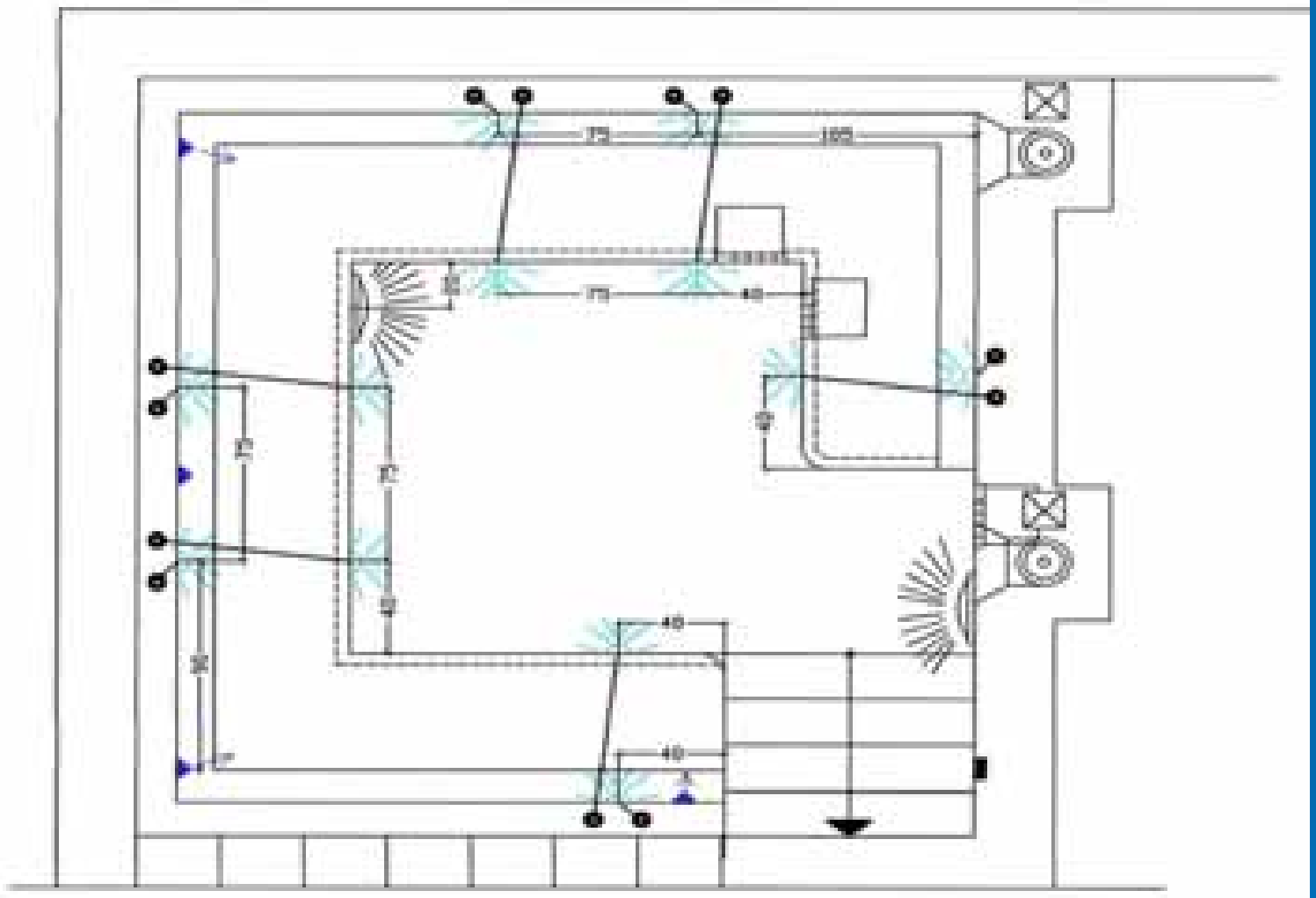
Consider a 3x3m Jacuzzi, 90cm water depth.

We can fit 6 people in this Jacuzzi .

Hence, 12 jets are used, 6 jets from each pump (Two pumps are used).

Each pump should deliver 5.7m3/hr x 6 ≅ 34m3/hr @ 3.5 bar.

So ,we can distribute the jets as follows:



JACUZZI LAYOUT

N.B.: We should apply all the requirements for the pool and all the equipment needed for a pool but with ***20 minutes*** turn over.

We can use smaller skimmer where free board could be 10cm instead of 15cm but we have to consider the backwash volume which could empty the Jacuzzi.

Hence, in public use using skimmer type Jacuzzi, it is better to have an independent source for backwash volume, or we can use the Jacuzzi volume and consider that as part of emptying it on weekly basis.

This cleaning process to be done after service hours ,to allow setup time for filtration ,and heating.

- SPA Equipment can be added to Spa to create more variety of water/air treatment equipment such as:

- Water canon, or water curtain (shoulder, neck and back massage).
- Air pad (Air in 50x25cm pad).
- Air lounger (Air in bed shape).
- Counter current equipment (Air with water).
- Floor jet (Air with water).

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acrylair

AIR BUBBLE SYSTEMS

rio bubbler

rio bubbler:
Pearls, nothing but pearls!

Dip into a pool full of pearls. Relax and enjoy the tingling sensation of water and air pearl-baths.

fluvo offers the air bubbler in ivory white. Of course, any colour of your desire is at ***fluvo's*** command.

And what about the hotel pool? Your guests expect more than a pool filled with water!

With *fluvo* rio you can offer your guests the best in pleasurable bathing!

Technical data

PVC air bubbler
white, RAL 9010
250 x 500 mm
airflow: 72 m³/h
electrical performance: 1,3 kW

Water Jets

rio floor jet

rio floor jet:
a truly bubbly pleasure!

Whether a foot/leg massage or a back/shoulder/neck massage **the rio floor** jet provides energy from the deep!

Rising currents of bubbly, air-filled pearls enliven your body and soul!

Equally suited to hotel pools, the fluvo rio is that extra attraction to entice and delight guests and swimmers alike.

Technical data

PVC multihole nozzle
white, RAL 9010

diameter	200 mm
water jet flow	48 m³/h
electrical performance	1.9 kW


Hydrothe
Water, a pow

CASCADE & FOUNTAIN DESIGN

Cascade can be built either independent or as part of the swimming pool.

The following factors should be taken into consideration while selecting the fountain nozzles and cascade water effect:

1. Location (Indoor or outdoor) to check dirt load.
2. Wind factors to select appropriate nozzle or to make a thicker water sheet.

3. Diameter of basin. Limit of nozzle height.
4. Depth of basin. Limit of nozzle fitting and also to avoid suction / vortex if shallow.

5. Buffer introduction to reduce wave and reflective wave especially with water dependent nozzles.
6. Height of cascade and reject span to avoid splash outside the hit area.

7. Underwater light, vertical illumination and horizontal illumination.
8. Filtration system of pool could also be applied here but **1 hour** turn over to be considered as a good practice.

   If we deal with an indoor fountain and clean atmosphere, this 1 hour turn over could be raised to 2 or even 4 hours.
   The reason for low turn over is due to the movement of water which implies more water surface contact with air and consequently more dirt collection.

There are plenty of nozzles types that could be water dependent or water independent. Also they are rated as good, fair, or week wind resistance.

Each nozzle has a spread diameter i.e. a circular hit shape.

As for minimum basin diameter, it should be twice as much as the nozzle spray height.

If we have 3 meters diameter basin, then the maximum height of nozzle is 1.5 meter, especially those water dependent nozzles which are affected by waves and reflective waves.

If we do not consider any parameter of the above mentioned our fountain will not function properly.

A water depth of 50cm to 60cm is acceptable for both fountain and water mirror basin.

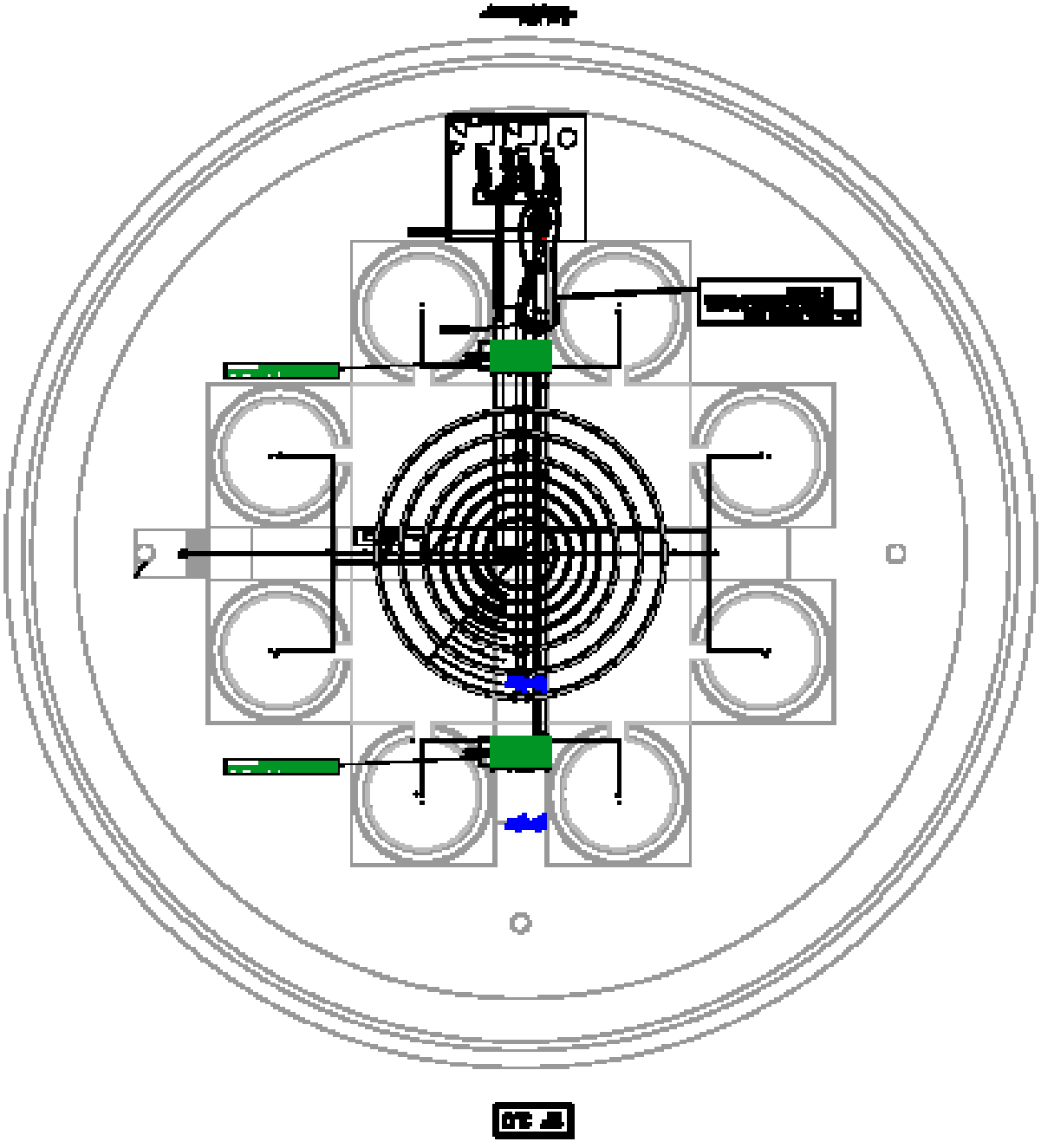
Closed circuit flow from and to the basin can be used to supply nozzles i.e. we can draw water from the basin itself same as Jacuzzi jet pump.

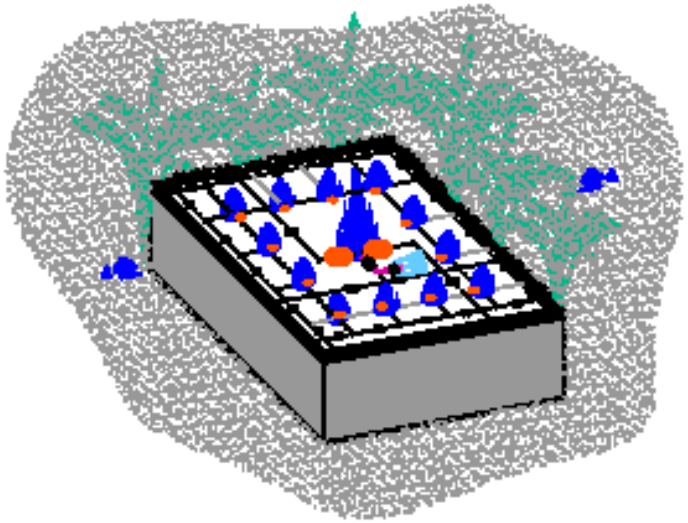
Please refer to the equipment list of pool where all fittings can be used for filtration system.

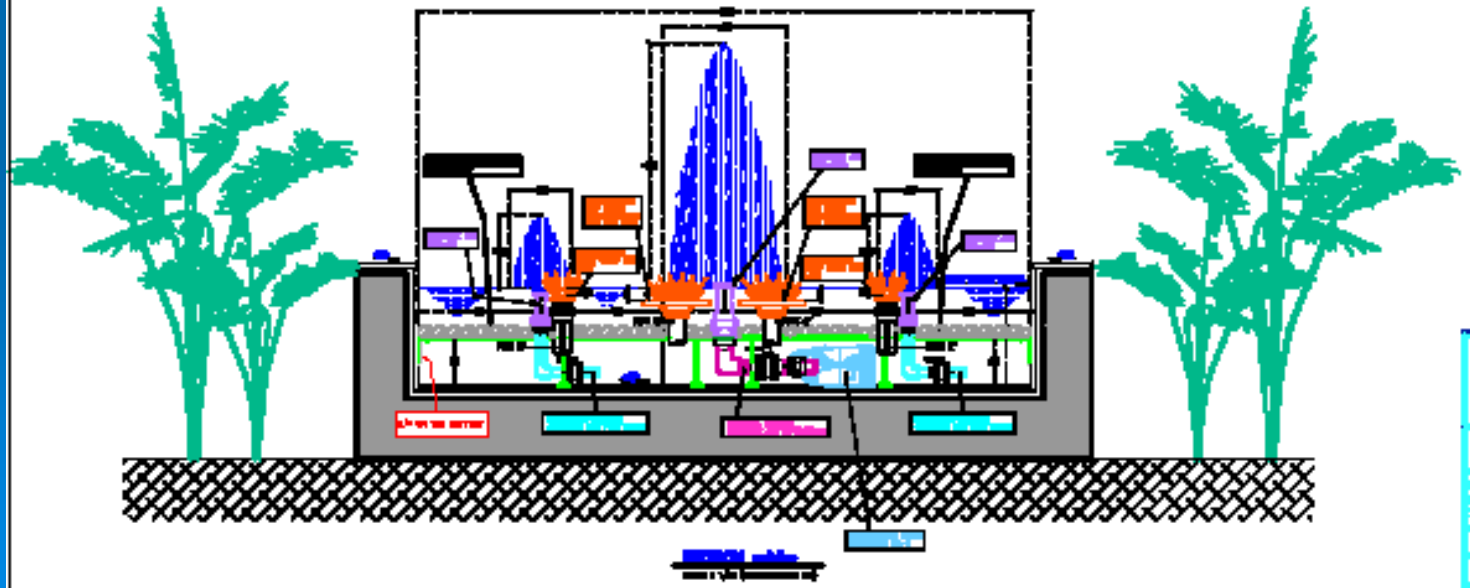
Design engineer should inform the client or architect about all the Limitations and restrictions in order to be taken into consideration prior to their design.

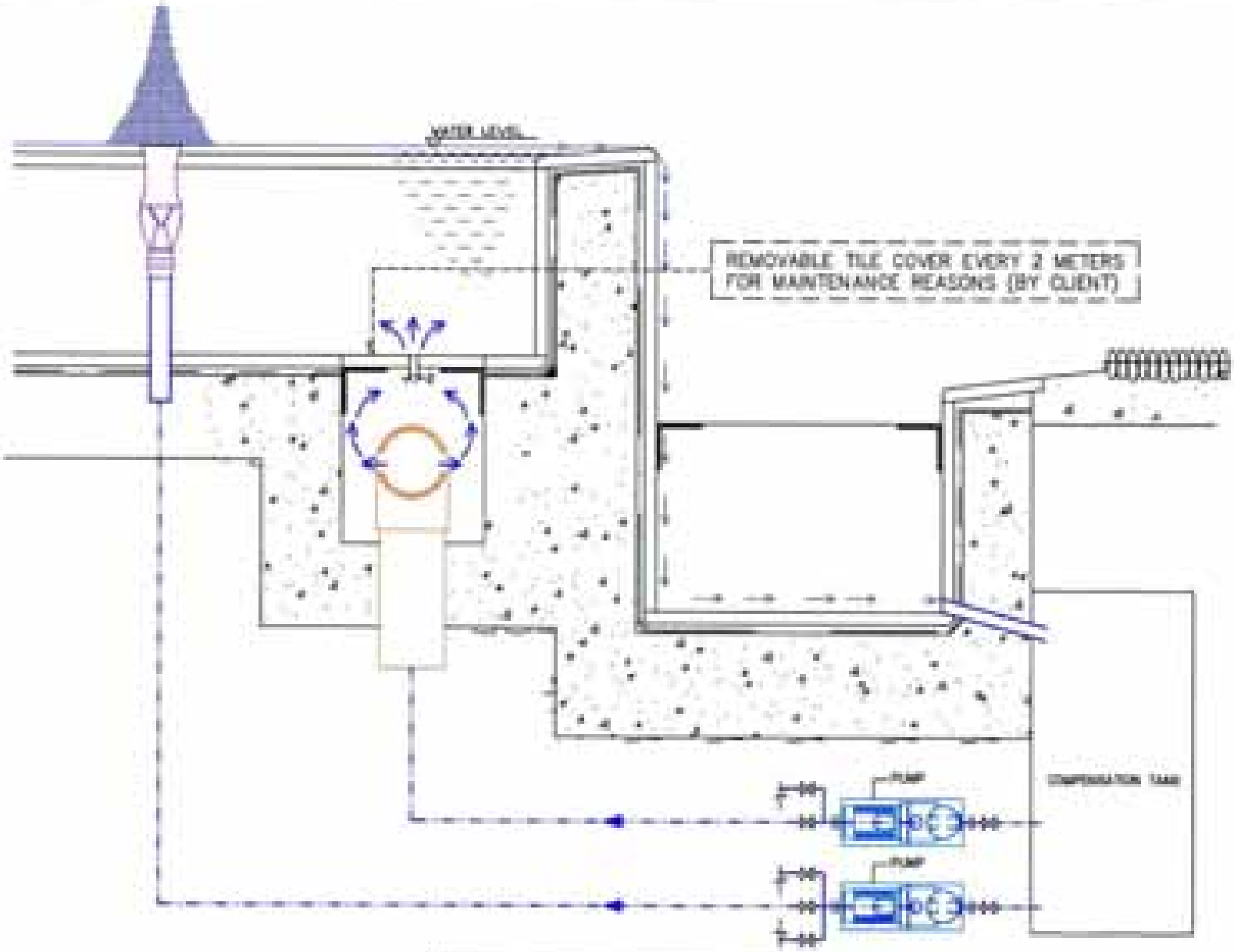
Upon selection of any nozzle type, we should have all the technical data about its flow, head, resistance to wind, splash diameter, water dependent or independent.

If we use different nozzles with the same pump, this pump should serve the sum of flows at maximum head needed by the biggest and highest nozzle.









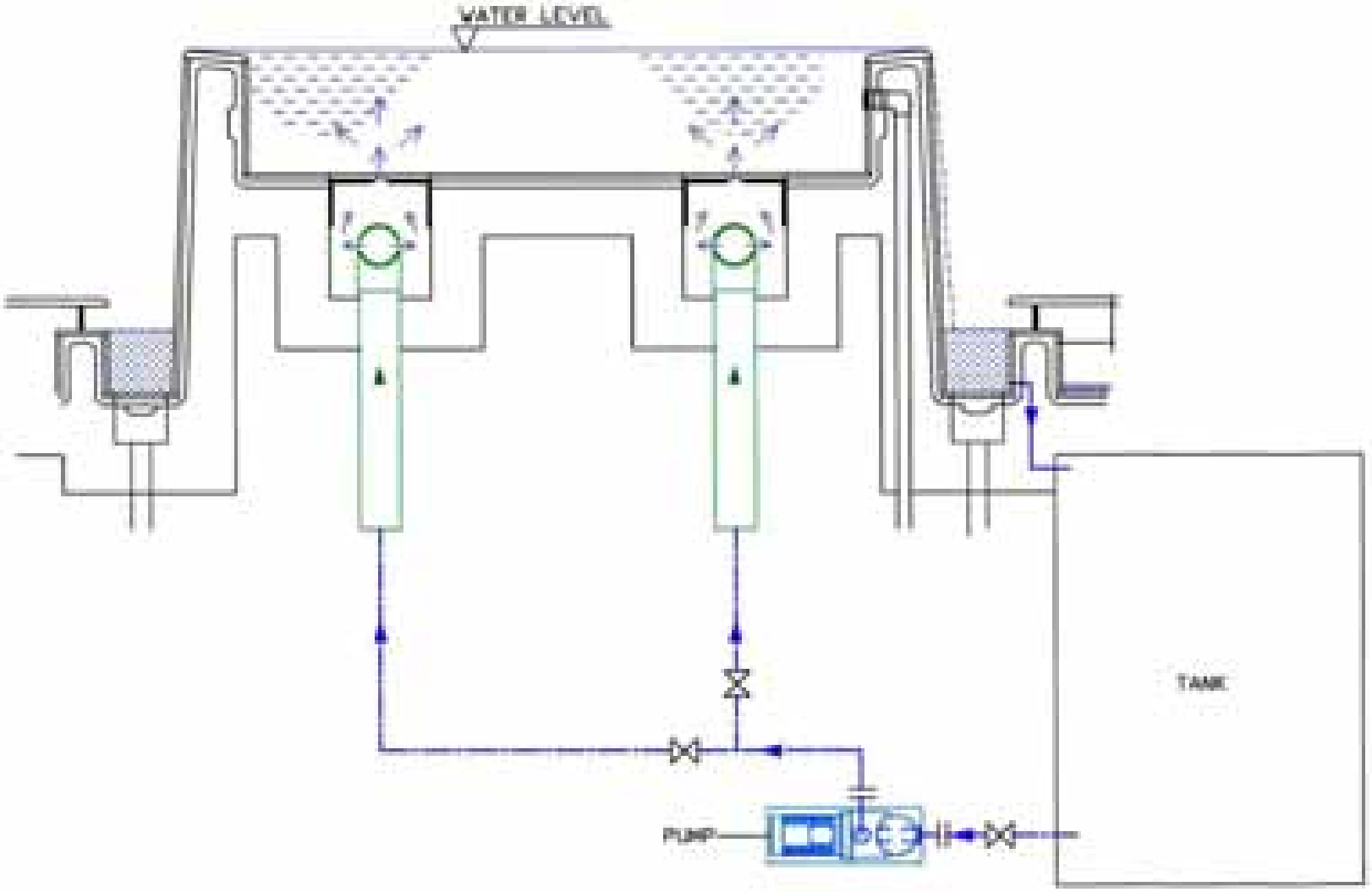
FOUNTAIN
SCHEMATIC DIAGRAM

P.09

As for water mirror, water thickness of 5 mm to 10 mm is to be considered to cover any imperfection in the tile edge.

The bigger the water basin the thicker the water thickness should be.

We may need to create ***more than 10 mm*** water thickness.



WATER MIRROR SCHEMATIC DIAGRAM

P.06

In order to overcome the turbulence when we supply water into the basin, reduction of water velocity and equal distribution should be provided through an embedded channel with distribution collector sent from pump room and with regulating valve ,so that we are able to regulate sections of the basin water mirror.

A 50cm channel depth can be applied with a perforated collector pipe.

A maximum velocity of 0.2 m/sec should be achieved out of the slot.

Cascade Design:

In order to supply an even and a reduced turbulence flow, we should utilize what is called ***chicane*** cascade channel.

This is strongly recommended for high cascade where water thickness may reach *3 to 5 cm* and flow requested is considerably high per meter run.

TAPERED WEIR

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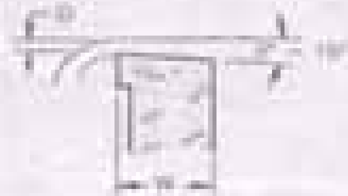

Height	Depth (D)	Weir Width (W)
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[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

FLAT WEIR (BETTER)

[illegible]

Height	Depth (D)	Weir Width (W)
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METAL EDGE WEIR (BEST)

[illegible]

Height	Depth (D)	Width (W)	Length (L)
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Waterfall Performance Data

GPM/FT (Minimum)	Water Depth (D) Thickness	Water Depth (D) Thickness	Water Depth (D) Thickness
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
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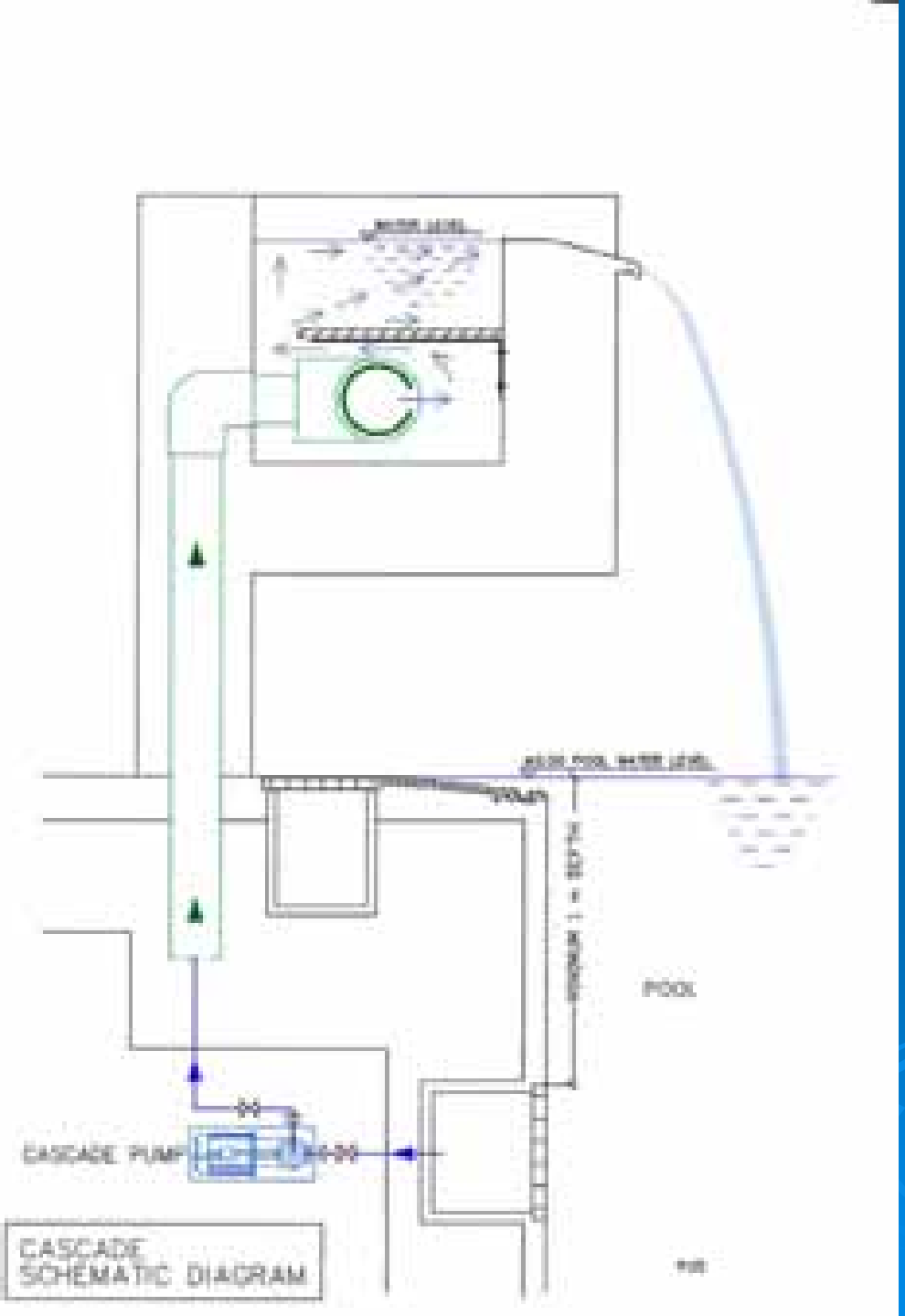
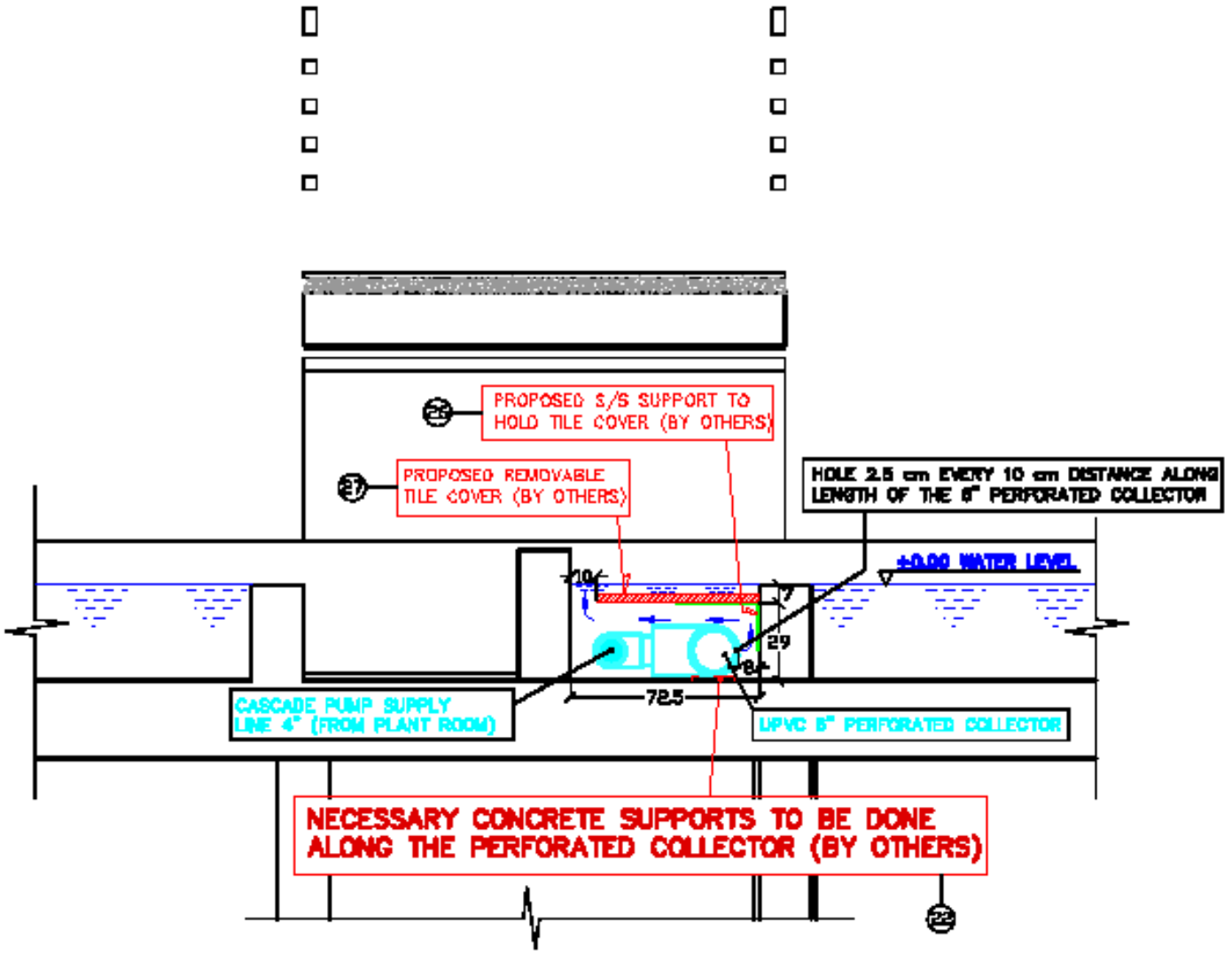

POOL
CASCADE PUMP
CASCADE
SCHEMATIC DIAGRAM

Upon selection of water thickness and pattern from the table of water thickness, we apply this upper channel or basin with intermediate separation to overcome turbulence problem.

- Aerated waterfalls.
- Consider height of step twice its length.
- Laminar flow to be achieved through a perforated collector.

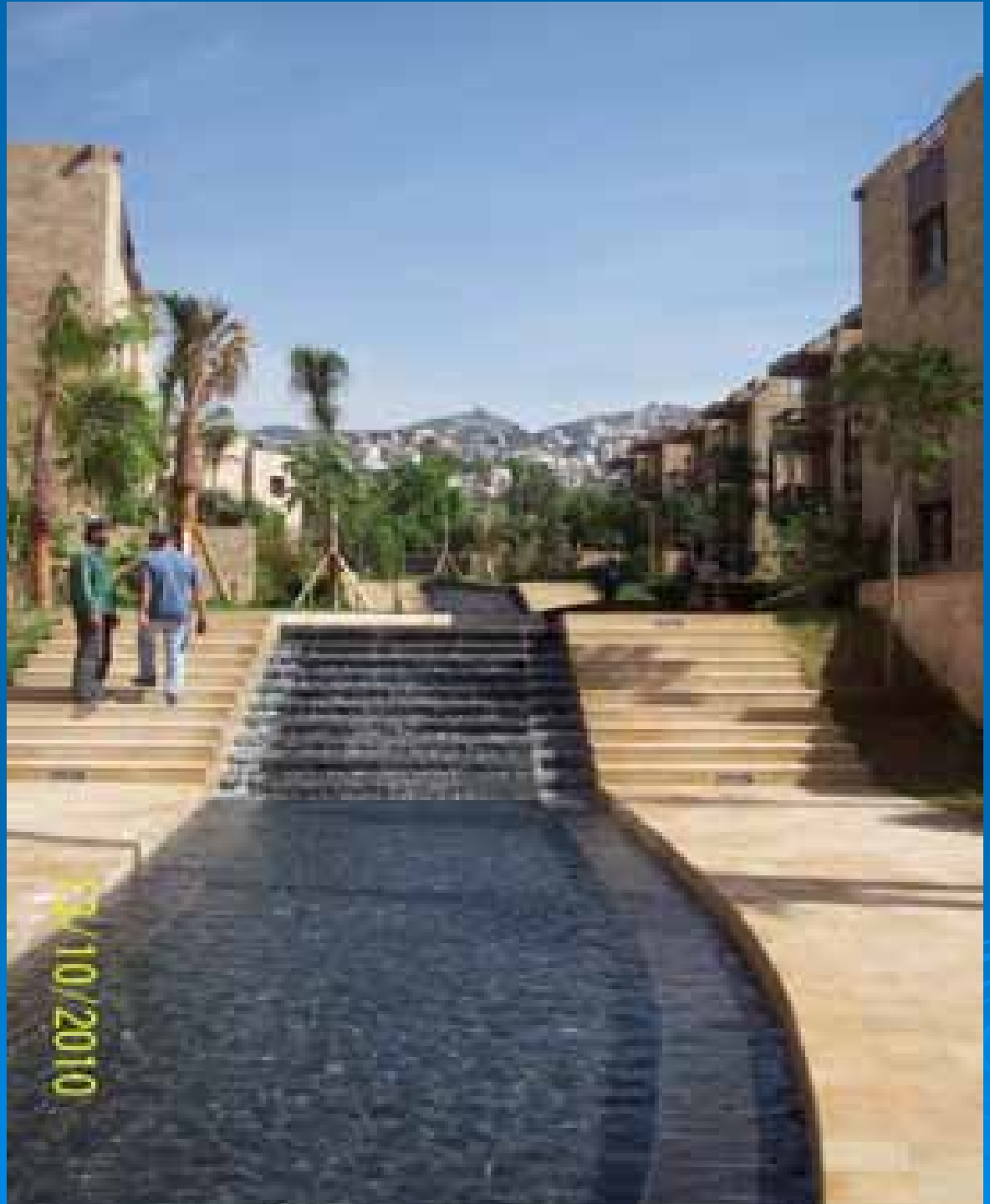

13/10/2010

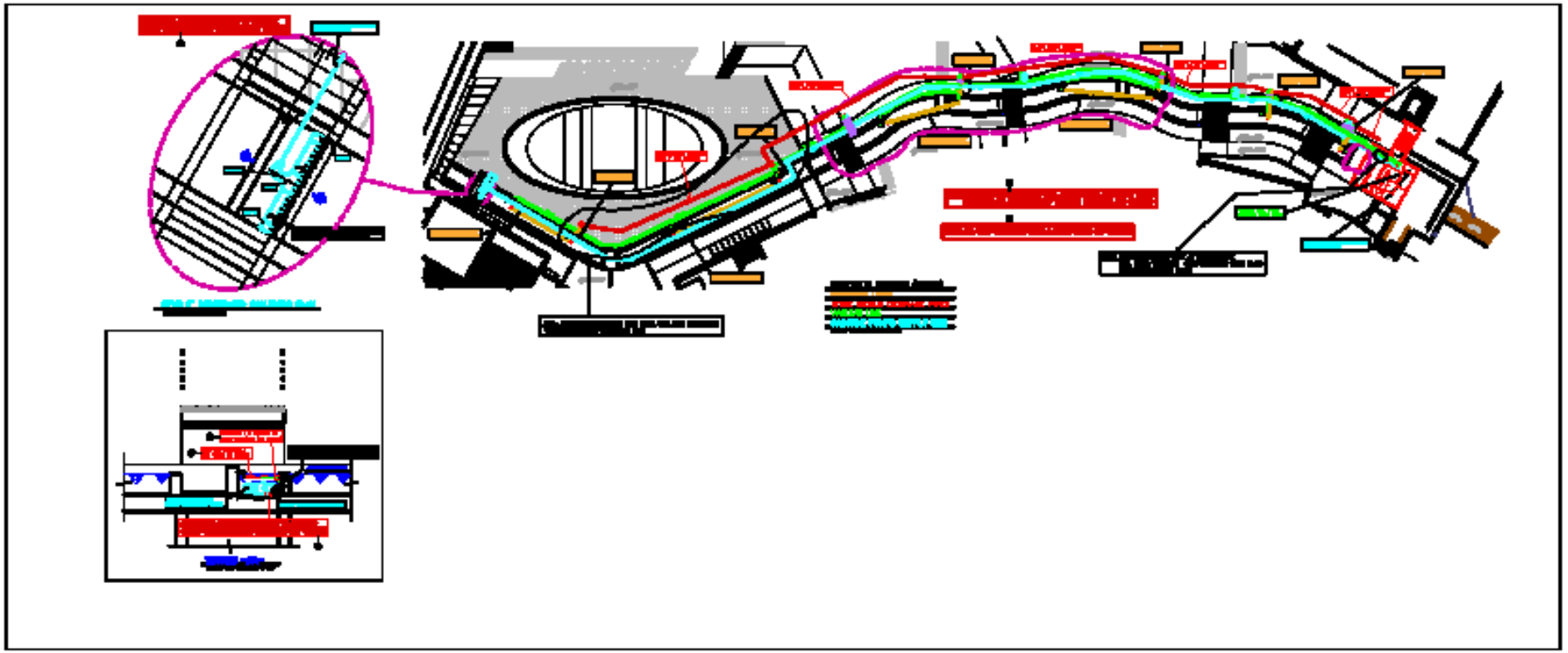

13/10/2010

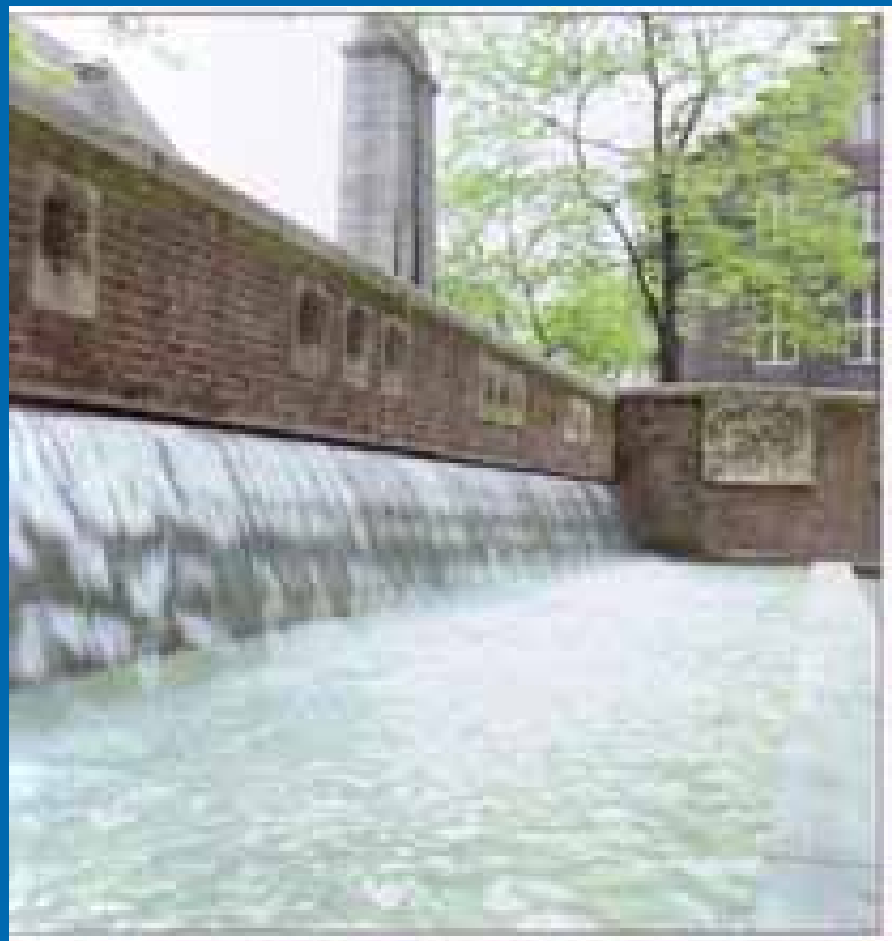


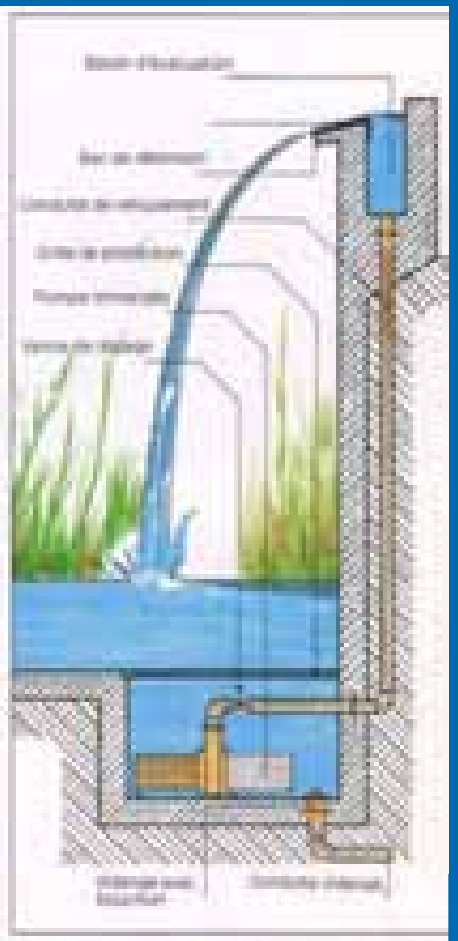
SECTION –AA–

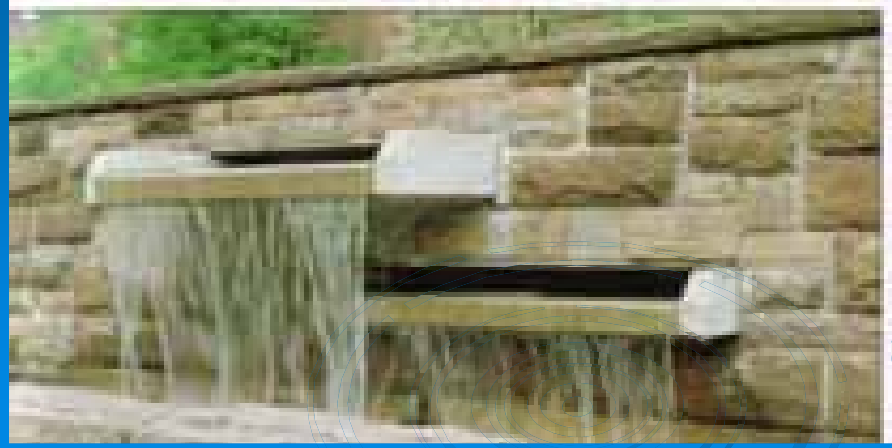
SCALE : 1/25 (DIMENSIONS IN CM)


13/10/2010





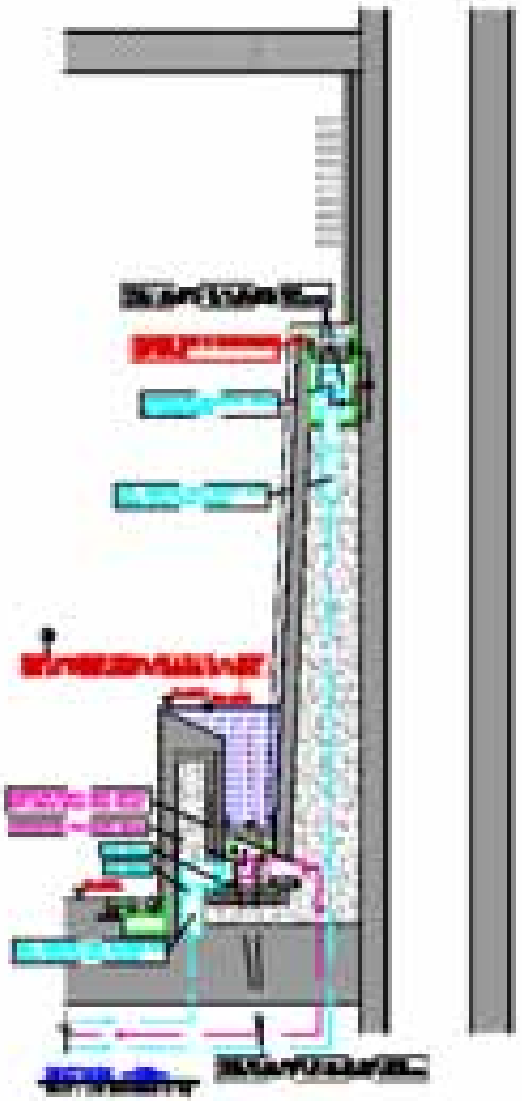




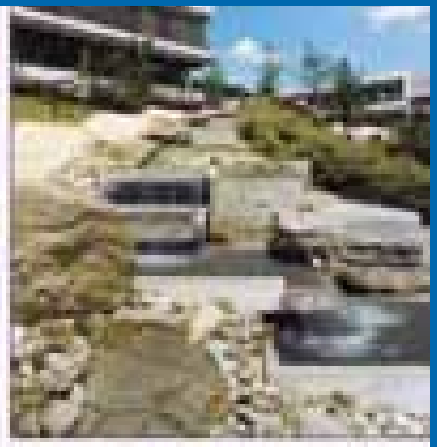
Wall cascade (wet wall)

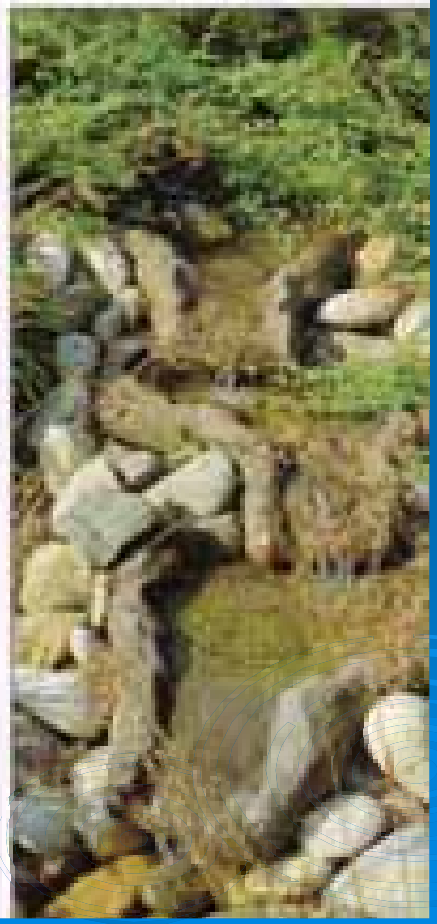
- Consider a 5 mm water thickness
  (5 m^3/hr/m run is assumed for wet wall effect)

- Either a concrete supply channel or a stainless steel supply channel is considered to achieve laminar homogenous flow along the entire length of the cascade.




23/01/2014





Thank you