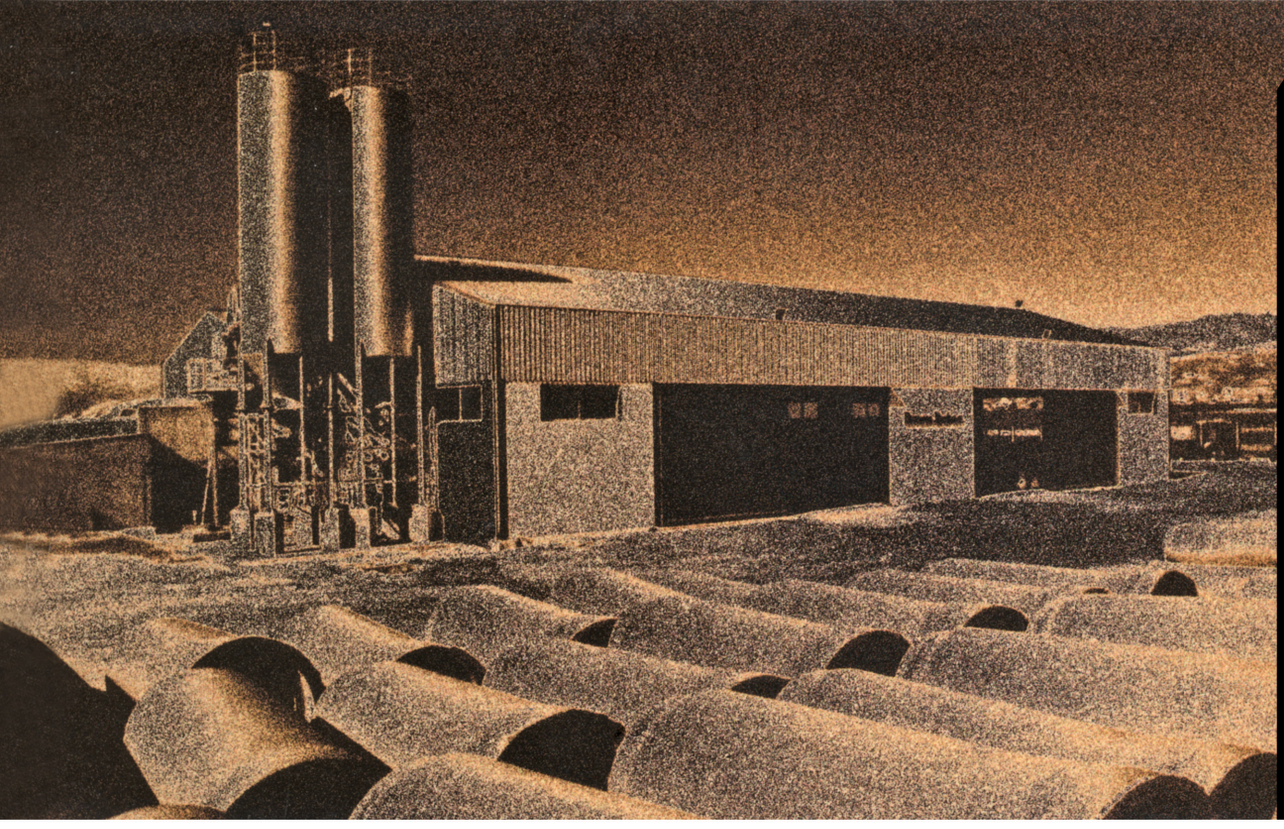
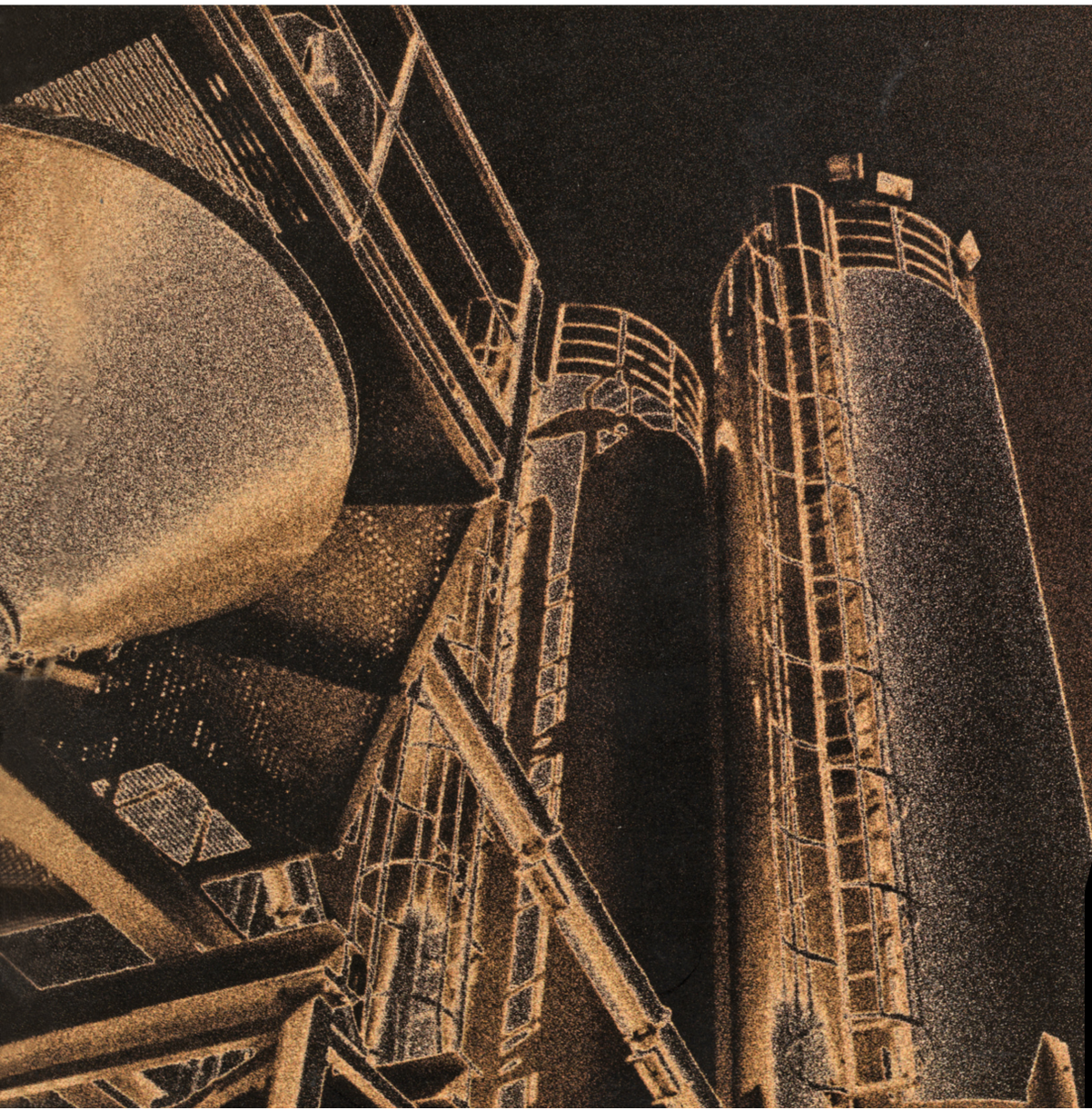
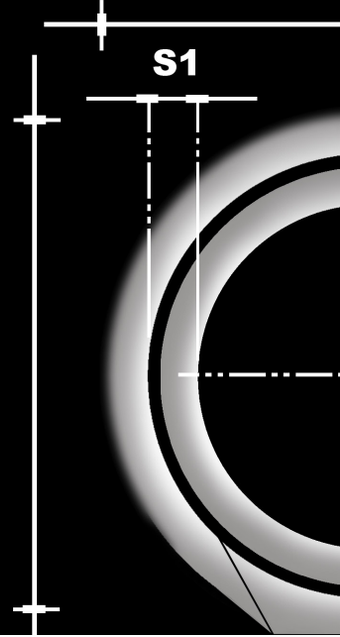


BETON BEKAA





Beton Bekaa

Introduction

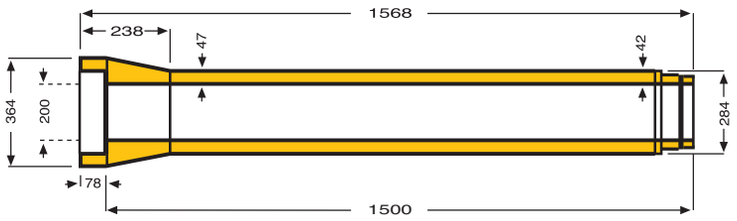
Beton Bekaa is specialised in the manufacturing of vibro-pressing concrete pipes, public utility fittings and accessories, as well as ready-mix concrete. The latest technology in pipe manufacturing and fully automated state of the art machines and equipments are being used, insuring quality and production control.

Our pipes and products undergo several tests in our modern and completely equipped laboratory, which is officially recognized by the concerned ministries. They comply with all the American and Europien norms and specifications as: ISO, BS, ASTM, FNOR, and DIN. Conclusive results on tests carried out by the laboratories of the American University of Beirut, St. Joseph University, Industry Institute, and our own testing facilities, have all confirmed the quality of our products and their strict compliance to German norm DIN 4032 (KFW & KW).

Our factory is located in the industrial region of Zahleh on a plot of 15,000 M2 of area and enjoy high production capacity.

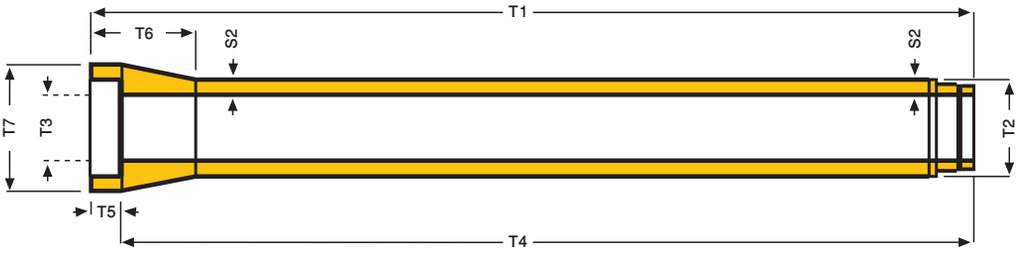
DIN 4032 KW

Measurements for pipes of diameter 200 mm.

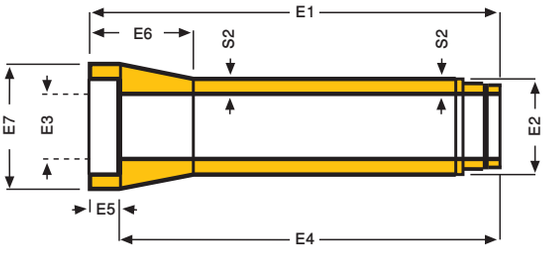


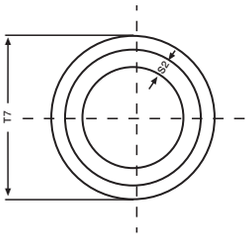
Pipes & Measurements

Measurements for pipes of diameter 300 mm till 1500 mm 2 m in lengh.



Measurements for pipes of diameter 300 mm till 600 mm 1m in lengh.





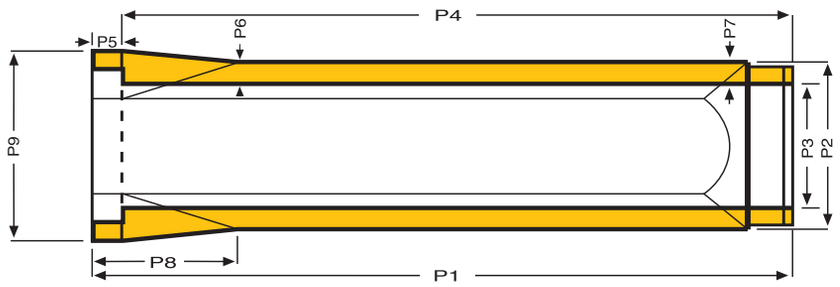
Diameter	Drawing Parameters							
(mm)	E1	E2	E3	E4	E5	E6	E7	S2
300	1095	400	300	1000	110	395	500	50
400	1095	530	400	1000	110	440	624	65
500	1095	670	500	1000	110	440	760	85
600	1110	800	600	1000	120	445	892	100

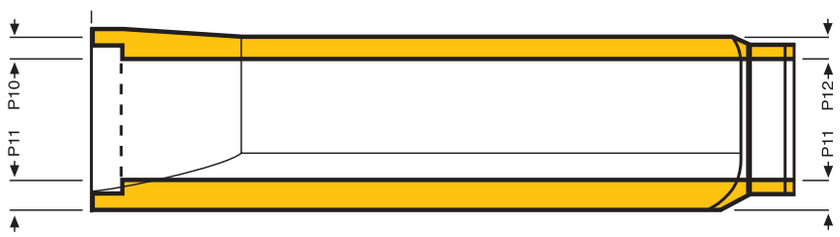
Diameter	Drawing Parameters							
(mm)	T1	T2/E2	T3	T4	T5	T6	T7	S2
300	2095	400	300	2000	110	395	500	50
400	2095	530	400	2000	110	440	624	65
500	2095	670	500	2000	110	440	760	85
600	2110	800	600	2000	120	445	892	100
700	2120	930	700	2000	140	360	1020	115
800	2120	1060	800	2000	140	360	1150	130
900	2120	1190	900	2000	140	405	1290	145
1000	2120	1320	1000	2000	140	405	1430	160
1200	2120	1580	1200	2000	140	485	1720	190
1500	2120	1970	1500	2000	140	485	2040	235

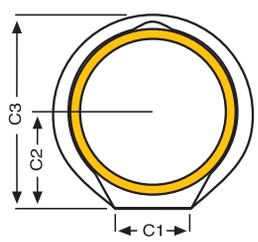
DIN 4032 KFW

Pipes & Measurements

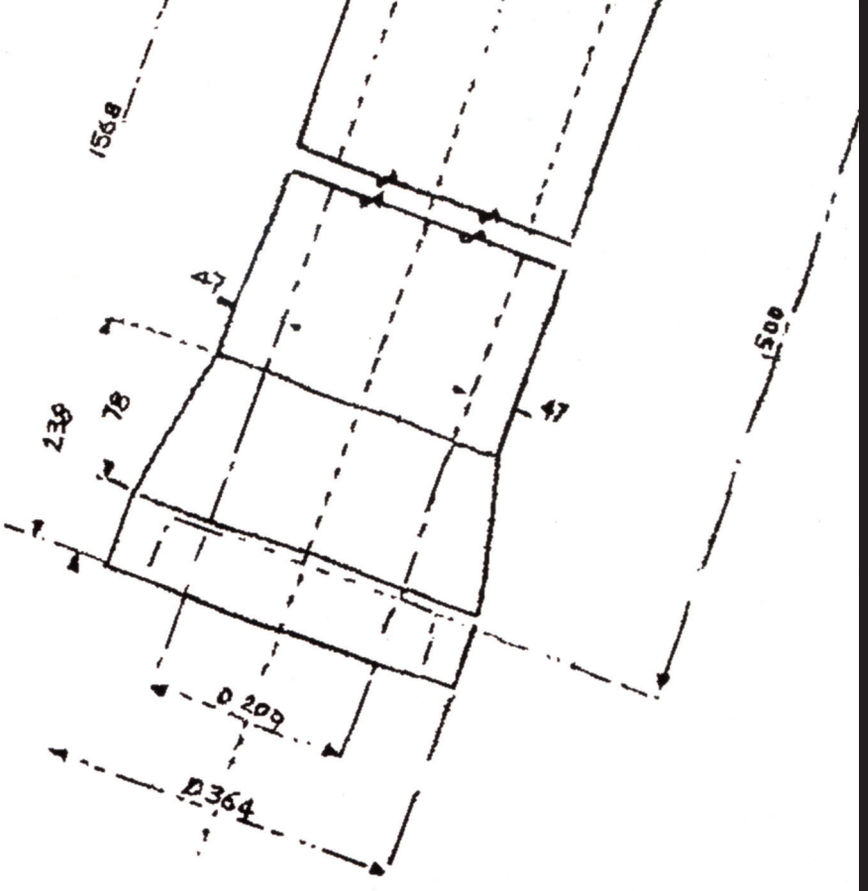
Measurements for pipes of diameter 300 mm. till 600 mm.







Diameter	Drawing Parameters														
(mm)	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	C1	C2	C3
300	2095	402	300	2000	95	57	51	290	500	83	100	71	240	250	500
400	2095	512	400	2000	95	61	56	450	624	86	100	76	320	300	612
500	2095	640	500	2000	95	74.5	70	490	760	98	120	89	400	370	750
600	2110	770	600	2000	110	89.5	85	500	892	109	131	100	450	413	877



Advantages

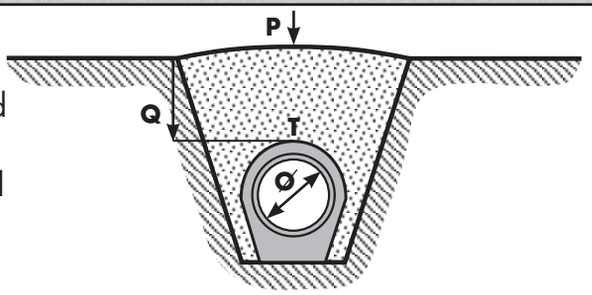
The main distinguishing feature of the pipes manufactured under DIN (4032 KW & KFW) is the extra wall thickness which provides much higher strengths when compared to pipes of other standards. This is clearly shown when comparing the crushing loads required by DIN 4032 with other standards.

Moreover, since pipes manufactured under DIN 4032 (KW and KFW) do not require steel reinforcement, they are less vulnerable to cracks. It is well known that reinforced concrete pipes require precision during the production and curing stages, and hence, lack of precision usually causes pipe defects that are not found in Beton Bekaa.

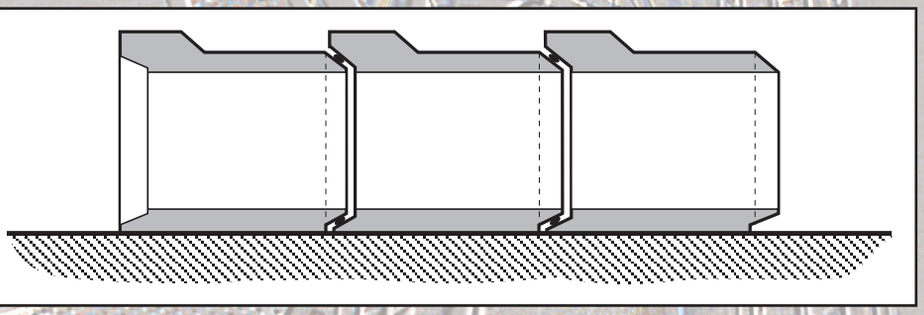
Finally, due to their extra wall thickness, the DIN 4032 pipes are more durable under abrasion and chemical attack, and have high tolerance for absorption.

Applying Bases

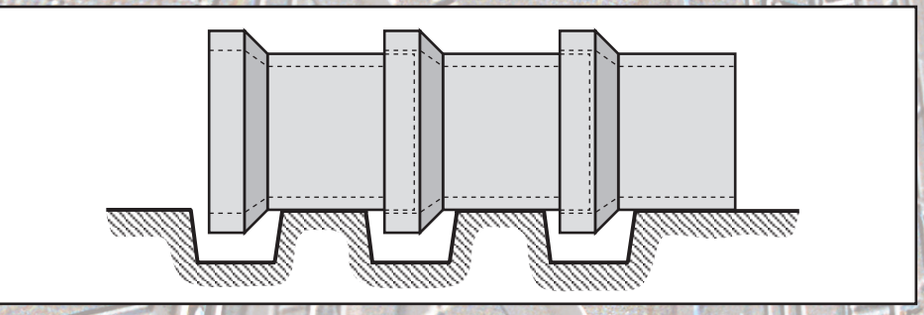
P - Superimposed Load
T1 - Type to fill
T2 - Type of natural soil
Q - Level of fill
O - Diameter of pipe



Advantage 1 : The flat base reduces the amount of refined aggregates used in the laying process.



Advantage 2 : Rapid and immediate installation. Proper load insured and perfect joining with the use of rubber joints.

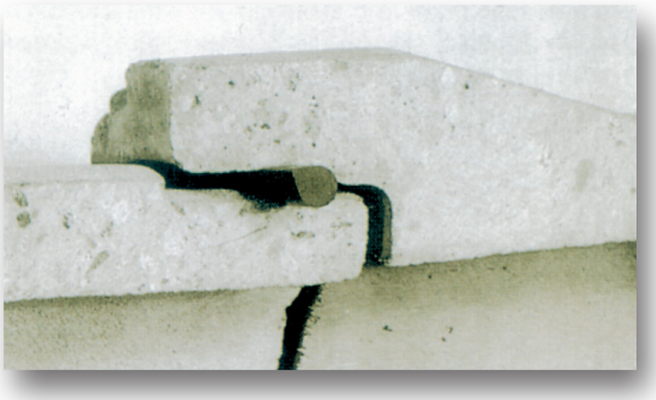


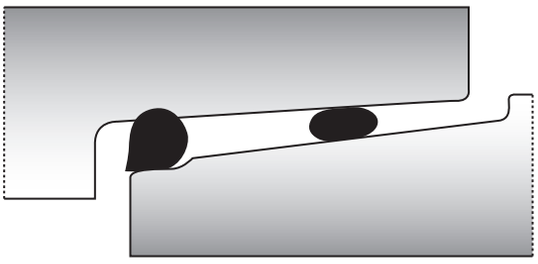
Advantage 3 : With the continuous base, the saddle is eliminated thus decreasing greatly the cost of installation.

Beton Bekaa is proud to be the first in Lebanon to introduce the flat base concrete pipes.

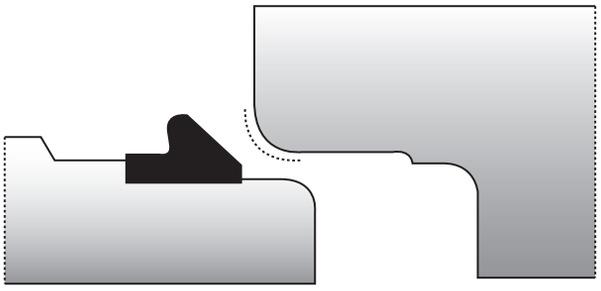
Rubber Joints

Rolling Joints





Sliding Joints



Even though our pipes can be installed without rubber joints, our design can easily accommodate the joints which are highly recommended to prevent leakage and meet international standards.

ROLLER JOINTS			
Interior Diameter (mm)	Joint Thickness d (mm)	Deflection (%)	Circomference (mm)
200	15	40	775
300	16	40	1100
400	17	40	1420
500	16	40	1760
600	18	40	2090
700	19	40	2460

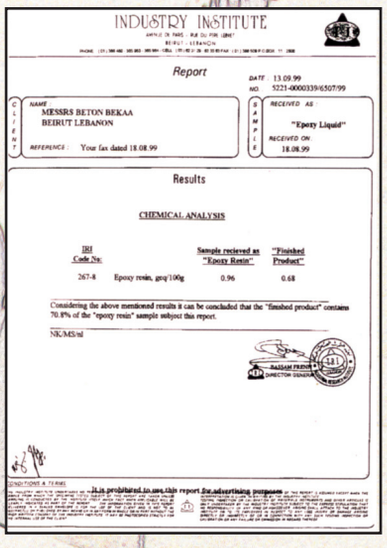
SLIDING JOINTS			
Interior Diameter (mm)	Joint Thickness d (mm)	Deflection (%)	Circomference (mm)
800	18	40	2690
900	22	40	3000
1000	21	40	3340
1200	21	40	3980
1500	22	40	4910

Joints

Coating

Description:

Coating is recommended for interior and exterior surfaces where a durable finish is desired to be used fer conrete pipes. Where a heavy duty protective, waterproof, and abrasion resistant coating is required, the chemical resistant properties of coal tar epoxy and bitumin make it particulary suitable in aggressive environments such as marine environments.



INDUSTRY INSTITUTE

Report

DATE 13.09.99
NO 5221-4000339/6507/99

CLIENT
NAME
MESSRS BETON BEKAA
BEIRUT LEBANON
REFERENCE : Your fax dated 18.08.99

SAMPLE
RECEIVED AS
"Epoxy Liquid"
RECEIVED ON
18.08.99

Results

CHEMICAL ANALYSIS

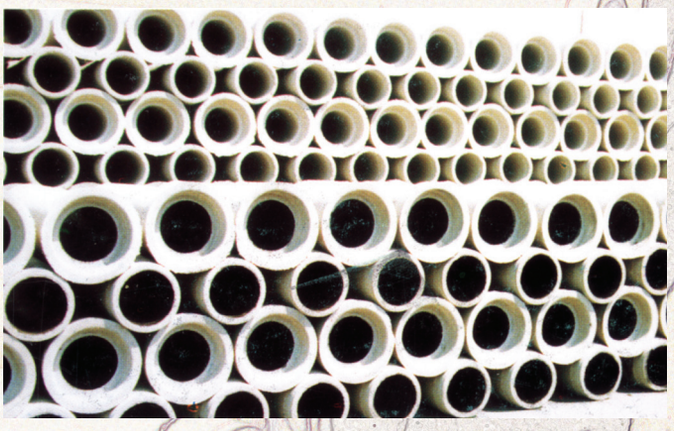
IRI Code No:		Sample recieved as "Epoxy Resin"	"Finished Product"
267-8	Epoxy resin, grs/100g	0.96	0.68

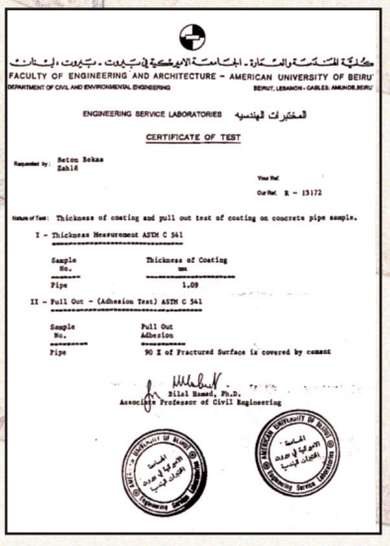
Considering the above mentioned results it can be concluded that the "finished product" contains 70.8% of the "epoxy resin" sample subject this report.

NK/MS/nl

RAISSAM PERSIANI
DIRECTOR GENERAL

CONDITIONS & TERMS
It is prohibited to use this report for advertising purposes





FACULTY OF ENGINEERING AND ARCHITECTURE – AMERICAN UNIVERSITY OF BEIRUT
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
BEIRUT, LEBANON - GABLES: AMAUNIB, BEIRUT

ENGINEERING SERVICE LABORATORIES

CERTIFICATE OF TEST

Requested by: Beton Bekaa
Zahlé

Your Ref.
Our Ref. E - 15172

Nature of Test: Thickness of coating and pull out test of coating on concrete pipe sample.

I - Thickness Measurement ASTM C 541

Sample No.	Thickness of Coating mm
Pipe	1.09

II - Pull Out - (Adhesion Test) ASTM C 541

Sample No.	Pull Out Adhesion
Pipe	90 % of Fractured Surface is covered by cement

Bilal Hamad, Ph.D.
Associate Professor of Civil Engineering

Advantage of coating:

- Excellent chemical resistance.
- Easily applied by roller or spray.
- Suitable for multi-layer applications.
- Abrasion resitant.

Coating

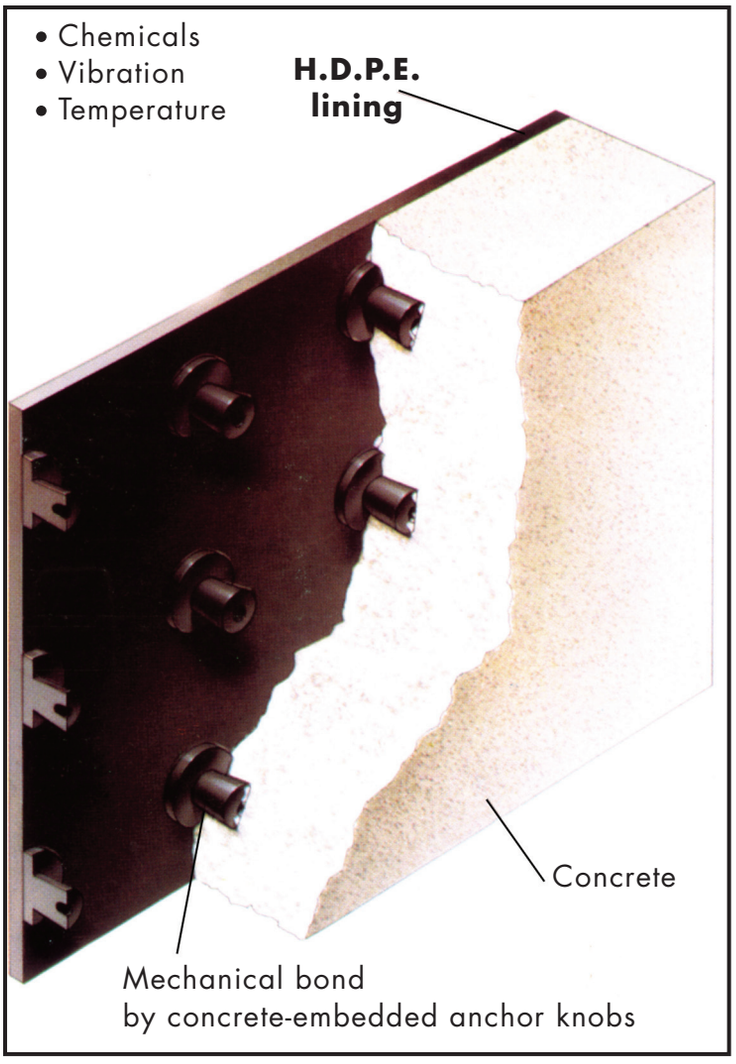
Lining

H.D.P.E. lining

Beton Bekaa offers sewer pipes with HDPE (High density polyethylene) lining.

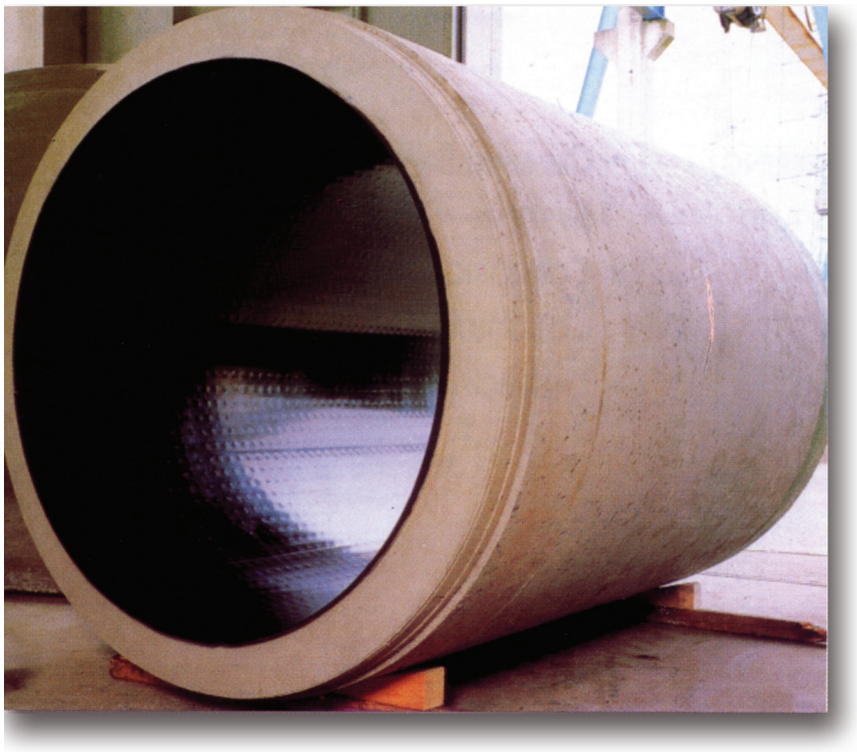
HDPE s a gas and watertight internal lining for sewage/effluent pipes. Successful results are ensured by HDPE both with new pipes and when reconstructing existing sewers.

HDPE linings offer high mechanical strength in combination with good chemical resistance. The well-designed studs, especially arranged, provide an integral bond between the plastic material and the concrete; hence providing perfect protection for ground water against pollution. Based on these outstanding properties, the system has proven its capabilities for many years under most severe operating conditions.



H.D.P.E. lining

Beton Bekaa HDPE lining - the benefits
- Welded system is gas and water tight.
- Uniform mechanical bond between the HDPE inner tube and the concrete outer casing.
No differential expansion due to divergent expansion coefficients of concrete and plastics.
- Sewers lined with HDPE are resistant to corrosion and chemicals as well as concentrated acids and alkalis as verified by the comprehensive resistance tests.
- Long standing expertise with HDPE linings in acid - proof construction association with severe mechanical, thermal and chemical loads.
- Smooth, anti-adhesive and low-friction internal tube surfaces enhance flow rate and reduce sludge accumulation and associated putrefaction processes with H_2S formation.
- Surface hostile to rodents.
- Ease of repair.



Quality Control

Quality Control

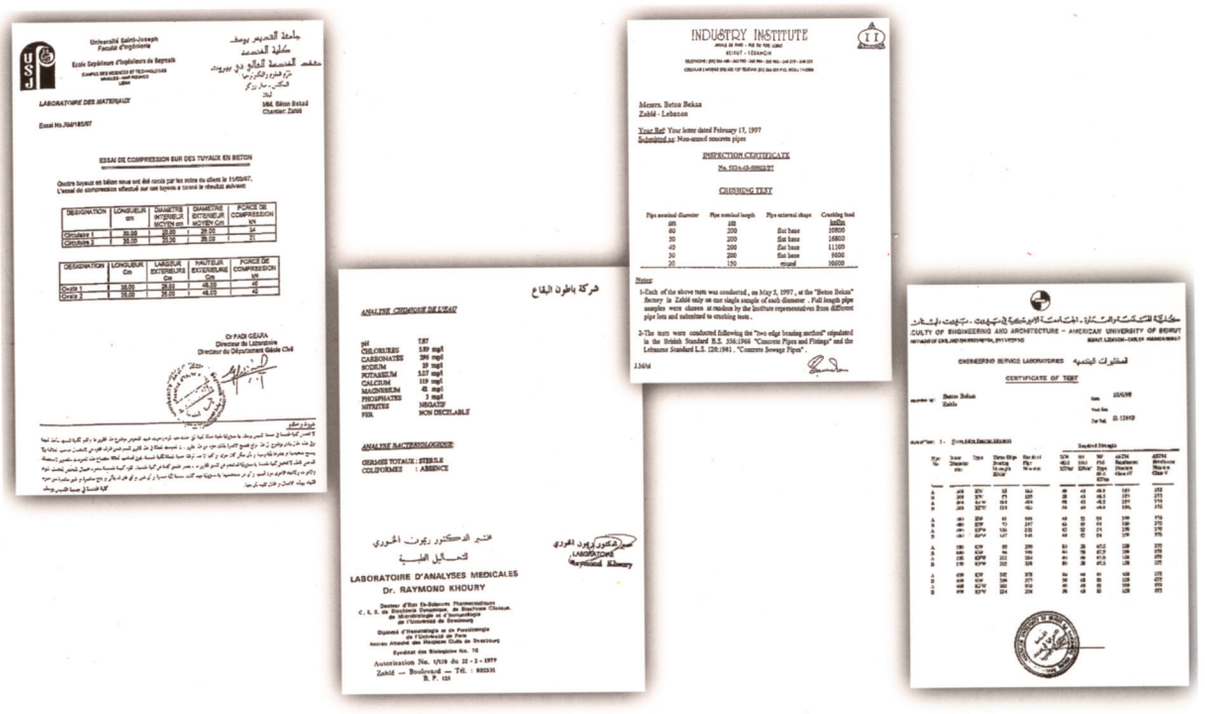
Testing of Raw Materials

Raw materials are procured from qualified sources. The following tests on aggregates are performed to guarantee consistency of concrete mixes.

1- Sieve analysis - ASTM C136, performed daily.

2- Absorption and specific gravity - ASTM C 127 and C128, performed once per week.

3- The moisture content of aggregates is measured by the mixer controller in order to make proper adjustments in mixing water automatically.



No	Type of Test	Frequency	Standard Reference
1	Visual inspection	Each pipe	QC team
2	Dimensional control of pipes	Each pipe	DIN 4032 Sec 8.2
3	Circularity of end faces	Each pipe	DIN 4032 Sec 8.2
4	Crushing loads	1 pipe every two weeks	DIN 4032 Sec 8.31
5	Cube compressive strenghs	3 cubes / week	DIN 4032 Sec 8.3.3.1
6	Water/cement ratio	Every mix	DIN 1048 Part 1
7	Water tightness	1 pipe / week	DIN 4032 Sec 8.4.1
8	Water absorption	1 pipe / week	DIN 4032 Sec 8.4.2
9	Air Test	1 pipe / week	BS 8005 Sec 5.13.3
10	Vacuum Test	Each pipe	ASTM C 1214

All tests performed by Beton Bekaa personal are supervised by an external qualified materials engineering consultant.

Quality Control

I- External load Crushing Strength Test

II- Vacuum Test

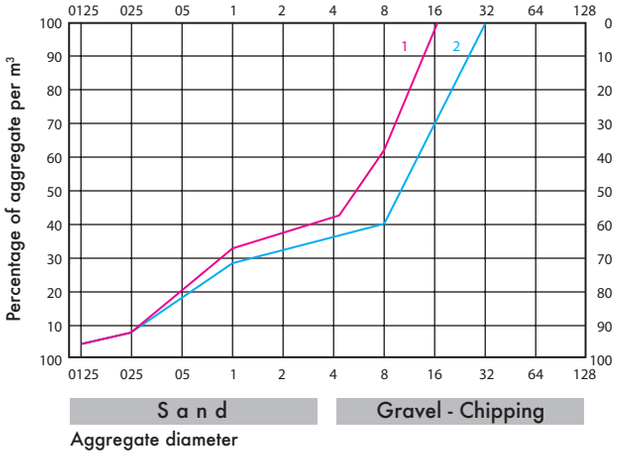
III- Hydrostatic or Air Test

Quality Control

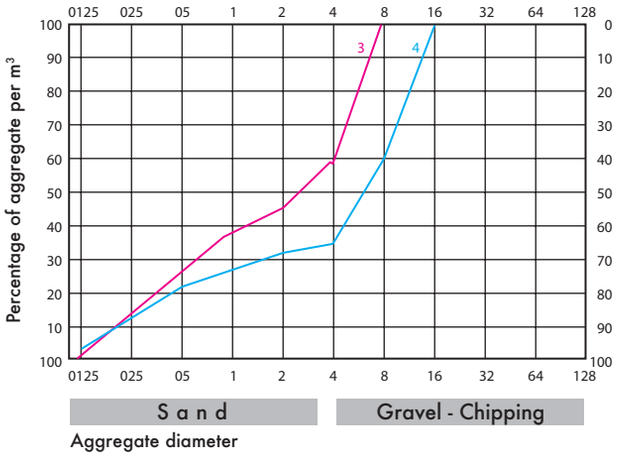
Mix Design

To obtain good quality, compact, resistant and waterproof products, it is necessary to use the correct concrete mix.

In order to make good concrete, the propotion of the various aggregates which compose the mix, and the correct quantity of water and cement are of fundamental importance.



Ideal grading curves for 2m long pipes, with maximum grading of 16mm corresponding to curve 1, and 32mm corresponding to curve 2.

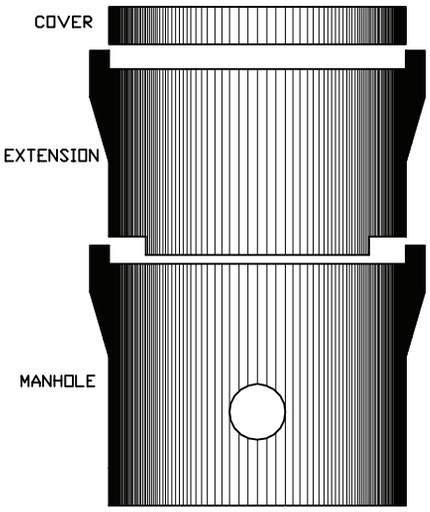


Ideal grading curves for 1.5m or 1m long small and large pipes, reduced thickness with maximum grading of 8mm corresponding to curve 3, and 16mm corresponding to curve 4.

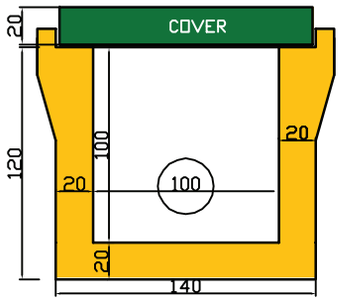
Design

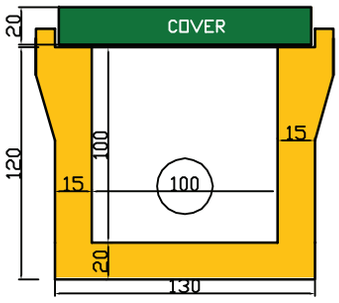
Manholes & Measurements

1- All dimensions are in centimeter unless otherwise indicated.
2- Internal surfaces shall be protected with a coat of coal tar epoxy if requested (min. thickness 0.6mm).
3- Surfaces shall be protected with bitumen upon requeste.
4- Steel reinforcement can be modified upon request as noted.
5- Concrete strength is 35 MPA. Incrementation of strength is available upon request.

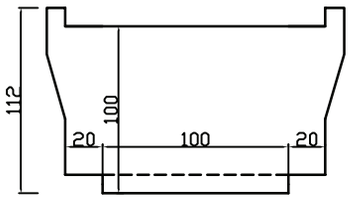


DETAILS FOR ø1000MM MANHOLES



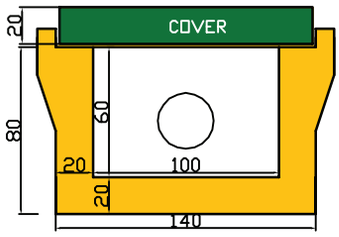


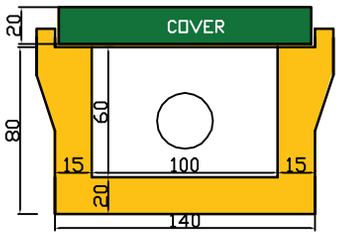
DEEP MANHOLE - SECTION
DIMENSIONS



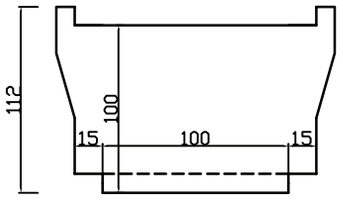
EXTENSION

Size of openings (inlet/outlet) as requested

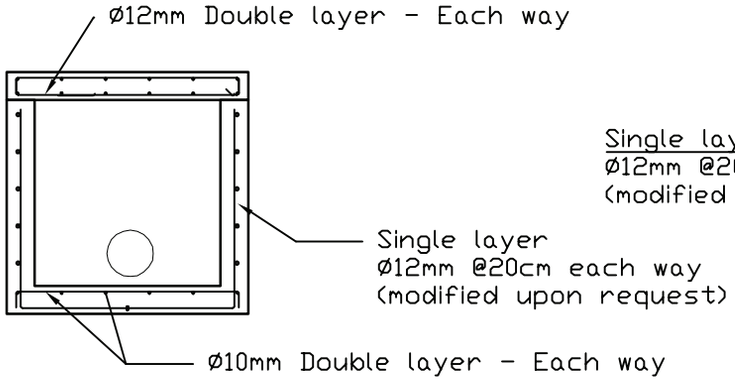




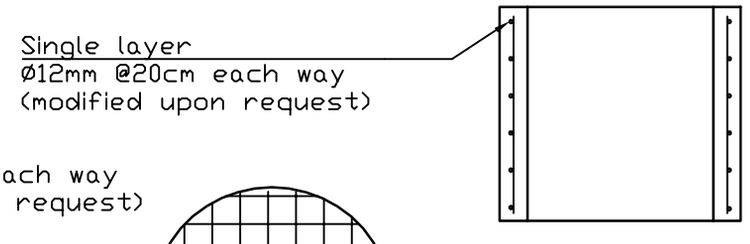
SHALLOW MANHOLE - SECTION
DIMENSIONS



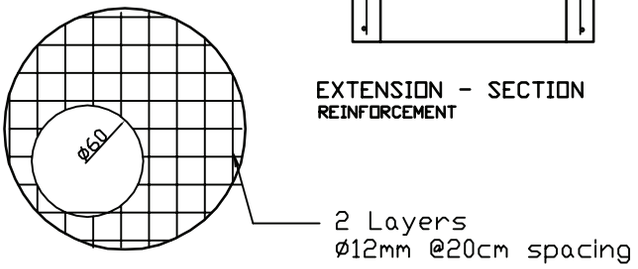
EXTENSION



SHALLOW & DEEP MANHOLE - SECTION
REINFORCEMENT



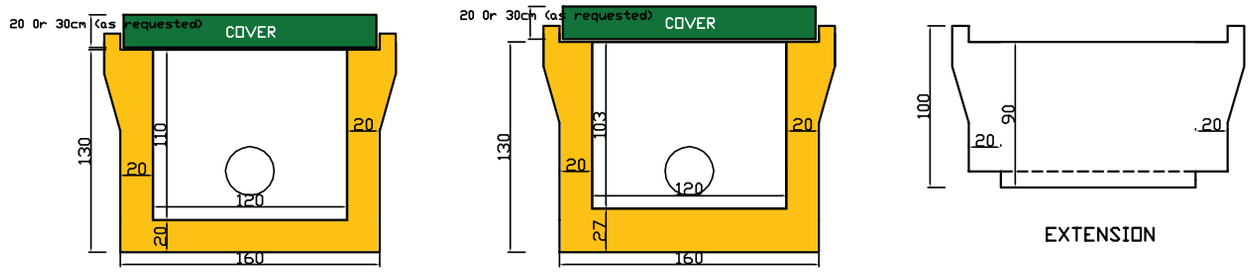
EXTENSION - SECTION
REINFORCEMENT



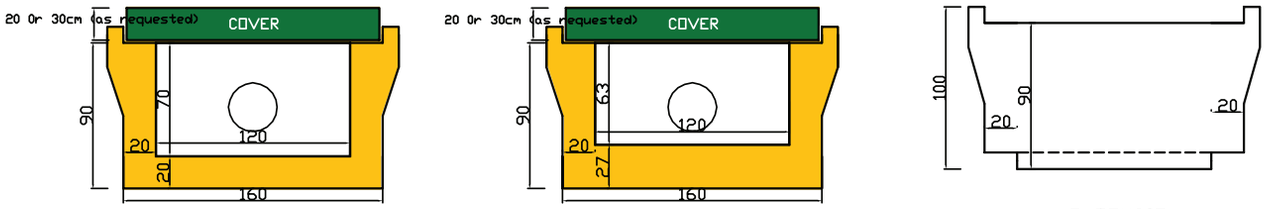
SHALLOW & DEEP MANHOLE TOP SLAB - SECTION
REINFORCEMENT

Manholes & Measurements

1- All dimensions are in centimeter unless otherwise indicated.
2- Internal surfaces shall be protected with a coat of coal tar epoxy if requested (min. thickness 0.6mm).
3- Surfaces shall be protected with bitumen upon requeste.
4- Steel reinforcement can be modified upon request as noted.
5- Concrete strength is 35 MPA. Incrementation of strength is available upon request.

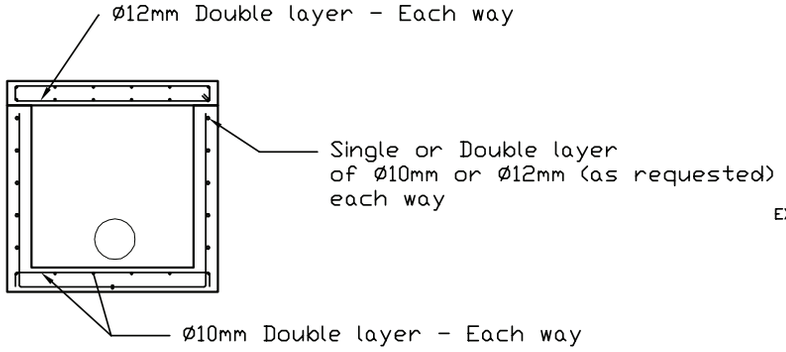


DEEP MANHOLE - SECTION
DIMENSIONS

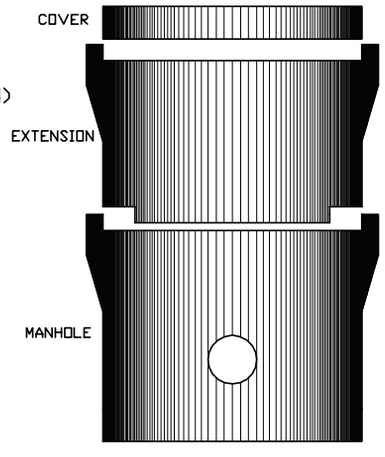


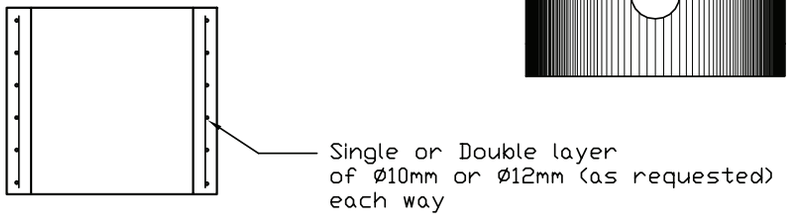
SHALLOW MANHOLE - SECTION
DIMENSIONS

Size of openings (inlet/outlet) as requested

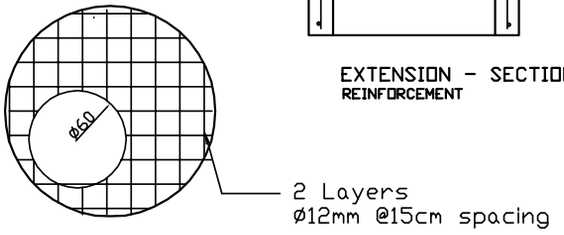


SHALLOW & DEEP MANHOLE - SECTION
REINFORCEMENT





EXTENSION - SECTION
REINFORCEMENT



SHALLOW & DEEP MANHOLE TOP SLAB - SECTION
REINFORCEMENT

DETAILS FOR Ø1200MM MANHOLES

Beton Bekaa

Zahle - Lebanon - Industrial City
Office: 08-960444 - 930555-930666 Fax: 08-930222
E-mail: beton-b@inco.com.lb