



Gulf Manufacturers Co.

A photograph of industrial machinery, likely a pipe manufacturing plant. A large, dark grey corrugated pipe is the central focus, extending from the left towards the center. The machinery is blue and white, with various cables and components visible. Several yellow triangular warning signs with black symbols are attached to the machinery. The image is framed by a large, stylized graphic consisting of overlapping blue and orange geometric shapes.

# CORRUGATED SYSTEM



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**GM INFRASTRUCTURE SOLUTION**



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## GM, Success Story

**GM Corrugated System** is first Egyptian producer of corrugated pipes and fittings in high density polyethylene with German technology under brand name of GM.

**GM Corrugated System** has high density polyethylene (HDPE) Co-Extruded twin wall pipe, which is corrugated externally and smooth internally.

**GM** as the biggest infrastructure leader for pipes networks (sewage, drainage, water, gas....etc.), started this new business to achieve requirements of national and international markets.

Pipe's range from ID 100 till 1000 mm, furthermore GM designs and produces connections and special fittings using technology of injection mould.

Knowing the product's quality is playing most important role for the positioning of company by the market and consequently.

On the development of company, GM from the beginning decided to follow a quality policy already established, which assuring that:-

- Products and services satisfy customer's expectations and all needs of more developed market by respecting all effective laws and rules.
- Quality rate at the highest possible level according to GM .target





ISO 9001  
14001  
18001



**GM** optimized the managing of all aspects that related to environmental impacts, as example, emissions in air, wastes limitations, recycling, reusing, transportation and disposal, the promptness in emergences managing though specific procedures.

**GM** work instructions are certified according to ISO 14001.

**GM** optimized all managing of all aspects for equipment and labors in order to achieve all healthy requirements, which leads GM to be certified for ISO 18001.

**GM** still stick on priority of investments and modernizing for facing up all markets challenges and get through future, counting on its relevant human potential and in force of its orientation to search for the best production technologies, working security and the environmental respect.

**GM** team is highly motivated and experienced individuals who are dedicated for helping customers to achieve their goals.

**GM** believed in building a long-term business relationship with our customers based on confidence and reliability.



# GM Double Wall Corrugated Pipe Advantages

**GM Corrugated System** is fully manufacturing with a version high density polyethylene (HDPE) materials, which offers high impact resistance even at low temperatures as well as excellent chemical resistance comparing with other alternatives pipes.

**GM** has ideal geometric structure guarantee a high deflection resistance and it's produce in different ring stiffness classes (class 4  $\text{kn/m}^2$ , class 8  $\text{kn/m}^2$  & class 16  $\text{kn/m}^2$ ), as in this way the pipe can fulfill different applications even in deep underground, also GM has facilities to produce all ring stiffness range in international standard.

**GM** outer black wall guarantees a high UV stability, inner wall is blue / yellow to make the pipe inspections easier by a different available method (TV inspection...etc.).

**GM** pipe can be produced in length of 6 or 12 meters according to customer's request.

**GM** pipe can be connected with socket exists by the end of pipe and elastomeric seal (rubber seals), the rubber seal is placed inside the corrugated, thus avoiding risk of being displaced during the coupling operations, as rubber seals has a particular profile which not only avoid leakage but also the ground water to interference into the pipe, means what's inside the pipe stays inside pipe itself and what's outside stays outside, this to ensure contaminated water always transferred safely to treatment stations.

**GM** is extremely versatile due to its wide range of special fittings and to possible connection with any other type of existing pipes.

**GM** is extremely easy to handle due to its lightness, even easy to store and to transport as well as to be installed as does not need any particular equipment to move it.

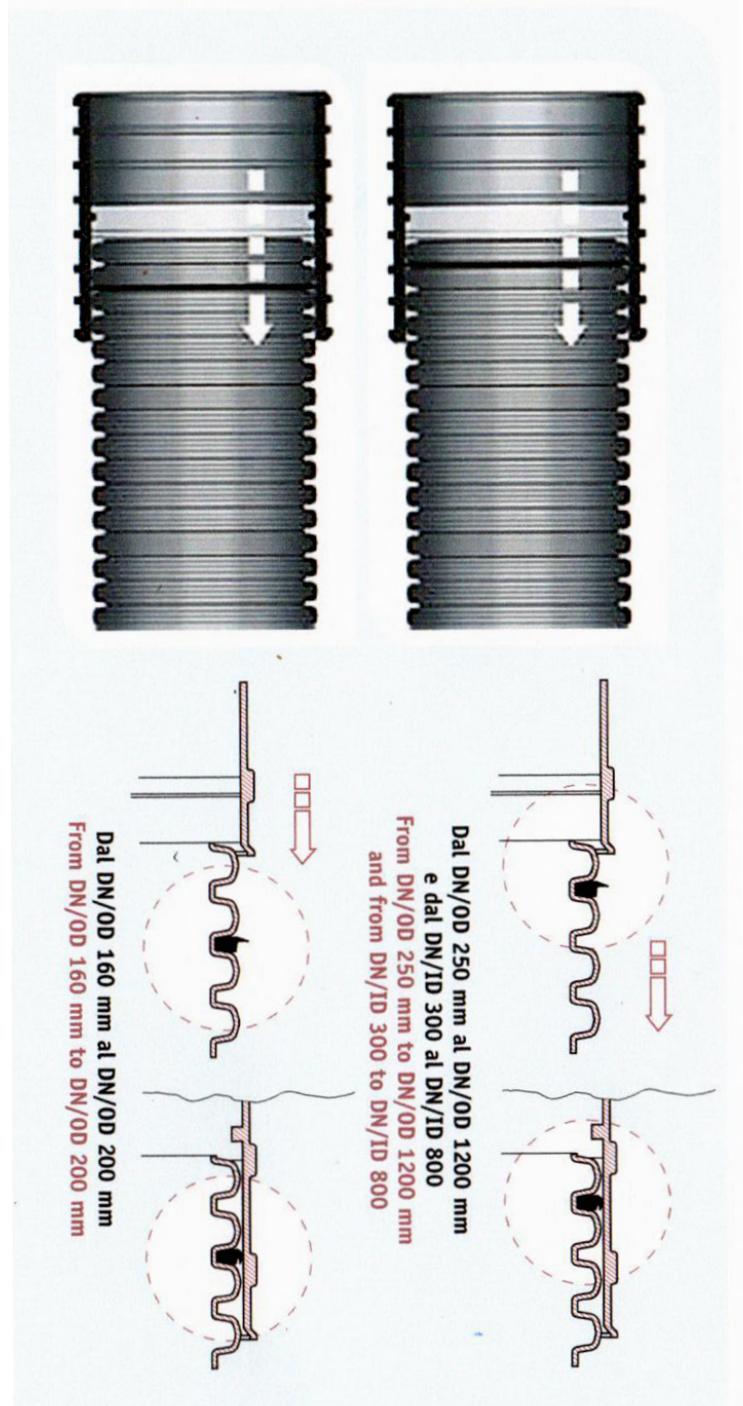
**GM** pipe is fixable, which can avoid obstacles during pipe lining and digging inaccuracy.



# GM Socket Connection

GM Corrugated System has a concept of sealing ring which is placed as follows:-

- For ID 100 up to 200 mm, the sealing ring should be placed in second pipe corrugation of pipe. (figure 1)
- For ID 250 up to 1000 mm, in the groove after first pipe corrugation. (figure 1)
- The sealing position decided to respect the minimum length of engagement acc. to EN standard. (see table 1 & figure 1)

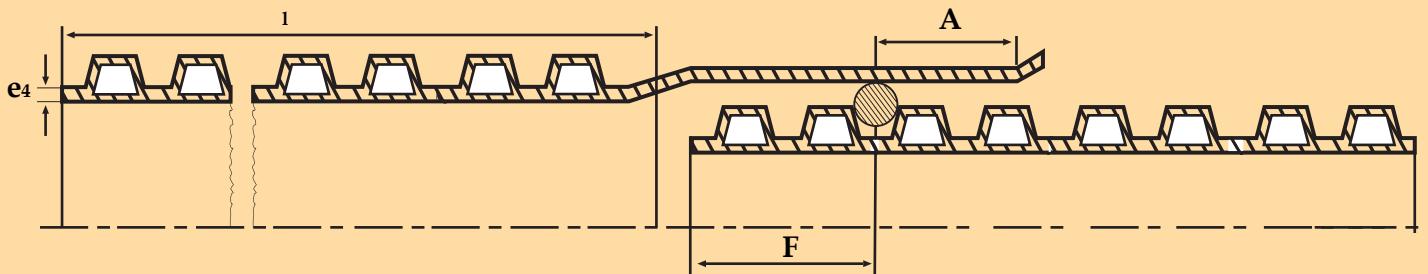


**“Table 1”** Amin. For Dn/ID

DN/ID Series	Dim. , Min.	Socket Amin.
100	32	95
125	38	120
150	43	145
200	54	195
225	55	220
250	59	245
300	64	394
400	74	392
500	85	490
600	96	588
800	118	785
1000	140	985
1200	162	1185

- Amin. : Minimum length of engagement.
- DN/ID : Nominal size related to inside diameter.
- Dim : Mean inside diameter.
- Dim. Min. : Minimum of mean inside diameter.

GM Corrugated System has all pipes' size exceed the Amin. recommended in EN 13476 – 3.



The position of the sealing ring on the spigot should be as specified by the manufacturer

Figure 1 - Typical examples of the Elastomeric sealing ring joints with the sealing ring located on the spigot. Type B

Table 5 – Nominal sizes, minimum mean inside diameters,

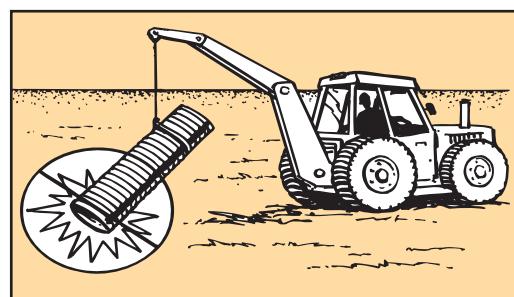
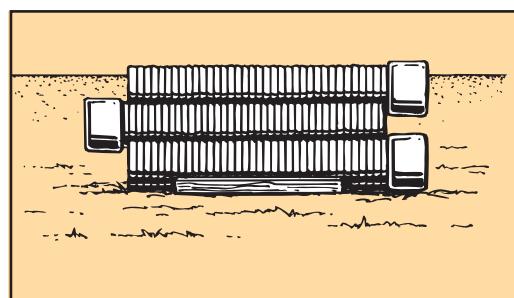
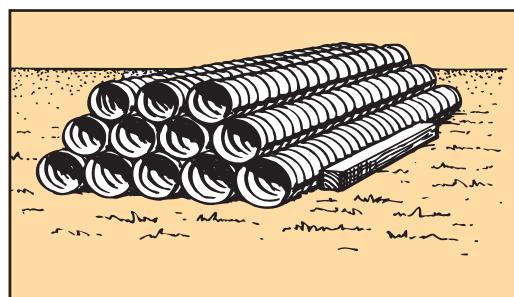
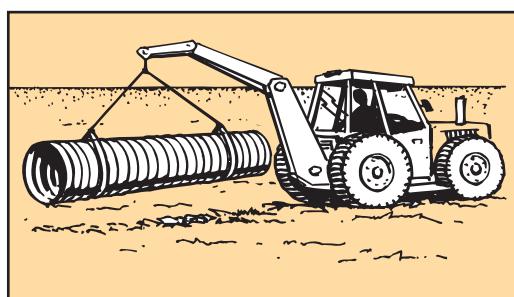
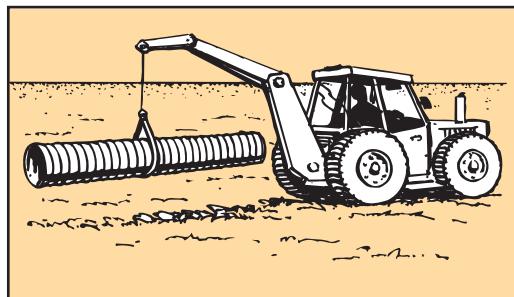
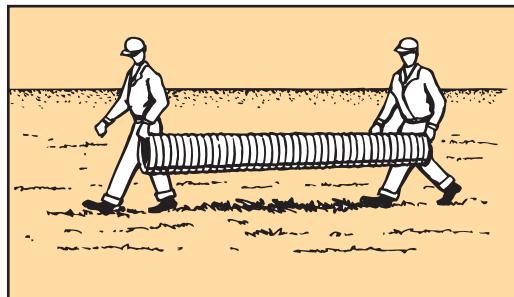
Thickness of inside layers and socket length

Dimensions in millimeters

DN/ID series		Minimum wall thickness		Socket <sup>a</sup>
DN/ID	$d_{m,min}$	$e_{4,min}$	$e_{5,min}$	A min
100	95	1,0	1,0	32
		1,1	1,0	35
125	120	1,2	1,0	38
		1,2	1,0	42
150	145	1,3	1,0	43
		1,4	1,1	50
200	195	1,5	1,1	54
225	220	1,7	1,4	55
250	245	1,8	1,5	59
		1,9	1,6	62
300	294	2,0	1,7	64
		2,3	2,0	70
400	392	2,5	2,3	74
		2,8	2,8	80
500	490	3,0	3,0	85
		3,3	3,3	93
600	588	3,5	3,5	96
		4,1	4,1	110
800	785	4,5	4,5	118
		5,0	5,0	130
1000	985	5,0	5,0	140
		5,0	5,0	150
1200	1185	5,0	5,0	162

# GM, Corrugated Pipe “Handling & Transportation”

- Direct driver to smooth, flat area, free from rocks or debris and any sharp things.
- Follow OSHA safety requirements.
- Don't drop the pipe.
- Pipes I.D 400 and smaller can be moved by hand. (see picture & table 3)
- Large pipe more than I.D 400 requires backhoe with nylon sling and to be lift from one point. (see picture & table 3)
- Large pipe I.D 800 and more must be lifting at two points with a nylon sling, space between two points around 3 meters. (see picture & table 3)
- Don't use loading boom or forklift directly on or inside pipe.
- Storage area must be protected from sunrays.
- Stack pipe no higher than 1.8 meter as pyramid shape (see picture) and alternate the socket for each row of pipe (see picture).
- Pipe also can be stored as bundles as shown in picture.



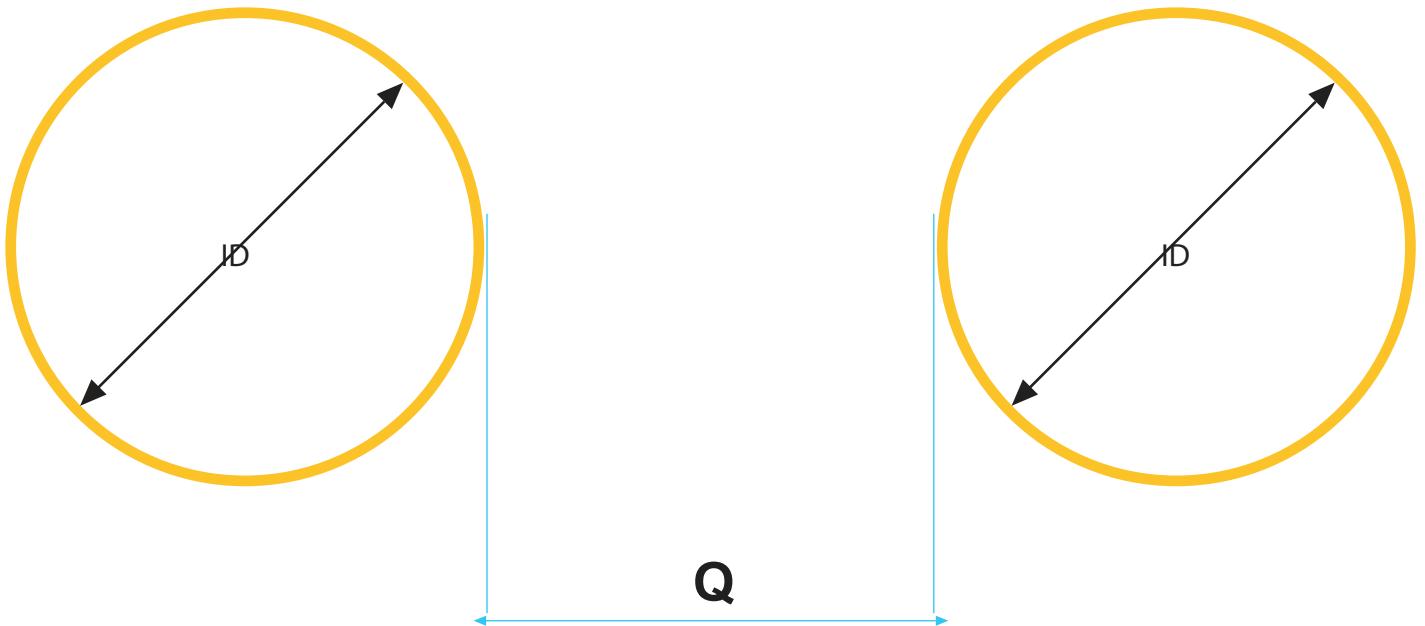
“Table 3”

Recommended Handling method for Pipes		
I.D (MM)	Approximated Weight KG/M	Handling Method
100	0.79	Labor
125	1.25	Labor
150	1.39	Labor
200	2.10	Labor
250	3.52	Labor
300	4.82	Labor
400	8.24	Labor
500	12.66	Sling (One Point)
600	18.63	Sling (One Point)
800	28.2	Sling (Two Point)
1000	40.6	Sling (Two Point)
1200	50.0	Sling (Two Point)

# GM, Trench Recommendations

- Information provided in this pocket installation guide planned as quick reference only and doesn't supersede requirements specified on project plans and recommendations of consultant.
- The trench must be wide enough to place and compact backfill around the entire pipe.
- Reference to table below for recommended minimum trench width, the designer and consultant may modify the trench width based on site specific conditions.

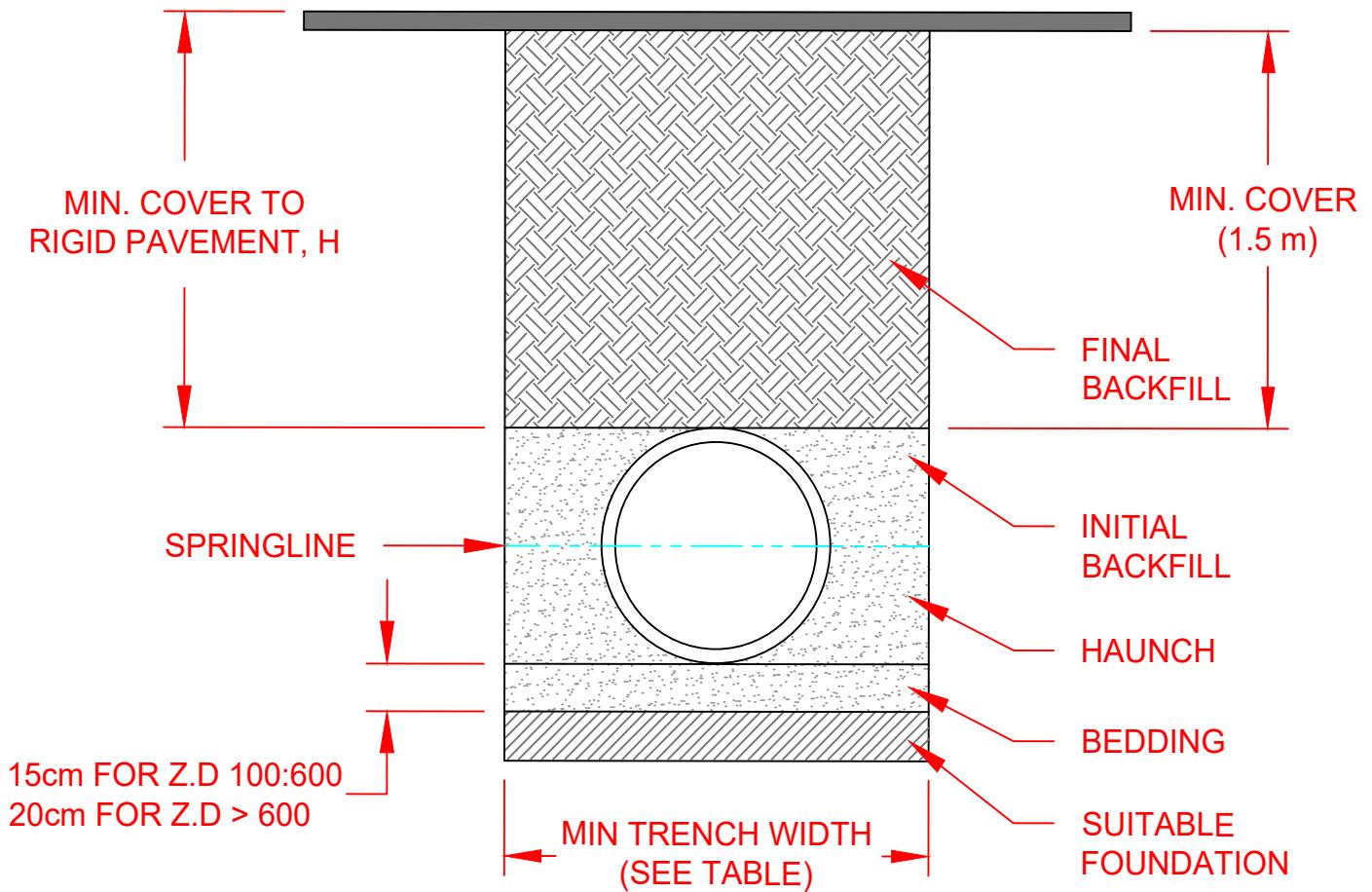
Minimum Trench Width									
Inner Diameter	100 200	250	300	400	500	600	800	1000	1200
Trench Width (CM) Acc. to ASTM D2321		70	80	90	100	120	130	160	200



**\*\* Up to I.D 600 mm Q = 300 mm**

**\*\* For I.D > 600 mm Q = 1/2 I.D**

# TRENCH INSTALLATION DETAIL



**Foundation:** - Foundation must be free from rock, large stones, clumps of soil or debris.

**Bedding:** - Bedding is the portion of the backfill envelope that is placed directly on the foundation, it should be sufficient to provide uniform firm support for the pipe has a socket and spigot joint where the socket is significantly large than pipe, in this case it suitable to carry a socket hole, socket holes are depressions in the bedding design to accommodate the connection so that a stress point does not occur.

**Haunching:** - the haunching area of backfill envelope provides the majority of the resistance against soil and traffic loadings, the backfill material should be installed in layers uniformly on each side of pipe, the back fill should be shoveled under the pipe, taking care to fill voids, if compaction required, it should be away that pipe alignment.

**Initial Backfill:** - Initial Backfill distributes the load into the haunching, this area of the backfill envelope extends from the pipe spring line to a minimum 15 cm above the pipe crown it should be placed compacted in layer, it is very important not to use the equipment directly on pipe.

**Final Backfill:** - Final Backfill extends from the initial backfill to the top of the trench (depth 15 cm).

For maximum cover follow table

Maximum cover over GM storm and drainage pipe

Compacted degree Pipe I.D (mm)	100% (m)	95% (m)	90% (m)	85% (m)
Up to 200	12.5	8.5	6.4	4.9
300	12.8	8.8	6.4	4.9
400	13.4	9.1	6.4	4.9
500	11.3	7.9	5.5	4.3
600	11.5	8.2	5.8	4.3
800	8.5	6.1	4.3	3.0
1000	8.8	6.1	4.3	2.7

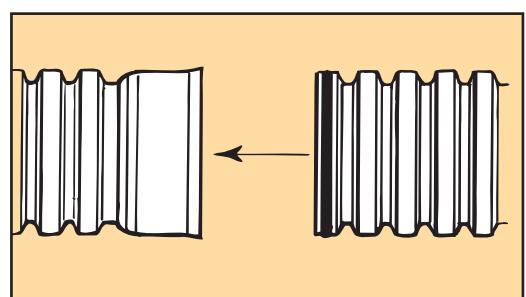
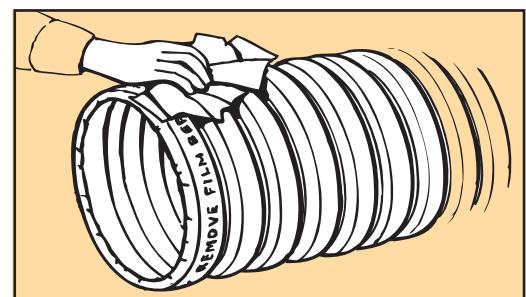
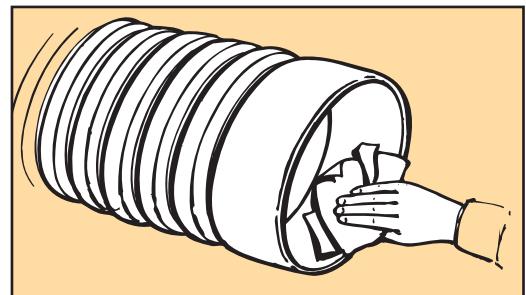
# GM, Socket and Spigot Joint Assembly

- Lower pipe into trench by hand or using nylon straps and excavating equipment.
- Inspect the socket and remove any foreign matter.
- Use a clean rag or brush to lubricate the socket with pipe lubricant.
- Clean spigot end of pipe.
- Remove the protective wrap from gasket.
- Using clean rag or brush to lubricate exposed gasket with pipe lubricant.
- Don't allow lubricant parts to touch dirt or backfill.
- Place spigot into socket and align, pushing spigot into socket with socket facing upstream, always push spigot ends into socket not socket into spigot.
- Assemble joint using one of the following methods.
- Smaller diameter up to I.D 100 can be assembly by hand.
- You must make a homing mark, measure the depth of socket and use a crayon or other material to place a homing mark on appropriate corrugation of the spigot end
- Fabricate a suitable stubs to be used for assemble as follows:-
  - o Cut a section of pipe five corrugations long in the center of corrugation valley.
  - o Using a saw, remove a strip of pipe wall from the short stub of pipe (see figure),

**Strip Width of Stub**

Inner Diameter	100 -150	200	250 -300	400	500	600	800 - 1000	1200
Width ( MM )	51	64	102	130	162	191	254	305

- To use stub, push on the pipe walls to change O.D of stub to I.D of socket to be installed.
- Bar and block method:-
  - o Place installation stub into socket end of pipe.
  - o Place wooden block horizontally across end of installation stub.
  - o With bar, push against wooden block until pipe is fully inserted into socket (see figure).
- Backhoe method:-
  - o Place installation stub into socket end of pipe.
  - o Place wooden block horizontally across installation stub.
  - o Carefully push back of backhoe bucket against block until pipe is fully inserted into socket.



## GM Perforated Corrugated Pipe

Perforated pipe done according the consultant recommendation to be suitable for fluid flow rate required, the perforated pipe can be carried as holes or slots.



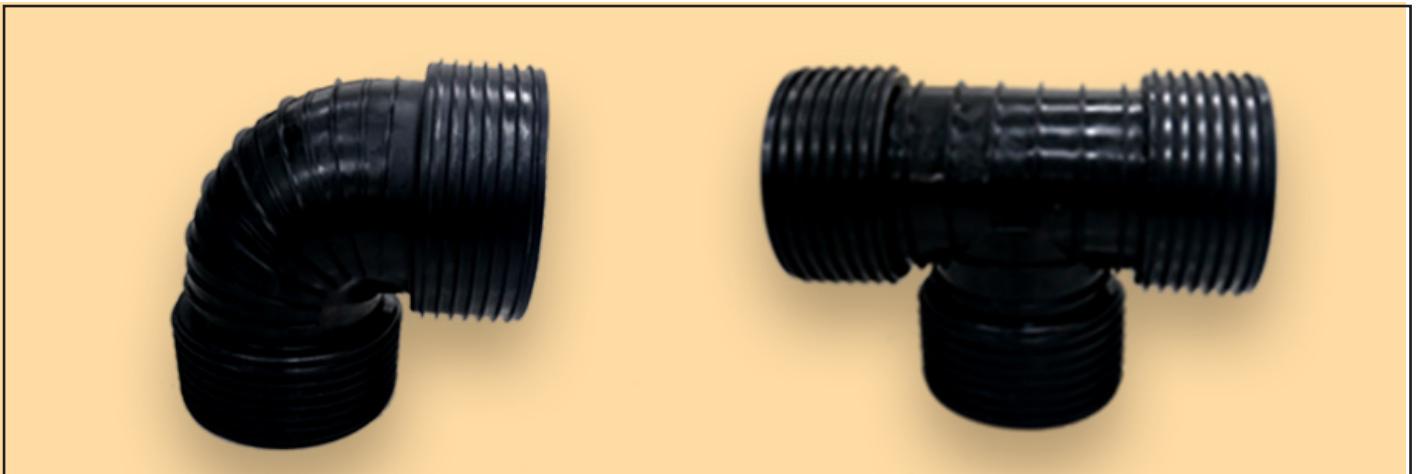
# GM Corrugated Fittings

Corrugated fittings carried by two methods:-

Injection, which used for some of fittings as I.D 100, 150 and 200 mm.

Segmented, which used for I.D 300, 400 and up to 100 mm) even small diameters can be fabricated by segmented method.

Both injection and segmented fittings obeys to tests and inspection according to international standard.



# Laboratory tests for corrugated pipe and fittings

The most important test carried on is according to EN standard or alternative international standard.

- Measuring inside diameter,

Measuring should be follows the values at EN 13476-3.

- Measuring ovality,

Carried by measuring maximum inside diameter and minimum inside diameter and the ovality is difference in between.

- Ring stiffness,

The ring stiffness is most important test which carried by using apparatus applied the force outside of pipe to create the deformation 3% which the ring stiffness reading is required using special equipment.





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