

真空管路指导标准

Vacuum Piping Guide Jets Standard



JETS

Sanitary Systems
- made to please

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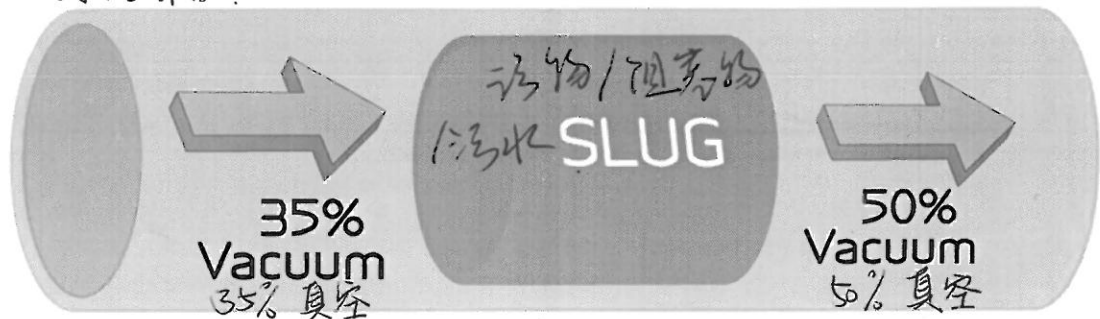
5.2 Complete vacuum system 完整真空系统

6 DESCALING OF VACUUM SEWAGE PIPELINES 除锈方案

1. Introduction 简介

本手册是关于真空污水系统管路,与污水管路连接于此类系统。
This manual is dealing with piping for vacuum sewage systems as well as waste water pipes connected to such systems. The vacuum piping must be in accordance with vacuum sewage system transportation principles:

真空管路必须遵循真空污水系统传输法则:
The transport proceeds in slugs as a result of difference in pressure in front of and behind this slug. 嵌条(金属块)中传递运作是嵌条前端与后端 压力不同而产生的结果。



传递通过管路系统过程中,嵌条在重力作用下会在一段时间后会流走。
During the transport through the piping system, the slug is affected by the gravity and will flatten out after a time. For this reason it is necessary to have low points in the piping system where the slug can form again, so that the pressure difference can be re-established. 因此,有必要在管路系统中设低位点,可使污物/嵌物再形成,生成不同压力。
Pipes are to be secured by clamps, and cleanouts to be made where convenient. 管路由紧固夹固定,清洗孔设于方便的地方。

1.1 Standards and regulations 标准与规则。

建筑用杰驰真空厕所系统:
See also building standards for Vacuum Toilet System:

- NS EN 12109 Internal vacuum systems

1.2 Terms and Conditions 条款与条件。

This manual is considered as guidelines only, and is intended to help pipeline designers to avoid common mistakes. It is not to be used as complete instructions. Pipelines are the customer's responsibility, and Jets can not be held responsible for malfunction of the system due to incorrect pipeline design or construction.

本手册仅为指导书,目的在于帮助管路设计师避免一些普遍错误。不可完全用作作为说明书。管路是客户方的责任,杰驰不对因设计或施工错误而导致故障负责。

1.3 Safety Annotations 安全须知

WARNING

警告

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CAUTION

注意

Indicates possibilities for hazards or unsafe practices, which COULD result in minor personnel injuries and/or property damage, if the required precautions are not taken.

可能会导致危险或不安全情况，故较小个人伤害或财产损失。如果未按预防注意执行。

NOTE

注意

Draws attention to specific information of technical significance which might not be obvious to specialist personnel, or points at important remarks in the procedures to follow.

对于图纸注意特殊技术重要信息，可能对专业人员不明确，或重要标注易于程序中不明确

1.4 Support 支持

Please contact Jets Standard Service.

请联系杰驰标准服务

2. System Description 系统介绍

真空污水系统使用不同气压运送污水。不同气压由真空泵产生。通过压力开关控制真空泵起止。A vacuum sewage system uses difference in air pressure for transport of sewage. This difference is created by the Vacuumator. By means of pressure switches controlling start and stop of the Vacuumator, a constant vacuum of 40%-55% (-0.40 - -0.55 bar) is maintained in the vacuum pipes. 恒定的真空在40%~55%之间存在于真空管路中。

When flushing the toilet, its contents are sucked into the piping system. Consequently transport will continue as long as the toilet valve is open. When the valve closes (after 1.5 -seconds) transport will stop. During the discharge period, the distance of transport will vary from 5 to 15 meters, depending on vacuum, dimension of pipe, direction of flow, the number of bends on pipe etc.

When transport stops, the water in the pipes will flow by gravity to the nearest low point. The pipes must consequently be installed with a water lock or "transport pocket" at this point. At the next discharging of the toilet, or other toilets connected at the same side of the "transport pocket", the contents of the "transport pocket" will be sucked further along in the pipes. In longer lines of piping there will be a simultaneous transport from several "transport pockets" until the sewage reaches the Vacuumator. Between each "transport pocket" the pipes should be installed with a slope along the direction of transport to secure that water will also flow in this direction.

当冲洗便器时，其污物会进入管路系统。因此，只要便器蝶阀打开，就会继续传送污物。当蝶阀关闭时(1.5秒后)传输将停止。在排放期间，传输距离将在5~15米之间。其取决于真空度，管尺寸，冲洗方向，管路转弯管数量等。

当传输停止，管路中的水会由重力作用流至最近的低点处。管路中必须安装存水弯或“回水弯”在此点处。在便器下次排放。或是一个连接在回水弯同侧的便器，“回水弯”中的污物会存在管路更远深处。在较长的管线上，会有多个“回水弯”同时传输，直至污物到达真空泵中。在每个“回水弯”之间的管路需安装一个斜坡，来确保水会流到这个方向。

3. Designing Pipe System 设计管路系统

3.1 Vacuum Sewage System Layout 真空污水系统布局

3.1.1 Choice of piping Layout 管路布局选择

For installations in buildings, the choice of piping layout design will have to be adjusted to many considerations. 安装在建筑中, 管路布局选择设计要适应于诸多因素考虑。



If possible the outlet pipe from toilets should point downwards, i.e. collecting pipes and branches should be on a lower level than the toilets.

如果可能管路的设计布局要在便器下方。例如, 排污管和分支要低于便器。

In this way you avoid the risk of "backflow", and sufficient vacuum for operation of toilets will always be present. Our experience has shown that in this way you obtain maximum operation reliability. 这样可避免回流风险, 并将装置持有足够量的真空来运行便器。根据经验, 这种方式可最大程度获得运作可靠性。

However, when using a vacuum toilet system, collecting pipes and branches may be installed in the ceiling. 但是, 当安装真空卫生系统时, 排污管路和分支可能装于天花板中。In this case it is vital that the piping layout is designed to avoid "backflow", un-intended collection of water in the pipe system and securing safe transport of sewage.

这种情况下, 管路布置避免回流就至关重要了。自然存水于管路且确保污水传输安全。

真空单元在不同形式建筑中的位置

3.1.2 Location of vacuum unit in different types of buildings

As a main rule the vacuum generating unit should always be located at the absolutely lowest point of the vacuum system. In addition it should be located in a way that main pipes and branches could be as short as possible. Branch pipes from toilets should be routed in a downward direction towards the vacuum generating unit.

首要原则是真空发生单元需装在绝对低于真空系统处。另外, 也要尽可能装在使管路和分支最短处。分支管路从便器到真空发生器单元需朝下方向。

真空存储: 计算与增加

3.1.3 Vacuum reservoir: Calculation and build-up

Usually the total volume of pipes creates the vacuum reservoir. When a toilet is flushed, 60 - 100 litres of air is let into the system. At a decrease in vacuum level, the vacuum generating unit will start and vacuum level is rebuilt.

However, this takes some time (e.g. from a few seconds to several minutes, depending on pipe volume and capacity of vacuumators). In cases of possible simultaneous flushing of many toilets (e.g. in larger installation) the total piping volume must be big enough to make the system function. In buildings with a total pipe volume less than 160 litres, we recommend increase of vacuum reservoir by installing an accumulating tank.

通常总管路量形成真空容器。当一个便器冲水后, 60~100升的空气会进入系统, 在真空度下降后, 真空发生单元启动并重建真空度。

然而, 会花费一定时间(例: 几秒钟到几分钟, 取决于管容量和真空系统产能)。当许多便器同时冲洗(例: 在大的装置)管路容量必须足够大来使系统工作。如果在建筑中的总管路少于160升, 我们推荐安装储蓄箱来增加真空存储量。

3.1.4 Choice of branches 分支选择.

An optimally constructed piping system is designed to contain as little water as possible during ordinary operation. This is obtained by making horizontal pipes as short as possible and with as few bends as possible. Horizontal collecting pipes/main pipes should be located in a way that branches will be as short as possible.

最佳的管路结构建造是设计为可最少存水(在普通操作时)。这需要造尽可能短的接管和尽可能少的弯曲处。水平排尿管/主要管路需装在使分支尽可能短。

3.1.5 Sectioning/shut-off of pipes for service 管分节/关闭装置(售后)

When deciding the number of main pipes from vacuum generating unit to branch points, the number of toilets, number of floors and the need for shutting-off for service should be considered. Each main pipe should be installed with a shut-off valve towards manifold of vacuum generating unit.

当决定主要管路从真空发生单元到分支点的数量时,便器数、层数和需要售后用关闭装置需要考虑到。每个主管需对应在不同真空发生单元安装常止阀。

3.2 Challenges regarding different types of buildings.

3.2.1 Large buildings 大建筑

此类建筑中有长走廊, 导致一个会连接多个便器到每个水平分支管路。这些水平管将存储多余的水, 会增加回流危险。因此, 在每个分支设置多个回水弯/锁水弯, 可减少真空度。
These buildings have long corridors and consequently one may be tempted to connect many toilets to each horizontal branch of pipe. These horizontal pipes will then contain more water than what is desirable, and this will increase the risk of "backflow". In addition, many "transport pockets"/waterlocks will reduce the level of vacuum at the end of each branch.

In certain periods public toilets will have a high frequency of flushing. This must also be considered when choosing branches. 在一定时间, 公厕厕所会有高频率冲洗, 这在选择分支时也要考虑到。

The risk of clogging of pipes is high, and the location of rodding points is important. Shut-off valves have to be installed at branches to secure as few toilets as possible out of operation in cases of operation breaks or servicing.

管路阻塞风险较高, 所以观察检查点的位置很重要。关闭阀要安装在分支, 确保尽可能少的便器在停止运作时的售后服务检查。

3.2.2 N/A

3.2.3 N/A

3.2.4 Small buildings 小建筑

In such building, with a high number of people in periods and a relatively low number of toilets, all the toilets will frequently be flushed simultaneously. In these cases it is vital to calculate vacuum generating capacity as well as vacuum reservoir according to simultaneous flushing of toilets. If necessary, an extra vacuum accumulating tank has to be installed to increase the vacuum reservoir.

Due to risk of low vacuum level during high load of operation, pipes from the toilets should have a downward direction, and horizontal branches should be installed lower than toilet level.

在此类建筑中, 一定时间较多且较少的便器数量, 所有便器将同时频繁冲洗。这种情况下, 计算真空发生器产量与真空存储量在同时冲洗便器。如果可能, 附加一个真空储罐来增加真空容量。

对于高负荷运作时, 低真空度风险, 便器管路需向下布置, 水平分支安装需低于便器高度平面。

3.3 Pipetables

3.3.1 Table 1 - Materials 材料

Material:	PEH	PVC	Steel	Stainless steel
Use:	Accommodation up to 75 mm (DN 65) 适用最高为	Accommodation up to 75 mm (DN 65) 适用最高为	In engine room or other heat producing areas. Sizes above DN 65/80 to be used* 在机房或其他热生成区域	In accommodation and engine room 机房.
Minimum Pressure Rating: 最低压力等级	PN 10	PN 10	PN 10	PN 10

PEH = High Density Polyethylene. PVC = Polyvinylchlorine, e.g. DIN 86013.



NOTE

- Plastic pipes do not resist temperatures above 60° C under vacuum conditions. 塑料管在真空条件下, 无法抵抗高于 60°C 高温.
- Steel pipes to be galvanized 钢管需镀锌.
- Rules of National Authorities and Classification Societies to be followed. 遵循国家官方和等级规定.

3.3.2 Table 2 – Number of vacuum toilets 真空便器数量.

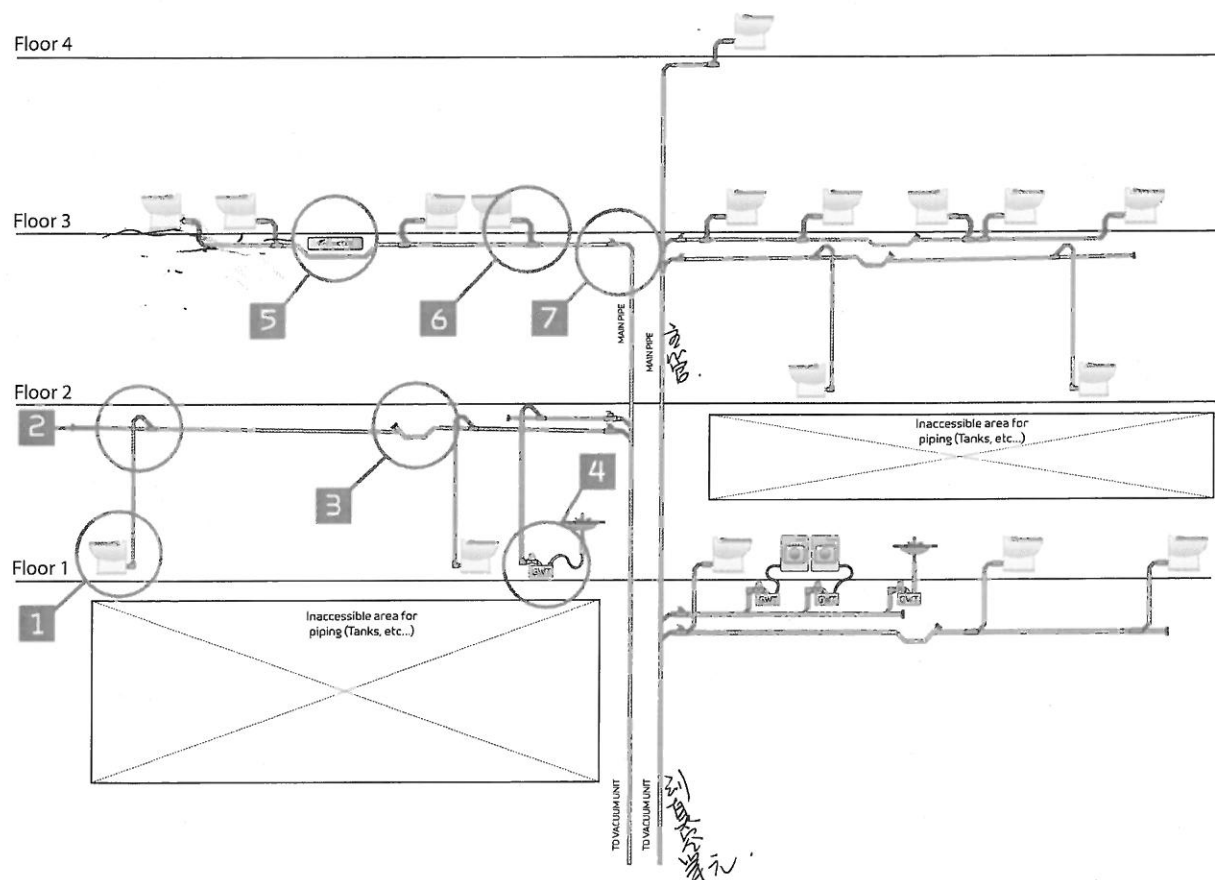
Number of vacuum toilets 数量	Min. pipe size 最小管尺寸				
	Connection DN 连接管	PEH d x s (mm)	PVC d x s (mm)	Steel d x s (mm)	Stainless steel d x s (mm)
3	40	50 x 3.0	50 x 2.4	48.3 x 2.6	50 x 1.0
25	50	63 x 5.8	63 x 3.0	60.3 x 2.9	50 x 1.0
100	65	75 x 6.9	75 x 3.6	76.1 x 2.9**	75 x 1

d = outside diameter. s = wall thickness. 外部直径 壁厚.

*	Supplier to be contacted. 联系供应商
**	Steel pipes for more than 100 toilets; supplier to be contacted. 钢管超过 100 便器, 联系供应商
***	For higher number of toilets, Jets Standard to be contacted. 更多便器时, 联系制造商

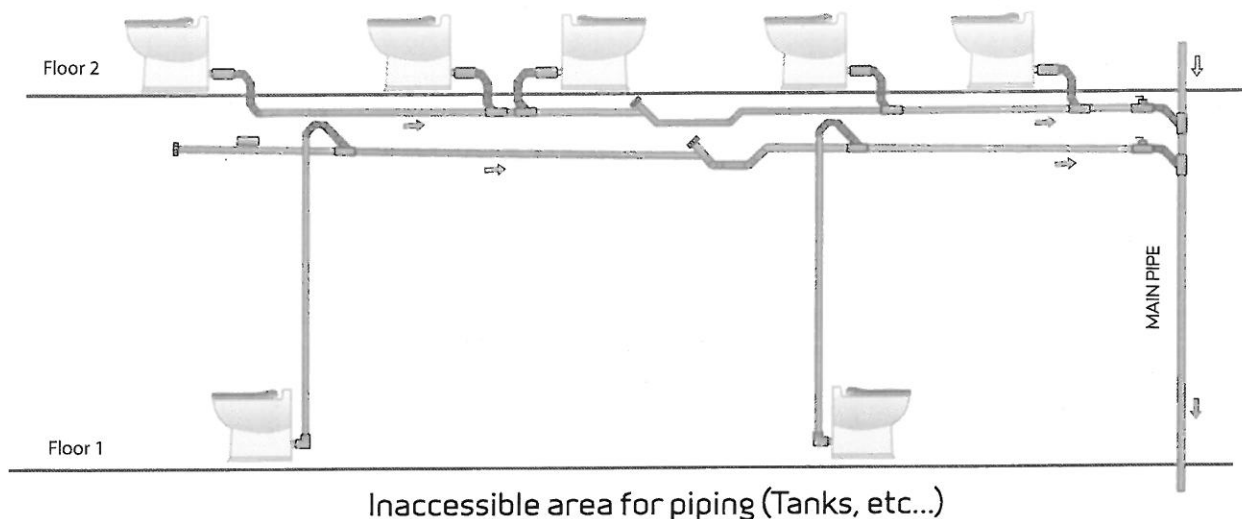
4. Installation Guidelines 安装指导.

4.1 Vacuum System Layout 真空系统布局图.



Reference	Name	Page
1	Toilet connection 便器接口	24
2	Gooseneck 水弯管	22
3	Transport pocket 回水弯 / 返水弯	17
4	Grey water 灰水	26
5	Pipelines passing obstructions 障碍物	17
6	Downward directed outlet pipes from toilets 便器向下排管	17
7	Bends 弯管	21

4.2 Pipe connections for two floors 两层楼管路连接.

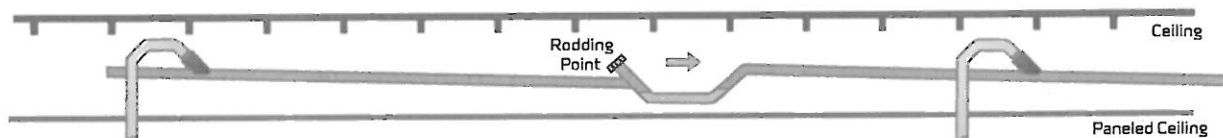


4.3 Horizontal Pipes 水平管路.

4.3.1 Transport in horizontal pipes 在水平管路传输.

Upward directed outlet pipes from toilet: 便器上方排放管:

Vacuum pipes are preferably to be mounted with a slope between the "transport pockets" in flow direction 真空管安装斜坡, 其间设回水弯, 倾斜向水流方向.



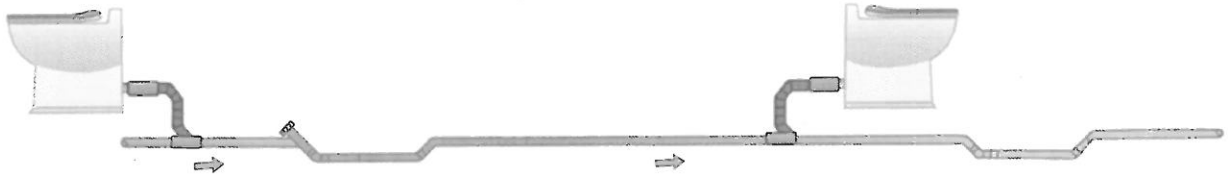
NOTE

- Important to remember: 注意记住:
- Total length of pipe branch 总管支路长度.
 - Fall 落差.

Downward directed outlet pipes from toilet: 便器下方排污管

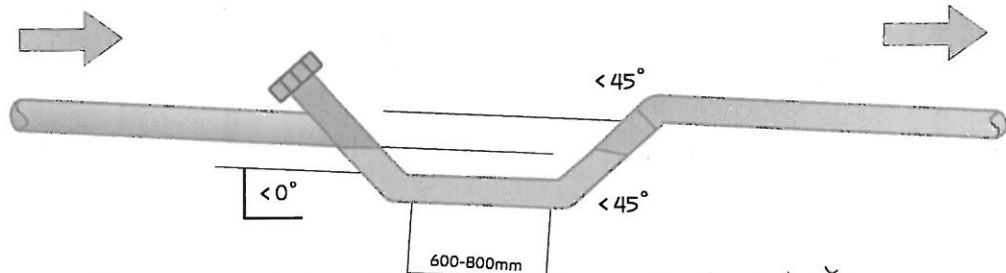
The pipes may be mounted horizontally between the "transport pockets", provided that the outlet pipes from toilets have a downward direction, or backflow is prevented.

管路在“回水弯”之间可水平安装,为便器排污管设向下方向,或防回水措施。

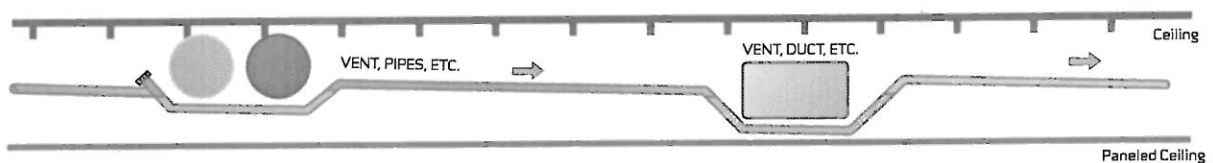


4.3.2 Transport Pocket 回水弯

回水弯用于重造阻塞/淤污物。当在同一管线上上的便器冲洗后,污物前后不同压力会“推”污物到下一个回水弯中。
Transport pockets are made to re-form slugs. When a toilet on the same pipeline is flushed, the pressure difference in front of and at the back of the pocket will “push” the slug on to the next pocket.

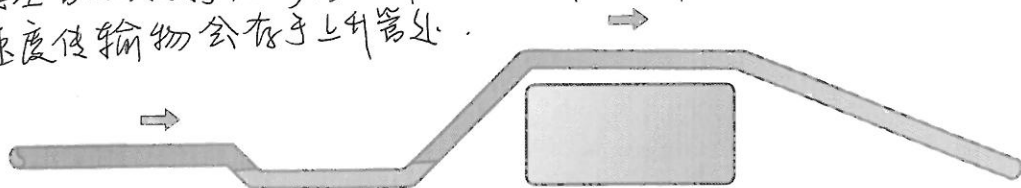


当通过障碍物如经过通风管,十字管等时,可设回水弯。
When passing obstructions like crossing ventilation ducts, crossing pipes and so on, it will be advantageous to construct the passing as a “transport pocket”.



If the vacuum pipe has to be placed above such obstructions, it is important to place a “transport pocket” in front of the rising pipe. In this way maximum speed of the transported sewage is obtained in the rising pipe:

如果真空管必须设于障碍物上端时,就需在上升管处前方设回水弯。这样最大速度传输物会存于上升管处。



决定回水弯间距时,要考虑安装尺寸。

The distance between transport pockets should be decided considering the size of the Installation.

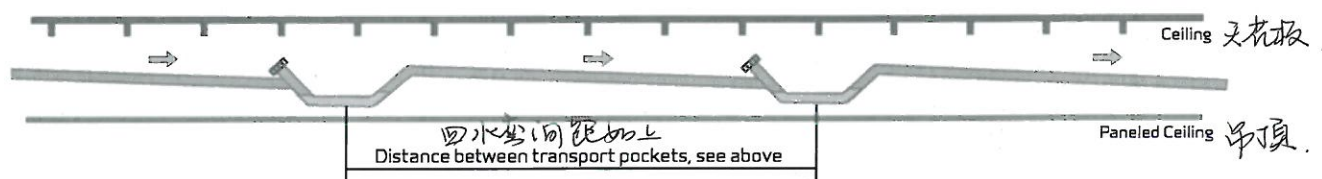
Recommended distances: 参考距离.

Building type	Distance
Small building 小建筑	5 meters
Medium building 中型	10 meters
Large building 大型	15 meters

便器排污管为向下的系统,到水平分支管,“回水弯”最大 25 米间距。
For systems with downward directed outlet pipes from toilets to horizontal pipe branch, the distance between “transport pockets” may be max. 25meters



Slope to be minimum 60 mm between transport pockets! 回水弯间距 倾斜坡度最短 60mm.



At transverse sections of vacuum pipes, distance between “transport pockets” should be considered separately. Even for large buildings, length of transverse sections may require reduced distance between “transport pockets”

在横向的真空管路中,回水弯的距离需要分开考虑。即使是大型建筑,横向断面长度也需要减小。

Bends in pipe lines will always obstruct the flow of transport. In horizontal lines bends will cause an accumulation of sewage just after the bend. It is therefore recommended to install a “transport pocket” just after such bends to collect the sewage and thereby obtain max flow speed at the next straight section. When several bends are located close to each other, a “transport pocket” should be located just after the last bend in flow direction.

管路中的弯管总会阻碍传输流动。新管路上弯管会导致污物在弯点后堆积。因此推荐在弯管后装回水弯。

It is recommended to install “transport pockets” close to branch joints in flow direction. 来收集污物并保证到下一直线段的最大流速。若多个弯管距离很近时,再在水流方向最后一个弯管后设回水弯。

4.3.3 Mounting of vacuum pipes in ceiling 推荐在分支连接处附近设回水弯(水流方向)

在天花板上安装真空管路。

In many installations in buildings horizontal branch pipes are mounted in the ceiling between the ceiling and the paneled ceiling. As a consequence toilet outlets are connected to a vertical pipe which in turn is connected to a horizontal branch pipe in the ceiling.

The greatest challenge in such cases is to avoid “backflow” to the toilets. “Backflow” is when sewage from upper pipes flows back to the rising pipe connected to the toilet. If this rising pipe is filled with sewage, it will influence the discharge function, and in worst case cause sewage to flow into the toilet bowl.

许多装于建筑中的垂直分支管路都是安装在天花板和吊顶之间的。而后便器排污管与垂直管连接,此管与天花板中的材料分支管连接。

此类安装的最大问题是避免回流至便器。回流是污物从高处管流回到便器上升管。

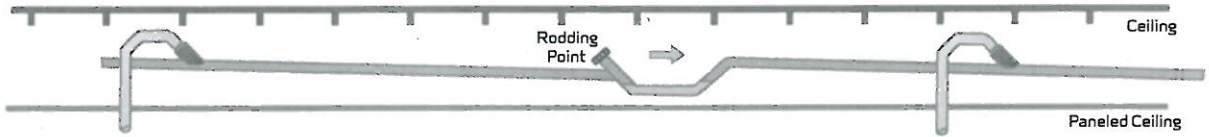
如果排污上升管充满污物,会影响排污功能,最严重时可能会回流到便器中。

安装^水行分支管路于吊顶中。

4.3.3.1 Mounting of horizontal branch pipes in the paneled ceiling

水行分支管路安装在天花板与吊顶之间,要尽可能装于靠近吊顶侧,也就是说回流水管的边界与天花板更低。
Horizontal branch pipes between ceiling and the paneled ceiling are to be placed as close to the paneled ceiling as possible, i.e. "transport pockets" to form lower boundary layer towards the ceiling.

这样的方式可以为鹅颈型弯管与便器上升管和^水行管接口处留出空间。
In this way maximum space for gooseneck in the joint between rising pipe from toilet to horizontal pipe is obtained.



4.4 Pipe connections 接管

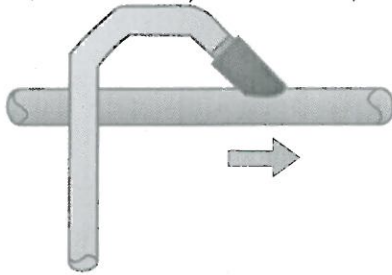
4.4.1 Joining of pipes with different dimensions 集污管

连接不同尺寸的管路。
便器连接的分支与排污水管数量将决定管路的尺寸。便器管路与分支管路,应对20-25个便器时。
The number of toilets connected to branches and collecting pipes will decide the pipe dimension. The most commonly used dimension for pipes from toilets, and also from branch- DN50. es is DN50 for a number of toilets up to 20- 25 toilets. For collecting pipes with larger quantity of toilets than this, DN 65 is used. 集污管路在对较大数量便器时,用DN65管。



Rising pipes with vacuum transport from lower to higher levels must never be installed with transition to larger dimension of pipe! Correct way to this, see illustration under.

从低位到高位传输真空的上升管路,决不可安装较大便大尺寸的过渡管! 正确方式见下文

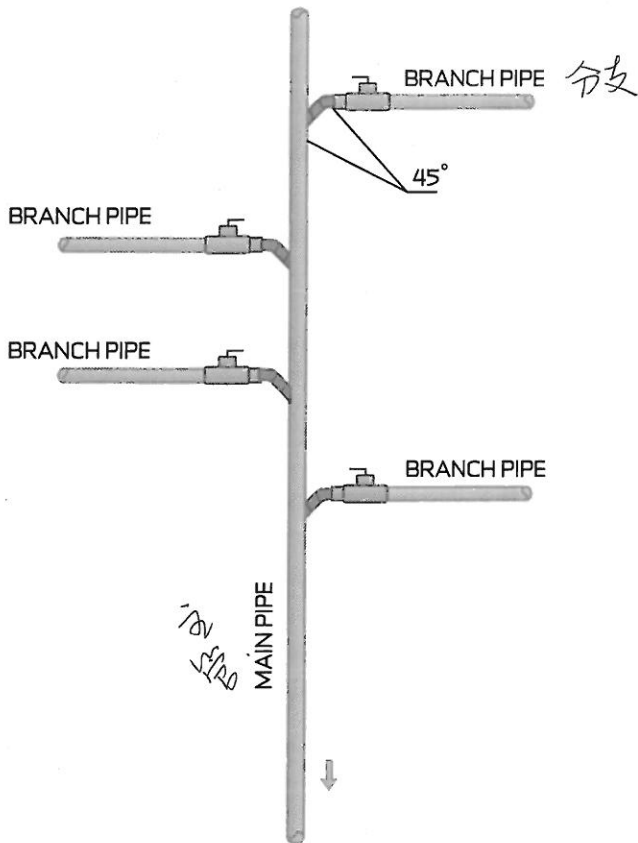


The reason for this is that larger dimension of pipe creates less speed of air and consequently slower transport and shorter distances of transport. The consequences of this are increased risk of build-up of sewage and thereby "backflow".

这样安装的原因是,若用较大尺寸管,会生成较少的空气传递速度和导致较慢的传输速度和更短的传输距离。这会致使增加形成污物的堵塞和回流风险。

水平分支管路向下至集污管需要设为向下45°斜度。在更大的系统中,推荐每个分支安装截止阀。记住要充分连接使用截止阀。

Connection of horizontal branches to downward going collecting pipes shall always be done with a downward 45° connection. In larger systems we recommend shut-off valve for each branch. Remember to make sufficient access for shut-off valves.



4.4.2 Rodding points 检查点, 疏通口

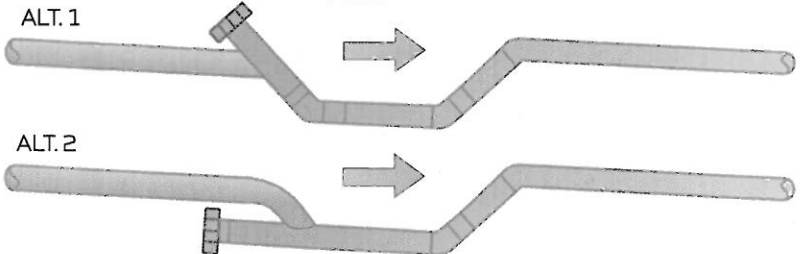
Rodding points should be installed with suitable distances and sufficient access. In longer stretches of pipes one should install the rodding points in connection with "transport pockets".

检查点需安装合适距离并充分接入使用。在较长的延伸管路上, 每一个回水弯连接处需安装一个检查点。

Rodding Point at End of Pipe 管路终点检查点



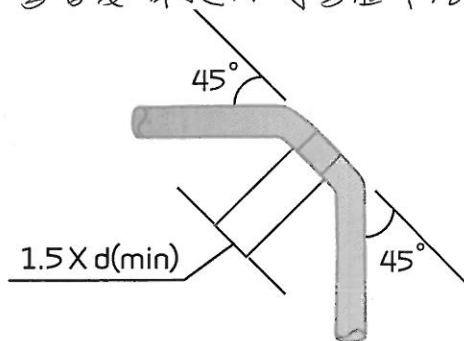
Rodding Point 检查点



4.4.3 Bends 弯管

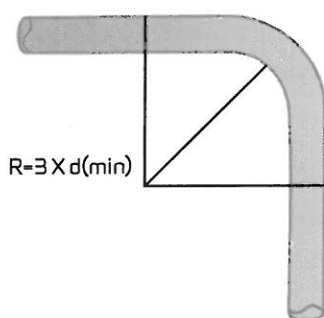
Bends to be made with a large radius of curvature.

弯管要有较大的弯曲半径。



For plastic pipes, and steel "push-fit" pipes minimum radius to be $2 \times D$, or a 90° bend made of two 45° bend pieces.

对于塑料管和钢制“快接”管的最小半径为 $2 \times D$ 或 90° 弯度作两个 45° 弯件。

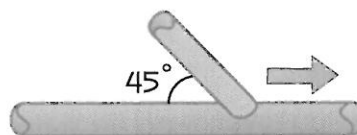
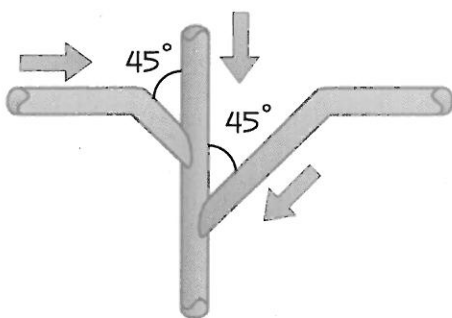


对于焊接钢管,最小弯曲半径为 $3 \times D$.
For welded steel pipes, minimum bend radius to be $3 \times D$

Inside of pipes and fittings to be smooth and without obstructions to avoid clogging.

管内和配件内要平滑且无异物,避免阻塞。

4.4.4 Branches 分枝



Connecting of pipes to be made at maximum angle of 45° in direction of transport. T-pipes are not to be used. Branch pipes are always to be connected to horizontal main pipes from above. Branch pipes always to be connected to vertical main pipes at an angle of 45°

管路连接时,要在传输方向要做最大 45° 角。“T型”管不可用。分枝管路要从上方与主管连接。分枝管路与垂直管连接要有一个 45° 角。

4.5 Connection to vacuum main branch 连接真空主分支.

4.5.1 Rising pipes from toilets 便器上升管路/上行

NOTE 注意

Vertical pipes connections are to be straight running with no bends, to obtain the best possible transport out from the toilet.

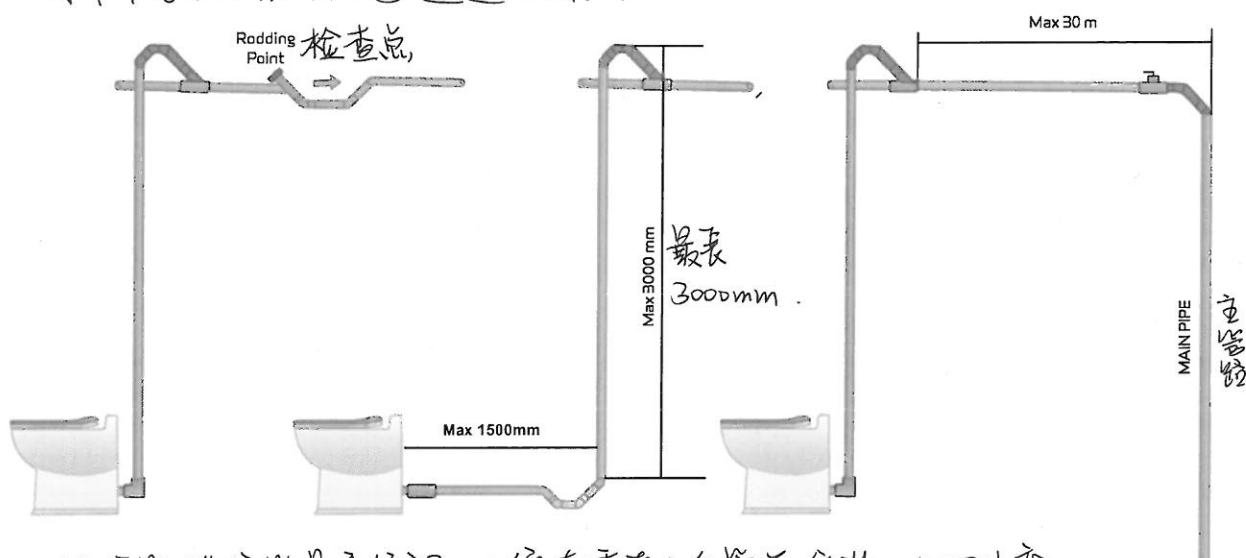
垂直管路连接要直线流动,无弯曲,以获得便器传输最佳效果。

The diameter of the rising pipe must not be increased in the rising part.

上升管径在上升部分必须不可在上升部分增加其直径。

Max. length of horizontal branch is not to exceed 30 m.

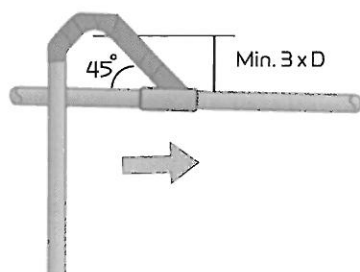
水平分支最长不可超过 30m。



如果便器排污水管是平行的,必须在垂直上升管前安装一个回水弯。

If horizontal outlet pipe from a toilet, a "transport pocket" must be installed in front of vertical rising pipe.

4.5.2 Gooseneck 弯曲管.



The rising pipe is to be connected to the upper side of the horizontal branch pipe with a gooseneck and at an angle of 45° in the direction of flow.

上升管在连接上方平行管上侧时,要安装成鸭形颈管和顺流方向45°角。

4.5.3 Connection to horizontal branch pipe 连接~~水平~~水平分支管路



The rising pipe from a toilet must never be connected to a point on a horizontal branch pipe that may be filled with water, i.e. at a low level point of the pipe line.

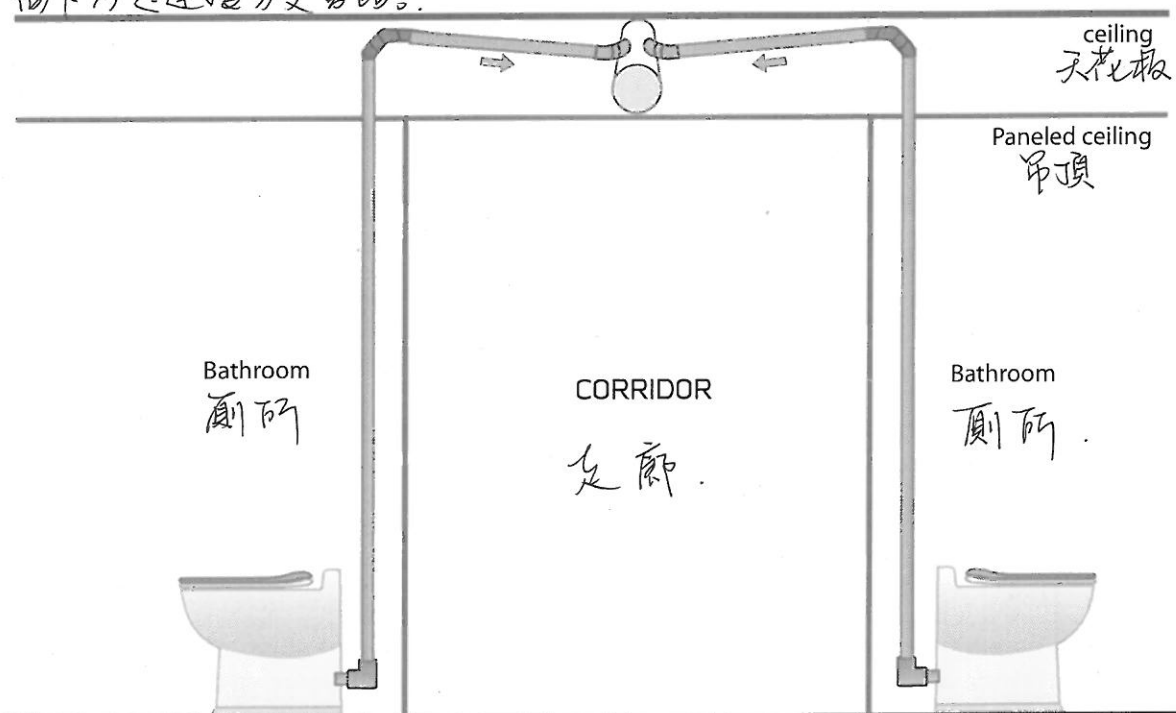
便器上行管路不可直接与水平分支管路连接, 可能會有存水, 即管路下方点。

The reason for this is that in case of low vacuum in horizontal branch pipes, water may be sucked through the gooseneck and gradually the rising pipe will be filled with sewage.

这种方式是为了防止水平分支管中低真空时, 水会卡在鹅颈形管中, 逐渐使上行管中存满污物。

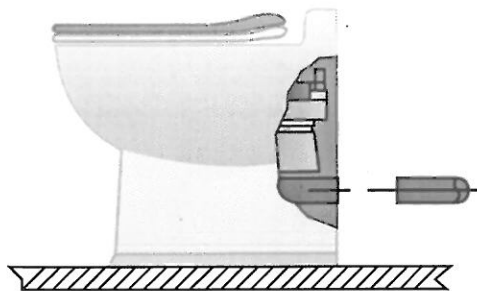
In corridors where rising pipes from toilets on both sides are connected to a common branch pipe, the rising pipe should go as high up as possible and then point downwards towards the branch pipe.

当便器上行管路在走廊两侧连接普通分支管路时, 上行管要尽可能高, 而后向下乃是连接分支管路。



4.6 Toilet Connections 便器连接

4.6.1 Alignment of pipe to toilet valve 便器阀匹配管路

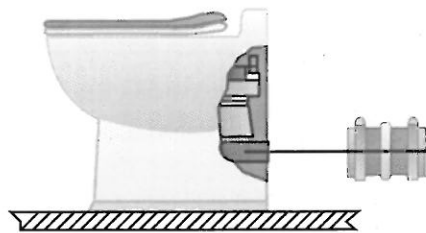
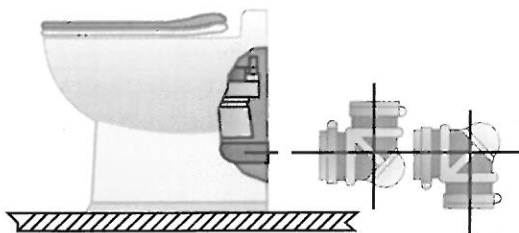


To avoid leakage between the toilet valve and the toilet bowl, it is important that the pipe is properly aligned.

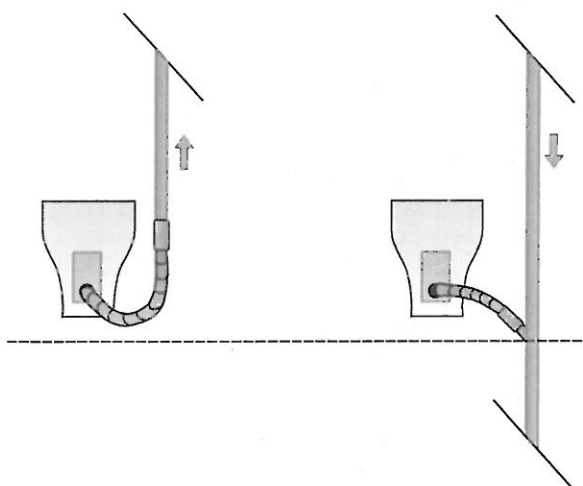
为了避免便器阀与便器间泄露，管路匹配校准很重要。

4.6.2 Connection to toilet valve 连接到便器阀

Rubber sleeve and elbow to be secured by hose clamps. 橡胶套管与弯接要用软管夹固定。



4.6.3 Flexible hose 可调节软管



- For the purpose of using less pipe fittings and secure easier maintenance, we recommend to connect the toilet to the pipe system by means of a flexible hose.
- This flexible hose must not be longer than 1 m.
- The distance between toilet outlet and the pipe system must not exceed 70% of the total length of the hose.
- The flexible hose is to be secured by hose clamps.

为减少管路配件使用和确保维修便捷，推荐以可调节软管用于便器与管路系统间连接。

可调节软管不超过1米长。

便器排污口与管路系统间的距离不超过软管长度的70%。

软管夹来固定可调节软管。

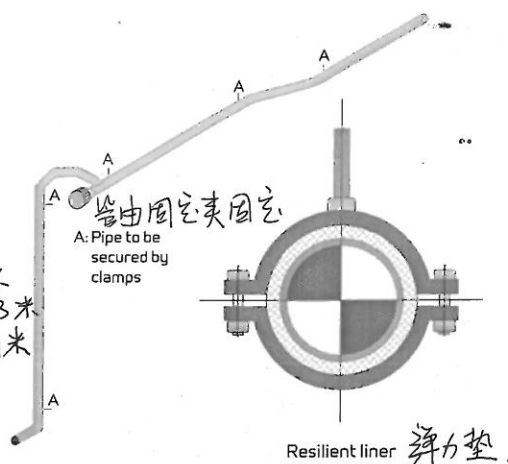
4.6.4 Pipe clamps 管夹

以下情况必须有牢固固定管路:
Pipes must be secured by clamps at:

- Change of direction 变更方向.
- Vertical piping 垂直管路.
- After connection of toilet or other equipment 连接便器或其它设备.
- Every 1,5 m or (every 2nd. frame) for plastic pipes. 每1.5米或(每隔第2段)塑料管
- Every 2,0 m for DN 40 steel pipe DN40钢管每2米
- Every 2,3 m for DN 50 steel pipe DN50钢管每2.3米
- Every 2,7 m for DN 65 steel pipe DN65钢管每2.7米

可参考管路生产推荐说明.

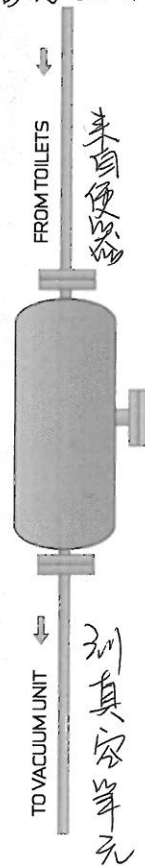
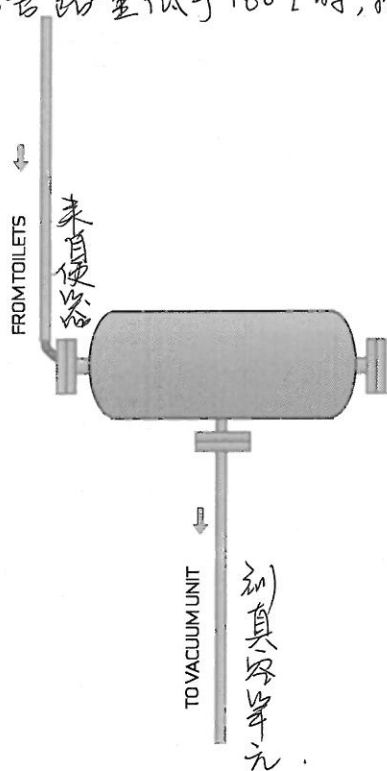
See also pipe manufactures recommendation.



4.6.5 Vacuum accumulating tank 真空存储箱

For small vacuum systems (up to appr. 10 toilets), a vacuum accumulating tank to be considered. An accumulating tank is recommended if total pipe volume is less than 160 l (equal to appr. 85 m pipe length DN50).

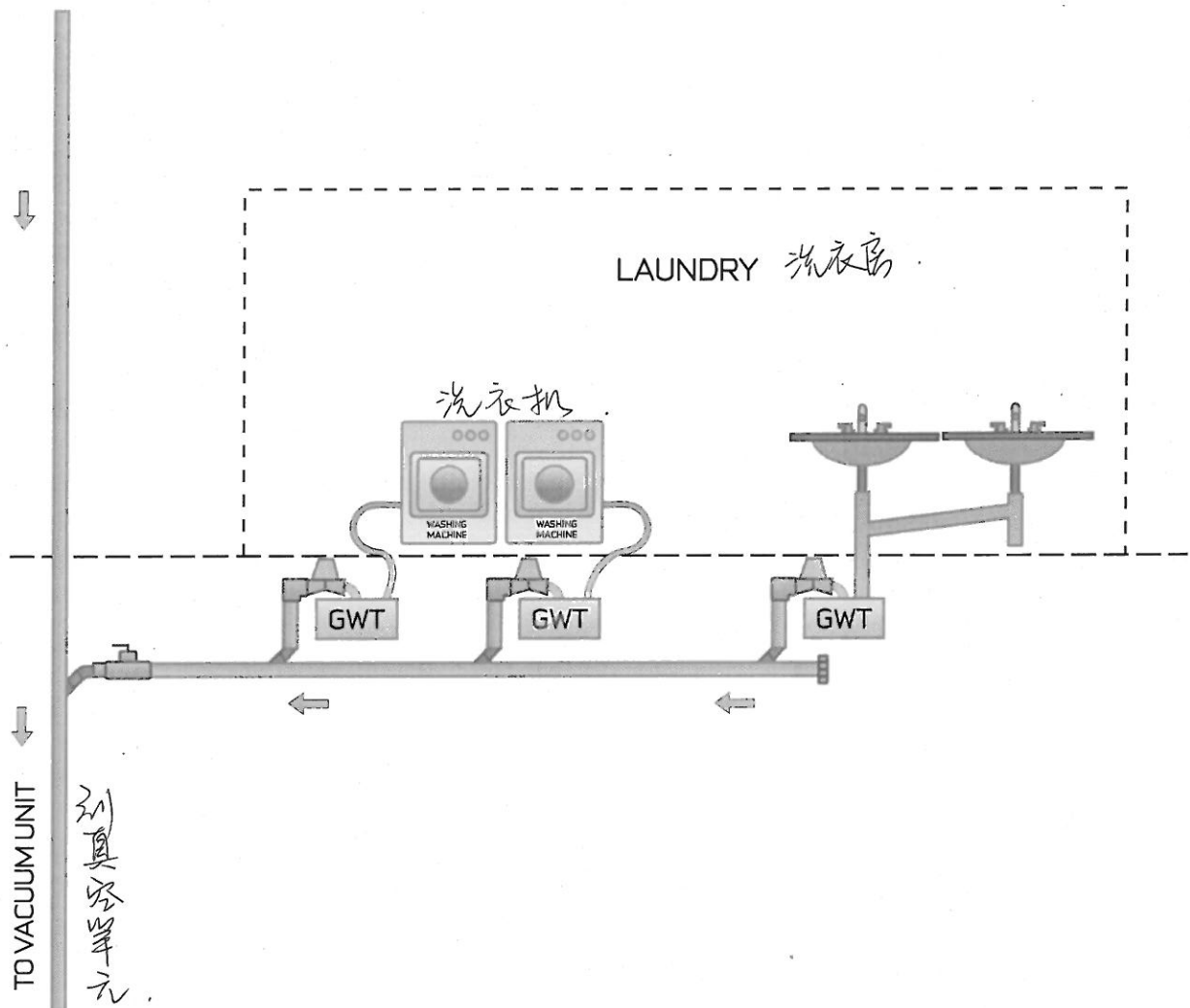
对于小型真空系统(最多应用10个便器), 需要考虑应用一个真空存储箱。
在管路量低于160 l时, 推荐使用存储箱。(DN50管约85米等同)。



4.7 Grey Water 灰水

4.7.1 Grey water piping 灰水管路.

Typical solution for grey water piping from laundry. 典型的洗衣间中灰水管路方案.



4.7.2 Grey water interface 灰水接口.

Normally, grey water should be led in separate gravity pipe lines to STP or collecting tank.

通常, 灰水需通过不同的重力管路排至污物箱.

However, in cases where the grey water must be connected to the buildings vacuum system, this can be done by installing a grey water tank with interface (ED valve) to the vacuum system.

但是, 为让灰水连接到建筑真空系统, 这需要安装一个含接口(ED阀)的灰水箱来连接真空系统.

5. Acceptance Criterias 验收标准

5.1 Vacuum pipes only 仅真空管路

Leakage test of complete vacuum pipes, without any components - toilets, grey water interface tanks, vacuumarators etc.- connected.

真空管路泄漏测试, 不含任何其他配件 - 便器, 灰水接口箱, 真空泵等连接。

All pipe ends to be blinded.

所有管路终端闭合。

Maximum accepted leakage: Vacuum drop from -0,6 bar to -0,5 bar during one hour.

最高可接受泄漏: 1 小时内真空下降 -0.6 ~ -0.5 bar

5.2 Complete vacuum system 完整真空系统

Leakage test of complete vacuum system, with all components- toilets, grey water interface tanks, vacuumarators etc.- connected.

完整真空系统泄漏测试: 含所有配件: 便器, 灰水箱接口, 真空泵等连接。

Maximum accepted leakage: Vacuum drop from -0,55 bar to -0,4 bar during 20 minutes.

最高可接受泄漏: 在 20 分钟内, 真空下降 -0.55 ~ -0.4 bar

6. Descaling of Vacuum Sewage Pipelines

Urine scale is a hard substance that arises of a chemical reaction between the calcium in the water and the urine. Without any action taken there will be a build-up of scale in the vacuum pipes sooner or later depending on various factors. The temperature, the contents of calcium in the fresh water and the frequency of the use of the toilets are factors which decide the rapidity of the scale build-up.

为了避免生水结垢, 推荐下述JETS除锈方案.
In order to avoid scale build-up, it is recommended to follow the Jets descaling programmes.

The Jets descaling programmes give treatment for 4 different scenarios:

- 1 The Jets descaling maintenance programme offers treatment to clean pipes in order to avoid new scale build-up. JETS除锈维护计划提供除锈清洗管路方案.
 - 2 The Jets descaling programme offers treatment to minor scale build-up and is done over a longer period of time. 提供处理方案给水垢最小生成, 且维持较长时间.
 - 3 The Jets descaling boosting programme offers treatment to severe scale build-up where immediate action is necessary. 紧急情况下提供立即除锈维护.
 - 4 Strong acid treatment is recommended to extremely severe scale build-up. This requires that the toilets must be disconnected and the pipes plugged.
强酸除锈要求便器断开与外界连接, 管路堵塞.
- a Fill up the pipe line with a liquid mixture of phosphoric acid and water. 10% acid and 90% water 将管路中充满混合磷酸水. 10% 酸和 90% 水.
 - b Arrange circulation of the mixture if possible. Keep the circulation running for 24 hours 循环流动混合液体. 保持循环流动 24 小时.
 - c Flush out with water. 冲水
 - d If there are still remains of urine scale, use the same procedure (a-c) with a mixture of 10% of Tetra Pyro-Potassium Phosphate.
如果仍有小便垢, 使用相同步骤(a-c) 以 10% 四亚磷酸钾混合.

The Jets descaling programmes allow running toilets during the processes 1-3.

It is therefore not necessary to disconnect the toilets or plug the pipes during the descaling process. 1~3项方案可使用便器. 在除锈过程中不需要断开便器连接和管路.

Jets recommend 2 options:

- 1 Manual dosing: Poor the Jets descaling liquid directly into the toilets according to recommended dosing programme by Jets.
- 2 Automatical dosing: Dosing units to be installed in the vessel according to the Jets recommendation.

It is highly recommended to follow the Jets recommendations accurately in order to obtain maximum effect.

Please contact Jets to get a dosing programme adapted to your installation.