イ　給水管の流出口は、水槽底面より少し上部とし、槽底の沈殿物を吸い込まない位置とすること。

（４）オーバーフロー管

ア　管端部は下向きとし、十分な下り幅をとること。

イ　管端開口部には２ミリメートル目程度の防虫網を取り付けること。

ウ　管端は間接排水とし、約１５センチメートル以上の排水口空間を確保すること。

（５）通気装置

ア　管端部は下向きとし、積雪で開口部が塞がれないような措置を講ずること。

イ　管端開口部には２ミリメートル目程度の防虫網を取り付けること。

ウ　通気装置管端部に笠を取り付ける場合は、容易に取れない措置を講ずること。

（６）排水設備

ア　水槽の底部に１００分の１程度の勾配をとり、吸込みピット等を設け、完全な水抜きができる構造とすること。

イ　水抜管の管端は間接排水とし、約１５センチメートル以上の排水口空間を確保すること。

（７）その他

ア　水槽は、ほこりその他衛生上有害なものが入らない構造とすること。

イ　水槽の上部面は１００分の１程度勾配をとる等たまり水のできない構造とすること。

ウ　水槽が直接日光を受ける場合は、水槽の板を厚くするなど、光の透過を防ぐ措置を講ずること。

エ　給水管の流入口とオーバーフロー管との間に、十分な吐水口空間を確保すること。

オ　水槽は、消火水槽と兼用しないこと。

３　給水管

（１）水を汚染するおそれのある箇所の中を貫通させないこと。

（２）排水管等他の配管と識別できる措置を講じ、直接連結させないこと。

（３）維持管理、点検及び配管の更新を容易に行えるように配置すること。

４　その他

（１）ポンプ室内の床は、排水、排油が速やかにできる構造とすること。

（２）貯水槽には、原則として水位警報装置を設置すること。

（３）貯水槽へ流入する給水管の立て管に給水栓を設けることが望ましいこと。

（４）地下水等の自己水源を使用する場合は、塩素注入装置を設けること。

簡易専用水道管理点検記録

施　設　名	
管理責任者	

社団法人 新潟県貯水槽管理協会
財団法人 新潟県環境衛生研究所

この記録類は法令等の定めにより５年間の保存が義務づけられています。

給水設備管理点検記録

年　　月

区分	日時	測定(採水)場所	残留塩素(mg/ℓ)	外観等異常の有無 色・濁り	におい	味	異物等	水質異常の状況
水質検査				有・無	有・無	有・無	有・無	
				有・無	有・無	有・無	有・無	
				有・無	有・無	有・無	有・無	
				有・無	有・無	有・無	有・無	
				有・無	有・無	有・無	有・無	
				有・無	有・無	有・無	有・無	
				有・無	有・無	有・無	有・無	
				有・無	有・無	有・無	有・無	
				有・無	有・無	有・無	有・無	
				有・無	有・無	有・無	有・無	

区分		点検月日	月　日(　曜)
施設・設備管理点検記録	項目	受水槽等	高置水槽
	水槽周辺の清潔さ	適・否	適・否
	水槽の水漏れ、損傷	適・否	適・否
	水槽内部の異物の有無	適・否	適・否
	マンホール施錠　防水パッキン	適・否	適・否
	オーバーフロー管からの出水	適・否	適・否
	オーバーフロー管の虫網	適・否	適・否
	通気管の防虫網	適・否	適・否
	塩素滅菌器の作動	適・否	
	防錆剤注入装置の作動	適・否	
	揚水ポンプの振動、異音	適・否	

特記事項	

水の使用量　　　　　㎥／月	担当者

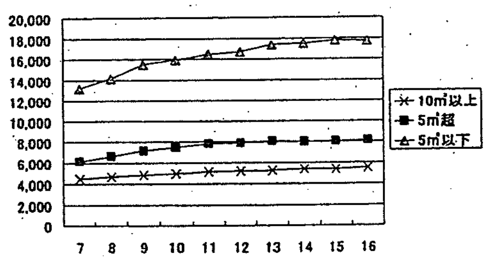
小規模貯水槽水道の衛生管理における
行政と清掃業者との協力について

名古屋市健康福祉局
環境薬務課　榑屋和紀

小規模貯水槽水道の現状

- 名古屋市内　　25,824施設
  うち5㎡以上　　8094施設
  10㎡以上　　17,730施設
  用途内訳 ●特定建築物　239施設
  ●共同住宅　15,772施設
  ●その他　9,813施設
  （平成16年度末）

受水槽保有施設数の推移



要綱について

- 「給排水設備の構造と維持管理に関する基準及び指導要綱」
  衛生的で安心な飲料水を確保するとともに、適切に汚水を排水するための基準を定める

  名古屋市健康福祉局・上下水道局・環境局
  住宅都市局・消防局の5局で策定
  昭和52年1月1日施行

維持管理基準（1）

- 清掃
  年1回以上行うこと。
  清掃方法について
  厚生労働省告示、厚生省通知、及び要綱で定められた基準に従い実施
  ・貯水槽内の消毒（2回）
  ・従事者の健康診断（おおむね6箇月ごと）
  ・水張り終了後に水質検査及び残留塩素濃度測定を実施

維持管理基準（2）

- 水質検査
  ・週に1回以上末端給水栓で水質検査
  検査項目：色・濁り・臭い・味・残留塩素
  ・六月に1回以上末端の給水栓にて実施
  （貯水槽清掃時も同様）
  検査項目：pH、一般細菌、大腸菌、鉄及びその化合物、亜鉛及びその化合物
  なお、自ら水質検査を行うことができない場合は、厚生労働大臣又は知事の登録を受けたものに委託することが望ましい

維持管理基準(3)

- 点検
  - ・通常の保守点検
    要綱に従い、週1回～年1回実施
  - ・地震、台風、浸水、断水、濁水等の異常があった場合
    その都度、給水設備等の点検を行い、必要な飲料水の水質検査を行うこと

環境衛生広域指導班

- 平成10年に設置
- 西・南保健所に10名在籍
  担当区域
  西保健所(千種・東・北・西・中村・中川・守山・名東区)
  南保健所(中・昭和・瑞穂・熱田・南・緑・天白区)
- 広域指導班の業務
  - ・小規模貯水槽保有施設の監視指導
  - ・水質検査

広域指導班立入実績

- 立入検査件数 4,707件(3,259件)
- 水質検査件数 749件(424件)
- 改善指導件数 801件(603件)
- 報告書徴収件数 80件(53件)

(平成16年度実績 ( )内は5㎡以下を再掲
保健所環境衛生担当・広域指導班合計)

主な指摘内容

- 構造設備 546件(398件)
- 水槽清掃 283件(253件)
- 現場調査 110件(74件)
- 保守点検 70件(58件)

(平成16年度実績 ( )内は5㎡以下を再掲
保健所環境衛生担当・広域指導班合計)

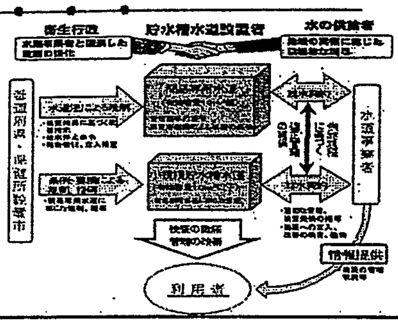
小規模貯水槽水道清掃率

- 届出義務も無く施設立入時に職員が管理者より聞き取りができた場合にしか確認できないので、実際の清掃率の把握は難しい
- 本市ではおよそ平成16年現在60%と推定される
  (水槽清掃指摘件数/水質検査件数)

水道法の改正について(1)

- 平成13年の水道法改正
  ●改正のポイント
  - ・「貯水槽水道」の定義を定める
  - ・貯水槽水道の管理について、従来の衛生行政に加え、水道事業者も関与することとなった

水道法の改正について(2)



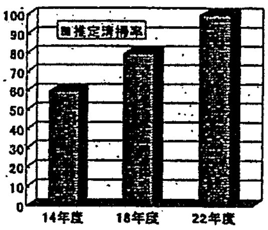
名古屋市新世紀計画2010

- 名古屋指針世紀計画2010とは･･･
  2010年(平成22年)を目標年度とした名古屋市の基本計画
  平成16年度から18年度までを計画期間とする第2次実施計画で「小規模貯水槽水道の衛生管理指導」が盛り込まる
  目標:安全な飲料水の確保のための定期的な清掃の実施率の向上を目指す

2010における数値目標について

- 平成14年度60%と推定される貯水槽清掃実施率について

平成18年度　80%
平成22年度　100%
を目指す



18・22年度は目標値

上下水道局との連携強化

- 従来より、飲料水汚染事故に備えた連絡体制あり
- 貯水槽水道関係業務連絡会議を設置
  立入検査結果や施設の情報など、貯水槽水道の構造設備及び維持管理に関する情報提供体制を整えた

三者協議会の設立について

- 貯水槽清掃率の向上のためには、衛生部局、水道事業者に加えて、貯水槽清掃業者との連携も欠かせない
- 健康福祉局、上下水道局と(社)全国建築物飲料水管理協会(略称:全水協)愛知県支部との間で名古屋市小規模貯水槽水道衛生管理対策協議会を設置

今後行う取り組み(1)

- 貯水槽清掃数の報告
  - ・自社で実施した貯水槽清掃数について、毎年環境薬務課に報告する
  - ・環境薬務課は報告を元に清掃数の把握に努め、今後の立入計画や衛生指導の参考とする

報告例

区名	10㎡超	5㎡超	5㎡未満	合計
千種	7(1)	12(3)	22(5)	41(9)
東	5(0)	2(2)	17(10)	24(12)

今後行う取り組み（2）

- 清掃済みシールの貼付
  - ・清掃を実施した受水槽に清掃済みのシールを貼付する

様式見本→

清　掃　済　証	
厚生労働省告示119号に基づく清掃を完了したことを証します	
実　施　日	年　月　日
次回予定日	年　月　日
実施責任者	
清掃実施者	建築物飲料水貯水槽清掃登録 愛知県　　号
	〇〇〇〇株式会社
	電話　(〇〇〇) 〇〇〇－〇〇〇〇

今後行う取り組み（3）

- 清掃業者リストの作成

（1）（2）で協力を頂ける清掃業者について

住所・所在地・連絡先等を記入した貯水槽清掃業者のリストを作成し、ホームページ上で公開するとともに、保健所や上下水道局において施設管理者等に配布する予定

営業所名称	住　所	電話番号
〇〇〇工業㈱	名古屋市千種区〇〇一丁目5－2	(〇〇〇) ×××・△△△△
(有)〇〇〇サービス	名古屋市東区〇〇三丁目2－3	(〇〇〇) ×××・△△△△
㈱〇〇システム	愛知県春日井市〇〇町5	(〇〇〇〇) ××・△△△△

今後の具体的なスケジュール

- 12月末までに平成16年度の清掃実績を環境薬務課あてに郵送・メール等で報告
- 平成18年度初頭に環境薬務課が貯水槽清掃業者リストを作成
- 平成18年度清掃を実施した施設については、貯水槽に清掃済みシールを貼付
- 名古屋市ホームページで貯水槽清掃の必要性を啓発

記入上の注意

- 数は受水槽容量ごとにまとめて記入し、一施設で複数受水槽がある場合はそれぞれの受水槽について計上する
- （　）内は地下式の受水槽の数について再度記入する
- 個人情報保護の観点から、具体的な施設名は挙げず数だけの報告とする

まとめ

- 現在、名古屋市に相当数あると見られている定期的に清掃されていない貯水槽について、行政と貯水槽清掃業者が協力することで清掃率を高めていく
- 貯水槽清掃業者には貯水槽清掃実施数の報告と貯水槽清掃済みシールの貼付をお願いし、行政は貯水槽清掃業者リストを作成し、施設管理者等に配布する

小規模貯水槽水道の衛生管理指導について

1　小規模貯水槽水道とは

名称	簡易専用水道	[redacted]
内容	容量が10㎥を超えるもの	[redacted]
法規制	水道法で規制あり	[redacted]
施設数	約５５００	[redacted]

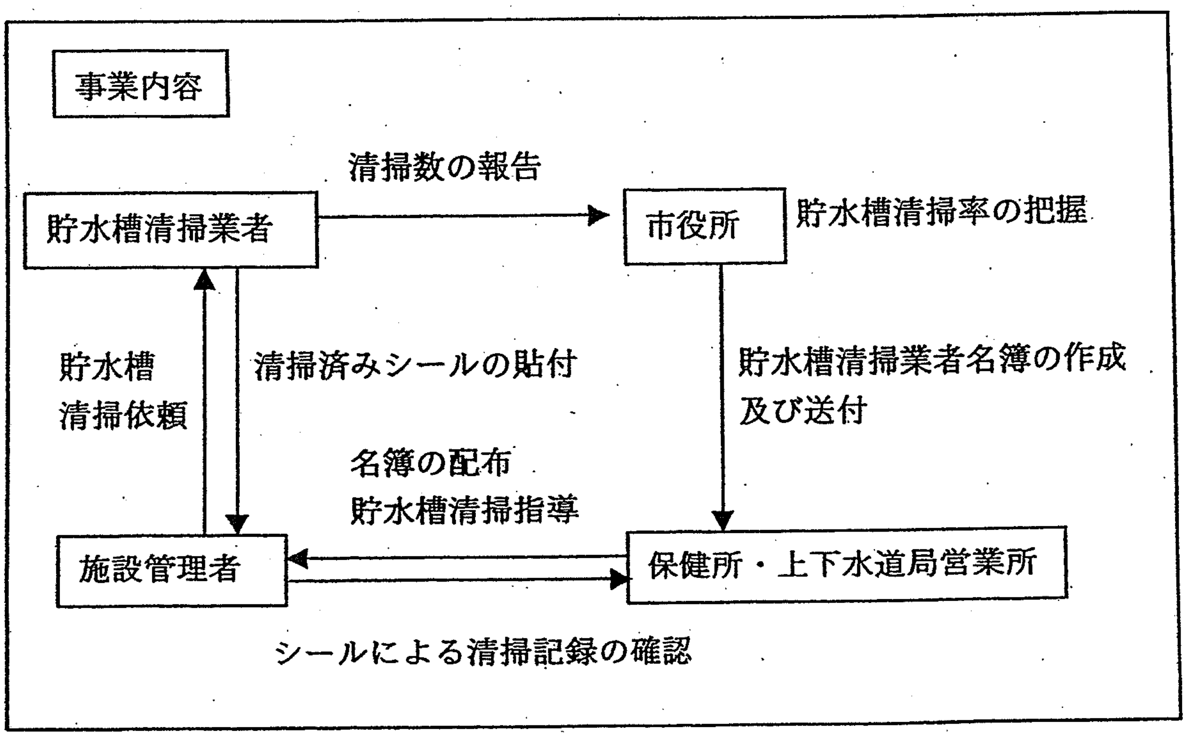
2　名古屋市新世紀計画２０１０

小規模貯水槽水道の清掃実施率を向上させる

平成１６年度	平成１８年	平成２２年
６０％	８０％	１００％

3　取り組み状況

平成１６年度	平成１７年度	平成１８年度以降
・関係者協議会の設置（健康福祉局、上下水道局、貯水槽清掃業者）	・関係者協議会の定期的な開催 ・講習会の開催（貯水槽清掃業者に対し、事業を説明） ・協力事業者の募集	・同左

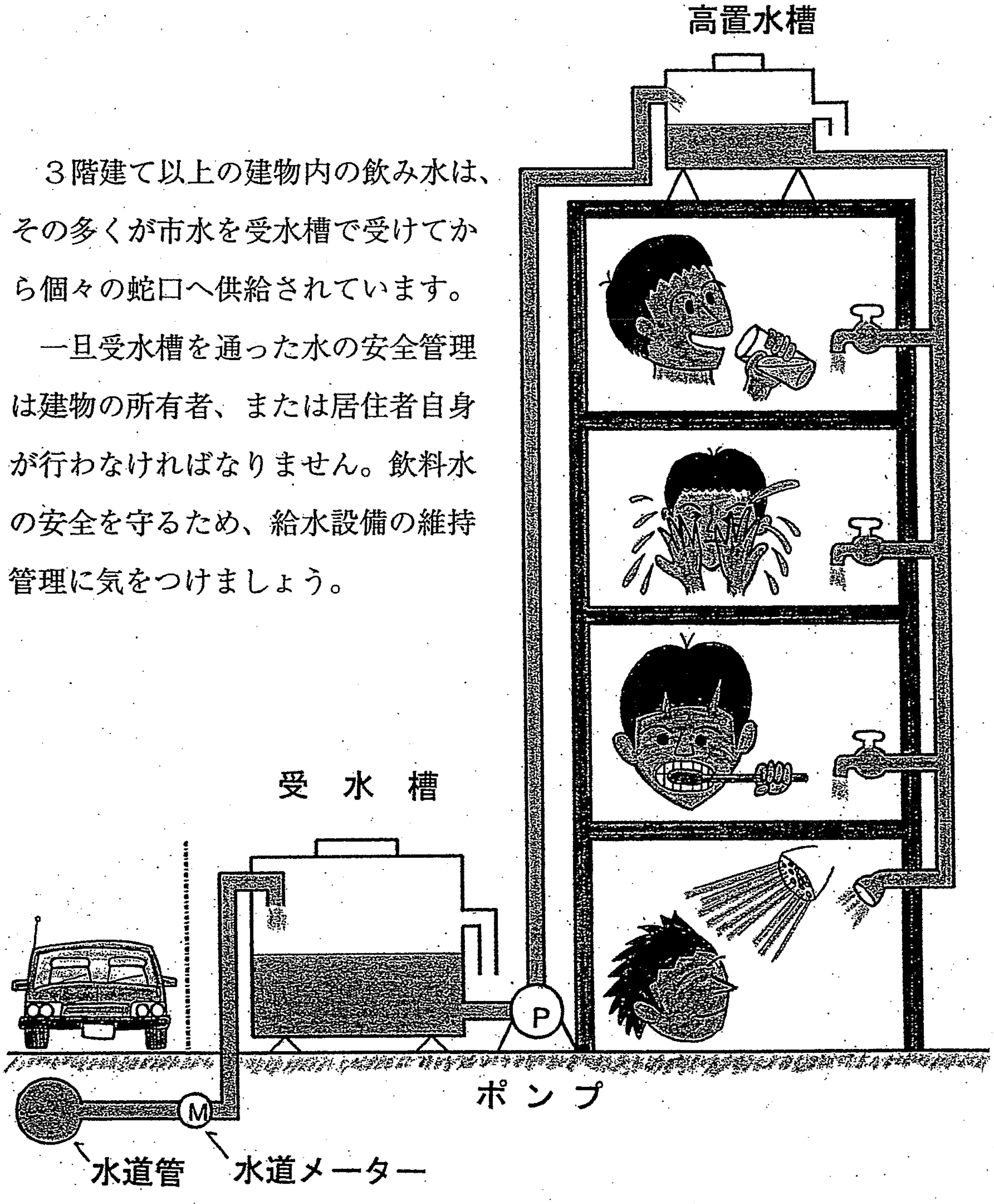


水の衛生管理

～ あなたの飲み水は安全ですか ～

３階建て以上の建物内の飲み水は、その多くが市水を受水槽で受けてから個々の蛇口へ供給されています。

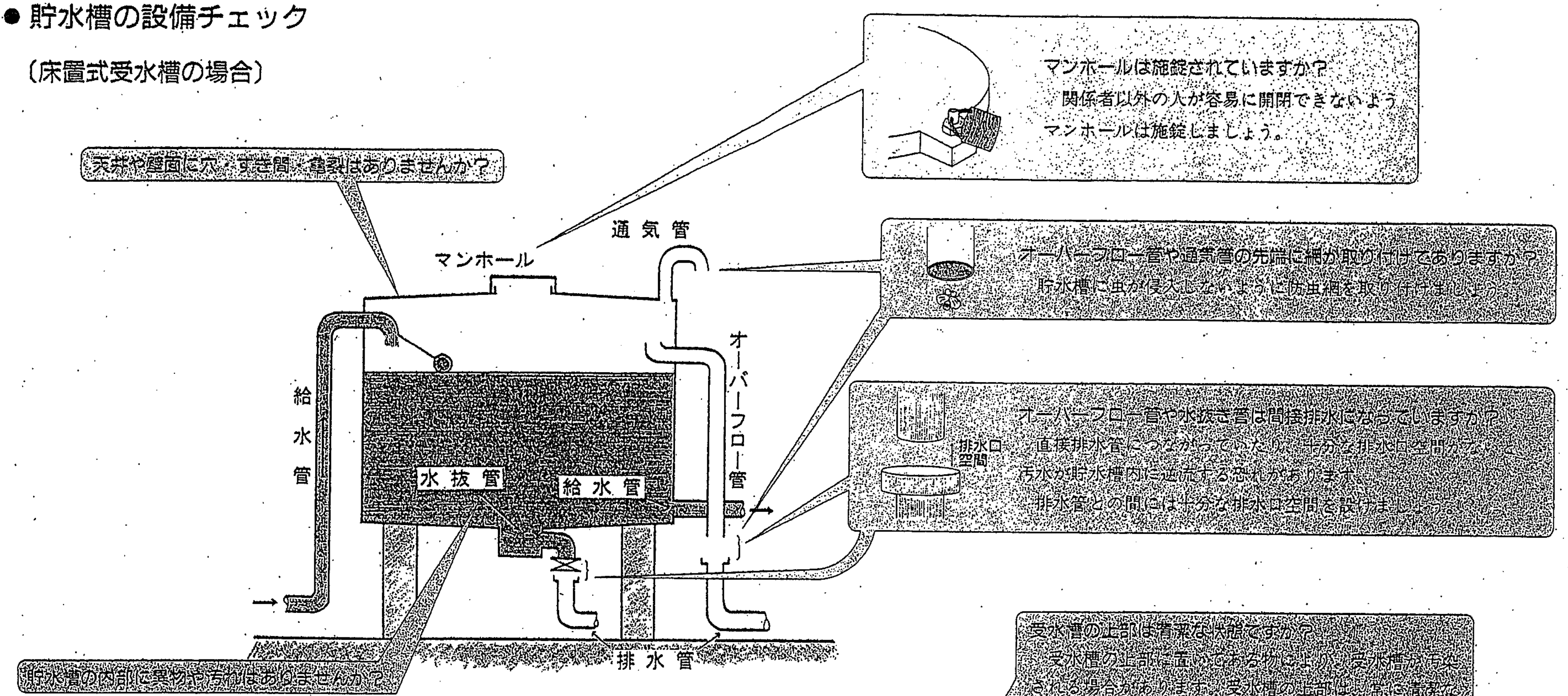
一旦受水槽を通った水の安全管理は建物の所有者、または居住者自身が行わなければなりません。飲料水の安全を守るため、給水設備の維持管理に気をつけましょう。



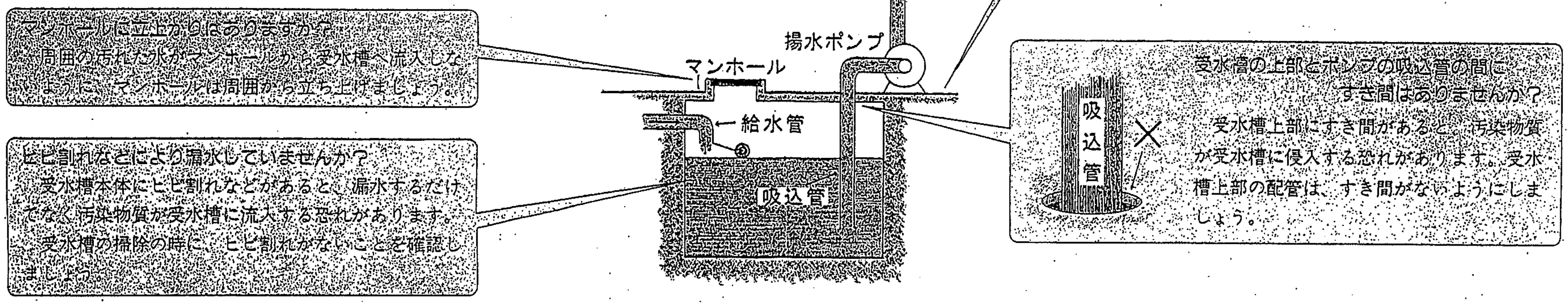
名　古　屋　市

● 貯水槽の設備チェック

〔床置式受水槽の場合〕



〔地下式受水槽の場合〕



●貯水槽の維持管理

1　貯水槽の掃除をしましょう。

貯水槽は、知らない間に鉄さびや水あかがたまって汚れてきます。少なくとも年に１回、専門業者による定期的な掃除が必要です。

掃除時に槽内面の破損・劣化などを点検し、必要があれば補修して下さい。

2　給水設備の点検をしましょう。

飲料水が衛生的に安全に供給されるためには、貯水槽・自動制御装置・給水ポンプなどの定期的な保守点検が必要です。

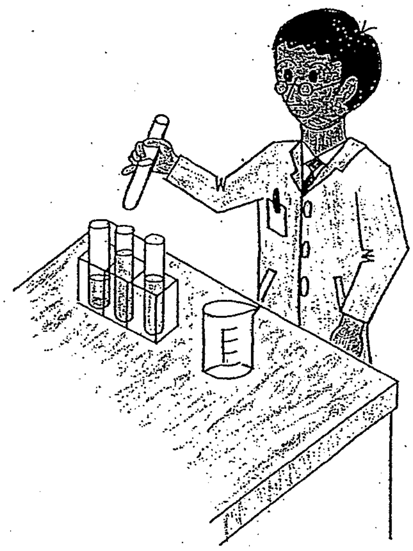
3　水質検査を実施しましょう。

(1)　週１回の眼視などによる検査

蛇口からしばらく水を流した後に、透明なガラスコップに水を入れてください。透かしてみて、色や濁りがないか、飲んでみて、味や臭いに異常がないかを調べて下さい。

また、残留塩素濃度の測定も併せて行うことが必要です。

(2)　年に２回以上、専門の水質検査機関で鉄・亜鉛・一般細菌・大腸菌・水素イオン濃度（pH値）の５項目について検査を受けましょう。



4　管理責任者を決めましょう。

管理責任者を中心とした、貯水槽の掃除、水質検査、給水設備の点検管理が行われるようにすることが大切です。

5　図面を保管しましょう。

給水設備などの図面や管理実施記録は大切に保管しておきましょう。

飲料水の衛生についてのお問い合わせ、ご相談は、最寄りの保健所生活環境課環境衛生担当へ。お電話でも結構です。なお、中高層建物については直結給水をお勧めしています。直結給水のご相談は、上下水道局営業部給排水設備課（☎ 972－3645）または最寄りの上下水道局営業所へ。

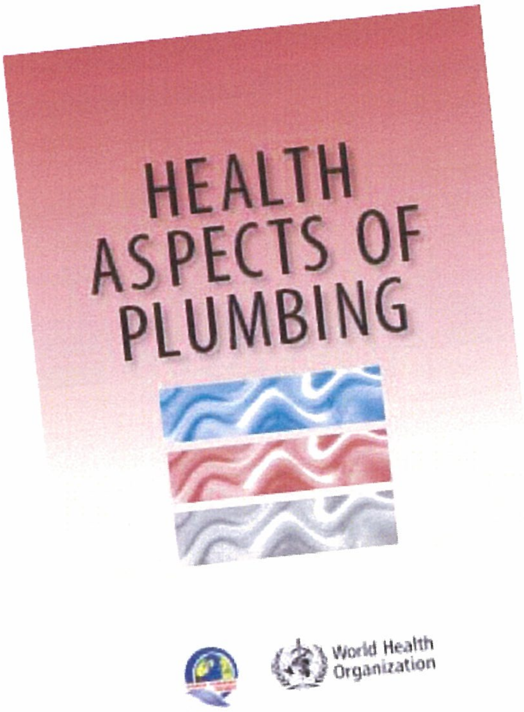
千種保健所・☎ 753－1973	東保健所・☎ 934－1211	北保健所・☎ 917－6546
西保健所・☎ 523－4611	中村保健所・☎ 481－2216	中保健所・☎ 251－4521
昭和保健所・☎ 735－3958	瑞穂保健所・☎ 837－3256	熱田保健所・☎ 683－9677
中川保健所・☎ 363－4458	港保健所・☎ 651－6471	南保健所・☎ 614－2811
守山保健所・☎ 796－4618	緑保健所・☎ 891－1411	名東保健所・☎ 778－3106
天白保健所・☎ 807－3906		

このパンフレットは再生紙（古紙配合率100%、白色度80%）を使用しています。

WHOの給水装置の健康影響についての書物　（2006年出版）

World Health Organization

Health Aspects of Plumbing



2006, x + 129 pages [E]
ISBN 92 4 156318 4

14. Design of plumbing systems for multi-storey buildings

For plumbing purposes, the term "multi-storey" is applied to buildings that are too tall to be supplied throughout by the normal pressure in the public water mains. These buildings have particular needs in the design of their sanitary drainage and venting systems. Water main supply pressures of 8–12 metres (25–40 feet) can supply a typical two-storey building, but higher buildings may need pressure booster systems. In hilly areas, the drinking-water supply pressures will vary depending on the ground elevation. In these cases, the water authority may have to specify areas where particular supply pressures can be relied upon for the design and operation of buildings. Where a building of three or more storeys is proposed a certificate should be obtained from the drinking-water supply authority guaranteeing that the present and future public drinking-water supply pressure will be adequate to serve the building. If the public water pressure is inadequate, suitable means shall be provided within the building to boost the water pressure.

14.1 Systems for boosting water pressure

Pressure-boosting systems can be of several different types:

- pumping from a ground level or basement gravity tank to a gravity roof tank;
- pumping from a gravity storage tank or public water main into a hydro-pneumatic pressure tank that uses captive air pressure to provide adequate drinking-water supply pressure;
- installation of booster pump sets consisting of multiple staged pumps or variable speed pumps that draw water directly from a gravity storage tank or the public water main. Multistage booster pump sets typically include discharge pressure regulating valves to maintain a constant drinking-water supply pressure.

Written approval should be obtained from the appropriate authority before any pump or booster is connected to the supply. Where booster pump sets are permitted to draw directly from public water mains, the public drinking-water supply must be adequate to meet the peak demands of all buildings in the area. Otherwise, there is a high risk of backflow and subsequent contamination of the mains from buildings not equipped with a booster pump. Building booster pumps are not a solution to the problem of inadequate drinking-water supply. Where public drinking-water supply systems are overburdened and cannot provide adequate pressure on a continuous basis, water must be stored on site during periods when adequate pressure is available to fill a gravity storage tank. The size of the storage tank will vary according to the daily water demand of the building, and the availability of adequate pressure available in the public water mains. It should not be excessively oversized to avoid stagnation due to inadequate turnover.

Multi-storey buildings can usually be divided into zones of water pressure control. The lower two to three storeys can generally be supplied directly from the pressure in the public water main. Upper storeys, usually in groups of five to eight storeys, can be supplied from pressure-boosted main risers through a pressure reduction valve for each group. Systems can be up-fed or down-fed. Up-fed systems usually originate from a pressure booster pump set or hydropneumatic tank in the basement of the building. Down-fed systems usually originate from a rooftop gravity tank. Where a building is divided into water pressure zones, care must be taken not to cross-connect the piping between two or more zones. This is a particular problem when domestic hot water is recirculated from a central supply system.

Where hydropneumatic tanks are used for storage, the tank is filled to one third to a half full by a float level device that controls the drinking-water supply source (a well pump or pressure booster pump). The pressure is maintained at the desired operating level by an air compressor. As the building uses water from the tank, the water level and air pressure drop. When the water level drops to the "on" setting of the float level control, the well pump or booster pump starts and raises the water level in the tank to the "off" level. This restores the pressure in the tank. If some of the captive air above the water has been absorbed by the water, the air compressor starts and restores the air charge, raising the system pressure to the normal level. Hydropneumatic tanks are typically made of steel or fibreglass and must be rated for the system operating pressure. Steel tanks must have a protective coating of suitable composition for drinking-water contact on the inside to protect the tank from corrosion and avoid contaminating the water. They should be checked on a regular basis to ensure that the protective coating is intact and the water remains potable.

Smaller hydropneumatic tanks can also be used to help control pressure booster pumps, allowing them to be cycled on and off by a pressure switch. The captive air within the tank keeps the system pressurized while the pump is off. When the water pressure drops to the "on" pressure setting, the pump starts and raises the volume and pressure of the water in the tank. No air compressor is needed where tanks have a flexible diaphragm between the air and the water in the tank, charged with air at initial start-up. The size of pressure tanks for booster pumps must match the capacity of the pump and the peak system demand so that the pump "off" cycle is longer than the "on" cycle and the pump does not cycle too frequently.

14.2 Drainage systems

14.2.1 Drainage system considerations

In the drainage system for a multi-storey building, the drains from the plumbing fixtures are connected to vertical drain stacks that convey the waste and sewage to below the lowest floor of the building. The fixture drain traps must be vented to prevent their water trap seal from being siphoned by negative pressure or blown out by positive pressure in the drain piping. The fixture vent pipes must extend through the roof to outdoors. They can be run individually or be combined into one or more vents through the roof. Where buildings are over 10 storeys high, the drainage stacks require relief vent connections at specified intervals from the top, and connected to a vent stack that terminates above the roof. This relieves and equalizes the pressure in the drainage stack to maintain the water seal in traps serving plumbing fixtures.

Wherever possible, the sanitary drainage system from a building should discharge to the public sewer by gravity. All plumbing fixtures located below ground level should be pumped into the public sewer or the drainage system leading to the sewer. The pump line should be as short as possible and looped up to a point not less than 0.6 metres (24 inches) above ground level to prevent back-siphonage of sewage. The pump discharge rate should be controlled so as not to cause scouring of the internal bore of the pump line or the drainage or sewer system into which it discharges. High-velocity discharge rates may also cause the flooding of adjoining plumbing fixtures or overloading of the sewer itself. The sump pits for sewage pumps must have sealed covers, be vented to outdoors and have automatic level controls and alarms. Sewage pumps in multiple dwellings and in multi-storey dwellings should be duplex, with each pump having 100% of the required pumping capacity for the building. Alternatively, an approved vacuum drainage system may be considered.

14.2.2 Vacuum drainage systems

In a vacuum drainage system, the differential pressure between the atmosphere and the vacuum becomes the driving force that propels the wastewater towards the vacuum station. Table 14.1 provides a summary of the advantages and disadvantages of vacuum drainage systems. Table 14.2 provides information on specific installation and operation requirements. Vacuum drainage systems should be considered when one or more of the following conditions exist:

- water shortage;
- limited sewerage capacity;
- where separation of black water and greywater is desired;
- where drainage by gravity becomes impractical;

TABLE 14.1 ADVANTAGES AND DISADVANTAGES OF VACUUM SYSTEMS (VERSUS GRAVITY SYSTEMS)

Advantages	Disadvantages
Low installation costs	High component costs
Environmentally safe	Mechanical components – possibility of failure
Electrical power only required at vacuum station	Skilled design, installation and maintenance required
Always self-cleansing	Regular maintenance required
No possibility of vermin in pipelines	Standby facilities required
Possible water-saving technique if vacuum toilets used	Require area for situation of vacuum tanks and vacuum generation equipment
High water velocities prevent deposits in pipework	High-velocity water may cause transient plumbing noise
Minimal risk of leakage	
Can use small-diameter lightweight pipes that can be installed without a continuous fall	
Vertical lifts are possible	
Ability to easily separate greywater and black water	
High turnaround time – no need for cistern to refill for subsequent flushes	

TABLE 14.2 COMPARISON OF INSTALLATION AND OPERATION REQUIREMENTS OF DRAINAGE SYSTEMS

Parameter	Conventional (gravity)	Conventional (pumped)	Vacuum
Pipe size (mm)	Branches 32–100 Stacks 100–150	Branches 32–100 Stacks 100–150	Discharge from valves 32–50 Service connection 38–90
Pipeline gradient	To a fall	To a fall	Flexible arrangements, with minimal gradients or saw tooth profile. Vertical upward flow sections lifts can be used
Maintenance requirements	Negligible, only after abuse or blockage	Regular planned servicing of pumps and interface units	Regular, planned servicing of pumps and interface units
Energy requirements	At time of installation	At time of installation and throughout lifetime of building	At time of installation and throughout lifetime of building
Retrofit or extension of system within building	May be difficult to accommodate pipework and falls	May require additional pumps	Flexible layout makes installation simple
Conventional water consumption WCs	7.5 litre flush WC	7.5 litre flush WC	NA
Low water consumption WCs	6 litre flush WCs	6 litre flush WCs	1.5–3 litre flush vacuum toilets
Loading of sewerage system	Dependent upon appliances installed	Dependent on pumping rate	Discharge from forwarding pumps can be timed to coincide with low-flow periods

NA: not applicable.
Source: BRE 2001 (p. 3).

- in penal installations where isolation and control of the appliances is necessary to prevent concealment of weapons and drugs;
- unstable soil or flat terrain;
- where a high water table exists;
- in hospitals, hotels, office buildings or other areas where congested usage occurs, and flexibility in pipe routing is required to drain appliances;
- restricted construction conditions;
- building refurbishment.

When conventional gravity drainage systems are extended, as in refurbishment work, the existing gravity drainage system can be fed into the vacuum drainage system. This may be achieved by the use of a sump into which the wastewater from the gravity system drains. When sufficient water has accumulated in the sump, an interface valve will open allowing the wastewater to enter the vacuum drainage system. This arrangement can also be used to collect rainwater or as an interface between a building with conventional drainage and a vacuum sewer.

The collection arrangements and the small-bore pipework of vacuum drainage systems provide the possibility of easily separating greywater and black water. This would be of particular advantage if sewerage capacity was limited, as the greywater could be run to a watercourse after appropriate treatment.

14.3 Hot water and other dual supply systems

Dual drinking-water supply systems are those in which two different grades of water are available in separate piping systems. An example is the provision of a tap at a sink supplying water directly from the incoming water service while all other fixtures are fed from a storage tank. In developed countries, the most common is a secondary system of piping carrying hot water to sink, washbasin and bath. Occasionally a water softener is installed to treat part of a domestic system, but apart from these cases dual drinking-water supply systems are rarely found within single dwellings. An approach to water conservation being introduced in some communities is to recycle greywater to an outside tap for irrigation uses. A principal concern of all dual systems is the assurance that no cross-connections have occurred during installation or repair.

14.3.1 Hot water systems

Correct installation of non-return devices will prevent hot water from entering the cold water system in the event of an interruption of pressure. Regulations controlling the delivery of hot water from a hot water vessel may require tempered or thermostatically controlled water in all ablution areas, aged persons' homes, hospitals, schools and other public places, and use of thermostatically controlled mixing valves is encouraged where practicable. The acceptable temperature of hot water systems at the tap should be determined in concert with public health officials. To avoid scalding, especially of children, and in hospitals and aged persons' homes, lower temperatures may be necessary. On the other hand, growth of *Legionella* organisms is reduced at temperatures above 50 °C, and this is a particular concern in hospitals and other large buildings such as hotels (see sections 3.1.4 and 3.3.1) (IPHE 2005).

Buildings such as hospitals, hotels, multiple dwellings and schools require large quantities of water to be heated, stored and distributed. Heating is usually carried out by a separate boiler, a steam coil or a heat exchange from a central heating or other system, and the temperature is normally controlled to within fairly narrow limits, 60 °C being an average temperature setting in some countries. Thermostatic devices should be installed to cut off the incoming heat source should the water in the storage vessel become excessively hot, and pressure relief valves should also be provided. Both these safety devices should be set in such a way that audible or visible warning is given whenever they come into operation. Heating and storage vessels should be clearly marked with their safe working pressure limits, and gauges should be fitted to enable a regular check to be made that those limits are being observed. Water heaters for the supply of hot water should always be installed strictly in accordance with the manufacturer's written instructions.

For reasons of safety, the water heater must be fitted with a combination temperature and pressure relief safety valve at the top of the unit prior to the commissioning of a mains or high-pressure water heater. To achieve this, a pressure relief safety valve must be fitted in the inlet or cold drinking-water supply pipework. The temperature and pressure settings of the respective safety valves should be specified by the manufacturer in accordance with the design capabilities of the specified water heater. The pressure setting for the pressure relief valve should be lower than the pressure setting for the combination temperature and pressure relief valve so that as the water heats up in the storage vessel and expands, the additional or excess volume is gently expelled from the lower and colder section of the water heater through the pressure relief safety valve. Where the available drinking-water supply pressure exceeds the upper limits of the pressure relief safety valve it is necessary to install a pressure reduction valve, appropriate to the pressure ratings involved, immediately after the isolation valve to the water heater and before the non-return valve. In some cases, it may be preferable to lower the drinking-water supply pressure to the whole system to avoid pressure imbalance in the hot and cold drinking-water supply systems. In these cases, the pressure reduction valve could be installed in the cold drinking-water supply pipework before it enters the building.

Low-pressure water heaters must not be pressurized beyond normal localized atmospheric conditions within the operating parameters of the manufacturer's specification. Equalizing the drinking-water supply pressure in a particular fitting (such as a shower) with the whole system is a little more complicated but it can be done by taking off a dedicated cold water service line from the drinking-water supply tank to the heater unit. Depending on the capacity of the cold water distribution system, a separate supply tank may be required to avoid depleting the dedicated cold drinking-water supply tank serving the hot water system. The hot water system that is not considered potable should never be allowed to enter the cold water cistern (see section 12.2).

14.3.2 Other dual supply systems

Multiple dwellings and multi-storey buildings may have fire protection systems such as sprinkler variety systems or high-pressure mains and hydrants. Industrial and commercial establishments may have one or more systems of piping. These may carry cooling or process water from a secondary source or mains water that has been specially treated for the purpose.

When one component of the dual system has been derived from another source, or when it carries mains water that has been treated, heated or stored, it is essential that the non-mains component is not allowed to reconnect with the mains water. Drinking-water supply systems should be designed, installed and maintained so as to prevent contaminants from being introduced into the drinking-water supply system. Water of drinking-water quality should be supplied to plumbing fixtures or outlets for human consumption, bathing, food preparation and utensil or clothes washing. Where water supplied from one source is connected to another water source, an appropriate backflow prevention device should be fitted and the installation should be registered with the water supplier.

Systems that permit the introduction of any foreign substance into the water service should not be connected directly or indirectly to any part of the drinking-water supply system. This includes systems for fire protection, garden watering and irrigation, or any temporary attachment to the water service. This can only be done with backflow prevention and cross-connection control devices.

Combined tanks storing potable water alongside water for other purposes should have a double partition wall installed internally to separate the two supplies. The space between the partition walls should be arranged to ensure that any leakage cannot enter the other compartment of the tank. To achieve this, an external drainage point should be provided from the bottom of the void or space so that any discharge or leak is readily noticed.

14.4 Water storage vessels

Separate water storage vessels are an integral part of many dual supply systems. This section deals with requirements for the storage of water supplied from the water main or other drinking-water sources. In the design of these systems, it is important to ensure that the required air gap is established between the drinking-water supply inlet and the overflow spill level of the fixture.

Water storage tanks are appropriate for use in the following circumstances: