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## **PUB CIRCULAR TO PROFESSIONAL INSTITUTES & QPs**

### **GRADIENT AND WATER TIGHTNESS OF SANITARY DRAINLINES AND SEWERS**

#### **Background**

Sewers and sanitary drainlines convey used water from the premises to the public sewerage system. Leakage from these pipes will cause pollution of our waterways/reservoirs and pipe blockages in drainlines that do not transport waste well will inconvenience users. It is therefore important for QPs to ensure that new sewers and sanitary drainlines under their development are laid with adequate gradients and examined to be watertight before being put into use.

2 The technical requirements on pipe gradients and hydrostatic tests are already stipulated in the **Code of Practice on Sewerage and Sanitary Works (CPSW)** and relevant sections are listed in **Annex 1** for your easy reference.

3 This circular serves to inform all of a revised procedure to certify and check compliance of these requirements to be effective from **1 Feb 2007**.

#### **Gradient of sanitary drainlines**

4 QPs are urged to pay particular attention to the design of sanitary drainlines and to check the drainline gradients during construction. The gradient of the drainline serving a water closet is critical to ensure proper waste transportation. The CPSW stipulates drainline gradients to ensure adequate flow conditions. We have received feedback that in some instances of landed developments with long sanitary drainlines and those encountering obstructions eg. ground beams, drainlines were laid much flatter than required. This has made these sanitary drainlines susceptible to blockage.

5 To ensure drainlines are able to function well in the long run and are constructed as designed, the **designed and as-built gradients** of the sanitary drainlines and top/invert level of the inspection chambers should henceforth be clearly shown in the QP's **detailed plans** and **as-built plans** submitted to CBPU or PUB.

## Water Tightness of pipes

6 Inspection and hydrostatic test for sewers and drainlines are currently already stipulated in CPSW to ensure that they do not leak beyond acceptable rates when in use. These tests are necessary during construction stage prior to covering up the sewers and drainlines as any defects of the pipes or joints can still be located and remedied to ensure water tightness.

7 To ensure that such tests are carried out properly, we will require **QPs to witness and endorse results of the hydrostatic test** carried out. From 2007, QPs will need to certify compliance with the “acceptable rate of water loss” stipulated in the CPSW.

## Revised procedure

8 We have revised the current forms for **Clearance Certificate** and **Certificate of Completion and Inspection for Sanitary/Sewerage Works** (Form C/QP) to include an additional endorsement by QPs to:

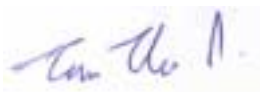
- check and witness the water tests during pipe laying stage; and
- certify compliance with the gradients and hydrostatic test requirements when applying for the Compliance Certificate.

The details of the revised procedure and proposed changes in the forms are given in **Annexes 2 & 3**. The above new measures will be implemented for **all new plan submissions to CBPU for clearance certificate on or after 1 Feb 2007**.

9 In addition, PUB will check compliance on water tightness for all the newly completed sanitary drainlines and sewers. From **1 Feb 2007**, PUB will carry out its own hydrostatic tests for randomly selected projects before the issuance of the Sewerage Clearance for Compliance Certificate (TOP/CSC) for the sanitary/sewerage works.

10 I would appreciate it if you could disseminate the contents of this circular to your members. For clarification, please contact Mr. Tan Chee Hoon at 67319564 or Email: [tan\\_chee\\_hoon@pub.gov.sg](mailto:tan_chee_hoon@pub.gov.sg).

Thank you.



**TAN THAI PIN**  
**DIRECTOR**  
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CE (CBPU, NEA)

## - Requirements of the Code of Practice on Sewerage and Sanitary Works

### (1) Hydrostatic Test Requirements:

- (a) All sanitary drainline and sewers of 600 mm and below in diameter, before being surrounded and covered, shall be tested by filling with water.
- (b) The pressure shall be measured from the highest point of the pipeline under test and shall be 1.5 metre head of water. Pipelines should not be accepted until they have withstood the required pressure for 30 minutes without a loss in excess of 1.5 litres for 100 m for each 300 mm in diameter.
- (c) The acceptable rate of water loss for 30 minutes for the following standard pipe diameters are as follow:

<b>Diameter of Pipe</b>	<b>Acceptable Rate of Water Loss</b>
(1) 100mm	0.005 litres/metre run
(2) 150mm	0.008 litres/metre run
(3) 200mm	0.010 litres/metre run
(4) 300mm	0.015 litres/metre run

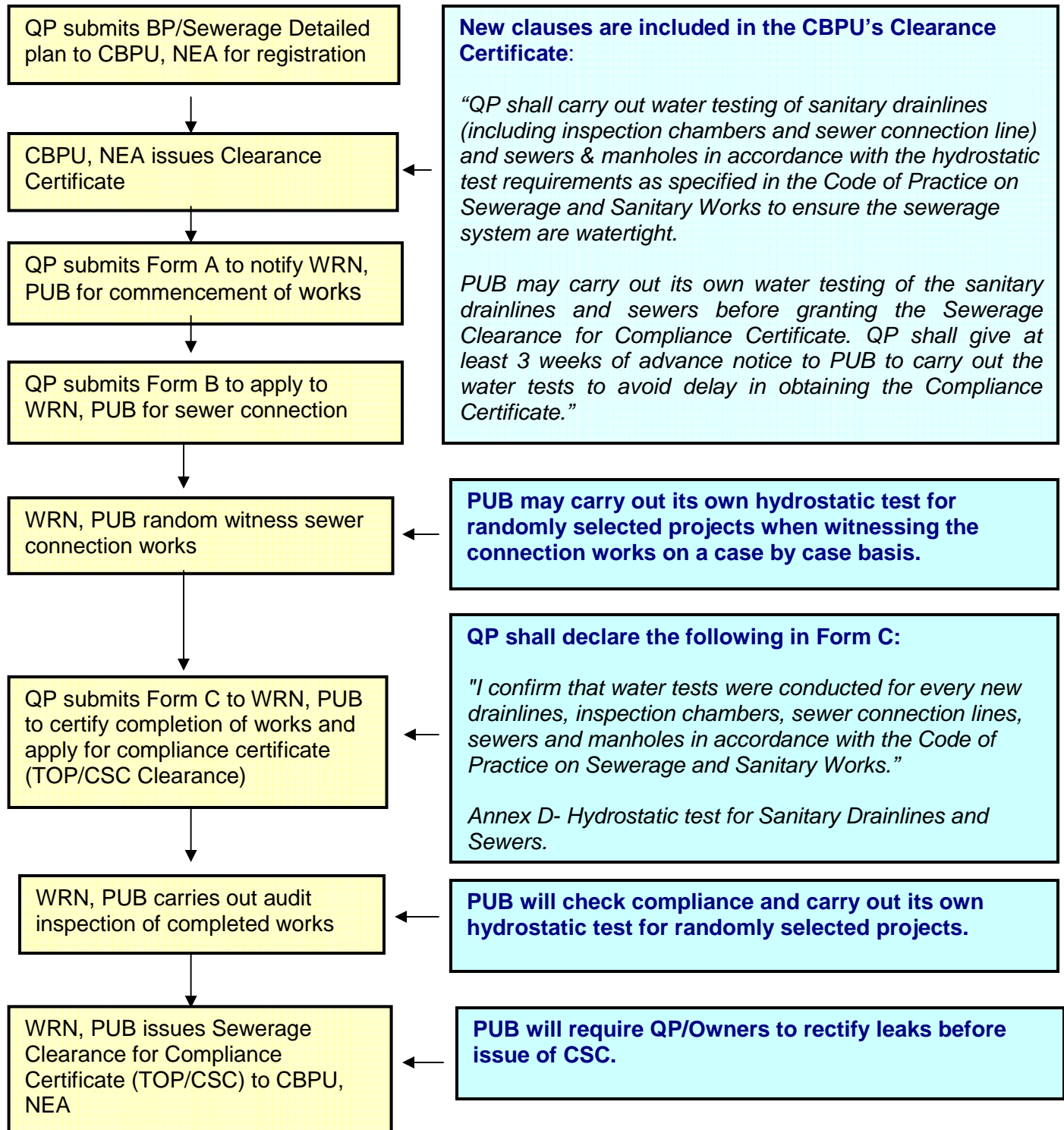
### (2) Gradients of Sanitary Drainlines

- (a) The branch drain-line shall have a minimum diameter of 100mm. The length shall preferably not exceed 10 metres.
- (b) The main drain-line shall have a minimum diameter of 150mm and distance between inspection chambers shall not exceed 50 metres.
- (c) The branch/main drain-line shall have a constant gradient. The size and gradient of the drain-line shall be chosen to provide adequate carrying capacity and also allow for adequate ventilation.
- (d) The choice of gradient for the branch/main drain-line shall be such as to maintain self-cleansing velocity (0.9 m/sec) and not to exceed scouring velocity (2.4 m/sec) under normal discharge condition. The recommended gradients for drainlines are as follows:

<b>Diameter</b>	<b>Maximum Gradient</b>	<b>Minimum Gradient</b>	<b>Maximum Gradient at upstream of backdrop or tumbling bay connection</b>
<b>100mm</b> (branch drainline)	1:20	1:60	NA
<b>150mm</b> (main drainline)	1:30	1:90	1:70
<b>200mm</b> (sewer connection line)	1:30	1:90	1:70

## Flow Chart on Procedure for Hydrostatic Test of Sanitary Drainlines for New Development or A/A works to Existing Buildings under BP submission

### Current Procedure



**(REVISED FORM)**

FORM C/ QP/SEW

Sanitary File Ref. No. \_\_\_\_\_

**PUBLIC UTILITIES BOARD  
WATER RECLAMATION (NETWORK) DEPARTMENT**

**Certificate of Completion and Inspection for Sanitary/Sewerage Works**  
[Under Section 35 (1) (e) and (f) of the Sewerage and Drainage Act (Chapter 294)]

To: Director  
Water Reclamation (Network) Department  
Public Utilities Board  
Environment Building  
40 Scotts Road #14-00  
Singapore 228231

Date: \_\_\_\_\_

Project Ref No. (BP No.): \_\_\_\_\_

Project: \_\_\_\_\_

Date Work Commenced: \_\_\_\_\_ Date Work Completed: \_\_\_\_\_

Company's name of Plumber\*\*/Contractor: \_\_\_\_\_

1. I, \_\_\_\_\_ NRIC No. \_\_\_\_\_  
(Name of QP)  
of \_\_\_\_\_  
(Name of QP firm)

being a Qualified Person, hereby certify that to the best of my knowledge and belief, the \* sanitary/sewerage works were carried out and completed in accordance with the above building plans and detailed sanitary plans/sewerage plans, the current Code of Practice on Sewerage and Sanitary Works, Sewerage and Drainage Act (Chapter 294) and the Sewerage and Drainage (Sanitary Works) Regulations and any other conditions under which the plans and amendments thereto were cleared by CBPU (NEA).

2. I also confirm that:

(a) For Sanitary works,

- (i) there is no sanitary pipe located directly above any potable water tanks.
- (ii) *water tests were conducted for every new drainlines, inspection chambers and sewer connection lines in accordance with the Code of Practice and the test results have met the stipulated requirements.*

(b) For sewerage works,

- (i) the sewer lines were laid to gradients and alignments to Water Reclamation (Network) Department requirements and in accordance with the sewerage plans.
- (ii) water tests were conducted for every sewer lines & *manholes* and the type of concrete haunching provided for the sewer lines were in accordance with the Code of Practice and the sewerage plans. *The water test results have met the stipulated requirements.*

3. The following documents are enclosed. I certify that the information contained in the following Annexes is correct. I also confirm that the \*sanitary/sewerage works as shown in the "As-Built" plans were carried out in accordance with the Code of Practice on Sewerage and Sanitary Works.

\* Annex A - Numbers of chargeable sanitary appliances installed in the above mentioned project attaching (a) the Allotment of Address from the Comptroller of Property Tax, (b) floor layout plan showing the location of the units.

Annex B - "As-Built" plans for the above mentioned \*sanitary works/sewerage works (to be endorsed by Registered Surveyor) with minor deviations, if any, incorporated thereon *and "as-built" gradients of drainlines/sewers and top & invert levels of the inspection chambers/manholes indicated.*

Annex C - Plumber/Contractor's confirmation of completion of sanitary works/sewerage works.

*Annex D - Hydrostatic Tests for Sanitary Drainlines and Sewers*

\_\_\_\_\_  
**Stamp & Signature of Qualified Person**

Name: \_\_\_\_\_

Address: \_\_\_\_\_

\*Delete if inapplicable

\*\*Note: The Singapore Plumbing Society (SPS) maintains a list of experienced sanitary plumbers whom QP/Developers can engage to carry out the sanitary works.  
*[Revision No. 7- Jan2007]*

## Annex C to Certificate of Completion and Inspection for Sanitary Works

**PLUMBER/CONTRACTOR'S  
CONFIRMATION OF COMPLETION  
OF SANITARY/ SEWERAGE WORKS**

Date: \_\_\_\_\_

**To:** Director  
Water Reclamation (Network) Department  
Public Utilities Board  
Environment Building  
40 Scotts Road #14-00  
Singapore 228231

**Through:** \_\_\_\_\_  
(Name of QP)

\_\_\_\_\_  
(Address)

**Particulars of \*Sanitary/Sewerage Works to which this confirmation relates :**

Project Ref No. (BP No.) \_\_\_\_\_

Project: \_\_\_\_\_

\*Lot/Plot \_\_\_\_\_ \*TS/MK \_\_\_\_\_

Address/Road \_\_\_\_\_

1. I hereby confirm that I have executed the above-mentioned \*sanitary/sewerage works in accordance with the plans as supplied by the Qualified Person (QP) and in accordance with the Code of Practice on Sewerage and Sanitary Works.

2. I also confirm that for the \*sanitary/sewerage works,

- (a) the type of concrete haunching provided as well as the result of the water tests conducted for every \*sanitary drainlines/sewer connection line/sewer & inspection chamber/manhole have met the requirements stipulated in the Code of Practice on Sewerage and Sanitary Works and the detailed sanitary/sewerage plans, and
- (b) the \*sanitary drainline/sewer were laid to gradients and alignments to Water Reclamation (Network) Department requirements and in accordance with the detailed \*sanitary/sewerage plans. Information on minor deviations and the levels and gradients of the \*sanitary drainline/sewer were submitted to the \*QP/Registered Surveyor for incorporation in the "as-built" plans for the above mentioned \*sanitary/sewerage works.

\_\_\_\_\_  
**Name, Signature and Company Stamp of \*\*Plumber/Contractor**

Date : \_\_\_\_\_

\*Delete if inapplicable

.\*\*Note: The Singapore Plumbing Society (SPS) maintains a list of experienced sanitary plumbers whom QP/Developers can engage to carry out the sanitary works

## ANNEX D TO FORM C/QP

**HYDROSTATIC TESTS FOR SANITARY DRAINLINES & SEWERS**

**File Ref.** \_\_\_\_\_ **Project Ref No.** \_\_\_\_\_

**Project Title:** \_\_\_\_\_

**Name of Qualified Person:** \_\_\_\_\_ **Name of Plumber/Contractor:** \_\_\_\_\_

- (1) Below are the details of water tests carried out on sanitary drainlines, sewer connection line, sewers, inspection chambers and manholes for the above project.

S/ No.	Sewer line (eg. MH No- MH No) / Sewer Connection (IC to MH/Sewer) Sanitary Drainline (IC no to IC no)/ Inspection Chamber / Manhole	Dia./Type of Pipe (eg. Ø200/VCP, Ø150/uPVC)	Length of Pipe line (m)	Rate of Water Lost (litre/sec) & Result (Passed/Failed)	Date of Water Test (dd/mm/yyyy)	Name of person witnessed the water test	Remarks
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

- (2) I certify that the sanitary drainage system including the sewer connection line and inspection chambers; sewers and manholes comply with the hydrostatic test requirements as specified in the Code of Practice on Sewerage and Sanitary Works.

\_\_\_\_\_  
(Stamp and Signature of QP)