

**Memorandum for the Review Committee on Quality Assurance Issues
Relating to Fresh Water Supply of Public Housing Estates of
the Hong Kong Housing Authority**

**Test Results of Water Samples taken from Public Rental Housing Estates
completed in or after 2005**

PURPOSE

This paper summarises the test results of water samples taken from public rental housing (PRH) estates completed in or after 2005, and the Housing Department (HD)'s major observations about these test results.

BACKGROUND

2. On 9 to 11 July 2015, HD and Water Supplies Department (WSD) announced that excess lead¹ was found in water samples from Kai Ching Estate, and that lead was found in two samples of solder used on water pipe joints. WSD then took water samples from a number of developments installed by the same Licensed Plumber (LP). Among these PRH developments, excess lead was found in samples taken from Kwai Luen Estate Phase 2, and lead was found in samples of solder. In order to address the residents' concerns, the Chairman of the Hong Kong Housing Authority (HA) announced on 15 July 2015 that water sampling tests would be carried out for all PRH estates completed since 2013, as well as for Kwai Luen Estate Phase 1 (which was completed in 2011). Among these estates, excess lead was found in a sample from Wing Cheong Estate, and lead was found in samples of solder. On 20 July 2015, the scope of water sampling tests was further extended to PRH estates completed in 2011 and 2012. Among these estates, excess lead was found in samples from five of them, and lead was again found in samples of

1 The provisional guideline value of the World Health Organisation (WHO)'s "Guidelines for Drinking-Water Quality"(2011) is 10 micrograms per litre for lead in drinking water.

solder. Given the public concern, the Chairman of HA announced on 24 July 2015 that the water sampling tests would be carried out for all PRH estates in a systematic way. The target was to complete such tests for PRH developments completed in or after 2005 by end September, and then taking into account experience and data consider how to do such tests for developments completed before 2005.

3. WSD and HD have been conducting water sampling tests systematically by batches, and conclusions on the lead content in water in the supply systems installed by HA's contractors are published as and when they have been confirmed. As at 16 September 2015, water sampling tests have been done for a total of 80 PRH developments involving 46 estates. Among these estates, the water samples taken from 11 of them have been found to contain excess lead content. The test results are summarized at **Annex**.

4. Having virtually completed water sampling tests for PRH estates completed in or after 2005, we have been considering how to do such tests for PRH developments completed before 2005. We are collating and analyzing the water test results obtained so far. At the same time, we will keep in view the interim findings of the WSD's Task Force on Excessive Lead in Drinking Water, which are expected to be available shortly.

Order of priority for water sampling tests

5. The year 2005 was a watershed in the construction of PRH estates. In general, water pipes in PRH estates completed before 2005 are connected mechanically and not by soldering, while water pipes in PRH estates completed in or after 2005 are mainly copper pipes joined by soldering. As solder used on water pipe joints is a cause of excess lead in drinking water, it is generally believed that there is one fewer risk factor leading to excess lead in drinking water for PRH estates completed before 2005. Therefore, **we give priority for water sampling tests to the "newer" estates which are associated with a higher risk of the presence of lead in drinking water, and we think the sampling method for pre-2005 developments, and that for developments completed in or after 2005, may not need to be identical.**

6. Notwithstanding the broad distinction mentioned above, there are exceptions. Individual PRH developments completed after 2005 did not use

soldering in general, while a small number of developments completed before 2005 had used soldering in pipe connections. The latter includes three developments, namely Kwai Shing (East) Estate (Shing Wo House), Tsz Lok Estate (Lok Foon House) and Lok Fu Estate (Lok Tsui House). To ensure that our first stage of systematic water sampling tests cover all PRH estates that used soldering in pipe connections (with which a higher risk of the presence of lead in drinking water is associated), we have covered these three developments in our current water sampling and testing exercise even though these estates were completed before 2005.

Non-domestic facilities in PRH estates

7. There are often non-domestic facilities used for commercial, social service, educational purposes etc. in PRH estates. As far as the supply of fresh water is concerned, some non-domestic facilities share the same water supply system as the domestic portion in the same estate. Other non-domestic facilities, which are situated in standalone buildings or the lower levels of domestic blocks, are fed by separate systems that are independent from those feeding the domestic portion. **HA's main contractors are generally responsible for the installation of the fresh water supply system in the common area of the non-domestic portion.** The water supply systems inside the non-domestic units are mostly installed by the tenants themselves.

8. While the systematic water sampling and testing exercise has focused on the domestic blocks of PRH estates, the quality of fresh water supplied to non-domestic tenants has not been neglected. In cases where the fresh water supply system of the non-domestic portion is independent from that of the domestic portion, **HD and WSD conduct separate water sampling tests for the two independent systems.** Test results for the two systems are independent from one another. Since HA's main contractors are generally responsible for the installation of the fresh water supply system in the common area of the non-domestic portion, water samples will be taken from the system in the common area for testing purpose. Consequently, **the test results will reflect the lead content in drinking water in the common area system rather than that inside the non-domestic units.** The test results for most of the separate systems tested so far have been announced in tandem with those for the domestic blocks in the same estates.

MAJOR OBSERVATIONS

9. We have the following observations about the water sampling test results obtained so far –

(a) HD and WSD have been focusing on carrying out systematic water sampling tests for PRH estates completed in or after 2005, due to the risk factor explained in paragraph 5 above (ie. the use of soldering in pipe connections). As mentioned in paragraph 6 above, we have also conducted water sampling tests for three developments completed before 2005 as soldering had been used in pipe connections therein. From the test results so far, we note that, even in this pool of “high-risk” estates, **the incidence of “excess lead in water” is not high** –

(i) the percentage of PRH developments in which excess lead content has been found in water samples is relatively small. Of the 80 PRH developments tested, 11 (14%) are found to have water samples exceeding the WHO’s guideline value; and

(ii) in terms of the number of samples, only 91(2%) out of 4 489 water samples taken are found to have exceeded the WHO’s guideline value. Among these 91 water samples with excess lead content, 63 (69%) had a lead content of between 10 to 20 micrograms per litre, 10 (11%) had a lead content of between 21 to 30 micrograms per litre, and 18 (20%) had a lead content exceeding 30 micrograms per litre¹.

(b) **The 11 estates with excess lead in drinking water are not confined to any individual main contractors, subcontractors or LPs.** There are a total of four different main contractors involved, namely Shui On Building Contractors Limited, China State Construction Engineering (Hong Kong) Limited, Paul Y. General Contractors Limited and Yau Lee Construction Company Limited. Indeed, these four contractors have been responsible for the construction of almost 70% of the 80 PRH developments which we have tested so far. As a matter of fact, out of the 69 PRH developments which have “passed” the water sampling test, 44 (64%) were constructed by these four main contractors. These 11

estates involved three different plumbing subcontractors and three different LPs.

- (c) **The 11 estates with excess lead in drinking water are not confined to the most recently completed estates.** They also include estates which were completed some years ago. Indeed, the completion years for these 11 estates straddle a number of years from 2008 to 2014.
- (d) As mentioned above, the year 2005 is a watershed in PRH construction, after which copper pipes with solder joints have been used in general. In the current water sampling and testing exercise, we have also covered nine estates (involving 11 developments) which used **stainless steel or lined galvanized iron pipes without solder joints**, as they were also completed in or after 2005². **No excess lead content has been found in any water sample taken from these nine estates.** This observation aligns with our preliminary views, subject to the interim findings of the WSD's Task Force on Excessive Lead in Drinking Water (which are expected to be available shortly), that solder used on water pipe joints is a cause of excess lead in drinking water. As a corollary, **PRH estates completed before 2005 carry lesser risks of the presence of lead in drinking water, and a smaller sampling size may be considered when these estates will be tested in the next stage of work;** and
- (e) As mentioned above, in many PRH estates there are separate fresh water supply systems feeding the lower levels of the domestic blocks or standalone buildings which house many non-domestic facilities serving various commercial, social welfare and educational purposes. These separate water supply systems are independent from those feeding the domestic portion of the estates. As far as water test results for these separate systems are concerned, we note that in cases where the water samples taken from the domestic blocks have "passed" the test, the

2 The nine estates are Tak Long Estate, Hung Fuk Estate, Shek Lei (II) Estate (Shek Foon House), Hin Yiu Estate, Shek Yam Estate Phase 5 (Lai Shek House), Lei Muk Shue Estate Phase 4 (Hong Shue House, Lok Shue House, Kin Shue House), Yau Lai Estate Phase 1 (Bik Lai House, Sau Lai House, Yi Lai House, Nga Lai House, Chi Lai House, Yat Lai House), Shek Pai Wan Estate Phase 1 (Pik Long House, Pik Yuet House, Pik Ngan House, Pik Fai House), and Kwai Chung Estate Phase 4 (Chin Kwai House, Tsz Kwai House) and 5 (Hiu Kwai House, Ying Kwai House, Yuk Kwai House, Nga Kwai House, Yat Kwai House).

samples taken from the separate systems in the same estate have also “passed” the test. However, **for estates which have “failed” the water sampling tests (in respect of their domestic blocks), the test results for their separate systems are mixed.** For example, in Kai Ching Estate (the first “excess-lead-in-water” estate), the water samples taken from its separate systems which feed the lower floors of the main domestic blocks stay below the WHO’s guideline value. Separately, water samples taken from the separate systems of Tung Wui Estate (another “excess-lead-in-water” estate) have been found to contain excess lead.

WAY FORWARD

10. We will continue to collate and analyze the results of the water sampling tests being carried out for the few remaining PRH estates completed in or after 2005. As mentioned before, we will then consider how best to take forward the water sampling tests for the PRH estates completed before 2005 based on data and experience. Looking ahead, the water test results of PRH estates completed before 2005 will also be useful. They may shed light on various aspects of PRH construction, in particular the plumbing works including pipe materials and connection methods etc.

INFORMATION

11. This paper is issued for Members’ information.

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Test results of water samples taken from public rental housing estates

The Housing Department (HD) and the Water Supplies Department (WSD) are systematically taking water samples from public rental housing (PRH) developments in which the fresh water supply systems were installed by the Hong Kong Housing Authority's main contractors, to determine whether the lead content in drinking water exceeds the World Health Organisation (WHO)'s provisional guideline value of not more than 10 micrograms per litre. In general, HD and WSD are taking water samples for testing by batches in accordance with the completion year of the PRH developments, starting with newly completed developments and working back to the older ones. Some estates involve more than one development, and the sampling tests for each development may be completed at different times. Once a batch of water sample tests are completed, HD will immediately announce the testing results.

(Results announced for 46 PRH estates involving 80 PRH developments up to 16 September 2015)

PRH developments with lead in water samples exceeding WHO's provisional guideline value

	Name of PRH development	Year of completion	No. of flats	Main contractor	No. of samples taken	No. of samples with excess lead
1	Kwai Luen Estate Phase 2 (Luen Yat House, Luen Yuet House)	2014	1,507	Shui On Building Contractors Limited	44	5
2	Kai Ching Estate	2013	5,204	China State Construction Engineering (Hong Kong) Limited	115	7
3	Wing Cheong Estate	2013	1,488	Paul Y. General Contractors Limited	46	1
4	Lower Ngau Tau Kok Estate Phase 1 (Kwai Leung House, Kwai Yuet House, Kwai Hin House, Kwai Sun House, Kwai Fai House)	2012	4,238	Yau Lee Construction Company Limited	130	6
5	Shek Kip Mei Estate Phase 2 (Mei Wui House, Mei Leong House)	2012	1,558	Yau Lee Construction Company Limited	59	5
6	Tung Wui Estate (Wui Sum House, Wui Yan House)	2012	1,333	Paul Y. General Contractors Limited	52	4
7	Hung Hom Estate Phase 2 (Hung Yat House, Hung Yan House, Hung Yiu House)	2011	1,938	China State Construction Engineering (Hong Kong) Limited	74	16
8	Yan On Estate (Yan Hei House, Yan Yuet House, Yan Chung House)	2011	2,587	Yau Lee Construction Company Limited	69	5
9	Choi Fook Estate (Choi Lok House, Choi Sin House, Choi Hay House)	2010	2,524	Yau Lee Construction Company Limited	90	13
10	Un Chau Estate Phase 2 and 4 (Un Lok House, Un Nga House, Un Chi House, Un Hei House, Un Kin House)	2008	3,533	Yau Lee Construction Company Limited	135	19
11	Ching Ho Estate Phase 1 (Ching Chung House, Ching Yu House, Ching Hin House)	2008	3,167	Yau Lee Construction Company Limited	145	10

PRH developments with lead in water samples complying with WHO's provisional guideline value

	Name of PRH development	Year of completion	No. of flats	Main contractor	No. of samples taken	No. of samples with excess lead
1	Cheung Lung Wai Estate	2015	1,358	Yau Lee Construction Company Limited	42	0
2	Hung Fuk Estate Phase 1 and 2 (Hung Foon House, Hung Yan House, Hung Hei House, Hung Lok House, Hung Fuk Shopping Centre and Ancillary Facilities Block)	2015	2,097	Hsin Chong Construction Company Limited	150	0
3	Hung Fuk Estate Phase 3 (Hung Long House, Hung Yat House, Hung Yuet House, Hung Cheong House, Hung Shing House)	2015	2,808	Yau Lee Construction Company Limited		
4	Shui Chuen O Estate Phase 1 (Ching Chuen House, Long Chuen House, Yan Chuen House, Hei Chuen House)	2015	3,039	China State Construction Engineering (Hong Kong) Limited	53	0 (Note)
5	Mei Tung Estate (Mei Tak House)	2014	990	Able Engineering Company Limited	24	0
6	Yee Ming Estate	2014	2,059	Hanison Construction Company Limited	102	0
7	Tak Long Estate	2014	8,164	Yau Lee - Hsin Chong Joint Venture	198	0
8	Fung Wo Estate	2013	1,607	Hsin Chong Construction Company Limited	50	0
9	Cheung Sha Wan Estate	2013	1,390	China State Construction Engineering (Hong Kong) Limited	42	0
10	Lung Yat Estate	2013	990	Shui On Building Contractors Limited	33	0
11	Mei Tin Estate (Mei Chuen House)	2013	1,216	Hsin Chong Construction Company Limited	33	0

12	Shek Lei (II) Estate (Shek Foon House)	2013	839	Hip Hing Construction Company Limited	26	0
13	Ching Long Shopping Mall	2013	-	Zone A: China State Construction Engineering (Hong Kong) Limited Zone B: Yau Lee - Hsin Chong Joint Venture	20	0
14	Shek Kip Mei Estate Phase 5 (Mei Yick House, Mei Yin House, Mei Sang House, Mei Shing House)	2012	2,496	Shui On Building Contractors Limited	73	0
15	Un Chau Estate Phase 5 (Un Mun House, Un Wai House, Un Yat House)	2012	1,486	China State Construction Engineering (Hong Kong) Limited	55	0
16	Domain and Yau Tong Community Hall	2012	-	China State Construction Engineering (Hong Kong) Limited	8	0
17	Choi Fook Estate (Choi Foon House)	2011	915	Hsin Chong Construction Company Limited	27	0
18	Choi Tak Estate (Choi Yan House, Choi Yee House)	2011	1,586	Hsin Chong Construction Company Limited	40	0
19	Kwai Luen Estate Phase 1 (Luen Yan House, Luen Hei House)	2011	1,470	Shui On Building Contractors Limited	41	0
20	Mei Tung Estate (Mei Yan House)	2010	799	China State Construction Engineering (Hong Kong) Limited	27	0
21	Choi Tak Estate (Choi Chun House, Choi King House, Choi Leung House, Choi Yin House) and Choi Tak Shopping Centre	2011	2,704	China State Construction Engineering (Hong Kong) Limited	82	0
22	Shatin Pass Estate (Wo Tin House, Shun Tin House)	2011	1,278	Chevalier (Construction) Company Limited	53	0
23	Yau Lai Estate Phase 5 (Cheuk Lai House, Yung Lai House)	2011	2,002	Shui On Building Contractors Limited	35	0
24	Yau Lai Estate Phase 6 (i.e. Yau Lai Shopping Centre)	2011	-	Shui On Building Contractors Limited	4	0
25	Shin Ming Estate (Shin Chi House, Shin Lai House)	2011	1,974	Shui On Building Contractors Limited	49	0
26	Tin Ching Estate Tin Ching Amenity and Community Building	2011	-	Paul Y. General Contractors Limited	24	0
27	Chai Wan Estate (Wan Poon House, Wan Ying House)	2010	1,600	Nishimatsu Construction Co., Limited	46	0
28	Choi Tak Estate (Choi Shing House, Choi Shun House)	2010	1,462	Hanison Construction Company Limited	69	0
29	Upper Ngau Tau Kok Estate Phase 2 and 3 (Sheung Hing House, Sheung Shing House, Sheung Fu House, Sheung Wing House, Sheung Hong House, Sheung Tai House), Upper Ngau Tau Kok Shopping Centre and Integrated Service Centre	2009	4,584	Paul Y. General Contractors Limited	124	0
30	Tin Ching Estate Phase 3 (Ching Moon House, Ching Hei House, Ching Yuet House)	2009	2,365	Paul Y. General Contractors Limited	65	0
31	Shek Kip Mei Estate Phase 1 (Mei Yue House, Mei Ying House)	2006	2,033	Paul Y. General Contractors Limited	55	0
32	Sau Mau Ping (South) Estate (Sau Ho House, Sau Wong House)	2009	1,598	Chatwin Engineering Limited	130	0
33	Sau Mau Ping (South) Estate (Sau Mei House, Sau Tak House, Sau Sin House)	2009	2,397	Hanison Construction Company Limited		
34	Upper Wong Tai Sin Estate (Wing Sin House)	2009	714	Chun Wo Construction and Engineering Company Limited	22	0
35	Yau Lai Estate Phase 4 (Tsui Lai House, Hong Lai House, Yan Lai House)	2009	2,369	Shui On Building Contractors Limited	121	0
36	Yau Lai Estate Phase 3 (Ying Lai House, Fung Lai House)	2008	1,598	China State Construction Engineering (Hong Kong) Limited		
37	Shek Mun Estate Phase 1 (Kin Shek House, Mei Shek House) and supermarket	2009	1,958	Paul Y. General Contractors Limited	45	0
38	Lam Tin Estate (Lam Fai House, Lam Tai House, Lam Bik House, Lam Wai House)	2009	3,036	Shui On Building Contractors Limited	102	0
39	Mei Tin Estate Phase 3 (Mei Lok House, Mei Mun House, Mei Ting House) and Mei Tin Community Hall	2008	2,333	Hanison Construction Company Limited	71	0
40	Tin Ching Estate Phase 1 (Ching Pik House, Ching Hoi House) and Tin Ching Community Hall	2008	1,918	China State Construction Engineering (Hong Kong) Limited	98	0
41	Tin Ching Estate Phase 2 (Ching Choi House, Ching Wan House), Tin Ching Shopping Centre and Tin Ching Ancillary Facilities Block	2008	1,918	Nishimatsu Construction Co., Limited		0
42	Choi Ying Estate Phase 1 (Ying Fu House, Ying On House)	2008	1,598	China State Construction Engineering (Hong Kong) Limited	137	0
43	Choi Ying Estate Phase 2 (Ying Hong House, Ying Lok House, Ying Shun House)	2008	2,397	China State Construction Engineering (Hong Kong) Limited		0
44	Choi Ying Estate Phase 3 (i.e. Choi Ying Place)	2008	-	Shui On Building Contractors Limited		0
45	Ching Ho Estate Phase 1 Ching Ho Shopping Centre	2008	-	Yau Lee Construction Company Limited	3	0
46	Ching Ho Estate Phase 2 (Ching Ping House, Ching Yun House)	2008	1,598	China State Construction Engineering (Hong Kong) Limited	54	0
47	Tung Wui Estate Tung Tau Community Centre	2012	-	Paul Y. General Contractors Limited	1	0

48	Shek Kip Mei Estate Phase 2 Ancillary Facilities Block	2012	-	Yau Lee Construction Company Limited	6	0
49	Lower Ngau Tau Kok Estate Phase 1 Lower Ngau Tau Kok Estate Plaza	2012	-	Yau Lee Construction Company Limited	3	0
50	Yan On Estate Yan On Shopping Centre	2011	-	Yau Lee Construction Company Limited	2	0
51	Oi Tung Estate (Oi Yat House)	2008	716	Nishimatsu Construction Co., Limited	23	0
52	Shek Pai Wan Estate Phase 2 (Pik Shan House, Pik Yuen House, Pik Wai House, Pik Luk House)	2007	2,398	Hanison Construction Company Limited	95	0
53	Lei Yue Mun Estate Phase 2 (Lei Lung House)	2007	799	Paul Y. General Contractors Limited	27	0
54	Shek Lei (II) Estate (Shek Wai House, Shek Yi House)	2007	1,598	Nishimatsu Construction Co., Limited	48	0
55	Ching Ho Estate Phase 3 (Ching Chak House, Ching Long House, Ching Chiu House)	2006	2,397	Shui On Building Contractors Limited	81	0
56	Kwai Chung Estate (Pak Kwai House, Hop Kwai House)	2008	1,983	Yau Lee Construction Company Limited	81	0
57	Mei Tin Estate Phase 1 and 2 (Mei Sau House, Mei Lai House, Mei King House, Mei Chi House) and Mei Tin Shopping Centre	2005	3,164	Nishimatsu Construction Co., Limited	95	0
58	Hoi Lai Estate Phase 4 (Hoi Shui House)	2005	558	China State Construction Engineering (Hong Kong) Limited	23	0
59	Kwai Chung Estate Phase 3 (Chui Kwai House, Pik Kwai House, Luk Kwai House)	2005	2,742	Yau Lee Construction Company Limited	84	0
60	Hin Yiu Estate (Hin Yiu House)	2005	799	Shui On Building Contractors Limited	26	0
61	Shek Yam Estate Phase 5 (Lai Shek House)	2005	340	Hanison Construction Company Limited	9	0
62	Kwai Shing (East) Estate (Shing Wo House)	2003	362	Hsin Chong Construction Company Limited	59	0
63	Tsz Lok Estate (Lok Foon House)	2003	265	China State Construction Engineering (Hong Kong) Limited	23	0
64	Lok Fu Estate (Lok Tsui House)	1994	360	Hung Wan Construction Co Ltd	16	0
65	Yat Tung (II) Estate (Mei Yat House, Mun Yat House, Kui Yat House)	2005	2,782	Yau Lee Construction Company Limited	108	0
66	Lei Muk Shue Estate Phase 3 (Chui Shue House, Wing Shue House) and Lei Muk Shue Shopping Centre	2005	1,983	Hip Hing Construction Company Limited	66	0
67	Lei Muk Shue Estate Phase 4 (Hong Shue House, Lok Shue House, Kin Shue House)	2005	1,918	China State Construction Engineering (Hong Kong) Limited	54	0
68	Yau Lai Estate Phase 1 (Bik Lai House, Sau Lai House, Yi Lai House, Nga Lai House, Chi Lai House, Yat Lai House)	2005	2,550	Leighton Contractors (Asia) Limited	78	0
69	Shek Pai Wan Estate Phase 1 (Pik Long House, Pik Yuet House, Pik Ngan House, Pik Fai House)	2005	2,877	Shui On Building Contractors Limited	89	0

(Note) One sample taken from a vacant unit at Hei Chuen House of Shui Chuen O Estate was found to have a lead level of 14 micrograms per litre, which slightly exceeded WHO's provisional guideline value. The water samples taken from the rest of the three domestic blocks did not exceed the value. WSD took more water samples from Hei Chuen House for testing to ascertain the situation. After analysis, it was concluded that the water sample which exceeded the value might have been affected by the environment.