

Table S1: Regulations and recommendations for *Legionella* prevention and control within healthcare buildings

	Temperature control				Initial system characterization (risk assessment)	Sampling sites (T° or <i>Legionella</i>)	Monitoring frequency	References	
	Water heater	Return loop	System	At point of use					Design specifications
Australia	≥60°C	Not specified		≤ 45°C childhood & healthcare centers, schools and nursing homes; ≤ 50°C all other buildings	Water velocity ≤ 3 m/s; Max flow rate at point of use device ≤ 9 L/min; Minimize deadlegs, must be flushable during maintenance	Not specified	<i>Legionella</i> : varies by state, from none to every month	Australian/New Zealand Standard (AS/NZS) 2011	
Austria	≥60°C		≥55°C		Thermal disinfection must be possible (70°C); Water heater volume ≤ 1 day of consumption; Avoid stagnant areas in HWDS; Shutting down recirculation is not permitted	Yes (risk analysis)	CW; HW outlet; HW at representative POU; Record: time to reach stable T°, final T°, usage frequency, system heat loss	T° and <i>Legionella</i> : from weekly to annually, depending on system's risk classification	Austrian Standards Institute 2007
Canada	60°C*	≥ 55°C* (Quebec only)		Showers and bath : ≤49°C; ≤43°C for healthcare and nursing homes (Quebec only)	For systems with 30 m length or 4 stories, temperature must be maintained with recirculation or reheating units; Shutting down recirculation at night is permitted. * Only applies to new building and expansions	Not specified	Not specified	Not specified	NRC 2005, CMMQ/RBQ 2013a, b, RBQ 2014
China	≥60°C	Not specified	≥50°C	≤43°C : pediatrics, geriatric, psychiatric wards, elderly homes, residential care for persons with disabilities; ≥50°C for all others	60°C for ≥ 5min prior to discharge into HWDS; Minimize dead legs and stagnant water	Yes (water safety plan)	According to water safety plan	<i>Legionella</i> : According to water safety plan	Hong Kong and The Government of the Hong Kong Special Administrative Region 2012

	Temperature control					Initial system characterization (risk assessment)	Sampling sites (T° or <i>Legionella</i>)	Monitoring frequency	References
	Water heater	Return loop	System	At point of use	Design specifications				
Europe	≥60°C (1h/d);	Ideally ≥55°C, no less than 50°C	Not specified	50 – 55°C within 1 min.	Return loop T° always ≥50°C; Water heater T° not <50°C for more than 20 min/day	Yes (risk assessment)	CW, HW outlet, return loop. Use temperature measurements to determine sampling sites	T° and <i>Legionella</i> , frequency not specified	The European Working Group for Legionella Infections (EWGLI) et al. 2011
France	>55°C Reg; ≥60°C Reco	>50°C	>50°C	≤50°C in rooms for personal care	For HWDS volume ≥ 3L, needs recirculation; Eliminate dead legs; Maintain water velocity ≥ 0.2 m/s; Connecting pipe volume ≤ 3 L	Yes (risk analysis)	8 to 11 sites: CW, HW outlet, return loop, POUs (representative, greatest pressure loss, high risk patients areas)	Representative and greatest pressure loss POU (1/yr <i>Legionella</i> , <i>L. pneumophila</i> & 1/wk T°), return loop (1/yr <i>Legionella</i> & 1/d T°); after flushing HWDS not used for several weeks (<i>Legionella</i>).	Castex and Houssin 2005, République Française 2010a, b
Germany	≥60°C		>50°C		ΔT ≤ 5°C; For HWDS volume ≥ 3L, needs recirculating; T ≤ 60°C permitted at water heater for a few minutes only	Data not available	HW outlet, return loop, 1 sample / rising pipe	<i>Legionella</i> : 1/year depending on size of installation; increased repeated sampling required if contamination present	Deutsche Regierung 2001, DVGW German Technical and Scientific Association for Gas and Water 2004
Italy	>60°C (Reco)			≥50°C	Not specified	Not specified	HW, CW if T>20°C	<i>Legionella</i> , frequency not specified	Regiona Assessorato alla Sanità et al. 2002
Netherlands	>60°C		≥60°C (warm water)		Mixing taps must be capable of immediately shut down if cold water pressure is lost	Yes (risk analysis every 3 yrs & ≤ 3 months after a change)	Recirculation (T°); HW furthest POU from the source; before and after flushing.	<i>Legionella</i> : Every 3 months; if requirements are met, monitor T° only; T°:return loop continuous monitoring.	Dutch Working Party Infection Prevention 2007
Switzerland	>60°C**	>50°C	>55°C	≥50°C	**Water heated to at least 60°C for a minimum of 1 h, must be used within < 24 h; Reduce nb of points of use to a minimum; heat loss less than 5°C	Yes (risk evaluation)	Hot water heater and points of use (cold and hot water)	Temperature: every 2 months, after 2 minutes flush <i>Legionella</i> : 1 or 2X/yr depending on types of wards;	Office fédéral de la santé publique 2008

	Temperature control					Initial system characterization (risk assessment)	Sampling sites (T° or <i>Legionella</i>)	Monitoring frequency	References
	Water heater	Return loop	System	At point of use	Design specifications				
United Kingdom	≥60°C	≥50°C (for each loop)	≥55°C	In healthcare premises: ≥55°C within 1 min at single hot water outlets and inlets to mixing valves; ≥50°C in all other buildings	Cut offs ≤ 2 Ø; Deadleg volume ≤ 1.5 L (principal system) or 0.5 L (secondary circulation); For sporadically used outlets, flush and purge weekly; low used outlets should be installed upstream of frequently used outlets; Shutting down recirculation is not permitted	Yes (water safety plan)	CW, HW outlet, return loop, HW purge, sentinel outlets (first and last POU on recirculating HWDS)	Temperature: monthly for HW outlet, HW return loop, sentinel POU; Annually: 20% taps. <i>Legionella</i> : when T° or disinfectant can't be met	British Standards Institution (BSI) 2011, Department of Health (DH) and Estates and Facilities Division 2006a, b, HSE 2009, 2013, HFS 2012a, b
USA	≥60°C	≥51°C	≥51°C	≥ 49°C hospital patient-care areas ≥ 43.3°C nursing-care facilities	Hot water T° at coldest point in hot water heater, storage tank or distribution system at or above 51°C	Yes (HACCP)	Not specified	Not specified	BSR/ASHRAE 2013, CDC 2003
World Health Organization	>60°C	>55°C	≥50°C	≥50°C after 1 min (except for where thermostatic mixers are installed)	Circulation system not more than 5°C below HW outlet T°; dead end length ≤ 10X pipe diameter or volume ≤ 3 L	Yes (water safety plan)	According to WSP	<i>Legionella</i> : according to WSP – frequency varies depending on system status	WHO 2011

CW : Cold Water; HW: Hot Water; POU: Point-of-use; T°: Temperature

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Table S2: *Legionella pneumophila* sampling plan and qPCR results in systems 1 to 5

System	Sampling point	Sampling objective			Number of sampling events	qPCR results (GU/L)	
		Initial assessment	Stagnation times	Repeatability		Mean	Standard Deviation
1	Water heater outlet	X		X	5	ND	-
	Principal return loop	X		X	5	ND	-
	Tap 1	X		X	5	ND	-
	Tap 2	X			1	ND	-
	Tap 3	X			1	ND	-
2	Water heater outlet	X			1	ND	-
	Principal return loop	X			1	ND	-
	Tap 1	X			1	ND	-
	Tap 2	X			1	ND	-
	Tap 3	X			1	ND	-
	Tap 4				1	73	-
	Tap 5				1	ND	-
Tap 6				1	ND	-	
3	Water heater outlet	X			1	ND	-
	Principal return loop	X			1	ND	-
	Tap 1	X			1	ND	-
	Tap 2	X			1	ND	-
	Tap 3				1	ND	-
4	Water heater outlet	X		X	5	269	106
	Principal return loop	X		X	5	532	217
	Hot water reservoir	X			1	ND	-
	Subordinate loop return	X			1	2080	-
	Tap 1	X			1	352	-
	Tap 2	X			1	593	-
	Tap 3	X			1	382	-
	Tap 4	X			1	ND	-
	Tap 5	X			1	76	-
Tap 6	X		X	5	453	325	
4	Tap 7	X			1	124	-
	Water heater outlet	X			2	8386	970
	Principal return loop	X			1	4300	-
	Tap 1	X			1	34378	-
	Tap 2	X			1	4366	-
	Tap 3	X			1	3497	-
	Tap 4	X			1	2118	-
	Tap 5	X			1	4827	-
	Tap 6	X			1	7098	-
	Tap 7	X			1	16705	-
	Tap 8	X			1	2454	-
	Tap 9			X	6	878	1320
Tap 10			X	6	2404	1819	

ND : Non Detect