Table A14. Cl-36 results for individual surface cement samples that were not part of the concrete cores listed in prior tables

Sample location	Mean depth (cm)	DS02 ground range (m)	Measured ^{36}Cl/Cl	Measured-bkg ^{36}Cl/Cl	SD ^{36}Cl/Cl	DS86 ^{36}Cl/Cl	DS02 ^{36}Cl/Cl	M/C DS02
Hiroshima Bank	2	257	7.76E-11	7.75E-11	1.30E-12	1.78E-10	1.35E-10	0.57
Hiroshima Bank	2	257	7.89E-11	7.88E-11	1.94E-12	1.78E-10	1.35E-10	0.58
Chugoku Electric Co.[a]	2	670	6.50E-12	6.37E-12	3.91E-13	1.02E-11	9.81E-12	0.65
HU Elementary	2.25	1277	2.21E-13	9.70E-14	3.05E-14	9.46E-14	1.06E-13	0.91
HU Main Bldg[a]	1.5	1386	4.27E-13	3.03E-13	5.57E-14	4.55E-14	5.11E-14	5.93
HU Radioisotope	1.5	1466	5.59E-13	4.35E-13	3.91E-13	2.58E-14	2.87E-14	15.17
Misasa Bank	1	1682	2.96E-13	1.72E-13	3.20E-14	4.91E-15	6.04E-15	28.49

[a]From Straume et al. (1992). These results illustrate the problem associated with the detection of ^{36}Cl in surface cement, which is now understood to be associated with chloride mobility (see text). Cl-36 measured in surface cement was not used in the DS02 dosimetry validation, but was evaluated here to provide an understanding of the surface issues related to chloride mobility.

Table A15. Composition of trace elements in representative concrete cores from Hiroshima

Element	Symbol	Unit	Gokoku Shrine	Kirin Beer Hall	City Hall	Elem. School
Boron	B	ppm	15	<10	<10	14
Barium	Ba	ppm	263	172	204	337
Beryllium	Be	ppm	<10	<10	<10	<10
Cadmium	Cd	ppm	<10	<10	<10	<10
Chlorine	Cl	ppm	40	20	31	36
Cobalt	Co	ppm	14	26	28	10
Chromium	Cr	ppm	30	28	14	17
Copper	Cu	ppm	26	31	18	47
Gallium	Ga	ppm	28	24	22	30
Magnesium	Mg	ppm	975	1652	535	774
Manganese	Mn	ppm	314	513	392	434
Molybdenum	Mo	ppm	<10	<10	<10	<10
Nickel	Ni	ppm	<10	10	<10	<10
Phosphorus	P	ppm	221	153	149	242
Lead	Pb	ppm	<10	<10	<10	<10
Tin	Sn	ppm	<10	<10	<10	<10
Strontium	Sr	ppm	174	152	155	225
Titanium	Ti	ppm	1318	1354	1146	1407
Vanadium	V	ppm	32	39	28	38
Zinc	Zn	ppm	33	47	43	39
Zirconium	Zr	ppm	40	31	36	46

Table A16. Composition of major constituents in four representative concrete cores from Hiroshima

Constituent	Unit	Gokoku Shrine	Kirin Beer Hall	City Hall	Elem. School
Ash	%	93.7	93.5	94.5	95.7
Sodium Oxide	%	2.21	1.76	2.10	2.18
Magnesium Oxide	%	0.97	1.27	0.91	0.80
Aluminum Oxide	%	12.02	10.15	11.91	12.84
Silicon Dioxide	%	78.88	74.80	77.38	77.03
Sulfur Trioxide	%	0.14	0.20	0.17	0.22
Potassium Oxide	%	2.78	2.14	2.93	3.23
Calcium Oxide	%	8.90	11.85	9.41	7.64
Titanium Dioxide	%	0.28	0.35	0.29	0.34
Ferric Oxide	%	2.12	3.74	2.65	2.91
Phosphorus Pentoxide	%	0.10	0.11	0.082	0.090

Table A17. Concentrations of neutron poisons in Hiroshima concretes

Sample location	Element	ppm
Gokoku Shrine core	Gadolinium	2.7
	Cadmium	<1
	Boron	8.1
	Lithium	11
Kirin Beer Hall core	Gadolinium	4.9
	Cadmium	<1
	Boron	6.8
	Lithium	20
City Hall core	Gadolinium	4.4
	Cadmium	<1
	Boron	4.4
	Lithium	0.4
Elementary School core	Gadolinium	4.3
	Cadmium	<1
	Boron	4.0
	Lithium	19

Table A18. Cl-36 measured in rainwater collected in northeastern U.S.[a]

Date of sample	Measured $^{36}Cl/Cl$ (at/at)	Factor times modern rain[b]
August 1957	4.06×10^{-11}	406
September 1957	1.25×10^{-10}	1246
April 1959	5.82×10^{-11}	582
May 1959	1.65×10^{-10}	1652
February 1960	1.08×10^{-11}	108

[a]Results based on measurement data by Schaeffer et al. (1960).
[b]Modern rain based on measurements in Maryland, U.S., during the 1990s (Hainsworth et al. 1994).

Table A19. Line-of-sight concrete analyzed in Nagasaki

Building	Ground range (m)	Mean depth (cm)	Height above ground (m)	Height above hypocenter (m)
Nagasaki University Hospital	653	2.0–5.0	17	10
Mitsubishi Steel & Arms Works	1075	4.5–7.5	10	4
Fuchi Middle High School	1156	2.0–5.0	10	30
Konpirasan Mt. Gun Emplacement	1582	4.0–8.0	2	280

Table A20. ^{36}Cl measured in Nagasaki concrete samples

Sample location	Ground range (m)	Measured Cl-36/Cl	Measured-bkg[a] Cl-36/Cl	SD Cl-36/Cl	DS86	DS02
University Hospital	653	2.67E-12	2.54E-12	4.92E-14	3.70E-12	2.74E-12
University Hospital	653	2.17E-12	2.04E-12	8.64E-14	3.70E-12	2.74E-12
University Hospital	653	2.25E-12	2.13E-12	4.61E-14	3.70E-12	2.74E-12
University Hospital	653	2.58E-12	2.46E-12	5.83E-14	3.70E-12	2.74E-12
University Hospital	653	2.30E-12	2.18E-12	4.46E-14	3.70E-12	2.74E-12
University Hospital	653	2.44E-12	2.31E-12	5.00E-14	3.70E-12	2.74E-12
University Hospital	653	2.48E-12	2.35E-12	4.92E-14	3.70E-12	2.74E-12
Mitsubishi	1075	3.95E-13	2.73E-13	3.07E-14	1.99E-13	1.63E-13
Mitsubishi	1075	3.46E-13	2.24E-13	3.04E-14	1.99E-13	1.63E-13
Mitsubishi	1075	3.67E-13	2.45E-13	3.20E-14	1.99E-13	1.63E-13
Mitsubishi	1075	3.48E-13	2.26E-13	3.23E-14	1.99E-13	1.63E-13
Mitsubishi	1075	2.92E-13	1.70E-13	3.31E-14	1.99E-13	1.63E-13
Mitsubishi	1075	2.88E-13	1.66E-13	3.13E-14	1.99E-13	1.63E-13
Fuchi Middle School	1156	2.15E-13	9.30E-14	3.13E-14	9.98E-14	8.83E-14
Fuchi Middle School	1156	1.82E-13	6.00E-14	3.06E-14	9.98E-14	8.83E-14
Fuchi Middle School	1156	1.97E-13	7.50E-14	3.02E-14	9.98E-14	8.83E-14
Fuchi Middle School	1156	2.39E-13	1.17E-13	3.06E-14	9.98E-14	8.83E-14
Fuchi Middle School	1156	2.24E-13	1.02E-13	3.03E-14	9.98E-14	8.83E-14
Konpirasan Mt.	1582	1.05E-13	-0.18E-13	4.31E-14	6.11E-15	5.18E-15
Konpirasan Mt.	1582	0.84E-13	-0.39E-13	6.18E-14	6.11E-15	5.18E-15

[a]Background of 1.24×10^{-13} was subtracted. Measurements, except for the last two are from Straume et al. (1994). Surface cement not included.

Table A21. Measured-to-calculated ratios for ^{36}Cl in Nagasaki concrete

Sample location	Ground range (m)	M/C DS86	SD[a]	M/C DS02	SD[a]
Nagasaki U. Hospital	653	0.69	0.07	0.93	0.09
	653	0.55	0.06	0.75	0.08
	653	0.57	0.06	0.78	0.08
	653	0.66	0.07	0.90	0.09
	653	0.59	0.06	0.79	0.08
	653	0.63	0.06	0.85	0.09
	653	0.64	0.07	0.86	0.09
Mitsubishi Steel and Arms Works	1075	1.36	0.21	1.66	0.25
	1075	1.12	0.19	1.36	0.23
	1075	1.22	0.20	1.49	0.25
	1075	1.13	0.20	1.37	0.24
	1075	0.84	0.19	1.03	0.23
	1075	0.82	0.18	1.01	0.22
Fuchi Middle School	1156	0.91	0.33	1.03	0.37
	1156	0.58	0.31	0.66	0.35
	1156	0.73	0.31	0.83	0.35
	1156	1.15	0.33	1.30	0.37
	1156	1.00	0.32	1.13	0.36

[a]Standard deviation (SD) estimates based on measured SD and 10% SD assumed for the sample-specific calculations (Chapter 12, Part D).

Next Page