Annex

Implementation status on the medical examinations for workers engaged in radiation work in Fukushima Prefecture

20 September 2013

1. Overview

(1) The Ionizing Radiation Ordinance [(Note 1)] and the Ionizing Radiation Ordinance for Decontamination [(Note 2)] under the Industrial Safety and Health Act mandate submission of reports on the status of the periodical medical examinations (medical examination for ionizing radiation and decontamination workers ;hereinafter referred to as "ionizing radiation medical examination, etc.") to the competent Labour Standards Inspection Office without delay. Furthermore, the Ordinance on Industrial Safety and Health also mandates the work site with 50 or more workers on it to submit similar reports on a general medical examination (hereinafter referred to as "general medical examination").

(2) The MHLW has announced the implementation status of the medical examinations of 2012, compiling the results within the jurisdiction of the Fukushima Prefectural Labour Bureau including the Tomioka Labour Standards Inspection Office that supervises TEPCO's Fukushima Daiichi and Daini Nuclear Power Plants.

(Note 1) Ordinance on Prevention of Ionizing Radiation Hazards
(Note 2) Ordinance on Prevention of Ionizing Radiation Hazards at Works to Decontaminate Soil and Wastes Contaminated by Radioactive Materials Resulting from the Great East Japan Earthquake and Related Works

2. Medical examinations and the definition of "have an abnormal finding"

(1) Ionizing radiation medical examination, etc.

The Ionizing Radiation Ordinance and the Ionizing Radiation Ordinance for Decontamination require employers to provide full-time workers engaged in radiation or decontamination works with regular medical examinations regarding the specified tests (see the attachment) by a medical doctor at the time of employment and once within every 6 months thereafter.

It should be noted that these ordinances allow certain tests to be omitted depending on the

exposure dose in the previous year and based on a medical doctor's determination.

(2) General medical examination

The Ordinance on Industrial Safety and Health under the Industrial Safety and Health Act requires employers to provide full-time workers with regular medical examinations regarding the specified tests (see the attachment) by a medical doctor once within every year (every 6 months for those engaged in specified work such as radiation work).

It should be noted that the ordinance allows certain tests to be omitted based on a medical doctor's determination.

(3) Definition of the "have an abnormal finding"

The "have an abnormal finding" means the case where remarks are written by a medical doctor such as: "detailed examination required", "treatment required", or "follow-up required". It should be noted that the reference value in the clinical test is conventionally determined so as to include roughly 95% of both subjectively and objectively healthy individuals who meet certain criteria (reference individuals).

3. Implementation status of the medical examination

(1) Implementation status of the ionizing radiation medical examination, etc.

a. The rate of having an abnormal finding in the ionizing radiation medical examination in 2012 was 6.90% as the national average, 6.26% within the jurisdiction of the Fukushima Prefecture Labour Bureau, and 4.21% within the jurisdiction of the Tomioka Labour Standards Inspection Office. These are 3 - 4 percentage points higher than those in 2010 before the disaster (Table 1). The rate of having an abnormal finding in the decontamination medical examination in 2012 was 5.48% as the national average, and 5.48% within the jurisdiction of the Fukushima Prefecture Labour Bureau (Table 1).

b. A sampling survey was conducted regarding each test of 2012 within the jurisdiction of the Tomioka Office. As a result, the highest rate of having an abnormal finding, 2.2%, was found in "white blood cell count", which increased 1.5 percentage points compared to that in 2010. In addition, the implementation rate of each test increased approximately 20 percentage points along with the decreased number of omitted blood tests (Table 2). It should also be noted that "white blood cell count" varies depending on other factors than radiation such as smoking and infectious diseases.

(2) Effective dose and change in reporting sites

a. While the rate of workers whose effective dose in 2011 exceeded 5 mSv was 32.5% in

the ionizing radiation medical examination, it was 1.9% in the decontamination medical examination. The weighted average estimates that were calculated with the median in each category were 10.26 mSv and 2.89 mSv, respectively, for the ionizing radiation and decontamination medical examinations. The former was roughly 3.7 times larger than the latter (Table 3).

b. When comparing the data of 2012 with those of 2010, it was found that 382 out of 545 sites (70.1%) that had reported in 2012 were different from those in 2010.

Table 1 Implementation status of the ionizing radiation medical examination, etc.

		Nationwide			Within jurisdiction of the Fukushima Prefecture Labour Bureau			Within jurisdiction of the Tomioka Labour Standards Supervision Office		
		Examinees	Examinees who have an abnormal finding		Examinees	Examinees who have an abnormal finding		Examinees	Examinees who have an abnormal finding	
		No. of persons	No. of persons	%	No. of persons	No. of persons	%	No. of persons	No. of persons	%
Ionizing radiation medical examination	2008	256,847	15,695	6.11	10,978	301	2.74	7,220	64	0.89
	2009	254,759	14,466	5.68	10,965	244	2.23	7,319	50	0.68
	2010	275,892	17,921	6.50	11,869	333	2.81	7,831	77	0.98
	2011	276,113	18,584	6.73	5,920*	339	5.73	1,814*	57	3.14
	2012	282,515	19,491	6.90	10,985	688	6.26	6,746	284	4.21
Decontamination medical examination	2012	2,172	119	5.48	1,606**	88	5.48			

(*) The reported number was significantly decreased in 2011 due to the earthquake and the subsequent shutdown of the nuclear power plants.

(**) Data on the decontamination medical examination are shown only from the Fukushima Prefecture Labour Bureau because of the smaller number of workers who undertook the examination and because the operation sites that implemented the examination are dispersed to many different inspection offices.

Table 2 Implementation status of ionizing radiation medical examination, etc. for each test (sampling survey)

			White blood cell count test				White blood cell differential test				Red blood cell count test			
		Examinees	No. of implementations (rate)		Examinees who have an abnormal finding		No. of implementations (rate)		Examinees who have an abnormal finding		No. of implementations (rate)		Examinees who have an abnormal finding	
		No. of persons	No. of persons	%	No. of persons	%	No. of persons	%	No. of persons	%	No. of persons	%	No. of persons	%
Ionizing radiation medical examination (Note 3)	2010	2,278	1,712	75.2	11	0.6	1,712	75.2	9	0.5	1,712	75.2	2	0.1
	2012	1,719	1,660	96.6	36	2.2	1,660	96.6	13	0.8	1,660	96.6	14	0.8
	Difference			21.4		1.5		21.4		0.3		21.4		0.7
Decontamination medical examination (Note 4)	2012	1,025	1,025	100	18	1.8	982	95.8	4	0.4	1,025	100.0	2	0.2

		Hemoglobin content test				Hematocrit value test				Eye test				Skin test			
		No. of implementation (rate)		Examinees who have an abnormal finding		No. of implementation (rate)		Examinees who have an abnormal finding		No. of implementation (rate)		Examinees who have an abnormal finding		No. of implementation (rate)		Examinees who have an abnormal finding	
		No. of persons	%	No. of persons	%	No. of persons	%	No. of persons	%	No. of persons	%	No. of persons	%	No. of persons	%	No. of persons	%
Ionizing radiation medical examination (Note 3)	2010	1,712	75.2	3	0.2	1,712	75.2	0	0.0	1,712	75.2	0	0.0	1,712	75.2	0	0.0
	2012	1,660	96.6	8	0.5	1,660	96.6	14	0.8	1,660	96.6	1	0.1	1,660	96.6	0	0.0
	Difference		21.4		0.3		21.4		0.8		21.4		0.1		21.4		0.0
Decontamination medical examination (Note 4)	2012	1,025	100	2	0.2	1,021	99.6	2	0.2	997	97.3	1	0.1	997	97.3	0	0.0

(Note 3) One-fifth of the samples were extracted in the reports submitted during the period from July to December each year from the sites within the jurisdiction of the Tomioka Labour Standards Inspection Office.

(Note 4) One half of the samples were extracted in the reports submitted during the period from July to December 2012 from the sites within the jurisdiction of the Fukushima Prefecture Labour Bureau.

Table 3 Comparison of effective doses (within the jurisdiction of the Fukushima Prefecture Labour Bureau, 2012)

		Effective dose (Note 5)								
	Examinees	≤ 5mSv		> 5mSv, ≤ 20mSv		> 20mSv, ≤ 50mSv		> 50mSv < 100mSv		Weighted average estimate (Note 6)
		No. of persons	%	No. of persons	%	No. of persons	%	No. of persons	%	mSv
Ionizing radiation medical examination	10,985	7,417	67.5%	2,074	18.9%	1,094	10.0%	400	3.6%	10.26
Decontamination medical examination	1,606	1,576	98.1%	22	1.4%	8	0.5%	0	0.0%	2.80

(Note 5) Cumulative dose in the previous year of the year when the medical examination was implemented.

(Note 6) Calculated by multiplying the median in each category by the number of examinees in each category, and dividing the sum of the multiplied numbers by the total number of examinees.

(3) Implementation status of the general medical examination

a. The rate of having an abnormal finding in the general medical examination in 2012 was 53.11% within the jurisdiction of the Fukushima Prefecture Labour Bureau, which increased 1 percentage point compared with that in 2010.

b. The tables compiled for each office indicate that the rates of having an abnormal finding have increased in some offices, and that the rate was 63.86% within the jurisdiction of the Tomioka office with the increase of 9.8 percentage points. The highest rate of having an abnormal finding was 48.42% for "lipid blood", which increased 11.50 percentage points (Tables 4 and 5).

Table 4 Rates of having an abnormal finding obtained from the general medical examination* (per inspection office)

	Rate of having an abnormal finding (%)										
	Nation-wide	Fukushima Bureau	Fukushima Office	Koriyama Office	Iwaki Office	Aizu Office	Kitakata Branch	Shirakawa Office	Sukagawa Office	Soma Office	Tomioka Office
2010	52.48	52.10	52.42	51.51	55.45	53.80	43.53	48.66	50.93	51.82	54.06
2012	52.69	53.11	52.12	53.24	56.85	53.31	47.67	48.37	53.32	54.56	63.86
Difference	0.21	1.02	-0.30	1.73	1.40	-0.50	4.13	-0.29	2.39	2.75	9.80

(*) Only operation sites with 50 or more workers are required to report the general medical examination results.

Table 5 Rates of having an abnormal finding obtained from the general medical examination* (for each test)

		The rate of having an abnormal finding (%)				
		General remarks**	Anemia	Liver function	Lipid blood	Glucose
Nationwide	2010	52.48	7.64	15.38	32.13	10.31
	2012	52.69	7.38	15.12	32.42	10.17
	Difference	0.21	-0.27	-0.26	0.29	-0.14
Fukushima Bureau	2010	52.10	7.99	17.09	33.78	10.68
	2012	53.11	8.34	18.41	35.23	11.41
	Difference	1.02	0.35	1.32	1.45	0.73
Tomioka Office	2010	54.06	6.20	18.07	36.92	10.28
	2012	63.86	7.89	24.52	48.42	10.99
	Difference	9.80	1.69	6.45	11.50	0.71

(*) Only operation sites with 50 or more workers are required to report the general medical examination results.

(**) Blood-related tests were extracted. Note however, that the general remarks cover all of the tests.

4. Discussion

(1) The data of 2010 and 2012 cannot be simply compared because 70% of the sites within the jurisdiction of the Tomioka Office that reported in 2012 were different from those in 2010. To evaluate changes in health through the comparison of the rate of having an abnormal finding in 2010 and 2012, information such as age distribution, lifestyle (habits of smoking, drinking, etc.), and medical history is required. However, such information is not included in the report.

(2) When comparing the rates of having an abnormal finding in the ionizing radiation and decontamination medical examinations with the effective dose distribution, the difference of the rates was as low as 0.78 percentage points (Table 1) while the distribution of the effective doses differs significantly (Table 3). It is unclear that there is a correlation between radiation exposure and changes in the rate of having an abnormal finding.

It should be noted that there is no particular relationship observed from the general medical examination between the distance from each location of the Labour Standards Inspection Offices to TEPCO's Fukushima Daiichi Nuclear Power Plant and the rate of having an abnormal finding (Table 4).

(3) It was presumed that the increased implementation rate of approximately 20 percentage points (within the jurisdiction of the Tomioka Office) in each test may have influenced the increased rate of having an abnormal finding in the ionizing radiation medical examination in 2012 (Note 7). For this reason, a survey was conducted on the rate of having an abnormal finding for each test item, which indicated that the highest rate of having an abnormal finding was 2.2% for "white blood cell count" with only an increase of 1.5 percentage points (Table 2).

It should be noted that there is a 5% probability that the test value deviates from the reference range even if one is a "healthy person" without health impairment. Therefore, the rate of having an abnormal finding of 2.2% can be considered to fall within the range.

(Note 7) The Ionizing Radiation Ordinance and the Ionizing Radiation Ordinance for Decontamination allow some of the tests (blood, eye, skin) except medical questionnaires to be omitted according to the exposure dose of the previous year and based on a medical doctor's determination. Since the accident, the MHLW has provided instructions not to omit these tests for workers working in TEPCO's Fukushima Daiichi Nuclear Power Plant

regardless of exposure dose.

Consequently, the workers who undertook medical questionnaires but omitted blood tests in 2010 are counted in the denominator of the rate of having an abnormal finding (i.e., the number of examinees), but are not counted in the numerator (i.e., the number of examinees who have abnormal findings). This may have caused lower rates of having an abnormal finding in 2010.

5. Actions by the MHLW

(1) The MHLW will provide instructions to TEPCO and the primary contractor to implement, in an appropriate manner, the follow-up actions described below for those who have an abnormal findings.

a. Implement appropriate follow-up actions based on the guidelines for follow-up actions (Note 8).
b. Provide instruction and support by the primary contractor to the involved subcontractors.
c. Encourage the involved subcontractors to utilize the Fukushima Occupational Health Promotion Center and the Fukushima Prefecture Local Occupational Health Promotion Center.

(2) Rigorous epidemiological studies, including investigations on age distribution, smoking, drinking, and medical history, are vital to evaluate radiological health effects. Therefore, the MHLW will conduct necessary step-by-step epidemiological studies.

a. Fiscal year 2013: Studies on cataract and thyroid
b. Fiscal year 2014: Necessary studies will be conducted with a step-by-step approach, in addition to those conducted in fiscal year 2013.

(Note 8) Guidelines for actions that should be taken by employers based on medical examination results (Guidelines No.1 for actions based on medical examination results, 1 October 1996). The guidelines include: (a) recommendations on undertaking secondary medical examinations, (b) obtaining opinions from medical doctors regarding medical examination results, (c) determining actions on working conditions, (d) notifying of medical examination results, and (e) providing health guidance.

Attachment

1. The tests in ionizing radiation and decontamination medical examinations

(1) Medical questionnaires: investigation on whether the worker has an exposure history (for any worker with an exposure history, questionnaires about location, description and duration of the work, if he/she has radiation impairment or subjective symptoms, and other items relevant to radiation exposure) and its evaluation

(2) White blood cell count and differential

(3) Red blood cell count and hemoglobin content test or hematocrit test

(4) Cataract eye test

(5) Skin test

2. General medical examination tests

(1) Investigation of illness in the past and work history

(2) Check for subjective or objective symptoms

(3) Measurement of height, weight, and abdominal circumference, and visual and hearing acuity tests (hearing acuity at 1,000 Hz and 4,000 Hz)

(4) Chest X-ray test

(5) Measurement of blood pressure

(6) Anemia tests: Hemoglobin content and red blood cell count

(7) Liver function tests: Serum glutamic-oxaloacetic transaminase (GOT), serum glutamic pyruvic transaminase (GPT), and gamma-glutamyl transpeptidase (GGT)

(8) Lipid blood tests: low-density lipoprotein cholesterol (LDL cholesterol), high-density lipoprotein cholesterol (HDL cholesterol), and triglyceride level in blood serum

(9) Glucose test

(10) Urine tests: glucose urine test and protein urine test

(11) Electrocardiography