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MINES BRANCH INVESTIGATION REPORT IR 63-98

**URANIUM AIR DUST MONITORING AT
ATLAS STEELS LIMITED, WELLAND,
ONTARIO, AUGUST 9TH, 1963**

by

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MINERAL SCIENCES DIVISION

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SUMMARY OF RESULTS

Air dust samples were collected before, during and after the addition of uranium to steel. The uranium was wrapped in plastic enclosed in a paper bag. The addition was made in one stage during tapping operations.

Results indicate that the concentration of air-borne uranium remained well below the permissible level.

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INTRODUCTION

A heat of steel containing uranium was conducted in the Atlas Steel Company plant at Welland, Ontario, on August 9, 1963. The writer attended these operations in order to obtain air dust samples in the area where this work was being carried out. Mr. R.K. Buhr of the Physical Metallurgy Division, Mines Branch, also attended to observe the metallurgical aspects of the work. The test was supervised by Mr. M.J. Kent, Supervisor of Metallurgical Services, for Atlas Titanium.

The heat No. B-5574, SAE-8615, was made in a basic electric furnace, the charge being approximately 13 tons, tapping temperature was 1616°C (2940°F). The uranium alloy (99% U + 1% Al) addition was made to the ladle during tapping, 2 lbs/ton, designed to give 0.1% uranium content.

MONITORING PROCEDURE

Two Staplex sampler units were used for air dust collection, five samples being collected.

(1) No. 1 unit, mounted on a tripod base, was placed on the pulpit floor, prior to tapping, to determine the background activity level.

(2) Collected during tapping. The sampler unit was held facing the ladle by Mr. Kent, while standing on the pulpit floor with the furnace attendant, who made the uranium addition.

(3) Sample collected on the pouring platform. The No. 2 sampler unit was held by the writer, standing as close as the operating personnel, while each of the six ingots was being poured. The line plug became disconnected momentarily during the pouring of No. 1 ingot.

(4) The No. 1 sampler, on its tripod base, was placed on the pulpit floor after the ladle was removed, to determine if the background activity had increased due to air-borne particles.

(5) A background sample collected on the pouring platform, after pouring had been completed. The No. 2 sampler unit was mounted on a tripod base.

RESULTS AND OBSERVATIONS

The filter samples were checked for beta activity in the Mines Branch Laboratory after a period of 6 days. The No. 1 sample, the initial background collected, showed the highest activity, 60 net c/min. A gamma spectrum was run by Mr. D. Fisher, in the Mines Branch Laboratory. This showed the presence of fallout products, identified as zirconium 95, ruthenium 103 and caesium 137, the concentrations of each being very low. Results of the beta activity tests, and chemical uranium determinations on each of the samples are shown in Table 1.

A surface survey for beta activity was made by the writer, using a portable probe counter on two samples taken during the pouring of the No. 1 and No. 2 ingots. The activity in counts per minute, varied from 100 to 900, with the No. 1 ingot sample indicating the higher activity.

The ventilation facilities appeared adequate to carry off the fumes, a south westerly wind through the ground floor openings creating sufficient updraft to the fans, but a sudden change in atmospheric conditions, during the pouring operations, with very heavy rainfall caused the fumes to ascend slowly. The No. 4 air sample was collected where this condition appeared more prevalent, and the test results show the radioactivity was low.

Film badges were worn by Mr. Kent, Mr. Matich, Mr. Kent's technical assistant, and the writer, during tapping and pouring operations. These were sent to the Department of National Health and Welfare, Radiation Protection Division, for development. No radiation dose was indicated on the badges.

The writer expresses his appreciation to Mr. Kent, Mr. Matich and Mr. Buhr for their friendly cooperation and assistance.

TABLE 1

Analysis on Air Samples Collected on August 9, 1963

Sample No.	Location	Sampling Time	Approx. Volume Sampled (cu ft)	Net Count Rate after 6 days (c/min)	Total Uranium (chemical) (μ g)	U Concentration in Air Calculated (μ g/cu ft)
1	Sampler unit located on pulpit, prior to tapping.	10:15am-11:10am	2695	60.0	8.46	0.0031
2	Held by hand on pulpit during tapping.	12:34am-12:38am	190	0.40	4.23	0.0222
3	Held by hand on pouring platform during pouring.	12:43pm-12:59pm	768	46.4	139.6	0.1817
4	Unit located on pulpit after tapping, and ladle removed.	12:57pm- 1:40pm	2042	47.2	64.3	0.0131
5	Unit on pouring platform after pouring of ingots.	1:03pm- 1:33pm	1500	47.9	44	0.0293

Notes: (1) Maximum permissible dose of uranium in air = 5.6μ g/cu ft.
 (2) Chemical analysis, by the fluorimeter in the Extraction Metallurgy Division.