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ROOM 305/2 BLOCK 4 OF THE CHERNOBYL NPP: ITS CONDITION, ASSESSMENT OF THE AMOUNT OF FUEL

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With the standard arrangement of the structural elements of the reactor in room 305/2, there is a so-called "cross" - a steel structure with a height of about 5 m with a concrete foundation, on which the reactor core rests; other communications at the bottom of the reactor. The ceiling of room 305/2 is the base bottom plate of the core, which after the accident was driven down by almost 4 m.

The first measurements of the amount of fuel left after the accident in the lower rooms in the form of lava were made using the integral heat-measuring method (1988-1990) [1].

The next estimate of the amount of fuel was made on the basis of the Cesium 137 balance in the long wall (1992) [2], and in 1993 on the basis of the balance of magnesium [3].

At the end of 1992, work [4] appeared, in which the amount of fuel in the faces of the under-reactor rooms was estimated by the so-called visual method. This estimate turned out to be significantly lower than all the others,

Estimates of the amount of fuel in the sub-reactor rooms

Method	Year	Fuel quantity, metric tons of uranium	Error, ± metric tons of uranium
Telemetric	1988 - 1990	75	25
By the balance Cs-137	1992	90	27
By the balance of magnesium in lava	1993	80	25
Visual	1992	25	5
Visual & analytical (room 305/2)	1996 - 1997	≥60	

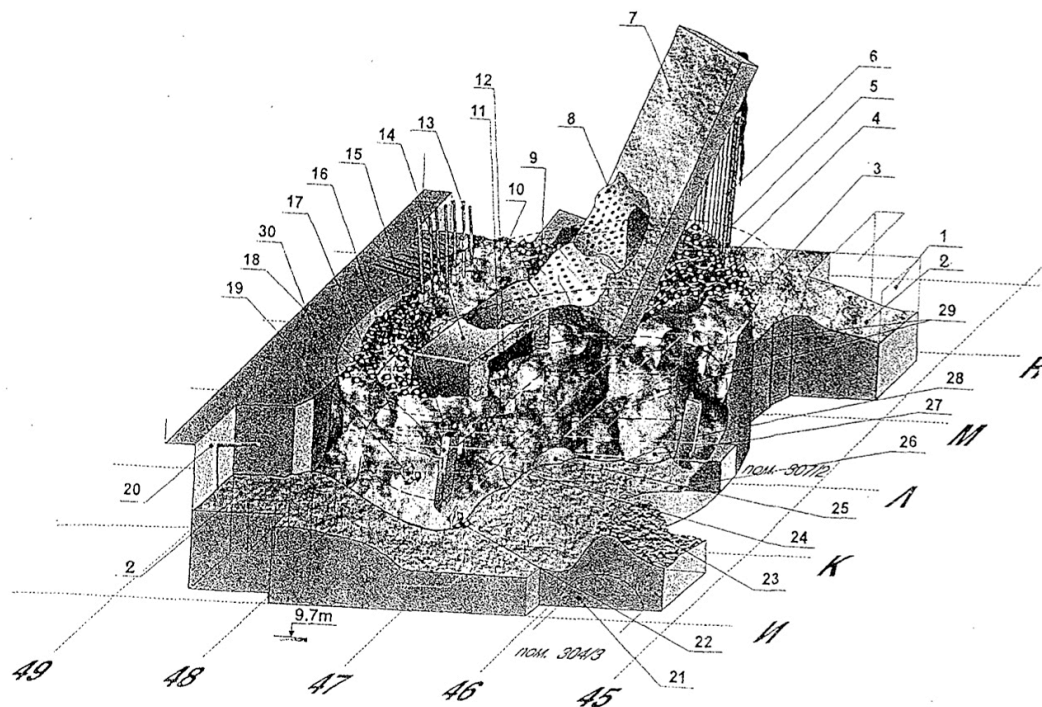
These works [4] were criticized in the work [5].

It was rightly pointed out that the visual method for determining the geometric boundaries of the existence of lava-like fuel-containing materials (FCMs) under conditions of their complete isolation under concrete leads to arbitrariness in assessments, and the law of communicating vessels, to which the authors of the work refer, for viscous, rapidly solidifying Chernobyl lakes, is simply did not have time to perform (by analogy with the stearin of a burning candle).

For the final assessment of the amount of fuel in room 305/2 and on the lower support plate of the reactor, which descended into this room, a complex method was used, which can be conventionally called visual-analytical. It is based not only on the generalization of direct visual observations of many researchers (in terms of the amount of data, it significantly exceeds everything that was used in [4]) but also on the superposition of these observations on objective data. The latter should be understood as the results of elemental and radiochemical analyzes (100 samples of TSM were taken from the equipment rooms, among which more than 30 were taken in 1995 - 1996), measurements of the dose rate of gamma radiation, as well as the results of all photographic and video filming, conducted up to 1997 (only in 1996-1997 such surveys were carried out three times).

The use of the visual-analytical method to study the room 305/2 made it possible to create an album of profiles of its cross-sections (a total of 13 sections). Based on the cross-sections obtained, a detailed computer model of the relative position of the main elements and FCM in this room was made (see figure, below).

The created model made it possible to conditionally divide the room 305/2 into 144 separate parts, in each of which an assessment of the amount of fuel was carried out (all uncertainties were interpreted in the direction of reducing its content). The minimum integral value obtained from such calculations was 60 metric tons.



Sub-reactor room model 305/2

Legend:

1 - opening of the northern sliding gates; 2 - surface of new concrete; 3 - backfill from the inter-compensator gap; 4 - "stalagmite"; 5 - an area filled with fragments of an active zana (?); 6 - reflector cooling channels; 7 - slanting reinforced concrete slab; 8 - facing of the separator drum; 9 - a fragment of a dam (reinforced concrete structure -?), (Elevation 17.0 m); 10 - "trench"; 11 - OP scheme; 12 - failure (mark 13.0 m); 13 - cooling channels; 14 - reinforced concrete structure; 15 - a fragment of a blockage element (reinforced concrete structure -?); 16 - assemblies with preserved fuel elements; 17 - edge of the "OP" scheme; 18 - additional southern support; 19 - fragments of fuel assemblies; 20 - western wall of room 305/2; 21 - a break in the wall; 22 - graphite blocks and pipe fragments (fragments of TVS-?); 23 - gravel heap; 24,25,27 - gaps in the wall of the re-melted substance; 26 - burn-through (break-?) in the wall of the room 307/2 ("grotto"); 28 - column; 29 - wall of re-melted substance (LFCM); 30 - projection of the tank "L" at 15.95 m.

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