

The Missing Large Explosion Chamber at Parchin?

Robert Kelley

Associate Senior Research Fellow, SIPRI

In November 2011, the International Atomic Energy Agency (IAEA) published an annex to its report on the implementation of safeguards in Iran that listed possible military dimensions (PMD) to Iran's nuclear programme, based on intelligence information provided to the Agency by certain Member States.¹

Among these was information that Iran had built a large explosion chamber at the Parchin military complex near Tehran. The annex noted that the chamber had been built to test components and detonators for nuclear weapons, but did not specify exactly what activities were planned by Iran in the chamber. The IAEA has not named its sources and, interestingly, its information has never been publicly confirmed by any Government but has been denied by Iran.

Further examination and analysis of the annex on PMD reveals significant inconsistencies that should have been questioned by experienced scientific experts in government and think tanks. For example, the dates, times and technical claims made in the annex reflected a lack of understanding of basic nuclear weapons physics and any related need for explosive containment chambers. In over four years, the IAEA did not specify what specific nuclear weapon related experiments or activities were to be carried out in the purported explosion chamber. On the other hand, the IAEA rather convincingly also accused Iran of conducting the same experiments at a remote site called Marivan some 500 kilometres from Parchin but did not allege that these were carried out in an explosion chamber, as described later in this piece.

While Iran continued to strenuously dispute the Agency's analysis on PMD, the two sides agreed on a "Road-Map" for the clarification of past and outstanding issues regarding Iran's nuclear programme that was signed in Vienna on 14 July 2015. Under the framework of the road-map, on 20 September, Iran allowed the IAEA Director General (from Japan) accompanied by the Deputy Director General

¹ Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran, *Report by the Director General*, GOV/2011/65, 8 November 2011

for Safeguards (from Finland) to visit a building identified by the Agency as housing the alleged chamber. Following the visit, the IAEA released a statement noting that the two above-mentioned IAEA officials had "...entered a building which the Agency had previously only been able to observe using satellite imagery. Inside the building, we saw indications of recent renovation work. There was no equipment in the building ... [as stated in Agency reports to the Board], the extensive work that has been conducted at the location since early 2012 undermines the Agency's ability to conduct effective verification there". This, however, refers to external work at and around the building in question as noted below.

Critics of Iran's nuclear programme already are advancing the claim that the chamber did in fact exist but was dismantled covertly by Iran and the debris carted away without being detected by the ever-present reconnaissance satellites that have been continuously monitoring the particular building at Parchin. Reports are available in the public domain listing various external construction and landscaping activities in the immediate vicinity of the building. These have been analyzed by several experts as having no relation to any possible dismantling of equipment within the building.²

The fact that the Agency officials did not find an explosion chamber at the designated building at Parchin is not surprising since apparently the Agency had not done the basic scientific and technical analysis of the original anonymous intelligence information on PMD. A simple example being the acceptance of the claim in the intelligence information that the chamber was being designed in 1999 and 2000 and was installed in the building at Parchin in 2000.

The alleged explosion chamber consists of a high strength steel containment vessel some 19 metres in length and about 4.6 metres in diameter. The wall thickness of the vessel is not given but by analogy with similar Soviet systems, the purported chamber could weigh about 200,000 kilogrammes. The chamber itself was said to be enclosed by a reinforcing collar. The block of reinforced concrete surrounding the purported cylindrical steel vessel, or chamber, is some 9 metres long, and 7.6 metres wide and 7.6 metres high, weighing about 700,000 kilogrammes. Anonymous intelligence sources seem to agree on these

² "The International Atomic Energy Agency and Parchin: questions and concerns," http://www.sipri.org/media/expert-comments/18jan2013_IAEA_Kelley.

dimensions to within a few centimetres. For comparison, the steel chamber would be 3 metres longer than a typical London double-decker bus and as large in diameter as the height of such a bus.

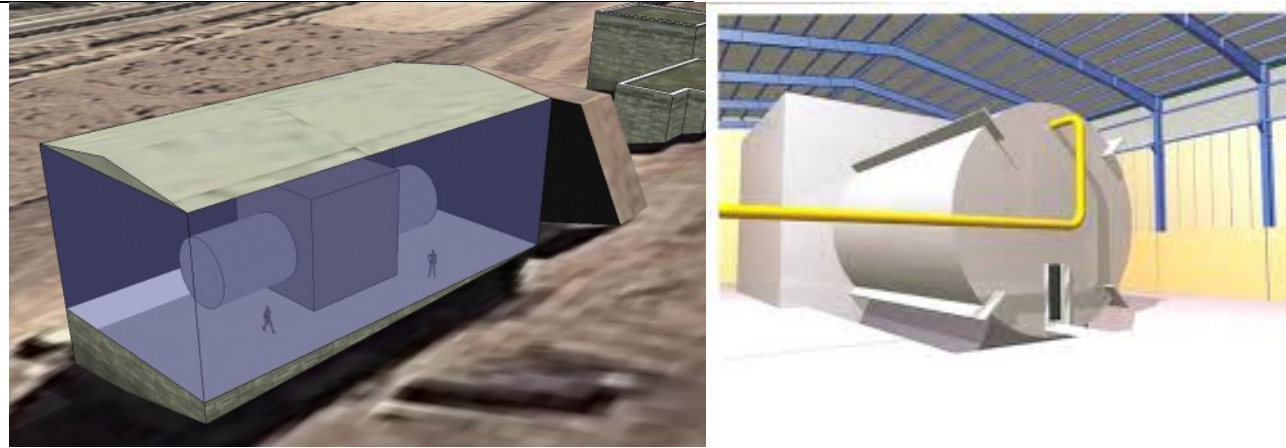
Any qualified civil or mechanical engineer can confirm that construction of a steel chamber of the size as alleged cannot be done in a few months and also that it would either need to be fabricated on-site and then enclosed in an engineered building or transported from the construction facility to the installation facility. The image below was taken around 1985 when a Soviet-built large steel sphere for making nanodiamonds with high explosives was being transported to Kazakhstan.³ The Soviet sphere and the alleged Parchin chamber differ in many respects but the magnitude is similar though the shape is not – the one at Parchin is cylindrical while the Soviet version is spherical (which is better suited to contain explosions). Clearly this is no small design and engineering enterprise.



The IAEA claimed that the explosion chamber and the block of reinforced concrete surrounding it were designed by a foreign consultant to Iran, subsequently identified as V. V. Danilenko – an explosives researcher in the former Soviet Union. He has written extensively on explosives and explosive engineering of materials, such as nanodiamonds, diagnostics and explosive hardening of construction steel such as railroad switches. In 2010, Danilenko claimed that he was designing such a chamber in 1999 and 2000 and that it would have steel reinforcing bars (‘rebar’) and engineering design confirms this logic; however, he did not say whether it was ever built and did not connect it to Iran.

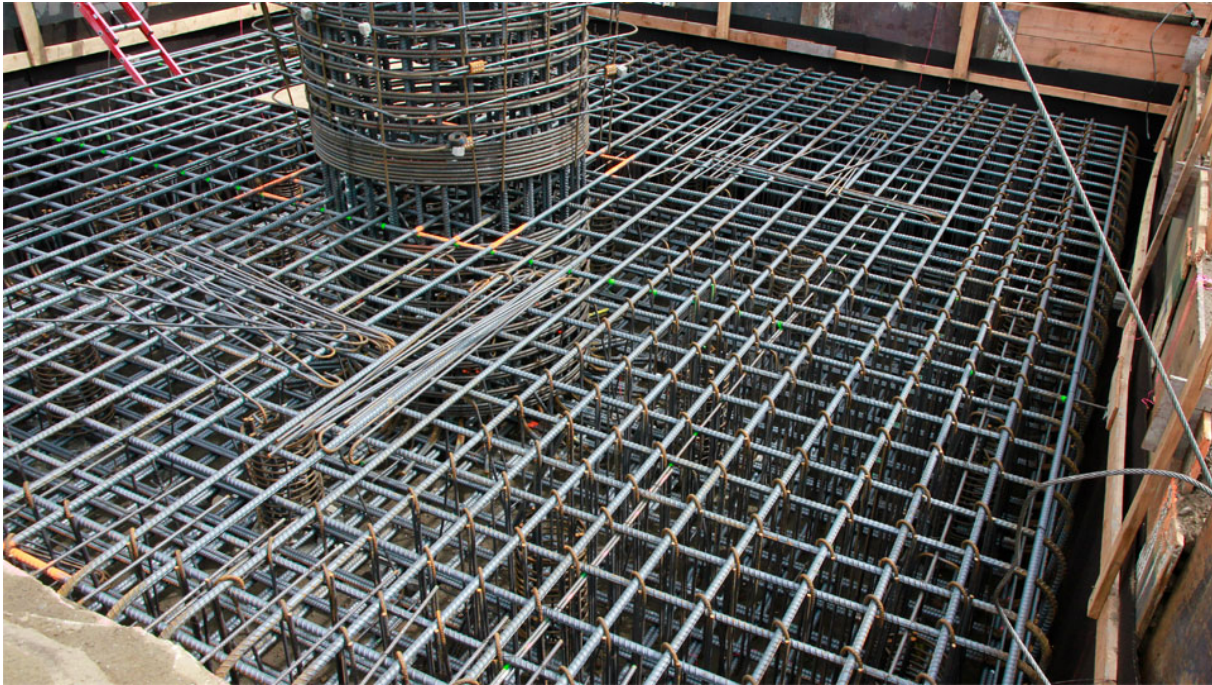
³ Explosive Content: Re-examining the mystery of Azgir, Jane’s Satellite Imagery Analysis, 18 August 2014

Here are two artist's concepts of the chamber in its protective building. It is worth remembering that no reliable or authentic images of such a chamber at Parchin have ever been publicly revealed.



Such a large and heavy steel chamber could not be easily removed without first destroying the concrete block surrounding it. The block would be heavily reinforced so that it helps the steel vessel contain a postulated (not proven) blast of 70 kilogrammes of high explosives, as claimed in the annex on PMD. The IAEA annex stated that the chamber was not for compressing carbon into nanodiamonds. Instead, it noted that the chamber likely was to be used for multipoint initiation experiments to test potential explosive hemispheres for a nuclear weapon. The purpose according to the IAEA was to contain within the chamber any uranium that might be used in the explosions conducted inside the chamber. Traces of uranium at the Parchin site might be interpreted as proof of nuclear weapons research, except that the hemispheres used in multipoint initiation experiments in fact do *not* use uranium at all. Any experienced nuclear weapons expert can confirm this. Hence, the real purpose of the purported chamber still remains in some significant doubt. The steel vessel likely is not strong enough to contain a massive blast of 70 kg on its own. The concrete block would have to be reinforced with enough strong crisscrossing steel reinforcing bars that it could contain the blast elastically without cracking or deforming. The mass of rebar inside the concrete block would make dismantling it a very cumbersome and challenging task. Artists' concepts of the purported chamber at Parchin show a concrete block with square sides – a rectangular solid block.

To destroy the concrete block, the best choice would be to use explosives and cutting torches, however, the suspect building at Parchin has not been blown up.



The generic image above from the Internet shows the kind of steel reinforcement that would be inside the concrete block. Once this matrix is filled with strong concrete, the dismantlement engineers would be faced with breaking out each cell of concrete individually and cutting the reinforcing steel at every opportunity as it is exposed. There no doubt that this is possible but is it probable? There are no satellite images of dozens of workers and dump trucks converging on the Parchin site for a long enough period of time to undertake this daunting task. They would need to have been so successful that the IAEA Director General would not see any trace of the foundation for a 700,000 kg massive concrete structure during his visit. The next image shows the relatively simple task of destroying a reinforced concrete building using physical impact. Destroying a solid concrete block of similar height and width is not a trivial undertaking.



While the concrete block is being destroyed, other workers would need to consider the task of dismantling the 200,000 kg steel chamber. Based upon other chambers designed for explosive containment, the walls of this steel chamber would need to be about 70 mm to 100 mm thick. It is alleged that this chamber was to have been built at the Azarab factory in the town of Arak in Iran. A review of their promotional website gives no indication that this company is capable of providing the forgings, machining and welding associated with such a huge steel object. The purported chamber is the approximate size of a nuclear reactor pressure vessel, something Iran has not shown it can build indigenously. Very few industrial countries can.

Cutting and removal of the thick steel would require heavy lifting capability. Pieces could be removed and placed on the floor using cables or possibly magnet fixtures. Hopefully the IAEA officials who went into the building will note in their report whether there was an overhead crane and what was its lifting capacity. If the crane is gone, the capacity can be estimated by analyzing the vertical members of the building and their load carrying capacity along with any crane rails. Once cut up into something like 200 one thousand kg pieces the purported chamber could be trucked away along with the 700,000 kg of concrete and rebar debris. It would also be useful if it were revealed how big the doors into the building are.

A removal operation would be obvious to an observer using panchromatic satellite imaging, supplemented by Synthetic Aperture Radar (SAR) and many forms of multi-spectral imaging. The fact that this has never been observed is not surprising since logic dictates that Iran could never have built the chamber in the first place. Although the United States and other countries have the huge imagery resources to watch the Parchin building several times every day, nothing of the sort has been reported.

That leaves a final conundrum: as reported by the IAEA based on satellite imagery, why did Iran renovate the site, remove some minor structures, insulate the buildings, repave one side of the site and add a sun shade over an entrance to a nearby unidentified building? Note too that Iran neglected to carry out these activities in a 360° circle around the building so clearly they were not “sanitizing,” that is removing traces of nuclear material. The most likely answer is that Iran was testing the quality of IAEA’s intelligence analysis capabilities and sources. Iran demanded that the IAEA produce evidence of the existence of a massive concrete block and chamber at Parchin. IAEA could not produce any evidence. Iran therefore was able to conclude that there was no evidence to support accusations about Parchin. The Agency’s claim was most likely based upon intelligence information on a book that described a future project in Russia and was unrelated to Iran. Such an assessment brings to mind the so-called “curveball” allegations made in February 2003 by the-then US Secretary of State Colin Powell showing at the United Nations a computer generated view of purported mobile biological weapon laboratories in Iraq, which turned out to be false and the work of an Iraqi defector.

The 2011 annex on PMD, describes the general need for such a chamber and refers to nuclear weapons development experiments that IAEA analysts thought were necessary. The annex describes those experiments in some detail, such as to test components and detonators for nuclear weapons. In the same description of the experiments, it is said very clearly that experiments also were done at another site called Marivan, 500 km away from Parchin. There was no claim of a chamber at Marivan that is located close to the Iraqi border and much easier to access for intelligence services than Parchin. When Iran offered several times to take IAEA to Marivan to inspect, the IAEA declined; a telling indication subsequently that there was little if any confidence in the information on

Marivan. It would have been advisable at this point to have conceded that there had to be no confidence in the intelligence information provided to the Agency.

Iran seems to have learned that IAEA analysis regarding allegations of PMD is not necessarily rigorous and impartial. The contradictory analysis of satellite imagery, the failure to produce credible timelines of chamber design and fabrication, and to sort out vague information from hard evidence, all point to the fact that as an international organization the IAEA is not structured to do competent intelligence or nuclear weapons analysis. The IAEA of course is well structured to verify the correctness and completeness of declarations about States' nuclear materials holdings and nuclear energy related activities.

Claims about the purpose of the alleged experiments at Parchin are not consistent with the logic of nuclear weapons design and testing. Containing explosive experiments involving small quantities of uranium is unnecessary, counter-productive and expensive. Such contained explosive experiments make sense only in States where such testing has to be done in populated areas or when plutonium is used. This is not the case at Parchin, although the alleged chamber facility does sit beside a divided highway and has minimal security. It does not even take advantage of the excellent opportunity for concealment that the hills and bluffs of Parchin could provide. Hence, the 2011 annex and follow-up on PMD are severely lacking in technical rigour and allow Iran to measure the remote sensing capabilities of the IAEA to draw technical conclusions. No doubt, this influenced Iran to insist upon taking samples at Parchin in September rather than let IAEA use its own materials.

The new administration at the IAEA chose to include information in its November 2011 annex on PMD in Iran that was suspicious from the beginning and should never have been published without proper competent analysis. Worse still, the same annex includes other information that comes from the same anonymous sources, for example, about Marivan and an alleged nuclear test site. It is instructive that the previous two Directors General prior to 2010 learned to be very cautious about accepting anonymous intelligence information and basing any analyses on it, thus they avoided exposing the Agency to releasing faulty and incomplete analyses or findings. The final report on Parchin has yet to be written, but it seems that such a report may have to contradict the assertions in the November 2011 annex possibly leading to embarrassment and a mark on the

Agency's credibility – all of which was avoidable given required competence and diligence in the first place.

Vienna: 30 September 2015