

A Waste Management 2011 Special Feature Presentation: Oak Ridge - History, Heart & Hope (Part 2)

**Y-12 National Security Complex's New Hope Center
Our "Front Door" for Public Access and Educational Information - 11158**

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ABSTRACT

In Oak Ridge, Tennessee, once the fifth largest city in the state that was not on any map, there is still a remnant of the most significant scientific and industrial achievement in the history of the world, the Manhattan Project. Locals know this holdover from the World War II era simply as "Y-12." The Y-12 National Security Complex has continuously served our nation's national security mission through the winning of the Cold War and even today helping to maintain our nuclear weapons stockpile, as well as providing nuclear fuel for the nation's navy and reducing nuclear based terrorist threats worldwide. The most significant changes since 1942 now are taking place in Bear Creek Valley where Y-12 is located. The newest structure, the Highly Enriched Uranium Materials Facility, is the world's most secure location. In a twist of a phrase, Fort Knox is now the "'Y-12' for gold storage" where we used to say that Y-12 was the "'Fort Knox' for uranium storage." Other new structures include the New Hope Center with its Y-12 History Center where the amazing history of Y-12 is now, for the first time, on display for all to see. A spacious lobby and welcome center awaits each visitor and the History Center features interactive educational materials to enhance the visit. A major mission of the Y-12 New Hope Center is to convey the proud heritage of Y-12 to the public and to help them better understand the contributions Y-12 has made historically and the contributions Y-12 continues to make in supporting our nation and the world through technological advances, precision machining, and nuclear component and special material manufacturing, and by helping reduce the threat of nuclear terrorism worldwide.

INTRODUCTION

The Y-12 National Security Complex began as the "Y-12 Plant," the first of the major sites of the Manhattan Project. Construction began in February 1943. Nine major buildings averaging close to 400,000 square feet each and several smaller support structures were quickly completed and filled with specialized production equipment and needed support items. While these nine major buildings remain today, only four are used for current missions. The remaining five structures are being cleaned out in preparation for demolition when funding comes available.

Y-12's original Manhattan Project role was to separate the U-235 from natural uranium to supply the fuel for the world's first atomic bomb ever used in warfare - Little Boy. The process that was used to accomplish this world-changing joint scientific and industrial achievement was the electromagnetic separation process.

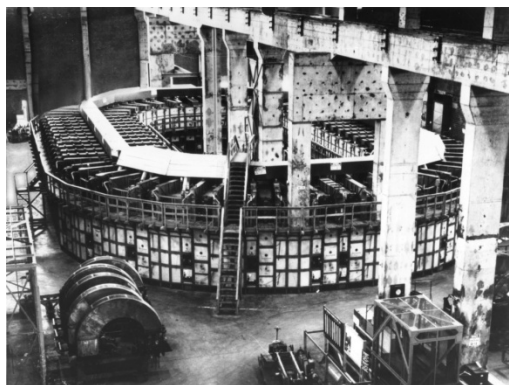


Fig.1. Alpha Calutrons stood 20 feet (6.5 meters) tall and each "racetrack" had 96 Calutrons.

Equipment invented by Nobel Laureate Ernest O. Lawrence – named Calutrons for "CALifornia University CycloTRON" – filled the nine large buildings. There were 1152 of the Calutrons installed in arrangements that came to be known as "racetracks" because of the oval shape of the first five installations.

After World War II was won, the Calutrons were removed from all but one large building (Beta 3 or Building 9204-3) and the pilot facility, Building 9731. There were two reasons for removing the Calutrons. First, the K-25 Gaseous Diffusion Plant came on-line and could operate and separate U-235 at a tenth the cost of running Y-12's Calutrons. The second reason was to return much

of the 14,700 tons of silver borrowed from the Treasury Department used as electrical conductors in the Calutrons because of a shortage of copper. Some 67 tons of silver remained in the two Alpha and two Beta Calutrons in Building 9731 until 1970 because these units were being used to separate isotopes of other elements.

AFTER WORLD WAR II CAME THE COLD WAR

The Calutrons that remained became the genesis of the medical isotope program as the isotopes separated there were sent to the Graphite Reactor at the Oak Ridge National Laboratory and made radioactive. The same science and equipment that separated the uranium for Little Boy also created materials for the life-saving research and diagnostic tool, radioisotopes.

This left eight of the nine large buildings empty. Y-12 quickly shrank from 22,000 workers to fewer than 2,000 in a matter of weeks. Yet, it was not long until employment was ramping up again to support the new production mission of machining uranium for additional nuclear weapons. The Cold War began and the hydrogen bomb quickly followed. These new designs, known as thermonuclear bombs, used fusion as well as fission to create even more powerful explosions. However, these new weapons needed a scarce material known as Lithium-6, or Li-6, to enhance the yield of the weapons.

The large spaces of these empty buildings where the huge Calutrons had once sat were ideally suited to the giant-scale process required to separate the small amount of Li-6 from the larger amount of Li-7 found naturally. The Atomic Energy Commission gave Y-12 what was known by local scientists as the “second Manhattan Project” when they asked Y-12, “You separated the uranium for Little Boy, can you now determine how to separate the Li-6 needed for the hydrogen bomb?”

In response, one of Y-12’s scientists, Dr. John Googin, designed the COLEX (column exchange) process and it was installed in two of the largest buildings at Y-12. This process operated from 1955 until 1963.

Y-12 separated Li-6 for the thermonuclear bomb and manufactured all “secondaries” (that part of the nuclear weapon that contains the second stage fission and fusion materials) for all nuclear weapons. During the 1980s, Y-12 had 8,000 workers making as many nuclear weapons as they could and essentially broke the Soviet Union’s economic “back.” The Soviet Union tried to keep up with Y-12 one for one, and simply could not. Thus, Y-12 helped win not only World War II, but the Cold War as well.

Y-12 TODAY

Today, Y-12’s missions help assure our nation’s nuclear weapons strategy. In addition to sustaining the secondaries in all active nuclear weapons through life extension programs to replace or refurbish needed materials as required, Y-12 also dismantles secondaries when nuclear weapons are taken out of the active nuclear weapons stockpile.



Fig. 2. The Highly Enriched Uranium Materials Facility securely stores the nation's stockpile of highly enriched uranium that is not in a nuclear weapon.

These secondaries are stored at Y-12 until they are dismantled and the special nuclear materials stored in the Highly Enriched Uranium Materials Facility. This 100,000 square-foot warehouse is the nation's secure storage location for all the weapons-grade U-235 that is not included in the secondaries of active nuclear weapons.

Other Y-12 missions include providing the highly enriched uranium for the Navy, assisting our government in the reduction of terrorist threats to obtain nuclear materials and support to other government agencies as requested. All of these Y-12 missions are major efforts to sustain our nation's freedom and help protect the world. All of them have tremendous historical significance. The need to interpret our history is not just to capture the history of what Y-12 accomplished in its early years during the Manhattan Project and later during the Cold War. It's also not just about the 9/11 attacks on the United States that ushered in the War on Terror still being waged today, but understanding the history is critical to the success of the missions Y-12 will assume in the future.

The importance of education for the coming generations regarding Y-12 missions is recognized and actions are being taken to capture the key historical facts for posterity. While all the historical structures cannot be preserved, at least two of the original World War II structures, Building 9204-3 (Beta 3) and Building 9731 (the Y-12 Pilot Plant), are slated for preservation. Therefore, the history behind those buildings not being maintained must be told in other ways.

The same holds true for all the many processes, such as COLEX, that cannot be kept forever. Yet what was accomplished in these structures and using these processes are important for the next generations to know and appreciate.

THE Y-12 HISTORY CENTER



Fig. 3. The interactive and educational Y-12 History Center is a feature of the Y-12 New Hope Center where the public has ready access to artifacts of Y-12's rich heritage.

To this end, the Y-12 History Center has been established as an educational tool to help the public, Y-12 employees and families better understand the tremendous heritage that is the Y-12 National Security Complex. The History Center is housed in the Y-12 New Hope Center along with the Y-12 Visitor Center and other organizations that routinely interface with the public to accomplish Y-12's missions.

Understanding the world-wide nature of the Y-12 missions is important. Our nation and the world depend on us to help assure that freedom and our way of life is maintained.

An early example is *Project Sapphire* - the removal of highly enriched uranium from Kazakhstan in 1994. This major expedition was cloaked in secrecy as the U-235 was not well protected at the time.

These tremendous stories of Y-12's heritage and history are now being told at this new facility called the New Hope Center. This new, privately financed structure is leased by Y-12 and serves as our "Front Door" to welcome visitors and provide public access to information and education about Y-12 through The Y-12 History Center.

THE NEW HOPE CENTER

The New Hope Center is a modern, light-filled facility with a huge, semi-circular lobby that welcomes each visitor. The Center houses a 420-seat auditorium named for one of our strongest supporters, Congressman Zach Wamp. A spacious museum displays artifacts and videos detailing Y-12's story. Each visitor is encouraged to take away educational materials that range from two, 90-minute DVDs (*Secret City: The Oak Ridge Story - The War Years* and

Secret City: The Oak Ridge Story – 1945–2006) written and other short DVD's as well as written materials prepared by Y-12's Historian.

Tour buses routinely stop at the Center and conduct DOE Public Tours daily during the summer months. A Knoxville-based tour group is considering taking over these public tours and extending them all year. Tour groups coming to Y-12 for mission-related purposes are provided orientation and get badges at the New Hope Center for the tours that take them into the various Y-12 buildings - depending on the reason of their visit.

Often tours are provided from conferences held in Knoxville and by the Y-12's Historian, and others who regularly assist him. Tours board the buses in Knoxville and share stories to illustrate Oak Ridge's history as the buses travel the 20 miles to the sites. Tours from the vacation resorts in Pigeon Forge and Gatlinburg near the Smoky Mountains National Park regularly visit Oak Ridge and are escorted through the Y-12 History Center as well as other historic sites within the city of Oak Ridge.

Other groups that tour the Y-12 History Center include the Leadership programs from surrounding cities and counties as well as the East Tennessee Regional Leadership program. These groups also get the opportunity to visit Building 9731; where the world's only 20-foot (6.5 meters) tall Alpha Calutron magnets are on display. Buses are also taken to the top of Chestnut Ridge where the tour participants are provided an excellent overview of Y-12 from this high vantage point on the south side of Bear Creek Valley.

Opened in July 2007, the New Hope Center was named for the small community that was here before the Manhattan Project. The center is giving new hope to Y-12's future by making the public aware, many for the first time, of the nature of Y-12's historic missions and the potential for a future without nuclear weapons.

Y-12's dismantlement role and efforts to prevent proliferation of nuclear materials make it one of the nation's key resources for our national security now and taking us into the future. Educating the public is more important for us now than ever before, and a center for effective education and access is vital to our success. Y-12's New Hope Center performs these functions well.



Fig. 4. The Y-12 New Hope Center is located at 602 Scarboro Road in Oak Ridge, TN, at the entrance to the Y-12 National Security Complex.

THE FUTURE FOR Y-12'S NEW HOPE AND HISTORY CENTERS

The uses being made of the Y-12 History Center have increased over the three years of its existence and new additions are already underway. A Y-12 History Library is being added, and documents as well as artifacts are already being assembled. A video viewing center is also being installed. Future plans include a soundproof booth for recording video oral histories.

Additional models and replicas will be added to enhance the visitor's experience at the Center. For example, replicas of Little Boy and the Alpha and Beta Calutron magnets are intended to be near life-size display monuments outside of the Center. Further, actual nuclear weapon cases without the nuclear materials on their handling units will be displayed in the main lobby, and eventually, the exterior shells of the nuclear weapon being dismantled by Y-12 will be displayed in the main entrance lobby.

The New Hope Center is being recognized as a tremendous community resource both locally and regionally and is being used by organizations such as the Knoxville Christian Youth Bands to hold concerts. The local camera club has begun to hold their annual Photographic Salon in the Center with award-winning photographs displayed all around the curved exterior wall of the auditorium facing out into the main lobby. Easy access and excellent natural lighting make the lobby an exceptional venue for displaying photography.

As the Y-12 National Security Complex continues to evolve – from its origin as a Manhattan Project uranium separation site, to a Cold War battle zone, to the nation's premiere precision machine shop and Uranium Center of Excellence, to the nation's secure uranium storage facility toward the missions of tomorrow of dismantling nuclear weapons and managing the future uses of the tremendously valuable uranium energy reserve with huge potential for nuclear reactor feedstock – the New Hope Center will serve as the "Front Door" for all comers. The Y-12 History Center will provide the unique educational perspective needed for visitors and employees alike to understand and appreciate the origin and history of Y-12, what has been accomplished here, and where Y-12 is going in the future.