

Implosion & Debris Cleanup of Savannah River Site Hyperbolic Concrete Cooling Tower - 11599

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ABSTRACT

Thanks to a \$1.4 billion dollar American Reinvestment and Recovery Act (ARRA) initiative at the Department of Energy's (DOE) Savannah River Site (SRS), Savannah River Nuclear Solutions (SRNS), the Site's operating contractor, is accelerating the closure of multiple legacy areas to prepare the 310-square mile Site for future missions. In all, 75% of the Site's operational footprint will be closed. Closure projects include the deactivation or demolition of excess facilities, soil and groundwater remediation of inactive waste units, and the shipment or disposal of low-level waste.

One of the most notable projects completed under the ARRA initiative at SRS was the K Area Cooling Tower project which involved the implosion and subsequent size reduction of the second largest Cooling Tower ever to be imploded in the world (also the largest structure on a DOE facility to ever be imploded).

With all possibilities considered, SRNS management selected controlled implosion as the most effective means of Tower demolition. Shortly thereafter, the search for experienced private construction and demolition companies began and ultimately, a subcontract was awarded to American Demolition and Nuclear Decommissioning (DND) Inc. (A Service Disabled Veteran Owned Small Business).

As scheduled, the Cooling Tower fell to the ground on May 25, 2010. More than 99 percent of the total structural volume landed within the 333' diameter basin footprint. The implosion design and layout of explosives produced a textbook controlled implosion which facilitated the subsequent handling, sorting, segregating and load out operations. More than 18,500 man hours of Safe Work were performed on the project with ZERO OSHA Recordables and a total Recordable Case Rate of ZERO.

Health & Safety Issues mandated compliance with the American Conference of Governmental Industrial Hygienist (ACGIH) Guidelines and applicable OSHA and ANSI Standards.

INTRODUCTION

Cooling Tower 'K'-O'd

DETONATION TIME = 1000 HOURS ON 5/25/10

National Demolition Association Members; American DND, Inc. (www.AmericanDND.com) of Buffalo, New York Teaming with Controlled Demolition, Inc. (CDI) (www.Controlled-

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Demolition.com) of Maryland, and LVI Services of North Carolina (www.LVI.Services.com) just imploded the second largest Cooling Tower in the world.

The 'K' Area Cooling Tower was built in 1992 to cool the water from a reactor in support of a National Defense Initiative. When the National Defense Initiative no longer existed, the Tower was no longer needed and no other economical use was available due to its unique and special design and location in a remote part of the Savannah River Site (SRS) located south of Aiken, SC.

The decision by the DOE to demolish the Tower eliminated ongoing carrying costs to the taxpayer and reduces the footprint of unnecessary facilities at SRS.

"The demolition of the 'K' Cooling Tower marks the achievement of a significant milestone in the Recovery Act mission at SRS. It has allowed us to create new jobs while reducing the site's cleanup footprint", said Rita Stubblefield, Deputy Federal Project Director for the Department of Energy. The project is funded under the American Recovery & Reinvestment Act (ARRA).

"The Cooling Tower Demolition Project is unlike any other closure initiative taking place at the site", said Dewitt Beeler, Savannah River Nuclear Solutions (SRNS) Director of Area D&D Projects. *"It isn't every day that we deal with the demolition of a structure the size of the 'K' Cooling Tower, and it was clear early in the process that we needed expert help."*

After weighing a variety of demolition possibilities, SRS Managers chose to hire American DND to complete the work. For the implosion portion of the Project American DND Partnered with the experienced Team of Control Demolition, Inc. (CDI) a Maryland based - family owned company with more than six decades of experience in controlled demolitions.

For the cleanup effort after the implosion, American DND Teamed with a subsidiary of LVI Services of North Carolina called Industrial Services Group (ISG) headed by Rich McManus. The ISG-LVI Team brought extensive resources and heavy equipment to help size reduce and load out the resulting debris pile.

The implosion occurred exactly as planned on Tuesday, May 25th, 2010 at 10:00 a.m. EST. The resulting debris pile was "perfect" by all accounts. As a departure from our normal article format we'll take you back in time and perform a countdown to the Detonation Time (***D-Time***) of this unique huge structure.

10 =D - MINUS 10 YEARS = JULY 2000

Bill Schaab who is currently the Senior Vice President for American DND was working as the VP of Operations for DEMCO, Inc. when he was the Project Director for performing the asset reduction and removal of the electrical transformer station, 2000 HP electric vertical shaft water pumps and other infrastructure at this very same Cooling Tower.

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It's not often in a Demo Contractor's life that you can go back to the same job twice to continue demolition work started nearly a decade earlier!! *What a treat!!*

9 =D - MINUS 7 YEARS = 2003

CDI, other blasters, and other demolition contractors were being contacted by DOE to provide consulting and advisory opinions to help develop the best Means & Methods to be used for demolishing this extremely huge and unique Cooling Tower.

DOE started almost a decade ago trying to determine if there was any beneficial reuse for the Tower and to search out the safest way to demolish such a structure. Ultimately the DOE selected "**Implosion**" as the *safest* means & methods to ensure the least amount of man hours at risk for demolishing this unique structure at one of the DOE's premier facilities.

8 =D - MINUS 6 YEARS = JANUARY 2004

American DND was started by Schaab in January 2004 with the focus of performing **Demolition & Nuclear Decommissioning (DND)** Projects on a national basis with High Quality, Customer Service and "Performance" as the Core Mission Statement.

American DND grew slowly at first then exploded when Schaab joined forces with his cousin Bill Sundeen. Sundeen had just retired from the Navy after 22 years and needed work in the private sector. Sundeen purchased 51% of the Company and by the end of 2006 American DND was a Qualified **Service Disabled Veteran Owned Small Business (SDVOSB)** with more managerial experience at performing radiological and nuclear decommissioning than many other Demolition Contractors combined.

In 2009, American DND was ranked the #1 Fastest Growing Company in Western New York by Business First Magazine (www.BusinessFirst.com). Since 2007 ADND has been ranked as one of the Top 100 Service Disabled Veteran Owned Companies on a National Basis by the www.Diversity.com organization.

7 =D - MINUS 4 YEARS = MAY 2006

CDI implodes the world's largest Cooling Tower for PG&E at the former Trojan Nuclear Station in Rainer Oregon. This Tower was 499' tall by 300 feet diameter, and weighed approximately 41,000 tons.

As usual, the CDI Explosives Design & Detonation Plan worked flawlessly for the Trojan Project and CDI brought their '*lessons learned*' forward to enhance the design and implosion for the SRS Cooling Tower.

For the Trojan Tower, CDI used the former Iconco Company to perform subsequent size reduction and load-out. As many of you may know Iconco was later purchased by LVI Services, Inc.

6 =D - MINUS 9 MONTHS = SEPTEMBER 2ND, 2009

American DND submitted multiple proposals with multiple options and means & methods of performing the same work.

The ADND options included three different implosion designs with three different blasters and multiple options for recycling the materials as part of an overall approach and comprehensive plan for the work. *“We figured this proposal approach showed our abilities to review ALL options, and objectively present the ‘Big Picture’ to SRNS-DOE so they could select the Implosion design they were most comfortable with”* said Schaab.

Ultimately, after months of evaluation, the SRNS-DOE selected the CDI Implosion Design under American DND’s proposal with CDI and LVI as Partnering Teammates offering the “Best Value” Offer to perform this one-of-a-kind project.

American DND’s Safety Record and management experience at DOE facilities coupled with the experience, performance, resources and Safety Records of both CDI and LVI provided the best overall value to the government and included one of the industry’s best Safety & Health Programs and Safety Record ever combined on a single DND Team.

5 =D - MINUS 6 MONTHS= DECEMBER 2009

The Contract was awarded, and submittals began.

The fact that this was the first time this amount of explosives were ever being brought into this DOE facility and within a half a mile of a secured reactor site on the facility posed unique challenges from a coordination, logistics, permitting, security and safeguards viewpoint.

American DND Project Managers Mike Furner, Todd Giolando, coupled with CDI’s Management Team of Doug Loizeaux, Stacey Loizeaux, Thom Dowd, Jesse McClesse and Craig Keyes all worked diligently for three months to complete all permitting, submittals, Task Specific Packages (TSP’s), Work Plans, Activity Hazard Assessments (AHA’s), explosives permitting, designs and layout to help ensure a flawless execution.

One of American DND’s mantras is the six- P’s Principle;

“Prior Proper Planning Prevents Poor Performance”

This model definitely applies to every aspect of work at a DOE facility and has paid big dividends in the performance for this job.

4 =D - MINUS 2 MONTHS = MARCH 25TH, 2010

American DND mobilized its forces to the worksite location.

There were absolutely **NO utilities** to be found within an approximate six mile radius. There was no water, phone, electric, or sewers. The only thing nearby to the site were a few retention ponds with some small fish and a rumored ‘gator’, and about 6” of water in the Cooling Tower basin which in the preceding years was full with frogs, small fish and thousands of bees, insects and wasps which used the water from the bottom of the basin as their own fresh water “lake”. Wild Turkeys roamed the remote location freely.

The site was so remote one of the hazards which needed to be overcome was the potential for insects and bug bites, poisonous snakes, spiders, swarms of bees, wild turkeys, wild pigs and the rumored alligator.

American DND worked with locally owned Aiken Pest Control to validate that none of the bees and wasps were an endangered species and there was no concerns for hibernating nests in the Cooling Tower pack materials. Before the Team could even set up trailers, red ant mitigation strategies and task specific plans for insect bites, snake bites and other safety measures needed to be implemented at this remote location.

The Team also had to bring in drinking water, set up generators and trailers, and install repeater antennas to facilitate cell phone service. Once complete they had their own little “Mini City/Safe Zone” to work from. Within a few days the site was buzzing with up to 30 craft workers which were performing preparatory activities to access locations up to 250’ above grade for the drilling and placement of explosives.

3 =D - MINUS 1 MONTH = APRIL 2010

In keeping with DOE culture, the lessons learned from prior projects were brought forward to this one to help ensure a ‘perfect’ Implosion.

Due to the heights and shape of the Cooling Tower typical man-lifts could not be used for drilling all the explosives locations and as such CDI utilized a *custom designed* and *custom fabricated* crane man basket with a carrying capacity of up to 10,000 pounds and the ability to carry up to six workers including all equipment for drilling and placement of explosives. The local firm of C.A. Murren handled the manlift Construction, and supplying the 150 ton Linkbelt Crawler Crane with 280’ of main boom with a 50 ‘ jib for a total of 330’ of stick. The man basket was designed to meet all OSHA and ANSI standards and passed the rigorous testing and inspection requirements for use in a DOE facility.

This is one design of a crane man basket which captured the many years of experience of Doug & Mark Loizeaux from performing some of the most difficult and complex implosions on some of the most unique structures in the world. The man basket could literally “roll” around the Tower as the crane moved it, and included specialty design factors to help shade the workers to prevent heat stress while at the same time including special arms and other attachments to help with the drilling and installation of cover materials and chain link fabric at such extreme heights and unique locations.

Hat's off!! to the Loizeaux's and the CDI Team to not only design productivity and creativeness into a unique man basket, but also to include every facet of *Safety* and protection of all the workers in the basket.

2=D - MINUS 12 DAYS = 5/14/10

A mere six weeks after the project was mobilized, all drilling activities were being completed and explosives were arriving onsite. Approximately 3900 holes had been drilled with over 50% of them performed at 120' above grade and higher.

The explosives arrived onsite after being transported by Jesse McClesse. This was a big day for SRS as over 1,300 pounds of explosives were being delivered to one of the most secure National Defense DOE Facilities in the country. This certainly was not an everyday event for the security and safeguards personnel, everyone was on their toes, and "*all hands on deck*" was the mantra from here on out.

Once again, perfect planning, proper design, flawless execution, and a truly cooperative *TEAM* effort from the DOE facility, SRNS Staffers, and Security/Safeguards Personnel helped ensure a safe, on time and uneventful delivery and storage of the explosives onsite.

Doug Loizeaux came in on Sunday of that weekend like a little kid at Christmas and couldn't wait to start planning his layout & preparations for making the charges to support the 'loading' activities in the next two weeks. One thing is certain after all these years = Doug *really* loves his work!

The Project had been blessed with fantastic weather for the preceding two months. "*We experienced no more than three days of lost time due to high winds and other than a few windy days there were no real interruptions or delays to the work for weather concerns. We even stopped work to support a site-wide "Turkey Hunt" for local disabled persons*" said Mike Furner. The CDI Teams hard work, efficient operations and good weather all helped with advancing the Schedule and being able to actually bring the Shoot Date forward by more than two weeks. The SRNS and DOE were exceptionally helpful when it came "maneuvering their ship" to support the advanced Shoot Date.

How often does that happen on a blasting job?!!

As usual on any blasting job the Project Team was working expeditiously to load all 3900 holes and connect over 20,000 feet of detonation cord to prepare for the final Detonation date.

1=DETONATION TIME = 5/25/10 @ 1000 HOURS

On the morning of the shoot the Team assembled at 0600 hours and began their final countdown phase.

The Tower was so tall the FAA needed to be notified because the strobe lights on top would no longer be utilized, and the visual landmark for aircraft in the area would soon be "no more". The

only 480 volt three-phase power line which ran to the lights on top was disconnected and removed and all personnel began to take up their appropriate positions at the firing location, control point and dignitary viewing area. Stacey and Devon Loizeaux took up camera positions in man-lifts at strategic locations to capture the momentous event.

Everything went flawlessly according to schedule and planned countdown activities. Wackenhut Security, DOE Facility personnel and the adjacent public roadway shutdowns were performed as planned and roadways were reopened again within 15 minutes after detonation.

The total time to fell the Tower took approximately eight seconds for the top ring of the Tower to hit the ground. The dust cloud meandered harmlessly over unoccupied areas and was fully dissipated within approximately 12 minutes after detonation. The seismic impact was less the 1/6th the allowable limit for 'peak particle velocity'.

In the end, Schaab & Sundeen calculated no more than 1 % of the tower fell outside the Cooling Tower Basin 'footprint' = FANTASTIC !!! Just imagine dropping a 'ring' of concrete 455' tall totally in on itself, without sway, or any damage to the adjacent stair towers.



Initial Detonation (1)



Foundation Support Failure



Top of Tower Folding Inward (3)

Tower Down Within Footprint (4)

POST IMPLOSION SAFETY RECOGNITION

On the evening after the Implosion, American DND held a Safety Recognition Party at the local VFW Post #5877 in Aiken, South Carolina. Over a 125 people enjoyed the *Eddie Hill & the Hoggy Bottom Boys* for an award winning southern-style BBQ dinner where the entire Project Team and all employees were recognized for their dedication and contributions to performing work Safely and in a cooperative/professional atmosphere.

Over \$7,000.00 in Safety Incentive Bonus checks were handed out to all employees who helped in the performance of the first 7,000 man hours without a Lost Time Accident and achieving a Zero Incident Rating for the Project.

As reinforcement of a dedicated Safety Culture for the next half of the job, the Size Reduction and Load-out Team was reminded of their responsibility to carry the torch forward and maintain the goal of “Zero”.

With the first and second largest Cooling Towers in the world now demolished, Bill Schaab and Doug Loizeaux are looking to search out the third largest Cooling Tower and wondering when it will come down = ???. Hypothetically, Bill Schaab is trying to figure out how to do a better job on the next one and how to take lessons learned from this one forward to further enhance their performance. About the only thing he can come up with now is to possibly place the trucks under the Tower before the Implosion and to see if Doug can land all of the debris in them.

Are you up for that challenge Doug??!!

Doug’s reply was: “ *Only if we can figure out how to do it Safely !!* “

CHALLENGES & CONCERNS

As we all know in the demolition industry, next to asbestos and lead, the next hot button is the carcinogenic affects of 'Silica' to the workers performing demolition and subsequent load-out activities of these large concrete structures.

American DND implemented an extensive Silica & Dust Monitoring Program under the guidance and supervision of their Safety Director = Mr. Mark Cotter, CSP, CIH. and the local engineering firm of S&ME Engineering, Inc. which provided local South Carolina Engineers for both Storm Water Management Plans and CIH services.

The Industrial Hygiene & Safety Team of American DND implemented a well planned, comprehensive and well documented Respiratory Protection Plan and Personal Air Sampling Monitoring Program which adequately protected all of the workers well below the permissible OSHA and AIGCH (PEL) Standards. In a DOE facility, the AIGCH Standards are used because they are more restrictive than OSHA's and help to obtain a higher level of safety for everyone performing the work.

When all the data was analyzed, the Industrial Hygiene Safety Professionals were able to prepare Negative Exposure Assessments to show the engineering controls and equipment utilized were more than adequate to keep airborne concentrations of Silica and Nuisance Dust below the Permissible Exposure Limits.

In addition to the Respiratory Monitoring Program extensive data was collected on all work tasks for a comprehensive Hearing Conservation Program. The use of pneumatic drills, hydraulic hammers, electric drills, grapples and concrete pulverizers are some of the most extreme demolition machines and present some of the highest exposures for potential hearing loss in the industry.

American DND's proactive Hearing Conservation Management Program and design of Safe Work Zones helped ensure everyone had the right hearing protection and maintained noise exposure readings at the lowest levels possible.

LOAD OUT & HAULING ACTIVITIES

Upon successful implosion of the Cooling Tower, Load Out and Site Restoration Activities began. The ISG/LVI Crews led by Kelly Arnold started up their fleet of hydraulic excavators including three hammers, two concrete pulverizers, two grapples, rock buckets and a MSD-100 shear. The fleet of excavators, complimented with a rubber tire loader, and four tractor trailer semi's with steel bodied dump trailers processed, compliantly size reduced, and shipped over 1600 loads of Construction and Demolition debris for proper disposal.

The ISG/LVI Team brought just the right mix of horsepower and equipment operations to mitigate manual labor and effectively move tons of debris in as short a timeframe as possible.

The final end state of the project included final grading and seeding to match the existing contours and facilitate rainwater runoff, safety barriers for personnel protection, and complete site restoration back to pre-implosion conditions.

PROJECT WRAP UP

The project was completed **only** three months after the detonation date. The following items summarize the actual load out, debris cleanup and safety record for the entire job:

- Completed project one month ahead of schedule.
- Total time onsite from the date of initial mobilization to the date of final acceptance inspection and all demobilization was only five months.

Safely performed over 18,500 man hours of work and achieved the Safety Goal for the following:

ZERO OSHA Recordables ZERO Accidents ZERO Total Recordable Case (TRC) & DART Rates

- Earned 100% value for safety incentive bonus from the DOE/SRS.
- Paid out over \$18,500. U.S.D. in safety incentive bonus checks directly to the onsite Craft Labor & Project Management Team.
- Paid out over \$35,000. U.S.D. for safety incentive awards, lunches, hats, customized safety shirts, koozies and “catch of the week” suggestions offered by the Craft Personnel.
- Loaded, transported and dumped over 1,600 truckloads of concrete and PVC debris without incident.
- Recycled over 1,100 tons (125 truckloads) of steel rebar, stainless steel & aluminum piping, steel plates and copper wire from the Cooling Tower structure.
- Logged over 20,700 “over the road” miles of heavy hauling and trucking onsite without incident and zero traffic citations (averaged over 27 loads per workday).
- Placed 1,000 cubic yards of CLSM fill in a below grade sump pit within four working days.
- Site restoration included revegetating areas, barricades for future site protection, water runoff management and rip-rap placement.

COOLING TOWER SPECIFICATIONS

Year Built & Last Operational = 1992

Size = 455' tall x 333' diameter at the base

Wall Thickness = Ranges from 36' thick at bottom lintel, to 24" at the top.

Concrete Volume = approximately 13,000 cu. yards. = 26,000 tons = 52,000,000 pounds

Metals = approximately 1,400-1,600 tons of rebar, stainless steel, copper & aluminum

PVC Fill Material = approximately 19,500 cu. yards of PVC fill and distribution piping

Trucking = approximately 1800 truckloads of material moved within a three month timeframe

Man Hours to Date = Over 7,000 man hours to date performed in 9 weeks to perform drilling, loading and explosives detonation with *Zero Accidents, Zero OSHA Recordables, Zero Lost Time Accidents* and a *Zero OSHA Incident Rating*.

*Prior Proper Planning **DOES** Prevent Poor Performance!*

American DND greatly appreciates and expresses sincere **THANKS** to the SRNS Project Management Team and DOE Management for supporting the Project with professional dedicated

oversight and providing a culture to help achieve the Safety Goal of a “**Zero**” rating across the board.



Site Cleaned and Restored