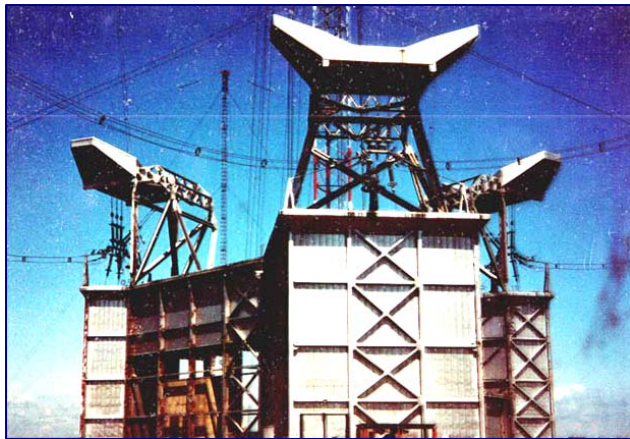


FALL ABATEMENT RESOLUTIONS AT NAVAL COMPUTER & TELECOMMUNICATION STATION (NCTS), CUTLER, ME

The primary mission of Naval Computer & Telecommunication Station (NCTS) Cutler, Maine is to provide a very low frequency (VLF) broadcast link between high level command authority ashore and U.S. and NATO ships, planes, and submarines operating at sea in areas of broadcast coverage. NCTS Cutler broadcasts VLF radio signals through two very large circular antenna arrays, each with a diameter of about one mile. The antennas are supported by approximately twenty 980 foot towers. Radio signals generated in the transmitter are tuned and frequency matched to the antennas by the elements in the Helix Houses, located at the center of each array.

Because of the strong electromagnetic (EM) field generated within the Helix Houses, they must be shut down before technicians are allowed to enter to perform routine maintenance activities. Within each Helix House are a variety of structures that require routine maintenance, each with their own unique fall hazards. A study by NCTS Cutler safety personnel revealed significant fall hazards - situations in which maintenance technicians would be in danger of sustaining injuries by falling while working on or operating equipment - in both the NCTS Cutler North and South Helix Houses.



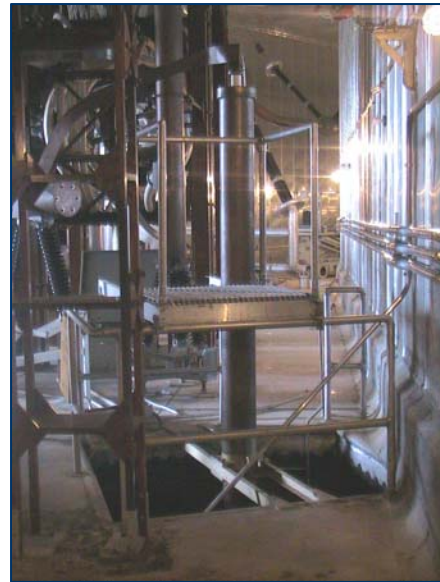
Helix House

The U.S. Navy Fall-Protection Guide For Ashore Facilities (and the primary reference for OPNAV Instruction 5100.23G, Chapter 13, Fall Protection Program), states “. . . the standard fall protection height for federal employees (military and civil service) on U.S. Navy Ashore Facilities is 4 feet as per 29 CFR 1910, Subpart D.” The guide goes on to say “. . . fall protection must be provided each employee on any elevated surface ABOVE 4 FEET including working from ladders – where there is a possibility of a fall to a lower level, onto dangerous equipment, or environment or onto impalement hazards.”

Each Helix House contains a variety of laminated wood structures, some more than 40 years old, held together with threaded wooden nuts and bolts. A good number of the fasteners are at heights up to 40 feet and require inspection by hand on an annual basis to determine their

integrity. The only possible anchorage points available to the maintenance crew were the wooden members of the structure they were climbing and inspecting, and it was doubtful whether they would be strong enough to resist the forces produced by a fall.

At several locations in each Helix House, maintenance is required at ceiling level, which is 80 feet high. For example, the wooden structures, as well as the insulators along the ceiling of the Helix Houses require frequent dusting to keep the entire structure electrically insulated. On occasion, adjustments must be made by hand to the tuning components of the helix house, again at height. In these locations, scaffolding was built from the ground up to provide a platform for maintenance crews. Once maintenance work was completed, the scaffolding was dismantled and removed from the Helix House. Building the scaffolding took several hours, and to stabilize the scaffolding, it was guy-wired to local plumbing. Anchoring in this manner was insufficient in that there must be engineered anchor points to connect and stabilize the scaffolding structure.



The “Horn Gap” is an area in the transmission circuit that requires periodic adjustment to maintain the proper frequency for the VLF. The “Horn Gaps” in each Helix House are located above an



Trap door to lower section of Helix House was not surrounded by guard rails.

18-foot hole between the Main Variometer and the Triple Stack. Maintenance technicians worked on an open platform with no fall protection guardrails. In addition, maintenance technicians worked around trap doors separating the three divisions of the Helix House. The platforms around these trap doors had no fall protection systems.

Open platform atop the “Horn Gap” had no fall protection guard rails.

During cold weather, maintenance technicians must access the tuning capacitors within the Helix Houses as often as necessary to remove ice that has formed on the capacitor plates as icing adversely affects system operation. Maintenance technicians gained access to the de-icing switch platform via ladders that were unanchored, and the platform itself did not have fall protection guard rails.



Customized anchored ladder and platform with fall protection guard rails provide safe access to deicing switch.

The Naval Facilities Engineering Command (NAVFAC) Mishap Prevention and Hazard Abatement (MPHA) Team was tasked by the Space and Naval Warfare Systems Command (SPAWAR) to evaluate the fall hazards in the NCTS Cutler North and South Helix Houses, and to develop, design and implement “best value” resolutions to the validated hazards. NAVFAC, which manages the Chief of Naval Operations (CNO) *Mishap Prevention and Hazard Abatement Program (MPHAP)*, oversees

and funds the correction of identified high-risk safety and health deficiencies that exceed the funding capabilities of Navy shore activities that request such assistance.

During the MPHAP Team’s initial survey at NCTS Cutler, they were told that the intense EM field generated within a Helix House during operation places material restrictions on any fall abatement resolutions introduced within range of the EM field. Because the supporting fixtures within the Helix House must not interfere with the broadcast signal, the primary construction material for both structures and fasteners is laminated wood as mentioned above. The MPHAP Team had to consider that materials for any permanently implemented fall hazard resolutions could not conduct or re-radiate an EM signal that would degrade the facility’s operability capability.



Fiberglass anchored ladder and metal guard rail approved by SPAWAR SMEs on elevated gallery in Helix House.

The MPHA Team generated and submitted design and fabrication drawings for their recommended fall hazard resolutions to NCTS Cutler safety and facility managers, maintenance technicians, and SPAWAR subject matter experts (SMEs) for review and comment. Proposed solutions included Occupational Safety & Health Administration compliant guardrails, swing gates, customized anchored ladders, raised platforms with guardrails, and mobile mechanized lifts. Guardrails were recommended for several locations to protect workers from falls greater than four feet while performing maintenance on high platforms or mezzanines within the Helix Houses. The custom anchored ladders would provide access to these and other high areas; the swing gates would provide fall protection at the top of the ladders. All of these solutions, with the exception of the mobile lifts were to be permanently mounted. The mobile lifts would be used to accomplish maintenance (i.e., cleaning system elements and structural inspections) at height in multiple locations within the Helix Houses



“Horn Gap” access platform surrounded by newly installed fall protection guard rails.



Large trap door (closed in foreground), separating one of the three divisions within the Helix House, is surrounded by a new safety rail.

where there was no place to anchor a ladder or construct a platform with guardrails.

All of the above fall protection solutions were accepted to protect maintenance technicians working at height in the NCTS Cutler North and South Helix Houses. The SMEs suggested that some items be designed and fabricated from non-conducting materials (fiberglass) to ensure there would be no interference with the generated electromagnetic field. Funding for the fall protection equipment was applied for and provided to NAVFAC through the Hazard Abatement Program

sponsored by the Naval Safety Center and NAVFAC Headquarters in Washington, D.C.

The MPHA Team worked closely with facility personnel and the contractor installing the equipment to schedule all work during a brief operational stand-down. At the conclusion of the installation, SPAWAR SMEs conducted full power (110%) tests and indicated in their final report that the installed fall abatement resolutions did not interfere with the operation of the Helix Houses.

The new fall protection solutions in the NCTS Cutler Helix Houses allow maintenance workers to safely access system and individual components within the Helix Houses and eliminate the need to construct and dismantle scaffolding or to anchor to plumbing fixtures. Facility maintenance technicians were complementary in their assessment of the new equipment and the protection it affords them while working at height in the Helix Houses. The technicians have found that the new fall protection equipment greatly simplifies their maintenance procedures while the time spent on maintenance has been significantly reduced.

Point of Contact: Mr. David Wiggins, NAVFAC Mishap Prevention & Hazard Abatement Program Manager/Deputy Operations, Safety Division
Telephone: Commercial (202) 685-9215, DSN 325-9215
Email: david.wiggins@navy.mil