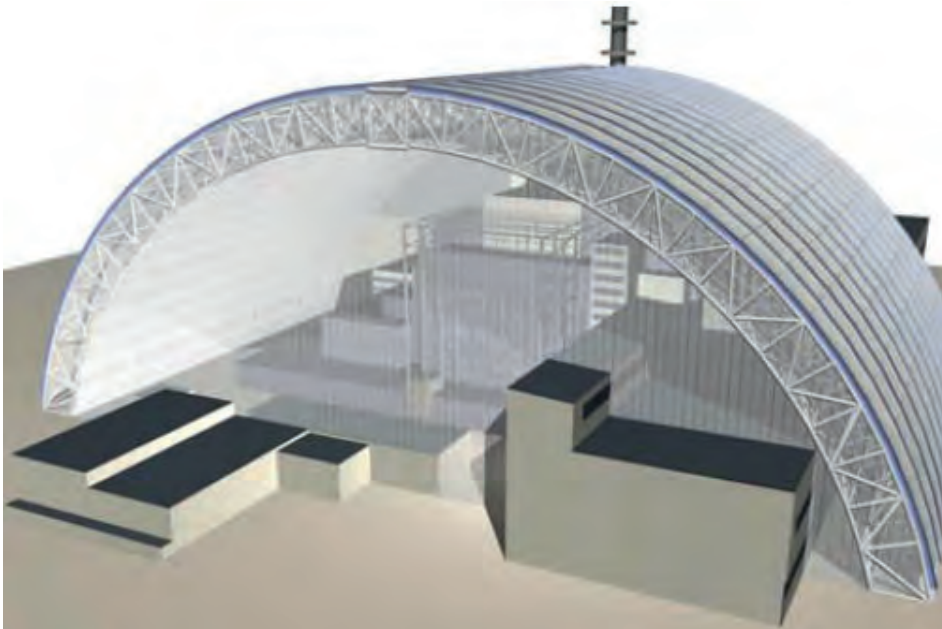


# Standing the test of time

CERAM has confirmed the new Safe Confinement Arch Cladding System at Chernobyl exceeds the stringent test requirements. The New Safe Confinement will confine radioactive remains for the next 100 years and is due to be completed in 2013



The New Safe Confinement (NSC) is set to replace the current sarcophagus. It is a sliding arch structure on rail tracks and CERAM was commissioned to test the individual system components and to build the rigs to test the entire system

In 1986, an accident destroyed reactor 4 at Chernobyl Nuclear Power Plant, Ukraine. To prevent the reactor wreck from leaking radioactive material into the environment, a shelter was erected shortly after the disaster. The existing object shelter, also known as the sarcophagus, is now deteriorating, increasing the risk of its radioactive remains leaking out into the environment. The sarcophagus is to be replaced by the New Safe Confinement (NSC), a sliding arch structure situated on rail tracks which will: convert reactor 4 into an environmentally safe system; reduce erosion and weathering of the existing shelter and reactor 4; lessen the consequences if the existing shelter or reactor 4 were to collapse; and facilitate the safe deconstruction of unpredictable structures within the NSC. The NSC is expected to be completed in 2013 and will confine the radioactive remains for the next 100 years.

Prior to construction commencing, the uniquely designed roof structure needed both its material and structural properties testing to ensure it met the stringent and crucial project requirements and to demonstrate how the components interact within the system.

As an independent materials testing laboratory with extensive facilities and experience in roof testing, CERAM was commissioned to

test the individual system components and to build the rigs to test the entire system.

## The right dimensions

The NSC design is an arch shape tubular steel structure with an internal height of 92.5m, a 12m distance between the centres of the upper and lower arch chords, an internal span of 245m and external span of 270m. The arch dimensions were determined through the need to operate equipment inside the new shelter and decommission the existing shelter. The structure is 150m in length and is comprised of 13 arch frames assembled 12.5m apart to form 12 bays. The external cladding arrangement consists of two distinct assemblies; the outer and inner cladding.

The outer cladding comprises steel deck sheets which span between purlins to support top hat sections. Halters are fixed to the span breakers which provide support to the outer sheets at regular intervals. The outer sheets are purpose-designed standing seam sheets manufactured from stainless steel. An air tight membrane and thermal insulation are situated within the cavity formed between the steel deck and stainless steel outer sheets.

The inner cladding completes the soffit and forms a plenum (annular space) between the outer cladding deck. Steel sheets span between the structural purlins and are sealed as an air



Reactor 4 Chernobyl Nuclear Plant: The sarcophagus, is now deteriorating, increasing the risk of its radioactive remains leaking out into the environment

barrier. Bespoke lining panels are secured to the inner deck and sealed to achieve an air barrier; the deck-lining panel assembly is included to support inspection trolleys.

CERAM designed the test rigs to withstand the high loads and impacts required from the test programme.

All of the test rigs were approved, calibrated and verified prior to testing, and during all phases of the programme, by independent auditors. Bespoke rigs and methods were also used by CERAM to fulfil the non-structural test requirements.

Each individual component and system layer was assembled and tested for: wind-uplift loads (including Tornado Class 3 loads), imposed loads, impact resistance (including a novel 25kg snowball test), fatigue, air leakage, radiation stability, lightning strike resistance, and trolley loading. Each test went beyond standard test methods, and each component or layer was tested to failure.

From the rigorous components and system testing, CERAM was able to confirm the chosen material and structural properties of the arch cladding exceeded the specification for the performance of the roofing system. The testing programme provided detailed components and systems reports, including: data analysis, in-depth measurements, observations, photographic documentation and videos.

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