BUILDING AN ARCH
Today, a New Safe Confinement (NSC) is being constructed at Chernobyl. It is an arch-shaped structure which will be placed over the destroyed unit to provide a controlled, weatherproof environment. The objective of the NSC is to confine the solid radioactive remains of Unit 4 for the next 100 years and to allow a partial deconstruction of the old plant in the future.

The project is led by Novarka, a joint venture between French companies Bouygues Travaux Publics and Vinci Construction Grands Projets. Mammoet was selected by Novarka to engineer and execute the jack-up and skidding operations – a highly challenging task requiring new approaches in engineered heavy lifting and transport.

The arch-shaped confinement structure is a design and construction project that is quite unique in the history of engineering. The structure will ultimately rise to a height of nearly 110 meters, will be close to 165 meters long, have a span of about 260 meters and weigh close to 35,000 tons. That is big enough to house the Statue of Liberty or Paris’ Notre Dame Cathedral.

The arch is being constructed in a decontaminated area – the ‘special erection area’ – at a safe distance from the reactor. It is built in two equal parts. Each half is elevated during three jack-up operations. The first half of the arch has already been finished. It was raised to its full height in 2013 and skidded to a temporary location, or ‘waiting area’, clearing the special erection area for construction of the second half. Building the arch in two parts is more cost-effective, as it requires only half the jacking capacity when compared to elevating the entire arch in one go. Cost-effectiveness is further increased by elevating each part in three jacking operations as it allows construction at lower heights. This would not be entirely possible if each arch would be elevated in one go.

To tackle the challenges posed by both the jacking and skidding operations, Mammoet designed an integrated approach covering a range of innovative, specialized solutions.

A customized jacking system was developed by Mammoet: the strand jacks are housed in special containers which are placed on top of the tower sections, making it easy to remove the strand jacks from the tower sections and lower them to ground level for maintenance. This allows for efficient maintenance of the jacking units while the towers are being relocated. New software was also developed to ensure precise control of as much as 60 strand jacks working simultaneously. A new camera system, with a camera in every container, monitors the reels and strand jacks from the control room. In addition, a customized method of protecting the strand wires against the extreme weather conditions is applied to reduce the risk of having to renew it regularly.

The most significant innovation for this project is the tailor-made skidding system. It has been engi-
Each arch is elevated in three jack-up operations at the special erection area

1. First jack-up to elevate the arch.

2. Repositioning jacking system for second jack-up.

3. Arch elements added and second jack-up operation to elevate the arch further.

4. Repositioning jacking system for third jack-up.

5. Arch elements added and third jack-up to elevate the arch to its final position.

6. Arch 1 is fully elevated and ready to be skidded from the special erection area (A) to the waiting area (B).

Each arch is elevated in three jack-up operations at the special erection area. The system is fully remote controlled and has 116 skid shoes, with an average capacity of 703 tons each. It has been designed to operate completely synchronized on both sides of the structure, to ensure the arch moves evenly during the skidding operation.

Once the second half of the structure is finished, the two halves will be connected to form the complete arch that is to be placed over the Reactor Unit 4 of the Chernobyl nuclear power plant. In order to connect the two sections, Mammoet will skid the first part back towards the second part. The skidding operation is scheduled for late 2014 or early 2015, after which it will take a year to install a fully remotely controlled overhead crane system and various monitoring and control systems which will ensure the integrity of the structure for its designed life span of a minimum of 100 years.

Upon finishing all preparatory works, the complete arch, weighing approx. 35,000 tons, will be skidded over a distance of 330 meters to Reactor Unit 4 in approximately 1 week, completing this exceptional project.