

# ENGINEERING FOR THE NEW SAFE CONFINEMENT

**ENVIRONMENT** The Ukraine subsidiary of Pörner, takes part in a project - “unprecedented in the history of engineering”: the design and construction of a new confinement shelter above parts of Chernobyl power plant, damaged in 1986.



Working progress on the arch in Chernobyl

## The project

The purpose of the new arch, designed and built by NOVARKA, is to:

- contain radioactive materials
- protect public and workers at the site
- protect the existing Object Shelter against weather damage

Standing on two concrete beams, the arch assembles to the west of the damaged reactor and slides into position over the existing object shelter, built in 1986 just after the accident.

## Our impact

As local supplier, the Ukrainian location has been assisting the gigantic project since 2011 with the detail engineering for supporting systems of the ventilation ducts, cable trays, some lifting systems and platforms.

On basis of a 3D model issued by the client, Pörner located the supporting systems. Using Caesar software the Ukrainian team calculated the stress in the ducts, the loads on the supports

(operating loads, fire, earthquake) and defined the type of supports needed, using SCAD software. Finally the Ukrainian Pörner location designed the supports finite elements and issued the 2D KM drawings of each supporting system. These operations required several iterations in order to optimize the design. In addition, Pörner checked the behavior of a shelter equipped with electrical panels under seismic condition.

## Challenges

During their work the Ukrainian engineers have to deal with several challenges of this unique project, like:

- the size of the technical buildings (several kilometers of pipes)
- the difficulties, as the installation was very congested and
- the complexity of some supporting systems

Never before such a huge structure has been assembled under comparable circumstances and in the vicinity of a heavily contaminated site.

We are proud to support this pro-

ject being essentially important not only for the country's welfare but also for the whole continent.

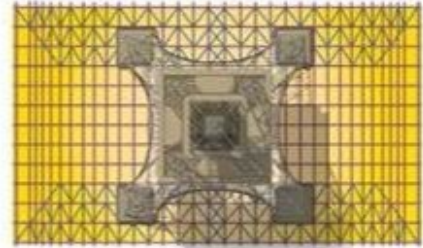
**Client:** NOVARKA

**Location:** Chernobyl / Ukraine

## Scope of work:

- Detail engineering for
  - \* ventilation ducts system
  - \* cable trays
  - \* lifting systems
  - \* platforms
- Positioning of the support systems based on 3D models
- Calculation of stresses in the channels and the loads on the support systems
- Definition, design, design optimization and 2D KM drawings for the necessary support
- Verification of the arch behaviour under earthquake conditions

**Commissioning:** 2011 - 2017



Working progress and impressive dimensions



The Team on site

## The New Safe Confinement

The NSC is designed and built by the French consortium NOVARKA.

A part of the Shelter Implementation Plan is designed to contain the radioactive remains of Chernobyl Unit 4 for the next 100 years and replaces the sarcophagus, that was hastily built shortly after the disaster in 1986.

According to NOVARKA the arch-shaped confinement amounts to approx. 1.5 billion Euros and is made up of a 25,000 t metal structure.

With its 108 m height, 162 m length and 257 m span, it is large enough to enclose the Stade de France, the Statue of Liberty, or the footprint of the Eiffel Tower. It is as tall as a 30-storey building. The work on the confinement is expected to be completed in late 2017.

Completion of the project is scheduled for the end of 2017.

## Pörner Kyiv

Pörner Kyiv, a 100% subsidiary of Pörner Group, is mainly focused on providing services in the state-of-the-art detail engineering of the following facilities in the oil and gas sectors:

- gas, crude and condensate pipelines
- gas filtering, metering and pressure reduction stations
- compressor stations
- gas treatment facilities
- above-ground installation for underground storage facilities
- distribution networks
- liquefied natural gas (LNG) receiving terminals
- LNG and natural gas piping systems on LNG carriers

The vast expertise of its engineers enables the Ukrainian location to render engineering services, upon request, for almost every type of installation.

## NSC Key data

### Technical data:

- Arch span: 257 metres
- Arch height: 108 metres
- Arch's covered length: 162 metres

### Total weight: 31,000 tons

- Life span: 100 years
- Exterior cladding: 86,000 m<sup>2</sup>
- Overhead bridge cranes: 2 x 750 tonnes
- Overhead bridge crane girders: 100 metres (equ. of a football pitch)
- Loads supported by the overhead bridge cranes: 50 tonnes vertical
- Final foundation: 20,000 m<sup>3</sup> concrete
- Engineering: 5 million hours

### Manpower:

- 1,200 Ukrainian workers at the site during the peak period
- 200 expatriate employees of 21 different nationalities
- 60 people at the site dedicated to radioprotection

### The confinement must withstand:

- Temperatures ranging from -43° C to +45° C
- Tornado class 3 (1,000,000 years)
- Earthquake with a maximum intensity of 6 (10,000 years)