

BALBOK

Real solutions for
environmental problems

CASE STUDY

“B-B CUBE”®:

**REINFORCED-CONCRETE CONTAINER FOR RADIOACTIVE AND
HIGHLY TOXIC WASTE**



“B-B CUBE”® IS A REGISTERED TRADEMARK OF BALBOK CO.
ANY USE OF IT WITHOUT AN EXPLICIT APPROVAL GIVEN IN WRITING BY BALBOK MAY RESULT IN A LEGAL ACTION.

The product

"B-B CUBE"[®] IS A REINFORCED CONCRETE CONSTRUCTION IN THE SHAPE OF A CUBE WITH A SIDE LENGTH OF 1950 MM CONSISTING OF TWO COMPONENTS - BODY AND LID.

DEPENDING ON THE FILLING PROCESS THE LID IS PROVIDED WITH OR WITHOUT AN OPENING WITH SPECIFIC FORM.

THE CONTAINER IS DESIGNED FOR STORAGE AND TRANSPORTATION OF LOW- AND INTERMEDIUM LEVEL SOLID AND SOLIDIFIED LIQUID RADIOACTIVE WASTE, IONISING RADIATION SOURCES, AS WELL AS HIGHLY TOXIC SOLIDIFIED WASTE.



The company

"B-B CUBE"[®] IS A REGISTERED TRADEMARK OF BALBOK Co., 118 VASIL LEVSKI BLVD., SOFIA 1504, BULGARIA, ESTABLISHED IN 1991. THE WHOLLY OWNED SUBSIDIARY BALBOK ENGINEERING IS THE PRODUCER AND SELLER OF CONTAINERS "B-B CUBE"[®].

IN ADDITION, THE COMPANY PROVIDES FULL RANGE OF SERVICES FOR DISPOSAL OF HAZARDOUS WASTE IN BULGARIA, INCLUDING PHYSICO-CHEMICAL TREATMENT AND PERMANENT STORAGE IN CONTAINERS "B-B CUBE"[®] ON OWN SITES.

Main characteristics

- INTERNAL VOLUME – 5 M³
- WEIGHT – TARE WEIGHT 6 T, ALLOWED GROSS WEIGHT – UP TO 20 T
- SPECIAL CONCRETE FORMULA WITH COMBINED USAGE OF ACTIVE MINERAL AGGREGATES
- OVERALL REINFORCEMENT WITHOUT WELDING (EXCEPT FOR HOOKS)
- STACKING ABILITY - 4 CONTAINERS STACK EASILY ON TOP OF EACH OTHER (I.E. 64 T OF WASTE ON 4 M² OF SPACE)
- INTERNAL VOLUME/EXTERNAL VOLUME RATIO – EXCEEDS 67.5%



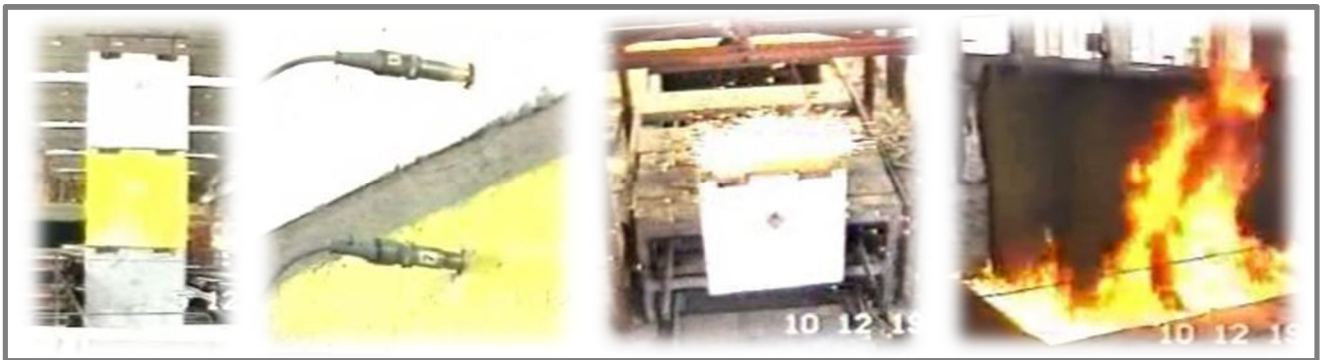
The advantages of "B-B CUBE"[®]

- HIGH STORAGE CAPACITY UTILIZATION DUE TO INTERNAL VOLUME/EXTERNAL VOLUME RATIO AND STACKING ABILITY
- POSSIBILITIES FOR AUTOMATED HANDLING IN THE STORAGE FACILITY
- HIGH COMPRESSION STRENGTH DUE TO SPECIAL CONCRETE FORMULA – THUS THE COMPRESSION STRENGTH IS RAISED FROM 25 TO 75% - UP TO 40 MPA ON THE 28TH DAY FROM PRODUCTION
- WATER PERMEABILITY IS 2 TO 7 TIMES LOWER COMPARED TO CONVENTIONAL CONCRETE MIXTURES
- GUARANTEED PERIOD OF HANDLING AND SAFE STORAGE
 - TRANSPORTATION AND HANDLING WITHIN 50 YEARS
 - SAFE STORAGE - UP TO 300 YEARS
- EASY RELOCATION OF FULL CONTAINERS (THE CONTAINER IS LICENSED AS IP-3 INDUSTRIAL PACKAGE)
- EXCEPTIONAL RADIATION PROTECTION PROVED BY SERIES OF TESTS AND IN PRACTICE
- LOW OPERATION COSTS FOR THE STORAGE FACILITY OPERATORS
- UP TO 3 TIMES CHEAPER SOLUTION COMPARED TO OTHER CONTAINERS FOR RADIOACTIVE WASTE ON THE MARKET

Proven by tests

BEFORE LICENSING FOR USE AT NUCLEAR POWER PLANTS, THE CONTAINER WAS TESTED ACCORDING TO BULGARIAN LEGISLATIVE REQUIREMENTS, AND INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA) SAFETY SERIES No.6. THE TESTS WERE PERFORMED IN BULGARIA IN THE PRESENCE OF AN EXPERT FROM THE IAEA.

THE SCOPE OF THE TESTS INCLUDED SEISMIC TEST (PIC. 1 AND 2), WATER PERMEABILITY TEST, PENETRATION TESTS, DROP TESTS – FROM 30 CM ONTO EDGE AND CORNER, FROM 60 CM ONTO BASE AND EDGE, AS WELL AS FROM 6.5 M (PIC. 3), FIRE TESTS (PIC. 4), AND TEST ON SHIELDING EFFICACY.



THE "B-B CUBE"[®] CONTAINER HAS PASSED ALL THE TESTS INCLUDING FOR IP-3 INDUSTRIAL PACKAGE, AS WELL AS AN EXTRA FIRE TEST, FREE FALL TEST FROM 6.5 M, SEISMIC TEST, SPECIFIED FOR TESTING OF A TYPE PACKAGES UNDER ACCIDENT TRANSPORT CONDITIONS. IN ALL DROP TESTS, INCLUDING FROM 6.5 M (SIMULATING ACCIDENT DURING STACKING), THE CONTAINER RETAINED ITS INTEGRITY AND NO CONTENT HAD BEEN RELEASED IN THE ENVIRONMENT.

Proven by usage

BALBOK ENGINEERING PRODUCED OVER 1500 "B-B CUBE"[®] CONTAINERS - CURRENTLY USED IN BULGARIA AND UKRAINE.

DURING THE PRODUCTION EACH STEP IS STRICTLY MONITORED AND RECORDED ACCORDING TO APPROVED BY COMPETENT AUTHORITIES QUALITY ASSURANCE PROGRAMME AND ISO 9001:2008 QUALITY MANAGEMENT SYSTEM. "B-B CUBE"[®] CONTAINERS HAVE AN IDENTIFICATION NUMBER EMBODIED ON 4 EXTERNAL WALLS, THUS EACH ONE CAN BE TRACED DURING PRODUCTION AND USAGE.



ALL "B-B CUBE"[®] CONTAINERS ARE DELIVERED WITH A PASSPORT, CERTIFYING QUALITY CHECKS AND RESULTS.

IN 1994 KHMELNITSKY NPP IN UKRAINE NEEDED A QUICK AND RELIABLE SOLUTION FOR SAFE STORAGE OF HIGHLY AGGRESSIVE RADIOACTIVE SALTS FROM VAPORISATION OF LIQUID RADIOACTIVE WASTE, WHICH WERE STORED ON SITE.

WITHIN 6 MONTHS (FROM JANUARY TO JUNE 1995) 100 CONTAINERS "B-B CUBE"[®] WERE PRODUCED AND DELIVERED TO BE FILLED WITH METAL DRUMS WITH RADIOACTIVE SALTS. A SPECIAL COMPUTERISED PROGRAMME, DESIGNED BY BALBOK COLLECTED DATA ABOUT THE CONTENT OF "B-B CUBE"[®] CONTAINERS, BASED ON MEASUREMENTS OF THE RADIOACTIVITY OF EACH METAL DRUM. FURTHER, THE BEST POSITION OF EACH "B-B CUBE"[®] WITHIN THE FIGURE WAS CALCULATED, THUS ACHIEVING MAXIMUM SHIELDING EFFECT.

THE RADIOACTIVITY MEASURED 1 M FROM ALL SIDES OF THE FIGURE PROVED THAT NO ADDITIONAL PROTECTION BARRIER IS NECESSARY AS THE RADIOACTIVITY IS WITHIN THE ALLOWED LEVELS.



SINCE 1995 THE 100 FULL CONTAINERS ARE STORED SAFELY ON SITE, AS SEEN ON THE PICTURE FROM 2011. NO PROBLEMS HAVE BEEN REPORTED. <http://www.xaec.org.ua/store/pages/eng/wastetreat/latest/page.html>

MORE INFORMATION ABOUT THIS EXACT CASE CAN BE PROVIDED BY REQUEST.
