

A EUROPEAN PROJECT OF TECHNOLOGICAL DEMONSTRATORS



Bentonitic Buffer Prefabrication and Emplacement

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TABLE OF CONTENTS

- **1/ OBJECTIVE AND SPIRIT OF THE PROJECT**

- **2/ CONTENT AND ORGANISATION OF THE PROJECT**

- **3/BENTONITIC BUFFER PREFABRICATION AND EMPLACEMENT PROCESS**

- **4/ CONCLUSION**

OBJECTIVE AND SPIRIT OF THE PROJECT

OBJECTIVES OF THE PROJECT

ESDRED PROJECT = INTEGRATED EUROPEAN PROJECT

ESDRED = *Engineering Studies and Demonstrations of Repository Design*

THE OBJECTIVE OF THIS PROJECT IS TWOFOLD:

- *1/ to fabricate full scale technological demonstrators and show how a given technique can be applicable to several concepts of geologic disposal in different host rocks*
- *2/ to promote a shared European vision in the field of technology applicable to geological disposal*

SPIRIT OF THE PROJECT

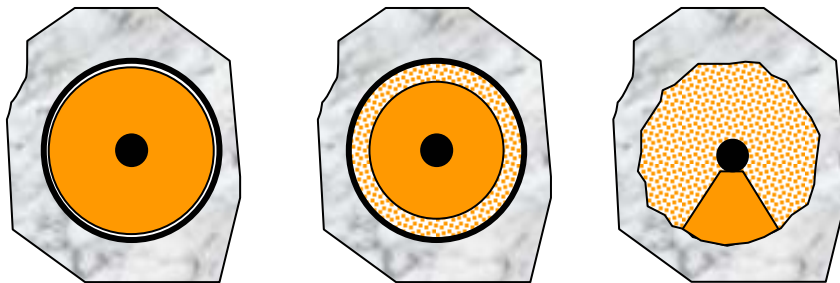
ESDRED Project = INITIATIVE of 13 ORGANIZATIONS
Belonging to 9 EUROPEAN COUNTRIES in the framework of the
6th framework program managed by the EUROPEAN
COMMISSION



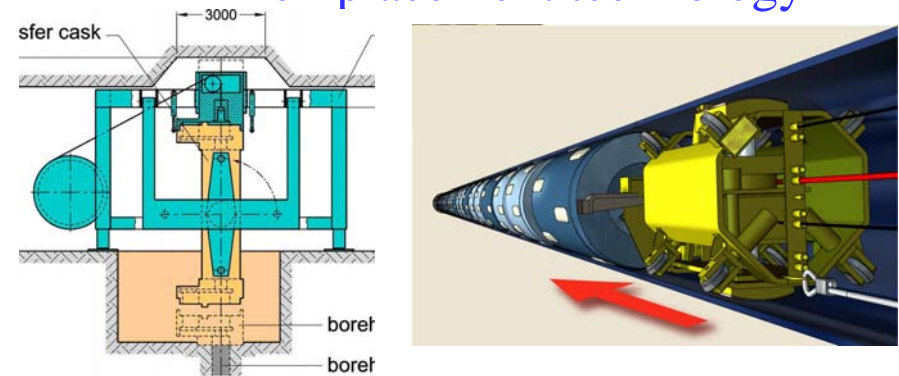
CONTENT AND ORGANISATION OF THE PROJECT

TECHNICAL CONTENT OF THE PROJECT : 4 MODULES

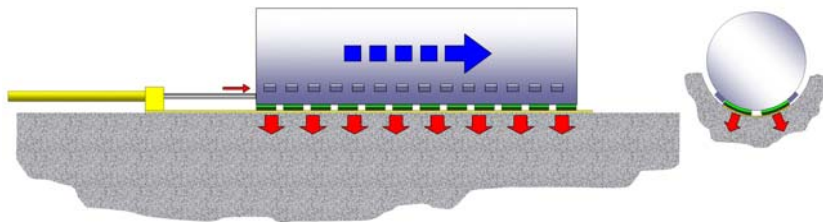
Mod. 1: Buffer construction technology



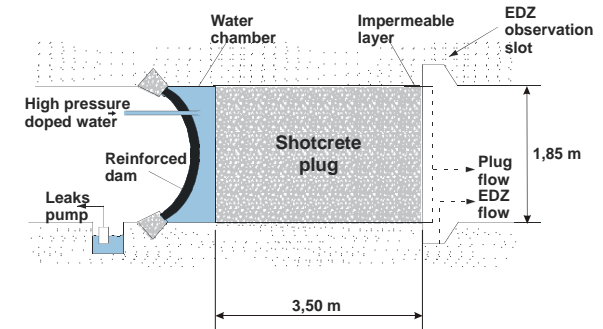
Mod.2: Waste canister emplacement technology



Mod.3: Heavy load transportation technology



Mod. 4: Temporary sealing



ORGANISATION OF THE PROJECT

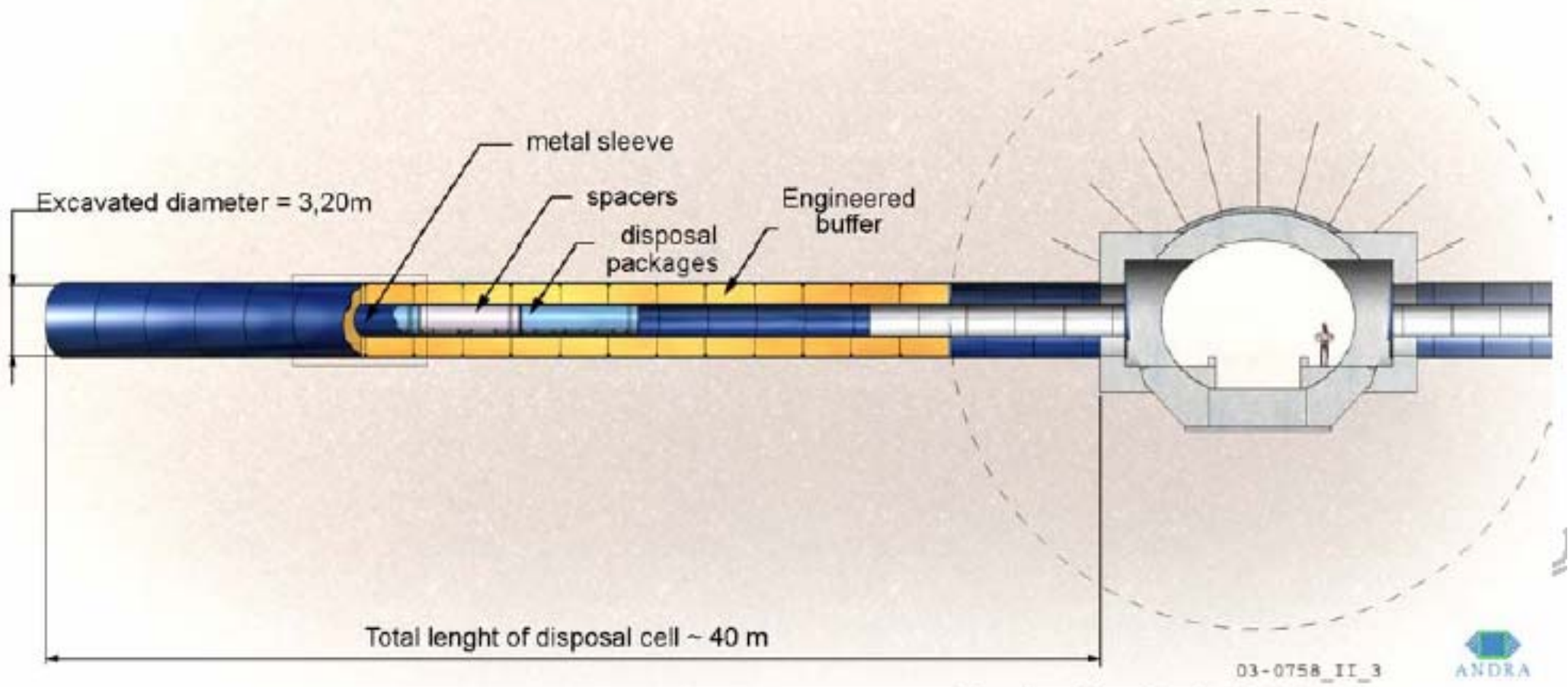
Modules leaders

- «Buffer construction technology»: **NIRAS/ONDRAF (Belgium)**
- «Heavy load transportation technology»: **SKB (Sweden)**
- «Waste canister transportation technology»: **DBE Tec (Germany)**
- «Temporary sealing»: **ENRESA (Spain)**

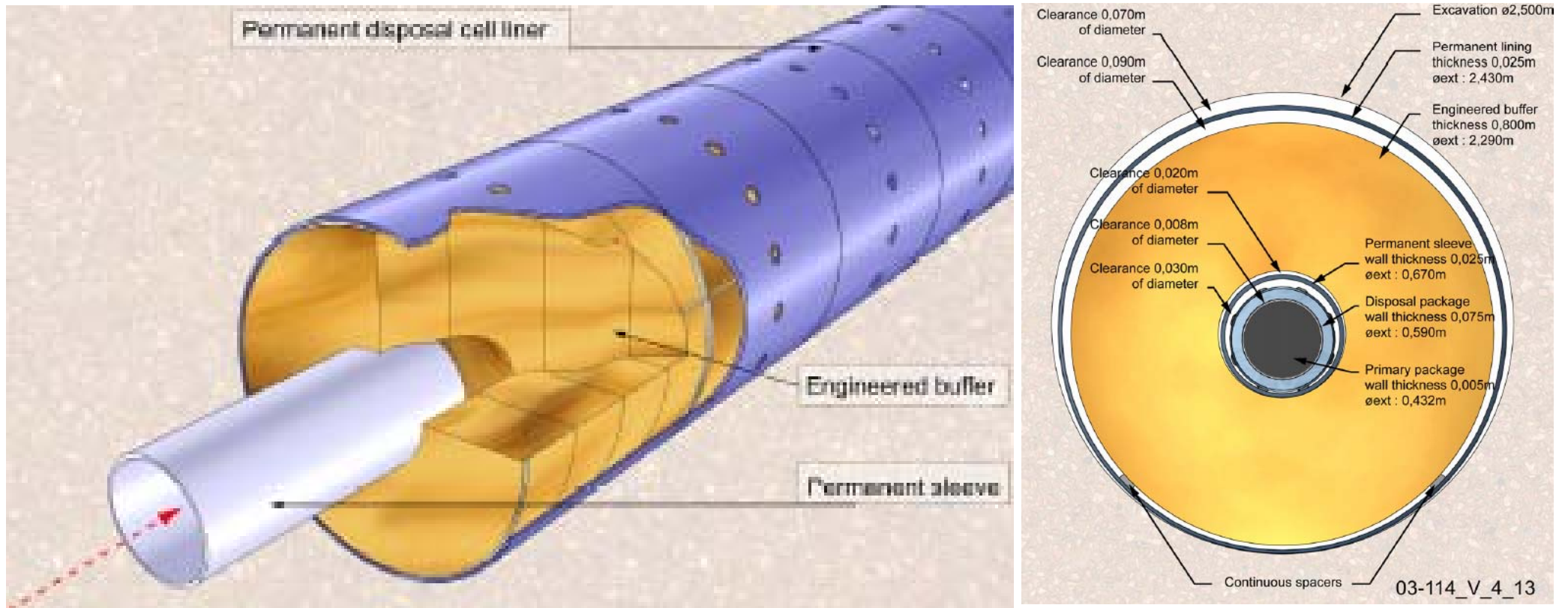
Project coordinated by ANDRA (France)

BENTONITIC BUFFER PREFABRICATION AND EMPLACEMENT PROCESS

MODULE 1: ONE OF THE 3 OPTIONS CONSIDERED = ANDRA DESIGN OF DISPOSAL TUNNEL FOR SPENT FUEL



A BUFFER MADE OF PREFABRICATED RINGS OF BENTONITE



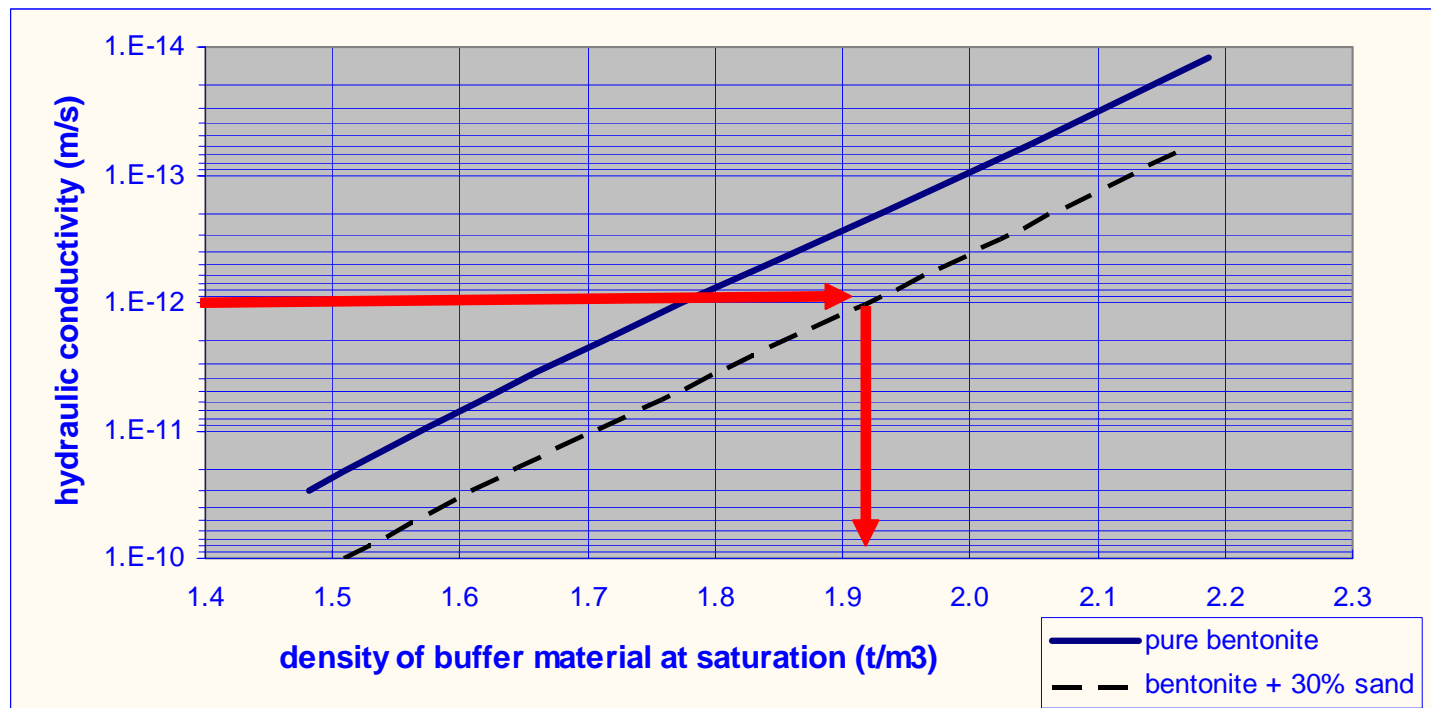
COMPOSITION OF THE BUFFER MATERIAL

REQUIRED PERFORMANCES

- Hydraulic conductivity = 10^{-12} m/s
- Thermal conductivity = 1.2 W/m.°C

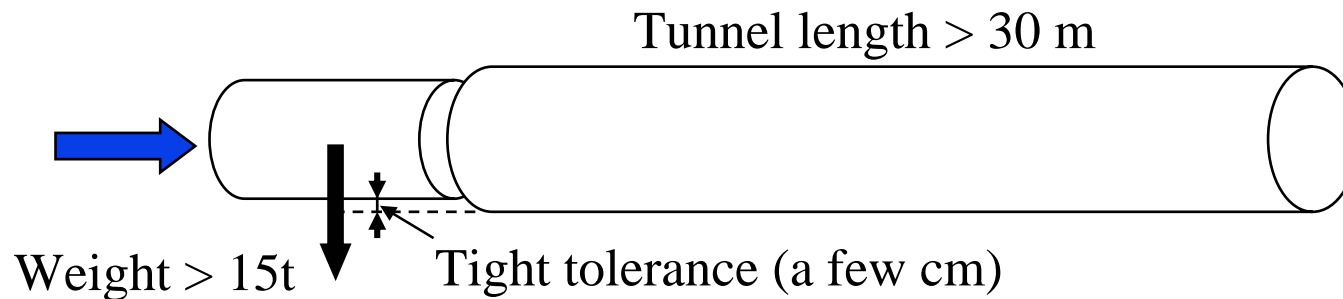
FABRICATION REQUIREMENTS

- Mixture: 70% bentonite / 30% sand
- Dry density = $1.9 \cdot 10^3$ kg/m³
- Water content at fabrication = 10%



MODULE 3: HEAVY LOAD TRANSPORTATION TECHNOLOGY

Challenge = Feasibility of the emplacement of a **cylindrical heavy load** (>15t) into a long **cylindrical horizontal tunnel** with a **tight tolerance** (a few cm) by using the **fluid cushion technology**



3 APPLICATIONS

BENTONITE RINGS
(15t-20t / Ø 2,30m - 3,20m)
into a steel lined tunnel
excavated in clay

SUPERCONTAINER
(45 t / Ø 1,80m)
of spent fuel into a long
tunnel excavated in granite
without lining

SPENT FUEL CANISTER
(43t / Ø 1,25m)
into a steel liner surrounded
by bentonite in a tunnel
excavated in clay

APPLICATION OF THE FLUID CUSHION TECHNOLOGY:

Bentonitic rings emplacement



APPLICATION OF THE FLUID CUSHION TECHNOLOGY:

Emplacement of a supercontainer into a tunnel excavated in granite



RESULTS OF EMPLACEMENT PROTOTYPE TESTING



CONCLUSION

CONCLUSION

ESDRED Project = INITIATIVE of 9 EUROPEAN COUNTRIES
in the framework of the 6th framework program managed by the
EUROPEAN COMMISSION

THIS PROJECT IS A FIRST OF ITS KIND:

- *Technological program managed at a European level*
- *Common corpus of input data (technical, regulatory,..)*
- *Common technology applicable to various European concepts*
- *Cross examination of the participating European countries*