

ANNEXE 1

**English version of the document:
VEOC Base Penetrator_CCTP_CNRS DR016_AO4**

PARIS-NORMANDIE DELEGATION

SPECIAL TECHNICAL SPECIFICATIONS

(In french : CCTP = Cahier des Clauses Techniques Particulières)

PUBLIC SUPPLY CONTRACTS

SUBJECT:

**Purchase of VEOC penetrators in the Base Module
(Called « Base Penetrator »)
for new detection lines for the KM3NeT-ORCA project as part of
NEPTUNE funding by the Normandy region.**

Lot n°04

BUYER :

CNRS-Délégation Paris-Normandie
3 rue Michel Ange
75794 PARIS Cedex 16

CONTRACTUAL FORM:

Single-award framework agreement based on unit prices following a formal open tender procedure in accordance with Articles L. 2124-2, R. 2124-2 and R. 2161-2 to R. 2161-5 of the Public Procurement Code.

This is a supply contract subject to the provisions of the General Administrative Clauses for Public Supply Contracts (CCAG/FCS) issued by the decree of 31 March 2021.

This document comprises 14 pages, including the cover page.

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LIST OF ABBREVIATIONS

CCAG	Cahier des Clauses Administratives Générale = General Administrative Terms and Conditions
CCTP	Cahier des Clauses Techniques Particulières = Special Technical Specifications
CCAP	Cahier des Clauses Administratives Particulières = Special Administrative Terms and Conditions
EPST	Etablissement public à caractère scientifique et technologique = Public scientific and technological institution
FCS	Fournitures courantes ou services = Routine supplies or services
HT	Hors taxes = Excluding taxes
RC	Règlement de la consultation = Consultation rules
RGPD	Règlement général sur la protection des données personnelles = General Data Protection Regulation
PEPR	Programmes et équipements prioritaires de recherche = Priority research programmes and equipment
SCTD	Service centralisé de traitement de la dépense = Centralised expenditure processing service
CNRS	Centre national de la recherche scientifique = National Centre for Scientific Research
LPCC	Laboratoire de Physique Corpusculaire de Caen = Caen Particle Physics Laboratory
LNS	Laboratori Nazionali del Sud (Catane -Italie)
KM3NeT	Kilomètre cube Neutrino Telescope
ORCA	Oscillation Research with Cosmics in the Abyss
ARCA	Astroparticle Research with Cosmics in the Abyss
NEPTUNE	Neutrino Physics with Telescope Underwater
DU	Detection Unit
VEOC	Vertical Electrical-Optical Cable
BM	Base Module

APPENDICES TO « French CCTP »

Annexe 1	English translation of these Special Conditions of Contract
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In these Special Conditions of Contract:

- The terms "equipment", "supplies" and "materials" refer interchangeably to the materials to be supplied for each lot;
- The term "Contractor", "holder", "supplier" "successful tenderer" refers to the company that is awarded one or more lots of the contract.;
- - The term "Contract" refers to the agreement concluded between the CNRS and the Holder of each lot.

1 Preamble

The provision of the services defined in this document constitutes a contract with a public institution with an obligation of means and results.

The Contractor undertakes that it is able to perform this contract in strict compliance with the obligations set out in the contract documents, in particular with regard to confidentiality, qualification and insurance clauses.

The Contractor shall be deemed, under its responsibility and regardless of any justifications provided, to have received the legal authorisations to perform and to possess the professional qualifications corresponding to the nature and importance of the service covered by this contract. The Contractor shall be solely liable for any consequences that may arise from the fact that these qualifications do not comply with regulations or are incorrect and, in particular, for the consequences of any termination that the CNRS may rightly decide to implement as a result.

In addition to the documents constituting the consultation file, the Contract Holder is required to comply with the specifications and requirements of the decrees, orders, regulations, standards and texts in force on the date of submission of its tender.

2 Presentation

The national centre for scientific research (hereinafter « CNRS » - Centre National de la Recherche Scientifique) is a public research organisation (a public scientific and technological institution, EPST, under the supervision of the Ministry of Higher Education, Research and Innovation). It produces knowledge and puts this knowledge at the service of society.

Its governance is ensured by a chief executive officer, assisted by deputy chief executives.

With over 33,000 employees, a budget of €3.5 billion and a presence throughout France, the CNRS is active in all fields of knowledge, drawing on more than 1,100 laboratories.

Present in all fields of knowledge

As France's leading multidisciplinary research organisation, the CNRS conducts research in all scientific, technological and societal fields. It covers the entire spectrum of scientific disciplines.

The CNRS is active in all major disciplines, grouped into 10 institutes, and focuses on developing collaborations between specialists from different disciplines, particularly with universities, opening up new fields of research that meet the needs of the economy and society.

Present throughout the country

17 regional delegations ensure direct, local management of laboratories and maintain links with local partners and local authorities.

2.1 General context of the project

The NEPTUNE project, funded by the Normandy Region, aims to continue the construction of underwater infrastructure to establish a KM3NeT ORCA underwater observatory for neutrino research, which will ultimately consist of around 115 detection lines and instrumentation for marine and environmental science. It is located approximately 40 km south of Toulon at a depth of 2,500 m.

2.2 Background to the purchase

The electrical devices for the ORCA experiment are housed in two types of container: optical modules (18 per line) and base modules (BM) (1 at each end of the line).

This contract concerns the supply of connection interface devices between high- and low-pressure environments, known as "penetrators".

These Special Technical Specifications describe all of the contractor's technical obligations under the contract. These obligations constitute a performance obligation for the contractor.

2.3 Subject matter of the contract

Purchase of VEOC penetrators in the Base Module (Called « Base Penetrator ») for new detection lines for the KM3NeT-ORCA project as part of NEPTUNE funding by the Normandy region.

Quantity : **14 units** (Estimated quantity in relation to the budget allocation).

2.4 Allotment

This contract is a supply contract.

The contract is divided into 08 separate lots. Each lot is the subject of a separate contract.

Lots	Lot names
01	Cable vertical Opto-Electrique (VEOC)
02	Buoy support structure
03	Electronic card BPS (Base Power System)
04	Penetrator VEOC in Base Module
05	Cylindrical container of the Base Module
06	Electronic card CLB (Central Logic Board)
07	TSFP optical Transceiver
08	Hydrophone

3 Description of expected equipment and general and technical specifications

3.1 Description of the expected equipment

3.1.1 General specifications

The Base Module penetrator (Base Penetrator) consists of an external housing and a water pressure-resistant feedthrough rated to 250 bars. The casing, to be made from **grade 5 titanium**, is based on a patented KM3NeT design.

The crossing, which must be designed by the holder to be compatible with the housing and must also accommodate electrical and optical conductors, namely :

- 24 optical fibres (type: single mode, 250 μm , compliant with ITU-T Recommendation G.657.B3 standard) ;
- The fibres, with a minimum length of 1.5 m on each side of the crossing, will be grouped into two ribbons of 12 fibres; the two ribbons on the low-pressure side will be terminated with a "SENKO 12 FIBER MPO + FEMALE MICRO LATCH LOW LOSS SINGLE MODE" connector.
- 2 electrical wires; size: 18 or 20 AWG; sheath colours: black and red; minimum wire length: 2.0m (low pressure side), 1.0m (high pressure side).

The insertion loss of each individual fibre in each version of the penetrator will be less than 0.25 dB at 1550 nm.

3.1.2 Dimensional specifications

The mechanical specifications for "BM" penetrators are shown in Fig. 1.

It should be noted that the holder may decide how to design the internal hole in the enclosure for the installation of the feed-through, provided that the assembly can withstand the environmental conditions detailed in section § 3.1.3 and that it complies with the tests described in sections §3.3.1 and §3.3.2.

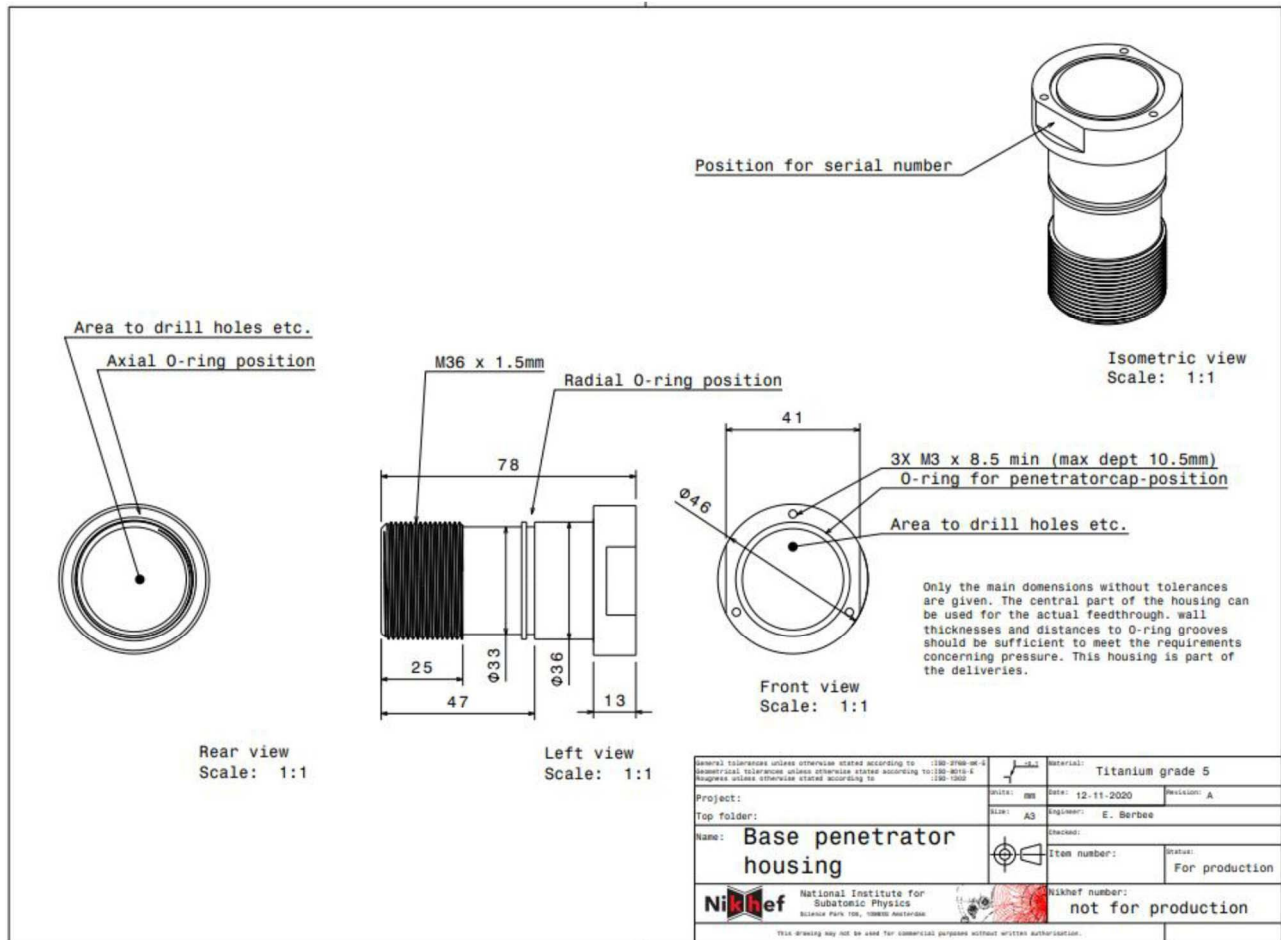


Figure 1: External casing of the "BM" penetrator, to be fitted with a water pressure-resistant feedthrough.

3.1.3 Environmental conditions and service life

Products must withstand temperatures between -20°C and +50°C, at any humidity level, during transport and storage.

Under operating conditions, the products will be subjected to pressure of up to 400 bar in seawater, at temperatures between 5°C and 30°C.

The minimum service life of the products must be 15 years under the conditions specified above.

Importante note :

A plastic plug connected to a pressure-balanced cable filled with oil will be installed on the penetrator housing. This will ensure that the penetrator's feedthrough is in contact with M&I Midel 7131 oil (<http://www.mimaterials.com/> and <http://www.midel.com/library>), not seawater.

3.2 Supplementary benefits

3.2.1 Qualification Test

Penetrators shall be tested in the following manner:

1. Stress Test

The following tests will be performed sequentially:

1.1. Vibration :

1.1.1. From 5Hz to 25Hz, amplitude +/-2mm and acceleration varying between 0.2 and 5g.

1.1.2. From 25Hz to 150Hz, with an acceleration of 5g and an amplitude varying between +/-2mm and +/-0.1mm.

In both cases, the frequency will be increased at a rate of 1 octave/minute and applied to the three axes..

1.2. Mechanical shocks :

This test consists of a series of three "hard" shocks (15g, duration 11ms) and 500 less severe shocks (10g, duration 16ms), to be performed on all three axes. The mechanical shock and vibration tests will be performed with the penetrators in their final configuration, equipped with a cap and cable filled with oil and mounted on a secure flange on the test platform.

1.3. Thermal tests :

Cycle 1: from 20°C to 70°C, over 2 hours (no humidity control)

Cycle 2: 96 hours at 70°C with 93% humidity

Cycle 3: from 70°C to 20°C, over 2 hours (no humidity control)

1.4. Thermal shock test :

The purpose of this test is to verify that the product can withstand sudden temperature changes, which may occur during deployment at sea. The product temperature will be maintained at 50°C for 2 hours, then the product will be immersed in water (depth 20 cm) at 10°C for 15 minutes.

2. Pressure tests :

Cycle 1: 1 hour at 100 bar
Cycle 2: 1 hour at 413 bar
Cycle 3: 20 hours at 413 bar
Cycle 4: 72 hours at 413 bar
Cycle 5: 16 hours at 413 bar

The pressure tests will be carried out following the stress tests described above. The penetrator will be mounted on the lid of a pressure chamber filled with Midel 7131 oil, in order to expose the low-pressure side to ambient pressure and the high-pressure side to high pressure. Après chaque cycle, la pression dans la chambre sera réduite à la pression ambiante. Les tests sous pression seront effectués à température ambiante.

Penetrators must not leak and must pass the acceptance tests detailed in section 3.3.2.

3.2.2 Acceptance tests

The following tests must be carried out (at ambient pressure) by the holder prior to delivery, and a report provided upon delivery.

- Optical fibre testing: insertion loss of each fibre < 0.25 dB at 1550 nm
- Electrical tests (between each wire and the penetrator body, as well as between the wires):
 - o Insulation resistance > 5GΩ at 500V DC
 - o Breakdown voltage > 1kV DC

3.2.3 Product identification

Each penetrator must be identified by engraving it with a serial number – the holder is free to decide the format of this number.

In addition, a QR code label will be attached to the product following the instructions provided to the holder prior to the start of production. The accepted label formats are shown in Fig. 2. A file containing the correspondence between the holder's serial numbers and the KM3NeT QR labels must be delivered together with the products..



Figure 2: Accepted QR label formats

3.3.4 Packaging for transport and storage

For transport and storage, the holder is invited to provide proposals for the protection of fibres and electrical wires, as well as protection solutions for the BM penetrator.

A list of the contents of each parcel must be displayed on the outside of the parcel, ideally by means of QR labels of the type shown in Fig. 2.

The format of the digital file detailing the characteristics of each piece of equipment and the association between the supplier's serial number and the UPI KM3NeT will be defined with the supplier at the end of the tender process.

Impact indicators must be present on the transport boxes.

The holder assumes all responsibility for transport, including insurance.

Transport costs will be paid by the holder, including any import costs.

4 Delivery times / Terms and conditions of delivery and performance of services

Delivery is at the expense of the holder.

The equipment will be packaged to ensure safe transport.

Delivery will be made in a single phase.

The delivery time must be stated in the tender by the contractor, provided that it does not exceed the maximum time limit.

4.1 Maximum delivery time for all products

Maximum time limit : 04 months

4.2 Delivery terms and premises layout

Deliveries are made on working days from Monday to Friday between 9am and 12pm and between 2pm and 5pm.

Packaging and delivery shall be borne by the contractor.

The contractor is responsible for packaging, packing, loading and stowage operations.

The risks associated with transport to the place of delivery are borne by the contractor.

The exact date of delivery of the services will be agreed upon between the laboratory and the contractor

The services delivered by the contractor or their representative must be accompanied by a delivery note drawn up in duplicate, specifying:

- ✧ The date of dispatch,
- ✧ Tender references,
- ✧ Identification of the contractor,
- ✧ Identification of delivered supplies.

Damage caused by deliveries and installations:

The holder remains liable for any damage of any kind caused by their agents or the carrier to equipment: buildings, land, plantations, installations, etc.....

The CNRS reserves the right to carry out itself or have carried out, on behalf of the holder, the repair of any damage caused.

4.3 CNRS Technical Correspondents

Jérôme PERRONNEL
Laboratoire de Physique Corpusculaire de Caen - LPCC
6 Boulevard Maréchal Juin
14050 Caen cedex
France

4.4 KM3NeT Technical Correspondents

Ronald BRUIJN
Nikhef
Science Park 105
1098 XG Amsterdam
The Netherlands

4.5 Delivery locations / Access

Delivery must be made to the following address:

Nikhef
Attn. Daan VAN EIJK
Science Park 103
1098 XG Amsterdam
The Netherlands

5 Documentation to be provided by the Holder

Documents must be written in French and/or English.

5.1 Documentation upon delivery

- A technical description of the Base Penetrators (mechanical plan, etc.)
- The qualification and acceptance test reports described in §3.3.1 and §3.3.2

5.2 Tender documentation

- A technical description of the proposed base penetrator, including their characteristics and dimensions.
- A schedule for completion and delivery.
- A quotation detailing the cost of Base Penetrators, testing and transport.

6 Verification operations

Upon delivery, the CNRS carries out the following checks and tests :

- Visual inspection
- Documentation control

6.1 Terms and conditions for final acceptance of services

Final acceptance shall be declared within a maximum of two weeks after delivery, following the checks described in § 6 and the provision of the documentation listed in § 5.1.