

SUBJECT

Delivery of sub surface data to Basisregistratie Ondergrond by
Rijksdienst voor Ondernemend Nederland

PROJECT NUMBER

C02011.000699

DATE

21 December 2022

OUR REFERENCE

BIM360Docs

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1 MANAGEMENT SUMMARY

Rijksdienst voor Ondernemend Nederland (RVO) collects sub-surface data for the development of offshore windfarms. RVO has a legal obligation to deliver the collected sub-surface data to the Basisregistratie Ondergrond (BRO). This memo describes the similarities and differences between the contract requirements used by RVO and the requirements of BRO with respect to sub-surface soil data delivery.

The most important differences are:

General:

- BRO uses the Dutch language and Dutch standards with National Annexes, whereas RVO requires English language and the international version of the standards without National Annexes.

CPTs:

- BRO requires test data in accordance with NEN-EN-ISO 22476-1, whereas RVO requires EN-ISO 22476-1 and Eurocode 1997-2. NEN-EN-ISO 22476-1 and EN-ISO 22476-1 are similar.
- KvK numbers may not be available for foreign companies
- Data may not be available in BRO required XML-format
- Quite some data may not be in the format (e.g. code list or start time of dissipation test) as required by BRO
- Not all data that is typically acquired by RVO can be stored in BRO (e.g. shear wave velocity and temperature dissipation test)

Borehole investigation:

- BRO requires boreholes to be performed according to the SIKB 2001 protocol and samples to be taken according to NEN-EN-ISO 22475-1. BRO seems to refer to the NEN-EN-ISO 22475-1:2021 version, which is not yet published. BRO also allows ISO 19901-8 to be used for both (protocol and sample procedure). RVO requires Eurocode 1997-2 and ISO 19901-8.
- Dutch practice is to provide borehole description in the field according to the Dutch translation NEN-EN-ISO 14668-1, which also includes a Dutch National Annex (NEN 8990). Classification after laboratory testing is usually not done. Offshore practice is to provide borehole logs, which include borehole descriptions and results of in-situ tests (e.g. CPT) and classification after laboratory testing in accordance with international standards ISO 19901-8 and/or EN-ISO 14668-1 and EN-ISO 14668-2. BRO does not seem to accept borehole logs.
- KvK numbers may not be available for foreign companies
- Data may not be available in BRO required XML-format
- Quite some data may not be in the format (e.g., code list or start time of dissipation test) as required by BRO
- There is some data that is required by BRO but may not be readily available, (e.g., data on bored interval, sample pre-treatment, sample quality, description quality, layer upper and lower boundary determination, anthropogenic, completed interval, borehole sample analysis procedure).

Laboratory tests:

- Some of the tests have a conflict between the standards required by BRO and standards applied by offshore contractors.
- ISO 19901-8 allows for international (ASTM) tests to be performed. BRO does not accept these standards.
- BRO includes some tests described in Dutch National Annexes, which are not mentioned in ISO 19901-8.
- The following tests have a possible conflict between standards required by BRO and RVO :
 - o Constant Rate of Strain Test
 - o Direct Simple Shear test
 - o Incremental load oedometer
 - o Unconsolidated undrained triaxial test
 - o Consolidated undrained triaxial test
 - o (An)isotropically Consolidated Undrained triaxial test
 - o Atterberg limits
 - o Particle size distribution
 - o Water content
- The following tests have a conflict between standards required by BRO and RVO :
 - o Penetrometer test
 - o Torvane test
 - o Permeameter
 - o Triaxial cell permeability
 - o Organic matter content: loss on ignition
 - o Carbonate content: rapid titration method
- Quite some data may not be in the format (e.g., code list or appropriate classes) as required by BRO
- Time recording is required by BRO for some tests but may not be recorded during testing
- Some test set-up specifications are requested by BRO, but may not be presented in the testing practice of the contractor (e.g., porous disc wet, different types of correction methods and sample moistness)
- Limits of the reported fractions of the particle size distribution test may differ from requirements by BRO

2 INTRODUCTION

Rijksdienst voor Ondernemend Nederland (RVO) collects sub-surface data for the development of offshore windfarms. RVO has a legal obligation to deliver the collected sub-surface data to the Basisregistratie Ondergrond (BRO). BRO produced formal documents (catalogue) describing the context of the database and the semantic data model (entities, attributes, business rules) in detail. These documents describe which data, and in which format the sub-surface data should be delivered to the BRO. It is mainly focused on onshore practice. The contract requirements currently used by RVO do not completely match the requirements of the BRO with respect to sub-soil data delivery.

This memo describes the main differences between the contract requirements used by RVO and the requirements of BRO with respect to sub-soil data delivery.

3 GEOTECHNICAL CONE PENETRATION TEST (CPT)

3.1 Standards

CPT type	BRO requirement	RVO (IJVWFZ*) requirement	Comments	Conflict
CPTs and Temperature CPTs (TCPTs)	NEN-EN-ISO 22476-1 (similar to EN ISO 22476-1) NEN-EN-ISO 22476-12 NEN 5140 NEN 3680 ISO 19901-8	ISSMFE Reference Test Procedures EN ISO 22476-1 Eurocode EN 1997-2:2007	It is noted that NEN-EN-ISO 22476-1 (and EN-ISO 22476) state that they cover onshore and nearshore CPTs. For extra offshore requirements NEN-EN-ISO 22476-1 (and EN-ISO 22476) refers to NORSOK-G001 rev. 2, however NORSOK-G001 rev. 2 is withdrawn. ISSMFE Reference Test Procedures are understood to be included in EN-ISO 19908-1. NEN 5140 and 3680 are withdrawn. Eurocode EN 1997-2:2007 has some additional requirements with respect to CPTs. At a downhole CPT location usually multiple CPTs are taken in the same borehole. It is understood that each CPT of a downhole CPT location will be stored separately in BRO.	No.
Mechanical CPTs	NEN-EN-ISO 22476-12 ISO 19901-8?	Not used	Mechanical CPTs are usually not deployed offshore.	Not applicable
Seismic CPTs	Currently not included in BRO	ISO 19901-8, ASTM D7400 or equivalent RVO approved methods	Although [1] indicates seismic investigations are also included in the BRO, [1] states that SCPTs are not stored in the BRO. Also the website of BRO does not mention seismic investigations as a registration object. Other measurements of seismic CPT can be stored as regular CPT.	Not applicable

* IJVWFZ is Annex 6 – Section V of the scope of work for IJmuiden Ver Wind Farm Zone IJVWFZ [2].

4 BOREHOLE INVESTIGATION

4.1 Standards

Data required by BRO	BRO requirement	RVO (IJVWFZ*) requirement	Comments	Conflict
Borehole performance	NEN-EN-ISO 22475-1:2006 (similar to ISO 22475-1) NEN-EN-ISO 22475-1:2021 NEN 5119:1991 ISO 19901-8	Eurocode EN 1997-2:2007 ISO 19901-8:2014	NEN-EN-ISO 22475-1:2006 in accordance with EN 1997-1 and EN 1997-2. NEN-EN-ISO 22475-1:2021 not published yet. NEN 5119:1991 withdrawn	No
Borehole description	NEN-EN-ISO 14688-1:2019, includes National Annex NEN 8990:2020 NEN-EN-ISO 14689-1:2018 NEN 5104 ISO 19901-8	Not required	ISO 19901-8:2014 states that soil descriptions should be performed in accordance with ISO 14688-1 or ASTM D2488. NEN-EN-ISO 14688-1 consists of the Dutch translation of EN-ISO 14688-1 and includes the National Annex NEN 8990:2020. NEN-EN-ISO 14688-1 only includes borehole description based on field observation. RVO does not require borehole description as end product. Borehole/sample description may be available. NEN-EN-ISO 14689-1 is related to rock. Not applicable for Dutch Sector of the North Sea. NEN 5104 is withdrawn	Yes
Borehole logs	N/A	EN ISO 14688-1 EN ISO 14688-2	ISO 19901-8:2014 states that soil description should be performed in accordance with ISO 14688-1 or ASTM D2488 and soil classification should be performed in accordance with ISO 14688-2 or ASTM D2487. Offshore borehole logs usually also include results from laboratory testing. This is not possible in the BRO.	Yes

5 GEOTECHNICAL LABORATORY ANALYSIS

5.1 Standards

Data required by BRO	Available test	BRO requirement	RVO (IJVWFZ*) requirement	Comments	Conflict
Settlement characteristics	Incremental Load Oedometer	NEN-EN-ISO 17892-5:2017 (similar to ISO 17892-5:2017)	ISO 19901-8:2014 BS 1377	Status of BS 1377-5:1990 is unclear. According to BSI shop the status of the standard is "project underway", "current", "partially replaced" and "superseded". Replaced by BS-EN-ISO 17892-5:2017 and 17982-11:2019. According to ISO 19901-8:2014 test should be performed according to ISO 17892-5 and ASTM D2435	Possibly
	Constant Rate of Strain Test	ASTM D4186:2012	ISO 19901-8:2014 BS 1377	ASTM D4186/D4186M – 12e1 is withdrawn, current standard is ASTM D4186/D4186M 20e1. According to ISO 19901-8:2014 test should be performed according to ASTM D4186. Unclear if test is covered in BS 1377 series.	Possibly
Undrained shear strength	Torvane test	NEN-EN-ISO 14688-2 (Dutch national annex)	ISO 19901-8:2014 BS 1377	Torvane mentioned in NEN-EN-ISO 14688-2 in the Dutch national annex. According to ISO 19901-8:2014 test should be performed according to BS 1377-7.	Yes
	Pocket Penetrometer	NEN-EN-ISO 14688-2 (Dutch national annex)	ISO 19901-8:2014 BS 1377	Pocket penetrometer (PP) mentioned in NEN-EN-ISO 14688-2 in the Dutch national annex. In ISO 19901-8:2014 no reference to other standards. Test described in ISO 19901-8:2014.	Yes

Data required by BRO	Available test	BRO requirement	RVO (IJVWFZ*) requirement	Comments	Conflict
Shear Stress Change During Loading Determination	Unconsolidated Undrained triaxial test	NEN-EN-ISO 17892-8:2018 (similar to ISO 17892-8:2018)	ISO 19901-8:2014 BS 1377	Status of BS 1377-7:1990 is unclear. According to BSI shop the status of the standard is "project underway", "current", "partially replaced" and "superseded". BS 1377-7:1990 replaced by BS-EN-ISO 17892-7:2018 and 17982-8:2018. According to ISO 19901-8:2014 test should be performed according to ISO 17892-8	Possibly
	(An)isotropically Consolidated Undrained triaxial test	NEN-EN-ISO 17892-9:2018 (similar to ISO 17892-9:2018)	ISO 19901-8:2014 BS 1377	Status of BS 1377-8:1990 is unclear. According to BSI shop the status of the standard is "project underway", "current", "partially replaced" and "superseded". BS 1377-8:1990 replaced by BS-EN-ISO 17892-9:2018. According to ISO 19901-8:2014 test should be performed according to ISO 17892-9	Possibly
Shear Stress Change During Horizontal Deformation	Direct Simple Shear test	ASTM D6528:2017	ISO 19901-8:2014 BS 1377	Unclear if test is covered in BS 1377 series. According to ISO 19901-8:2014 the test should be performed according to ASTM D6528.	Possibly
Consistency Limits	Atterberg limits	NEN-EN-ISO 17892-12:2018 (similar to EN-ISO 17892-12:2018)	ISO 19901-8:2014 BS 1377	Status of BS 1377-2:1990 is unclear. According to BSI shop the status of the standard is "project underway", "current", "partially replaced" and "superseded". BS 1377-2:1990 replaced by BS-EN-ISO 17892-12:2018. According to ISO 19901-8:2014 test should be performed according to ISO 17892-12 or ASTM D4318	Possibly
Particle Distribution	Sieving and hydrometer	NEN-EN-ISO 17892-4:2016 (similar to EN-ISO 17892-4:2016)	ISO 19901-8:2014 BS 1377	Status of BS 1377-2:1990 is unclear. According to BSI shop the status of the standard is "project underway", "current", "partially replaced" and "superseded". BS 1377-2:1990 replaced by BS-EN-ISO 17892-12:2018. Internationally related to (EN) ISO 17892-12:2018 (liquid and plastic limits, particle distribution part of the standard). According to ISO 19901-8:2014 test should be performed according to ISO 17892-4, ASTM D6913 (for sieve) or ASTM D422 (for hydrometer). It is noted that ASTM D422 is withdrawn. ASTM D7928-17 describes hydrometer test.	Possibly

Data required by BRO	Available test	BRO requirement	RVO (IJVWFZ*) requirement	Comments	Conflict
Saturated Permeability	Triaxial Cell	NEN-EN-ISO 17892-11:2019 (similar to ISO 17892-11:2019)	ISO 19901-8:2014 BS 1377	Status of BS 1377-6:1990 is unclear. According to BSI shop the status of the standard is "project underway", "current", "partially replaced" and "superseded". BS 1377-6:1990 replaced by BS-EN-ISO 17892-11:2019. According to ISO 19901-8:2014 test should be performed according to ISO 17313 or ASTM D5084	Yes
	Permeameter	NEN-EN-ISO 17892-11:2019 (similar to ISO 17892-11:2019)	ISO 19901-8:2014 BS 1377	BS 1377-5:1990 replaced by BS-EN-ISO 17892-11:2019. Internationally related to ISO. (BS-EN-ISO 17892-11:2019 was not studied. Differences with international ISO may exist). According to ISO 19901-8:2014 test should be performed according to ASTM D2434 or ISO 17312.	Yes
Water Content	Water content	NEN-EN-ISO 17892-1:2014 (similar to ISO 17892-1:2014)	ISO 19901-8:2014 BS 1377	Status of BS 1377-2:1990 is unclear. According to BSI shop the status of the standard is "project underway", "current", "partially replaced" and "superseded". BS 1377-2:1990 replaced by BS-EN-ISO 17892-12:2018. Internationally related to (EN) ISO 17892-12:2018 (liquid and plastic limits, water content part of the standard). (BS-EN-ISO 17892-12:2018 was not studied. Differences with international ISO may exist). According to ISO 19901-8:2014 test should be performed according to ISO 17892-1 or ASTM D2216.	Possibly

Data required by BRO	Available test	BRO requirement	RVO (IJVWFZ*) requirement	Comments	Conflict
Organic Matter Content	Loss on Ignition Chemical treatment (H ₂ O ₂)	NEN-EN-ISO 14688-2:2019 has National Annex NEN 8991:2020	ISO 19901-8:2014 BS 1377	NEN-EN-ISO 14688-2:2019 does not describe tests for Organic Matter Content Tests are described in National Annex NEN 8991. Dry combustion is usually used, except for clay. For clay a chemical method (hydrogen peroxide) is used. BS 1377-3:2018 is current. According to ISO 19901-8:2014 test should be performed according to ISO 10694 or ASTM D2974 (both dry combustion method). ISO 10694 describes Organic matter content test. Status of NEN-EN ISO 10694:2008 is unclear: Standard is withdrawn. Reference is made to NEN-EN 15936:2012 en, which is also withdrawn and replaced with NEN-EN 15936:2020 which has not been published yet.	Yes
Carbonate Content	Loss on Ignition Rapid Titration Method	NEN-EN-ISO 14688-2:2019 has National Annex NEN 8991:2020	ISO 19901-8:2014 BS 1377	NEN-EN-ISO 14688-2:2019 does not describe test. This test is described in National Annex NEN 8991. NEN 8991 uses Loss on Ignition test/dry combustion method. BS 1377-3:2018 is current. According to ISO 19901-8:2014 it should be performed according to ISO 10693 or ASTM D4373. ISO 10693 describes test (dry combustion).	Yes

6 REFERENCES

- [1] Ministerie van Infrastructuur en Milieu (2017), "Basisregistratie Ondergrond (BRO) Catalogus, Geotechnisch sondeonderzoek", 27 juni 2017, versie 1.0.
- [2] Rijksdienst voor Ondernemend Nederland (2021), "Annex 6 – Section V, Scope of Work Geotechnical Survey, IJmuiden Ver Wind Farm Zone", 17 March 2021, final.