



# **WG10 - Foundations**

- **Progress of WG10 work**
- **NWIP**
- **Revision ISO 19901-4 - Foundations**

**4-5 June 2009**  
**Milano meeting**

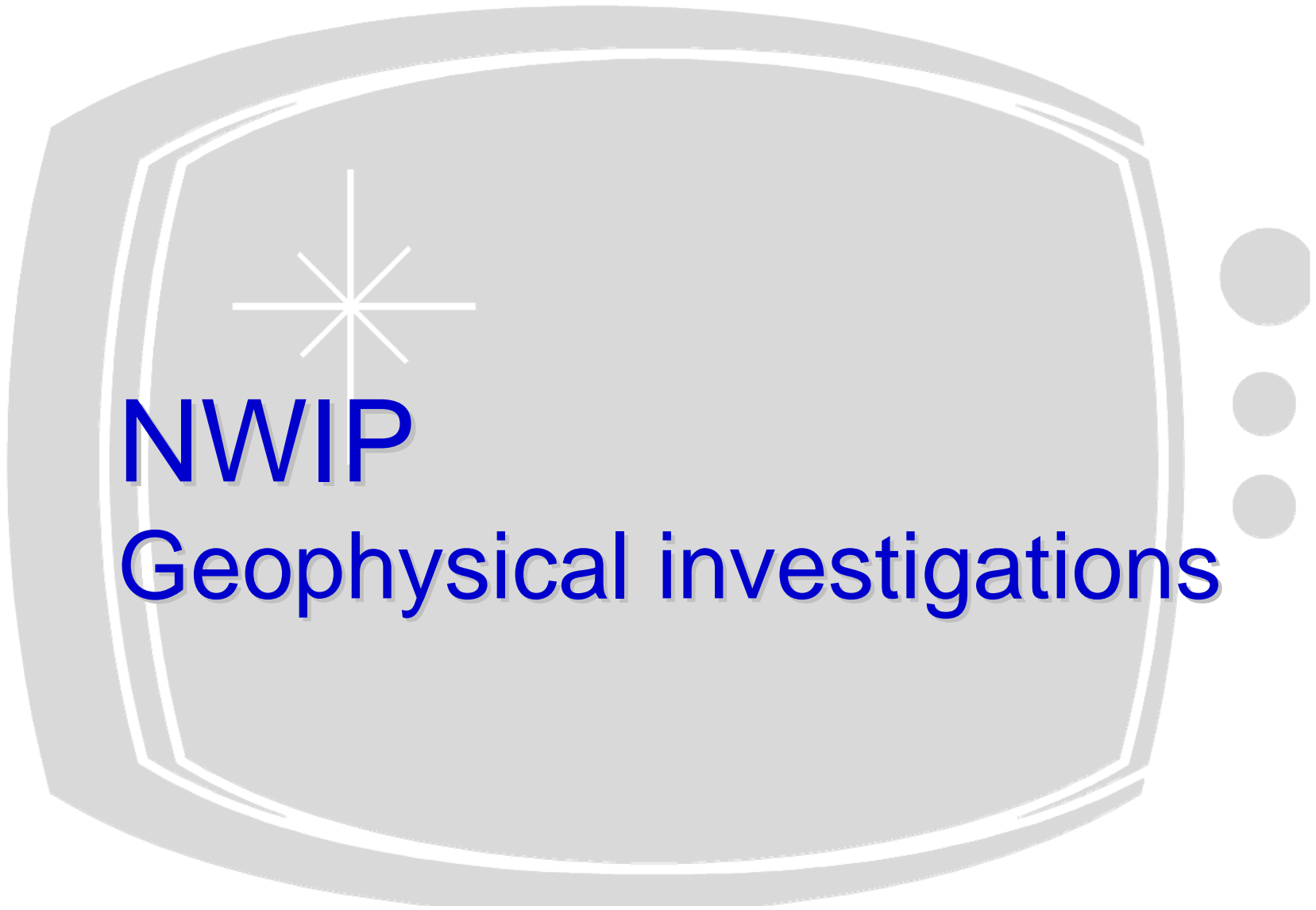
# Progress of work

## Background

- Foundations have joint panels ISO WG3 Panel 4 (now WG10) – API RG7. All meetings are joint, members belong to both groups, share chairman-/vice-chairmanship.
- Many want to join our panels, we say no to several applicants and have to limit membership; inactivity/lack of response results in loss of membership.
- Strong interest and involvement from both academia and industry

# Progress of work - technical progress

- 19901-8 "Marine Soil Investigations"
  - Done a tremendous amount of work - first draft is completed and is to be issued to Panel 4 – approval by Panel/WG10 at meeting in Oct. 2009/May 2010
  - CD/DIS to be issued in 2010
- 19902 - "Pile foundations"
  - no change – text from 19902 inserted in API RP2 GEO
- 19905-1 "Jack-ups"
  - waiting for final text on geotechnics from WG7 Panel 4; WG3 Panel 4 to comment before 1 June!
- 19901-4 – item on agenda today



**NWIP**

**Geophysical investigations**

# Resolution 259 (Beijing, 2008)

## Resolution 259 (Beijing, 2008)

SC7 notes WG3 TP4's recommendation that the work underway on Marine Soils Investigation should be published as a separate part of ISO 19901 and resolves that it shall be published as ISO 19901-8, "Marine Soils Investigation". SC7 request WG3 TP4 to confirm that they intend to include geophysics for foundations investigations into the scope of ISO 19901-8. SC7 notes that these are changes to the previous Resolution 250 (Stavanger) 2008.

# NWIP

**Title/titre**

**Geophysical Seabed and Sub-Seabed Surveying  
and Assessment of Geohazards for  
Geotechnical Design**

***Reconnaissance géophysique des fonds et sous-  
sols marins et évaluation des géohazards pour  
le dimensionnement géotechnique***

# NWIP - Need

An accurate knowledge of site conditions is a necessity for the safe design and installation of any offshore structure

No international standard exist, there is a need for a reference

All ISO and API documents with foundations considerations refer to the necessity of a geophysical survey prior to/together with the geotechnical work, but there is no standard that says how to do it.

# Proposed NWIP

Phase A  
Desk Study

→

Phase B  
Geophysical Survey

→

# 19901-8 Geotech. Invest.

Soil Investigation

A.1	Review of available information
A.2	3D seismic data (need for re-processing ?)
A.3	Local environmental conditions and site accessibility
A.4	Bathymetry and seabed topography
A.5	Seabed features and obstructions
A.6	Preliminary assessment of likely presence of shallow gas
A.7	Preliminary assessment of active geological features, faults, or other geohazards
A.8	Preliminary assessment of variability in site and soil conditions
A.9	Previous experience in same area or in similar soil conditions

B.1	Echo-sounding or swathe bathymetry
B.2	Side scan sonar imaging
B.3	Sub-bottom profiling
B.4	Other relevant seismic survey equipment
B.5	Sampling
B.6	Assessment of presence of shallow gas
B.7	Assessment of active geological features, faults, or other geohazards of concern
B.8	Assessment of soil conditions and possible variability
B.9	Budgetary or time constraints

C.1	Type of soil investigation (regional or site specific, geohazard assessment or foundation design, preliminary or final)
C.2	Type of structure and foundation methods under consideration
C.3	Assessment of geotechnical design issues
C.4	Type and availability of naval support
C.5	Drilling equipment and procedures
C.6	Sampling
C.7	In-situ tests
C.8	Laboratory tests
C.9	Budgetary or time constraints

# NWIP - Scope

- Standardisation for seabed and sub-seabed surveying methods and practice

Bathymetry, seabed morphology, sub-bottom profiling and imaging, assessment of shallow gas and any other offshore geohazards

- Shallow or coastal waters to great depth (3000m)
- Depth of investigation 0 to 1500 m
- 2D and 3D HR seismic
  - includes 3D exploration seismic
  - excludes exploration deep seismic acquisition.

# NWIP - Contents

....

- Survey objectives and methodology
- Planning and equipment selection
- Desk studies
- Field data acquisition and processing
- Data interpretation and deliverables
  - Integration of geotechnical and geophysical information
- Health, Safety and Environment of marine operations

....

# NWIP Task group

## Leader

**Thierry des Vallieres, Total**

Canada

Dave Butler

France

Eric Cauquil, Total

Malaysia

Kelvin Chow, Fugro Survey SEA

UK

Ken Games, Gardline

Mick Cook, Self Employed

Richard Salisbury, Fugro Survey Ltd

USA

Craig Shipp, Shell

Kerry Campbell, Fugro GeoConsulting, Inc

Earl Doyle, self-employed

Philippe Jeanjean, BP

Norway

Statoil Hydro

Svein Johnsrud, Multifield Geophysics

Martin Vanneste, NGI

Australia, Brazil, Italy, Netherlands, Russia to come

# NWIP - Long term plan

*Suggestion for ISO soil/site investigations document in 5 years:*

## **One document**

### General statement

Purpose, need, integration information

Part 1-19901- 8 Marine geotechnical investigations

Part 2-19901- x Geophysical investigations

Until each part is completed, the two continue in parallel. Each document will be quite large.

# NWIP application

WG10 requests SC7's approval of this new work item

Task group is already formed and ready to start 1st meeting, if approved, will be in June 2009 in Oslo.



# WG10 - Foundations

- Decision on NWIP - Geophysics

4-5 June 2009  
Milano meeting



# ISO 19901-4 Foundations

Proposal for  
a single geo-document

# Systemic revision 19901-4

Each chapter has been assigned to individuals, and are "under review"

Completely new section on shallow foundations

- inserted in 19901-4

- already inserted in API RG2GEO

# Resolution 258 (Beijing, 2008)

## Resolution 258 (Beijing, 2008)

SC7 notes that the behaviour of each form of offshore structure is highly dependent on the behaviour of the foundations, and that the structure and foundation(s) act together as a single structural system. SC7 therefore resolves that the specific foundations design requirements shall continue to be embedded within the applicable International Standard for the structure (i.e. ISO 19902, ISO 19903, ISO 19904-2 (TLPs), ISO 19905 and ISO 19906 and any future International Standard on subsea structures).

# Organisation of geo-documents

single vs part of several different documents

## Discussion issue

Panel 4 Foundations/WG10 requests to reopen for discussion the need for a single GEO document for ISO, just like API has recently adopted.

			<b>INTRODUCTION</b>				
			<b>RP 2GEN/ISO 19900</b>				
<b>General Parts</b>							
Metocean	Seismic Design	Topsides Design	Geotechnical	Weight Control	Marine Operations	Station Keeping	Fire and B
RP 2MET/ ISO 19901-1	RP 2EQ/ ISO 19901-2	RP 2TOP/ ISO 19901-3	RP 2GEO/ ISO 19901-4	RP 2WGT/ ISO 19901-5	RP 2MOP/ ISO 19901-6	RP 2SK- RP 2SM/ ISO 19901-7  RP 2I	RP 2FI  ISO 19901-
	<b>Specific Structures</b>						
	Fixed steel structures	Concrete Structures	Floating Structures	TLP	Jack-ups	MODU	
	RP 2A WSD	RP 2A LRFD/ ISO 19902	RP 2CON/ ISO 19903 ?	RP 2FPS/ ISO 19904-1	RP 2T	??	??
	N/A				N/A	ISO 19905-1	ISO 19905

# Problem statement

An **all inclusive** (perhaps set of) geotechnical standards

or

Foundation requirements remaining in the **(sub)structure standard** (as we currently have), particularly for piled structures and jack-ups.

**”One-sided” argumentation, but  
the geoman’s argumentation,  
for an all inclusive document.**

Preparing a single ISO document with all the  
geotechnical practice is endorsed by all  
members of API RG7 Panel and ISO WG2  
Panel 4.

## Argumentation for an all inclusive document (1/4)

Current structure with ISO 19901-4 Foundations (*really only shallow foundations and a few tidbits here and there*), and then sections on foundations in each of the structure types is confusing to users (both geo-people and others).

ISO needs to provides clear guidelines. The options are to either have **NO** foundations document (everything is in the structure codes, by type of structures) or have a **SINGLE** foundations document (*recommended load and resistance factors and advice for structural design stay in the structures codes*).

Users do not understand why a document entitled "Geotechnical and Foundation Design Considerations" does not have any recommendations on piles, when ~90% of offshore structures are founded on piles.

## Argumentation for an all inclusive document (2/4)

The profession continuously improves and updates the geotechnical methods/standards. There is a real danger that, without a single foundation document, the standards will have inconsistent foundations recommendations in different structures codes, because the updates will be out of phase with each other.

There are several different foundation types (*piles, shallow, shallow with skirts, suction piles .....*) which are not uniquely related to a single structure type.

It doesn't make sense to have shallow foundations only for GBS, and piles only for steel structures, etc. which currently is the case. Today, to design a pile/mudmat system for a spar, you currently need to read three documents: 19904-1, 19902, and 19901-4. This seems unduly complicated.

## Argumentation for an all inclusive document (3/4)

We have today some inconsistencies between WSD, LRFD and true “limit state” (i.e material factor) approaches to design. RP2GEO is consistent in its approach (all WSD), so we felt that it is the ISO documents we need to work on.

It is essential, with our codes, that the same size foundation should be determined for any scenario, irrespective of the code adopted.

Having a single document would help us solve these inconsistencies by highlighting areas of inconsistency. We first need to explain the inconsistencies and why they exist. We find that dividing the geo-procedures into different documents masks the inconsistencies that exist.

## Argumentation for an all inclusive document (4/4)

Publishing the 1<sup>st</sup> edition of 19902 was a challenge, and was significantly delayed. The ISO 19902 document is large at 600+ pages. The 5-year updates will be as challenging as the 1<sup>st</sup> edition. ISO runs the risk of not being able to have timely updates. One way to alleviate the problem and ease the review process is to reduce the bulk by removing sections, such as the foundation section, from 19902 and moving them into other documents.

Last, but not least, the 1st edition of RP2GEO will include the guidance on the geotechnical design of piles in addition to guidance for shallow foundations. *Advice on safety factors, structural design and installation will remain in RP2A.* Since ISO and API have objectives to align their documents, we need to be consistent with this decision.



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# API RP2 GEO

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## Plan for interim and long term:

### - "living with" two documents (next 5-6 yrs)

Rewrite 19901-4 as the one single foundation document –  
Insert the geo-parts from all other ISO-199xx documents,  
make consistent, etc;

Review and update text where required; reissue 19901-4.

If significant change, issue an errata for ISO 199xx documents  
that are affected by the change;

At next review of each ISO-199xx document, remove detailed  
geo-text and refer to single geo-document that contains the  
required guidelines. Keep basic geotechnical requirement  
for each type of structure, but approach and details are  
found in "single Foundation document.

## **An all inclusive foundations document**

Notwithstanding the downsides, we (the joint API/ISO geo-panels) find it definitively more desirable to have a single document.



# WG10 - Foundations

- Discussion and decision  
on structure of Foundations document(s)

4-5 June 2009  
Milano meeting