

GENERAL SPECIFICATION

STRUCTURAL

GS EP STR 106

Assessment of existing fixed offshore steel platforms
--

05	10/2016	§ 1, 2, 6, 10.1.1, 10.1.3, Appendix 2 § 5, Appendix 3 added
04	05/2015	Organisation change – January 2015
03	01/2012	§ 7.2, 10.4.1, 10.4.2, Appendix 2 revised, 7.5, 7.6 added
02	10/2008	§ 2 revised
00	10/2007	First issue
Rev.	Date	Purpose of the revision

Owning entity: DSO/TEC	Managing entity: DSO/TEC/STR
Other Approving entity(ies):	

General Specification		GS EP STR 106
Assessment of existing fixed offshore steel platforms		
Rev.: 05	Effective date: 10/2016	Page: 2 of 29

Contents

1. Scope	4
2. Reference documents	4
3. General	5
4. Assessment process	6
5. Data collection	8
5.1 Structure data and history	8
5.2 Exposure level	8
6. Structural assessment initiators	9
7. Review of condition	10
7.1 General	10
7.2 Topsides surveys	10
7.3 Underwater and splash zone surveys	10
7.4 Foundation data	10
7.5 Subsidence	10
7.6 Crane loads combinations	10
8. Review of actions	10
8.1 Metocean parameters and environmental actions	10
8.2 Deck elevation and additional environmental actions	11
9. Comparison with similar structures	11
10. Resistance assessment - Ultimate limit state	12
10.1 Assessment level 1 - Linear analysis and component checks	12
10.2 Assessment level 2 - Refined actions and resistances	13
10.3 Assessment level 3 - Linear elastic redundancy analysis	14
10.4 Assessment level 4 - Non-linear analysis and component checks	14
10.5 Assessment level 5 - Structural reliability analysis	15
11. Resistance assessment - Fatigue limit state	16
11.1 Method	16

General Specification		GS EP STR 106
Assessment of existing fixed offshore steel platforms		
Rev.: 05	Effective date: 10/2016	Page: 3 of 29

11.2	Acceptance criteria	16
12.	Prevention and mitigation	16
Appendix 1	Definition of Exposure Levels	17
Appendix 2	Non-linear Push-over analysis	20
Appendix 3	Fatigue Analyses of existing platforms	23

General Specification		GS EP STR 106
Assessment of existing fixed offshore steel platforms		
Rev.: 05	Effective date: 10/2016	Page: 4 of 29

1. Scope

This document defines the codes, standards, reference documents, the procedures and the acceptance criteria to be applied for the assessment of existing fixed offshore steel platforms, including the jacket, the foundations and the superstructures.

The text of this document is based on [ISO 19902](#) Section 24 Assessment of existing structures and on not yet published ISO 19901-9 Structural Integrity Management. It amends and supplements various clauses/sections for the studies and works to be performed for platform re-assessment

The assessment shall be performed according to WSD ([API RP 2A-WSD](#)) or LRFD ([ISO 19902](#)), which is subject to Company approval, unless otherwise indicated in the present specification.

In all cases, the design principle (i.e. WSD or LRFD) shall be the same for all parts of the platform (jacket, deck, etc.), and for all conditions.

Materials for procurement, welding and associated inspections are covered by specifications [GS EP STR 201](#), [GS EP STR 301](#) and [GS EP STR 304](#).

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

The assessment of existing fixed offshore steel platforms shall be conducted in accordance to the reference documents including codes and standards defined hereafter.

Where national regulations exist, their provisions and those of the standards and codes to which they refer shall apply, supplementing or amending the provisions of this document, subject to prior Company approval.

If there are no national regulations covering all or part of the subject of this document, the reference documents shall be strictly applied, as supplemented by the provisions of this specification and the project documents.

In case the re-assessment of a particular structure or part of a structure is not covered by any of the listed reference documents, Contractor shall propose the use of a reputed and fit for purpose international code or regulation, subject to Company approval.

Only the main reference documents are mentioned; the Contractor shall be responsible for complying with all secondary reference documents dealing with the subject of this document.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published at the effective date of this document.

Reference	Title
API RP 2A-WSD	Recommended Practice for Planning and Constructing Fixed Offshore platforms, Working Stress Design
DNV-RP-C205	Environmental Conditions and Environmental Loads

General Specification		GS EP STR 106
Assessment of existing fixed offshore steel platforms		
Rev.: 05	Effective date: 10/2016	Page: 5 of 29

Reference	Title
ISO 1000	SI units and recommendations for the use of their multiples and of certain other units
ISO 19900	General requirements for offshore structures
ISO 19902	Fixed steel offshore structures

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published.

The provisions of this document shall be applied in the light of the project documents supplied by Company, including:

- Country specificity appendices
- Particular specification Data sheets
- Articles and conditions; list of tasks
- Quality assurance provisions

Reference	Title
GS EP STR 101	Design of offshore jacket and subsea structures
GS EP STR 102	Design of offshore topside structure
GS EP STR 201	Materials for offshore steel structures
GS EP STR 301	Fabrication of offshore steel structures
GS EP STR 304	Fabrication of Welded Plate Girders (W.P.G.) and Box Girders (B.G.)

3. General

This document gives procedures for the assessment of existing fixed steel offshore structures to demonstrate their fitness-for-purpose. The aims and procedures are also applicable to topsides structures. The assessment process has a number of stages and where a numerical assessment is required there are five levels of complexity, as per ISO 19902. It is recommended that an assessment follows the levels sequentially although some may be skipped.

An assessment shall be undertaken if any of the initiators specified in section 6 are triggered, with the objective to demonstrate the fitness-for-purpose of the structure for its specific site conditions and operational requirements, based on the principles given in this document.

A structure is fit-for-purpose when the risk of structural failure leading to unacceptable consequences is sufficiently low. The process described in this document shall be followed for the assessment of fitness-for-purpose.

General Specification		GS EP STR 106
Assessment of existing fixed offshore steel platforms		
Rev.: 05	Effective date: 10/2016	Page: 6 of 29

A structure that complies with the requirements given in **GS EP STR 101** and **GS EP STR 102** may be considered fit-for purpose.

Demonstration of adequate fitness-for-purpose may include justified deviation from **GS EP STR 101** and **GS EP STR 102**, or modifications to either the structure or its operation (i.e. prevention and mitigation measures). Deviations from **GS EP STR 101** and **GS EP STR 102** shall be reviewed and approved by the regulator, where one exists, and/or personnel with sufficient knowledge and experience of the behaviour of fixed steel offshore structures to understand and assess the implications of the deviations. The rationale for the deviations shall be documented.

For existing structures, it is permissible to accept limited individual component 'failure' (i.e. action effects exceeding the component strength as given in this document), provided that both the reserve against overall system failure and deformations remain acceptable. The assessment process involves detailed review, analysis, testing or calculation of the aspects of the design that do not comply with **GS EP STR 101** and **GS EP STR 102**. The current state of scientific and technical knowledge and the best available data should be used in this process. It is recommended that simple techniques be exhausted prior to the use of technically complex analyses.

For structures that do not comply with **GS EP STR 101** and **GS EP STR 102**, the risk associated with a failure shall be reduced, as much as is reasonably practicable, by effecting risk prevention and mitigation measures. In determining the reasonable practicability of effecting these measures, the balance between the benefits and the cost, time and difficulty of implementing the measures should be considered. Local conditions and circumstances and the degree of confidence in the data and techniques used in the assessment should also be considered.

Prevention and mitigation measures to reduce the occurrence and the consequences of structural failure should be considered during all stages of the assessment process. If the structure is strengthened because of a failure to pass the assessment, the design of the strengthening should enable the structure to pass subsequent assessments at level 1.

In certain circumstances an assessment of one structure may be taken as an assessment of similar structures in similar conditions if all the requirements of section 9 are met.

4. Assessment process

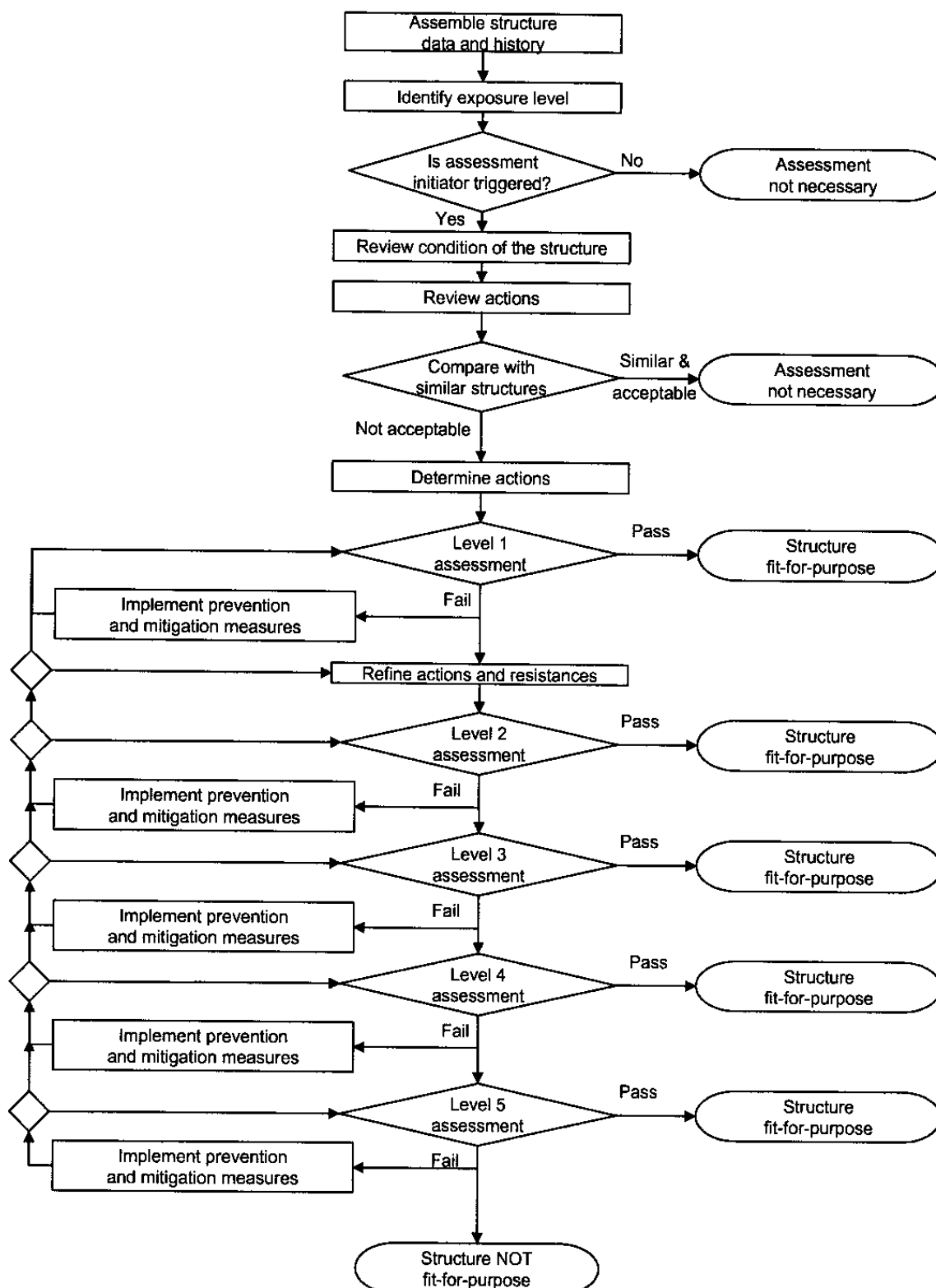
Figure 1 shows a flow chart of an assessment. As can be seen, there are several points at which an assessment can be completed and it is not always necessary for an assessment to include numerical analysis.

Assessment of existing fixed offshore steel platforms

Rev.: 05

Effective date: 10/2016

Page: 7 of 29

Figure 1 - Flow chart of an assessment


General Specification		GS EP STR 106
Assessment of existing fixed offshore steel platforms		
Rev.: 05	Effective date: 10/2016	Page: 8 of 29

The main elements in the process of initiating and conducting an assessment of a structure are:

- Assemble data on structure, its history and exposure level, see section 5
- Determine if assessment initiators is triggered, see section 6
- Review condition of the structure, review actions and compare with similar structures, see sections 7, 8 and 9
- Level 1 assessment in accordance with **GS EP STR 101** and **GS EP STR 102**, see section 10.1
- Level 2 assessment, refined actions and resistances, see section 10.2
- Level 3 assessment, linear elastic redundancy analysis, see section 10.3
- Level 4 assessment, system strength analysis, see section 10.4
- Level 5 assessment, structural reliability analysis, see section 10.5
- Prevention and mitigation see section 12.

All stages of the assessment shall be fully documented and become part of the structure data.

A structure shall be assigned an exposure level for the assessment process, see section 5.2. The exposure level is used to evaluate the assessment triggers and the acceptance criteria for the numerical assessments.

5. Data collection

5.1 Structure data and history

The following data shall, where possible, be reviewed as part of the assessment:

- Original design analyses
- Specifications and fabrication records including material certificates and inspection
- Records of transportation, installation (including piling) and in-service inspections
- Engineering evaluations
- Modifications and repairs, and
- Incidents.

5.2 Exposure level

Acceptance criteria for assessment can depend on the exposure level of the platform. The life safety and consequences categories shall be determined for the conditions for which the platform is being assessed.

The exposure level is defined in **ISO 19900** and **ISO 19902** and indicated in Appendix 1.

General Specification		GS EP STR 106
Assessment of existing fixed offshore steel platforms		
Rev.: 05	Effective date: 10/2016	Page: 9 of 29

6. Structural assessment initiators

An existing structure shall be assessed to demonstrate its fitness-for-purpose if one or more of the following conditions a), b) or c) exist:

a) Changes from the original design or previous assessment basis. Such changes include:

- 1) Addition of personnel or facilities such that the platform exposure level is changed to a more onerous level
- 2) Modification to the facilities, such that the magnitude or disposition of the permanent, variable or environmental actions on a structure are more onerous.

Note: If the facilities modifications are such that the level of congestion and/or the risk of fire and blast are increased, safety studies must be updated and the structure shall be verified accordingly.

- 3) More onerous environmental conditions and/or criteria
- 4) More onerous component or foundation resistance data and /or criteria
- 5) Physical changes to the structure's design basis, e.g. excessive scour or subsidence
- 6) Inadequate deck height, such that waves associated with previous or new criteria will impact the deck, and provided such action was not previously considered. Inadequate deck height may result from one or more of the following events: deck elevation set too low by equipment limitations at the time of installation, deck elevation set to clear a lower design wave height, inadequate wave clearance requirements at time of installation, field installed cellar deck, structure installed in deeper water than designed for
- 7) Subsidence due to reservoir compaction.

b) Damage or deterioration of a primary structural component

Minor structural damage may be accepted on the basis of appropriate local analysis without performing an assessment. However, cumulative effects of multiple damages shall be documented and included in an assessment.

c) Exceedance of the original design service life

Although exceedance of the original design service life is not, in itself, considered as an assessment initiator by [ISO 19902](#), studies and inspection of the structure shall be undertaken to ensure that time dependent degradation (i.e. fatigue and corrosion) has not become significant.

Note: Estimation of the significance of a change from the original design may be assessed from [API RP 2A-WSD](#) section 17.2.6: Changes from the design premises are considered to be significant if greater than 10%.