JNRC Floating Unit Mooring Assessment (FUMA)

Code of Practice (CoP)

and

Survey Scope of Work (SoW)

Name	Date of issue	Version	Changes
JR2013/003	18/11/2013	1	Original
JR 2024/044	22/01/2024	2	Reformatted
JR 2025/044	06/02/2025	3	Amended to include: - Floating Offshore Wind Turbines (FOWTs) - Mobile Offshore Drilling Units (MODUs) - Mobile Offshore Production Units (MOPUs)

Table of Contents

Floating Unit Mooring Assessment (FUMA)

1.0 Introduction

The purpose of this Floating Unit Moorings Assessment (FUMA) document is to promote and enable constructive dialogue with Assureds with respect to mooring systems.

Mooring lines are safety critical systems, inherently protecting both the vulnerable flexible and static subsea architecture (risers, cables, umbilical's, hoses, manifolds and riser bases as appropriate).

Mooring line failure can lead to major damage to these components, with station-keeping failure exposing other assets in the field to further consequential damage, resulting in potential property damage and Loss of Hire (LOH)/Business Interruption (BI) claims.

1.1 The FUMA process will:

a. Provide an opinion on the fitness for purpose of an Assured's mooring system(s) and Mooring Integrity Management System (or Process) (MIMS), as part of a wider station-keeping design relative to:
   i. Recognised international standards, Codes of Practice (CoP) and guidelines for design and operations,
   ii. Appropriate industry best-practice
   iii. Defined safe operating limits

b. Assist Underwriters in understanding the Assured's:
   i. Operational practices and experiences with respect to mooring systems, with the aim of establishing major station-keeping risks and how these risks are recognised and managed.
   ii. Contingency planning and strategies for the reinstatement of operations following an event which interrupts operations.

c. Facilitate, wherever possible, the gathering of information through remote Desk-Top/Correspondence Technical Reviews and, where Underwriters consider it necessary, attendances by agreed Mooring Assessors (MA's) of:
   i. Onshore sites i.e. assured's offices
   ii. Offshore sites i.e. floating units with, if required, subsea inspection to varying levels.

1.2 This document has been developed by the JNRC Survey and Engineering sub-committee and contains:

a. Guidance Notes
b. FUMA flowchart
c. Code of Practice (CoP)
d. Generic Scopes of Work (GSoW)

The four FUMA inspection levels, each with a more onerous SoW, are as follows:

GSoW 1	Level One:	Remote Technical Survey: Desk-Top Evaluation, Correspondence and Technical Review
GSoW 2	Level Two:	Focused engineering risk-based assessment with site Attendance:

	2a. Onshore or 2b. Offshore	
GSoW 3	Level Three:	Focused engineering risk-based and visual Inspection of moorings.
GSoW 4	Level Four:	Engineering Assessment and Detailed Physical Inspection of Moorings

1.3 The Guidance Notes, CoP and GSoWs are recommended for use with all Moored Floating Units including but not limited to:

- Floating Production Storage & Offloading Systems (FPSOs)
- Floating Storage Units (FSUs)
- Floating Offshore Wind Turbines (FOWTs)
- Floating Offshore Wind Substations (FOWSs)
- Floating Production Units (FPUs),
- Mobile Offshore Production (MOPUs)
- Mobile Offshore Drilling Units (MODUs)
- Tanker and other offloading systems
- Drillships

The type of structure covered may be:

- Monohulled vessel (powered and dumb)
- Semi-submersible
- Tension Legged Platform (TLP)
- Spar
- Barge
- Complex-shaped (symmetric or asymmetric) floater

Type of moorings may be as follows:

- Single Anchor Leg Moorings (SALMs) with hawsers or yokes
- Catenary Anchor Leg Moorings (CALMs) with hawsers or yokes
- Internal and External Turret Mooring Systems
- Spread mooring systems
- Buoyant Turret Riser Systems
- Single Point Moorings (SPMs)
- Tension Legs
- Taut Moorings
- Thruster Assisted Mooring Systems (TAMS)
- Innovative mooring systems such as the honeycomb system
- Moorings with shared anchors
- Submerged turrets

Mooring components are considered to include, but not be limited to:

- <u>Mooring:</u>
  Chain
  Hawser

Fibre ropes
Wire ropes
Composite ropes (e.g. Kevlar or Dyneema)
Hawse pipe/fairleads

- Mechanical chain equipment:
  Windlass
  Chain stoppers
  Deck protection
  Chain lockers
  Tethers/Tether bases
  Tendons

- Connectors:
  Links
  Shackles
  Swivels
  Buoyancy modules and their connections
  Yokes and articulated joints

  Anchors:
  Drag embedment
  Mono piles
  Suction piles
  Gravity anchors
  Clump weights
  Torpedo anchors

- Other mooring equipment:
  Winches (either fitted or not fitted, the mooring system being non-adjustable)
  Arches
  Monitoring systems (both onboard and remote)
  Load monitors
  GPS location system
  Inclinometers
  Taut wire

Other considerations:

- Storage of moorings underwater if the unit has to depart from the site.
- Establish if the draught can be changed for different moored and environmental conditions
- Comment on the movement of the unit. For instance, if it has a drilling derrick or wind turbine that may make it particularly sensitive to roll and pitch motions due to the high Centre of Gravity (CoG).
- Establish if, for unmanned units, boarding is possible without onboard assistance.
- Moorings used on floating wind turbines which are designed to allow disconnection, should a tow to port be required for maintenance and reconnection, once back on site

Moorings also include those supporting ‘in water’ risers, hybrid risers and umbilical and cable systems (including dynamic power cables connected using a riser configuration).

Also included are Thruster Assisted Mooring Systems (TAMS) where such systems could intentionally or unintentionally influence the ability of a permanent mooring system to maintain station keeping.

The Endorsement allows Underwriters to select Mooring Assessments appropriate to new builds (pre/post installation) and existing installed systems whether the floating unit remains in situ or relocates.

The associated Endorsement also gives Underwriters the option to specify the application of a Project Specific Scope of Work (PSSoW).

FUMA is not a pass/fail assessment but a recognition that auditees will aim towards reducing mooring risk to As Low as Reasonably Practicable (ALARP) and maintain the system to these standards.

FUMA's help engenders a longer-term relationship with assureds. Experience indicates that operators and leaseholders appreciate their value in recognising and reducing station-keeping risk.

Please note that whilst FUMA makes provision for MA's reports to include recommendations, there is no provision for them to automatically become Warranties with which an Assured must comply. Any amendment of policy terms in the light of recommendations or warranting of compliance with a recommendation is at the discretion of underwriters.

2.0 Guidance Notes

2.1 Initial Screening Process (ISP)

Before conducting an assessment, Underwriters may prefer to apply an internal and informal Initial Screening Process (ISP) to review key elements of a particular unit. A schedule of suggested considerations is included.

2.2 FUMA Flowchart

A flowchart detailing the suggested process for the application of the ISP and any further level of assessment is included.

2.3 Code of Practice

The Code of Practice for Floating Unit Moorings Assessment (attached) will ensure that:

3.1 Objectives of the Moorings Assessor (MA) in performing FUMA's are clear.
3.2 Minimum information required by the MA to perform the assessment is defined.
3.3 Criteria for reporting the findings of the assessment and recommendations arising out of FUMA's are established.
3.4 The roles and responsibilities of the Assured and Underwriters are clear.

2.4 Generic Scopes of Work Overview

There are four levels of Generic Scope of Work (GSoW) (attached) for use by Underwriters and MAs.

These are presented in matrix format to enable Underwriters to select the activities they require based on the information required or the nature of the floating unit.

The audit level selected should include all the preceding GSoW stages. For instance, if GSoW 3 is selected, GSoW 1 and GSoW 2 should also be carried out and precede GSoW 3 in the report.

It should be understood that Underwriters:

- Are not precluded from applying further levels of review if the findings of each preceding level justifiably recommend further review.
- May elect to move immediately to any higher level of review subject to this being conducted in conjunction with all preceding levels.

3.0 Initial Screening Process (ISP)

Key considerations may include:

3.1 Location

- The latitude and longitude of the unit
- Water depth (m)
- Exposure to known harsh MetOcean conditions (e.g. Tropical Revolving Storms (TRS), North Sea fetch limited wave conditions, Ice, Loop Currents).

3.2 Mooring Type

- Spread moored
- Passive weathervane
- Active weathervane
- Taut moored
- Support mooring (e.g. for water or hybrid riser)
- Fixed moorings with thruster assist
- Mooring configuration (number of lines and attachment points)
- Foundation type

3.3 Age

- When was the unit built or converted/modified?
- History of conversion / modification for the unit (hull and topsides)
- If unknown, when was first oil and/or gas or power produced and the unit commissioned?
- When was the mooring system installed?
- Modifications to the mooring system, if any?

3.4 Class

- Is the unit classed and, if so, by who?
- Are there any Conditions of Class (CoC) in place?
- What is the extent and frequency of current mooring system inspection as required by class?

3.5 Mooring Integrity Management

- Overview of the MIMS (Mooring Integrity Management System):
- Inspection regime – scope and frequency
- Risk management regime
- Monitoring of mooring integrity
- Contingency plans in place in the event of failure
- Sparing philosophy

3.6 Design & Operating Standards

- Who owns the unit?
- Who operates the unit?
- Who operates the mooring system, if different from above?
- Who designed the mooring system?
- Who maintains the mooring system computer model?
- Which regulatory guidelines apply to the unit?
- To which code is the unit operated?
- What is the design life of the vessel mooring system?
- Has the operating life been extended beyond the original design life?
- What are the mooring system excursion limits and allowable operating envelopes?

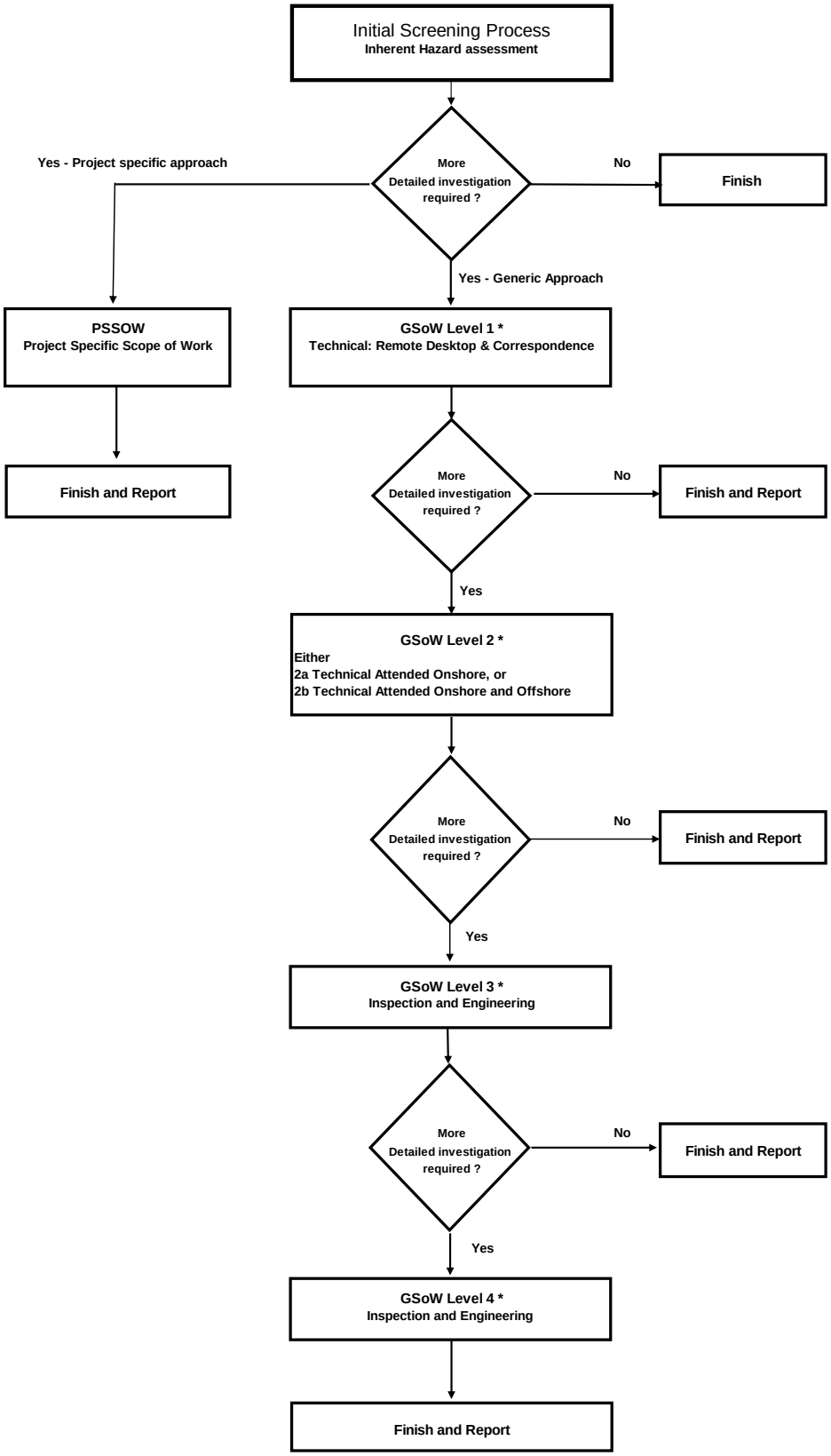
- Is a position monitoring/warning system in place to manage vessel excursion?

3.7 Consequential Damage/Loss Potential

- Connected subsea architecture (1st Party and 3rd Party)
- Nearby surface and sub-surface architecture
- Business Interruption / Loss of Hire (Contract)
- For floating offshore wind turbines, the potential for damage to wind turbine components should one or more moorings fail (for example, to the blades or drive train).

Depending on the findings of the ISP, Underwriters may then wish to conduct a formal and more detailed review process.

FUMA FLOWCHART



* The initial assessment election may be at any level from 1-4 but an initial election of Level 2 or above must include all preceding levels. This princple also applies to any subsequent escalation of the assessment level i.e. an escalation from Level One to Level Three must include a Level Two assessment.

4.0 Code of Practice (CoP)

This CoP has the following objectives:

- Clarify the roles of the following in the performance of FUMA:
    1. Mooring Assessors (MA's)
    2. Assured
    3. Underwriters
- Establish agreed standards for MA's performance while conducting FUMA.
- Define the function of the GSoW.
- Outline criteria for reporting the assessment findings and making recommendations arising out of FUMA.

Nothing in this CoP shall relieve any party of any legal obligations existing in the absence of this document and nothing contained in this CoP shall take precedence over any provisions of any policy.

The CoP includes four levels of GSoW. A bespoke Project Specific Scope of Work (PSSoW) may be substituted with the explicit agreement of Underwriters.

4.1 Role of the Mooring Assessor (MA)

The MA shall:

a. Provide a signed copy of their agreement to adhere to this CoP to the incumbent Broker prior to taking receipt of the assured's information relating to the specified Floating Unit.

b. Provide a quote for performing the assessment in accordance with this CoP and the specified SoW(s) prior to commencing the work. Such a quote is to specify expected costs of each activity, as specified in the SoW.

c. Appoint only personnel who are demonstrably competent, in terms of qualifications and experience, to perform the assessment activity being undertaken. This will include the appointment of third-party Mooring Inspectors (MI's).

d. Upon request, provide particulars of the experience of the key personnel to be engaged by the assessor.

e. Notify Underwriters of statements on any conflicts of interest (in the absence of a statement it will be assumed that no conflict of interest exists).

f. Notify Underwriters of any Confidentiality Agreement with the Assured which would preclude the exchange of information or communication with Underwriters.

g. Maintain the Assured's information in strict confidence.

h. Provide, to the Assured and Lead Underwriter(s), a schedule of actual and proposed site attendances and inspections.

i. Provide, where applicable, status reports to Underwriters at agreed key risk milestones detailing MA activity carried out in the preceding period which must include details of costs incurred to date, any anticipated cost overruns and activities planned prior to the next risk milestone.

j. Review relevant documentation in accordance with the requirements of the SoW including, but not limited to, calculations, drawings, procedures, certificates, manuals, inspections and reports consulting, as necessary, with the authors etc. thereof and/or Operators / Managers of a Mooring System or inspect the Mooring Systems of the unit(s) specified by Underwriters in accordance with the specified SoW.

k. Where necessary, consult with the Assured and agree upon the appropriate technique for the removal of any obstacles to visual inspection with priority given to ensuring mooring elements are not damaged during removal.

l. Inform Underwriters of any:

    i. Insufficiency of information or access provided to the MA's by the Assured.

    ii. Outstanding responses to questions/requests for information which prevents a comprehensive assessment outlining the potential implications of such omissions.

m. Issue the report in an agreed format.

4.2 Role of the Assured

The Assured shall:

a. Directly contract the MA (without the involvement of any contractor or intermediary unless required to enable compliance). Alternatively, this contract may be placed by the lead underwriter on behalf of subscribing underwriters' or through the broker.

b. Provide the MA with a point of contact for the Lead Underwriter and an appropriate point of contact in the Assured's organisation to assist with the resolution of queries.

c. Provide the information specified in the SoW and any other information requested by the MA and to facilitate access to Mooring Systems where physical inspection is required.

d. Ensure that the report is received by Underwriters by the specified date or seek their agreement to amend the due date.

4.3 Role of the Underwriters

The Underwriters shall:

a. Specify:

    i. The Floating Unit(s) to be assessed.

    ii. The panel from which the MA is to be selected and agree any changes thereto.

    iii. The dates by which the MA will perform the survey and issue the report.

    iv. The required GSoW (or PSSoW).

b. Specify any requirement for a Kick Off meeting of Underwriters and / or the Assured and / or the MA. If required the Underwriters, the Assured and the MA shall agree key risk milestones and date(s) for a joint review of the project scope and development.

c. Provide the MA with relevant applicable policy terms and conditions including, in particular, any warranty provisions or conditions precedent.

d. Provide the identity and contact details (including telephone, email, fax and out of hours numbers) of the Contract Leader(s).

4.4. Function of the Scope of Work

i. To provide an assessment and / or measurement and / or characterisation of the Mooring System and of the Assured's MIMS**,** appropriate industry best-practice and defined safe operating limits.

ii. To quantify as practically as possible, given the accessibility and age of a system, the risks associated with the reviewed operations.

iii. To provide details of the Assured's operating practices and experiences.

4.5 The MA's Report

The MA's report shall:

a. Include the name of the individual performing the assessment.

b. Provide a written opinion of the fitness for purpose of the Mooring System and the Assured's MIMS in 'summary' and 'detailed' formats (see attached suggested format for the 'summary' element) which is to include:

i. An estimate of the theoretical Factors of Safety for the moorings for the Design Storm for both the intact and damaged condition (assuming good integrity of all mooring components).

ii. An assessment against mooring design code requirements i.e. do the theoretical Factors of Safety from the mooring analysis match or exceed the design code requirements?

Note: There may be a grandfathering issue to address here if the original code and met-ocean criteria used is significantly less robust than current codes being used in industry such as API RP2SK, Offshore Energies UK (OEUK) etc.

iii. A clear statement of the return period environmental criteria and parameters being used for the original design and analysis.

iv. A clear tabular presentation of theoretical results with the minimum mooring design code requirements for ease of comparison.

v. An opinion as to the ability of the mooring system to achieve the theoretical factors of safety based on current condition of the mooring system and taking account of any degradation, including fatigue, corrosion and other damage.

vi. An opinion as to whether the fatigue life of the mooring system will exceed the operating life with an adequate factor of safety and comment on any factors that may adversely affect the fatigue life of the mooring system.

c. Make where necessary, recommendations targeted to reduce risk to Underwriter's, expressed clearly and in writing explicitly. Recommendations must be capable of verifiable implementation.

d. Make where necessary, in writing, clearly and explicitly in a manner which can be verified, any recommendations for the implementation of a higher level of assessment.

5.0 Generic Scope of Work (GSoW)

5.1 GSoW 1: Remote Technical Survey: Desktop Evaluation and Correspondence

Guidance for Mooring Assessors:

This section includes the ISP considerations and then extends to include the requirements below.

Mooring Components are considered to include but not be limited to chain, chain hawse, chain tables, chain lockers, wire rope, fairleads, fibre rope, composite rope, fairleads, tethers, tether bases, tendons, connectors, links, shackles, swivels, buoyancy modules and their connections, yokes and articulated joints and anchor systems, winches arches and monitoring systems. Moorings also include those supporting in water riser, hybrid riser, umbilical and cable systems. Other station-keeping mechanisms, including thrusters, are also to be considered where such systems could intentionally or unintentionally influence the ability of a permanent mooring system to maintain station-keeping.

Activity	Action
Technical	X
Type	
a. Type: Spread Moored / Passive Weathervane / Active Weathervane / Taut Moored /Thruster Assist/Tension Leg b. Intended function:	
Design	
a. By whom? b. Code / Guidance / Year e.g. API RP 2SK 2005 (or other examples referenced in FUMA Guidance Notes; Appendix 1) with regard given to mooring make-up and materials specification.	
Age / Design Life	
With particular regard to: a. Year of unit build / conversion b. If unknown; when was first production ? c. Year Mooring system installed d. Unit / Mooring System Design Life remaining - Pre or post installation Baseline Assessment - Significant period remaining - Partially remaining - Significantly elapsed - Exceeded e. Strategies for replacement or extension of Design Life f. If beyond Design Life; details of design Life extension studies performed and Design Code applied	

Activity	Action
Technical	X
Manufacture a. By whom? b. Availability of QA/QC Certificates c. Code / Guidance used	
Installation	X
a. By whom was the system installed? b. Unit leasing arrangements c. Details of incidents which may have impacted the integrity of the system.	
Integrity Management	X
Inspection Procedures With particular regard to: a. Frequency b. Techniques used c. Findings d. Responses to findings e. Code / Guidance used	
Management Systems Details of System used e.g. OEUK (previously O&GUK) 'Mooring Integrity Guidance' (or other examples referenced in the FUMA guidance notes) with particular regard to: a. When last applied b. Identification of specific unit mooring risks c. Their assessment d. Description of risk control strategies to minimise accidents and failures e. Process for identifying and assessing specific vessel mooring risks and strategies to minimise them (i.e. its Mooring Integrity Management System)	
Maintenance , Repair & Replacement With particular regard to: a. Planned Maintenance programmes b. Modifications and Rectifications performed c. Repairs required and performed d. Replacement frequency relative to Design Life e. Design Life Extension strategies	
Class With particular regard to:	

Activity	Action
Technical	X
a. Classification Society b. Survey renewal dates c. Class notations d. Project Certification (if obtained) for floating offshore wind turbines	
Unit / Mooring Leasing Arrangements	
Environmental	X
Environmental operating conditions	
With particular regard to wind, wave and currents for annual and seasonal conditions considering severe natural catastrophes (e.g. Tropical Revolving Storm (TRS), North Sea fetch limited wave conditions , Ice, Loop Currents).	
Water Depth (relative to LAT or Chart Datum)	
Geotechnical Conditions	
With particular regard to: a. Sea-Bed make-up and condition (including drivability, soil type and chemical composition) b. Source of geotechnical data (surveyor, when surveyed, survey scope, company deriving the technical data) c. Code used for derivation of key geotechnical parameters for the mooring design d. Location and distribution of soil samples	
Operational	X
Operator	
a. State operator b. Code / guidance to which the operating system is based	
Monitoring Systems	
With particular regard, as applicable, to systems used for continual monitoring of: a. Line tension and/or breakage and/or Yoke Arm Tension (including details of system) b. Turret mooring system's i. Position relative to the sea-bed ii. Offset distance from turret geo-stationary centre (Note: No item iii) **Note:** The required system accuracy as the offset may be limited to 25m or less. c. Environmental conditions (wind, wave, current) d. Riser and dynamic cable tolerance limitations	
Requirements for Intended Operations	
a. Schematics of intended mooring pattern and orientation b. Unit's intended mode of operation and specific operational requirements including use of thruster assist, if fitted.	

Activity	Action
Technical	X
c. Hydrographic map showing existing seabed hardware. d. Proximity of other moored units	
Training and Competency	
With particular regard to: a. Competency of Marine Control Room Operators b. Adequacy of training & assessment programmes and periodic refresher courses	
Practices and Procedures	
With particular regard to: a. Storm /Ice disconnection procedures b. Weather/Ice monitoring c. Use of DP and thrusters during operating, harsh weather and other conditions including those where mooring failure has occurred d. Contingency procedure to enable timely disconnection e. Post-harsh environment event procedures f. Post-mooring failure procedures, including emergency shut down and idle mode for floating offshore wind turbines g. Provision of backup power to critical wind turbine safety and communication systems and whether they are contingent on the ability of the wind turbine to generate power h. Disconnection of moorings and towing of unit away from the site and returning to site i. Marine Operating Procedures Manual: i. Accessibility in Marine Control Room ii. Emergency procedures content	
Contingency Planning	
a. Spares b. Maintenance c. Ease of repair d. Lead time of main or critical components (chains, wires etc.) e. Weather restrictions f. Time to tow to port, repair and tow back to site g. Crane availability (floating offshore or in port, ring cranes or other suitable cranes) h. Warranties i. Timely review of indications of failure and resulting actions j. Preventative maintenance k. Harsh weather contingency plan. For instance, a typhoon or hurricane procedure.	
System Functionality	

Activity	Action
Technical	X
With particular regard to: a. Historic performance of the mooring and thruster/DP systems (if fitted) b. Details of failures and losses of station-keeping control including that caused by mooring and thruster/DP failures (including drive-offs) c. Blackouts and drive-off events associated with thruster assisted moorings d. Loss of station keeping incidents e. Modifications, rectifications, repairs and replacements employed f. Review of operator's documentation of system performance and findings of post-failure investigations.	

X Denotes activity to be performed

5.2 GSoW 2: Site Attendance: Onshore or Offshore

Requirement for the Underwriters' Engineer or Mooring Assessors from the Assured's Head Office and/or Mooring Integrity Management Function to visit the Assured's office(s) and/or offshore site location(s)

2A Attended Technical: Onshore

2B Attended Technical: Onshore and Offshore

This allows a more detailed investigation and follow-up of topics covered in GSoW 1

Activity	Action
2 Mooring Assessor (MA) Attendance either:	X
a. Onshore only: Assured's Floating Unit Moorings Operations/Management Centre, or	
b. Onshore and Offshore: The Floating Unit and the Assured's Floating Unit Operations/Management Centre	

5.3 GSoW 3: Engineering Assessment and Visual Inspection of Moorings

Activity	Action
Engineering Assessment	X
With particular regard to: a. Identification of most probable mooring failure mode. b. Quantification of as-installed/aged capacity of mooring components as applicable. c. Fatigue assessment of individual mooring components based on anticipated/experienced environmental cycles and/or met-ocean predictions as applicable. d. Assessment of risk introduced by thruster assist and/or DP (if fitted) e. Present day operational status of mooring (Fitness for Purpose) for maximum operational and maximum survival conditions. f. Mooring system design reassessment based on appropriate member classification society standards using as installed mooring condition as input. g. Assessment of as-installed operational viability (life) of mooring system.	
Inspection	X **Visual**
Visual Inspection of Unit/Mooring Interface, Mid-Water Elements, Sea-Bed elements to consist of Video Inspection of: a. Unit / Mooring Interface including but not limited to fairleads, daisy wheels, turret attachment points, chain tubes and hawsers. b. Mid-water elements (between mooring/unit interface and seabed) including but not limited to chain, wire rope, fibre rope, connectors, flotation models and clump weights. c. Seabed mooring elements (directly adjacent to seabed and regions in periodic and/or permanent contact with the sea floor) including but not limited to chain, wire rope, fibre rope connectors, clump weights, weight chains, piles and anchors. d. Method to ensure the preservation of property during necessary pre-inspection cleaning process.	
Additional Information required by the MA	
Requests by the MA for additional information and/or extension of GSoW to be agreed by Underwriters prior to commencement of work.	

5.4 GSoW 4: Engineering Assessment and Detailed Physical Inspection of Moorings

Activity	Action
Engineering Assessment	X
With particular regard to: a. Identification of the most probable mooring failure mode. b. Quantification of as-installed/aged capacity of mooring components as applicable.[1] c. Fatigue assessment of individual mooring components based on anticipated / experienced environmental cycles and/or met-ocean predictions as applicable.[2] d. Assessment of risk introduced by thruster assist and/or DP (if fitted). e. Present day operational status of mooring (Fitness for Purpose) for maximum operational and maximum survival conditions. f. Mooring system design reassessment based on appropriate classification society standards using as installed mooring condition as input. g. Assessment of as-installed operational viability (life) of mooring system.	
Inspection (See Footnotes 1 and 2 Below)	X **Detailed**
Physical Inspection of Unit/Mooring Interface , Mid-Water Elements, Sea-Bed elements to consist of Detailed Video Inspection of: a. Unit/Mooring Interface including but not limited to fairleads, daisy wheels, turret attachment points, chain tubes and hawsers. b. Mid water elements (between mooring / unit interface and seabed) including but not limited to chain, wire rope, fibre rope, connectors, flotation models and clump weights. c. Seabed mooring elements (directly adjacent to seabed and regions in periodic and/or permanent contact with the sea floor) including but not limited to chain, wire rope, fibre rope connectors, clump weights, weight chains, piles and anchors.	
Additional Information required by the MA	
Requests by the MA for additional information and/or extension of GSoW to be agreed by Underwriters prior to commencement of work.	

Notes

1. Removal of visual obstructions to inspection and modelling
2. Visual obstructions to inspection and modelling e.g. marine fouling, organisms, sessile plants, animals, corrosion, scale, gravel and sediment deposits, to be removed as required.

6.0 Guidelines for MA's and MI's for the performance of GSoW 4

Prior to an inspection MA and Assured to consult on and agree appropriate technique(s) for the removal of visual obstructions to inspections e.g. High-Pressure (HP) water and rotating brushes and/or flail chains with priority given to ensuring mooring elements are not damaged during removal.

Detailed Visual Inspection/Dimensional Examination/Characterisation.

A detailed visual inspection is to be by means of High Definition 3D video (HD 3D) or General Visual Inspection (GVI).

A detailed dimensional examination and characterisation of chain, wire rope and fibre rope is expected to include but not be limited to:

Chain:

(a) Measure the inter-link grip-zone and link side bar diameters.

(b) Not less than 12 adjacent links in each continuous chain section to ensure a data set of sufficient size to support a statistical analysis.

Wire rope and fibre rope spanning elements:

(a) Measure outside diameter of the entire element and 360 degree visual inspection.

(b) Record to a digital medium and archived appropriately to facilitate later detailed investigation should data show anomalies.

Appropriate techniques for dimensional examinations include but are not limited to underwater wire rope inspection systems, underwater fibre rope inspection systems, mechanical and optical calliper systems, 3D photogrammetry and LIght Detection And Ranging (LIDAR) all of which are to be of verified precision and accuracy.

Appropriate techniques for the dimensional examination of 'spanning' chain sections does NOT include 'go-no-go' gauges and hand-held diver-deployed callipers.

Other techniques may be considered but should ultimately provide a detailed dimensional characterisation.

7.0 Project Specific Scope of Work (PSSoW)

For a PSSoW the following must be defined:

(a) Criteria for selection of the PSSoW [could include proposed modifications to the mooring system/construction project, follow up of series losses with similar root cause, novel technology, high fatigue risk, change of use etc.]

and

(b) Account specific scope of work document covering the areas of interest.

Appendix 1: Examples of Codes/Guidance*

- OEUK Mooring Integrity Guidelines Issue 3
- BS EN ISO 19901-7Petroleum and natural gas industries; Specific requirements for offshore structures, Station-keeping systems for floating offshore structures and mobile offshore units (including Annex B)
- API RP 2SK Recommended Practice for the Design and Analysis of Station-keeping Systems for Floating Structures
- API RP 2I In-Service Inspection of Mooring Hardware for Floating Structures
- API RP 2SM Design, Manufacture, Installation and Maintenance of Synthetic Fibre Ropes for Offshore Mooring
- DNV-OS-E301 (Offshore Standard) – Position Mooring
- DNV-RP-E301 Design and Installation of Fluke Anchors
- DNV-RP-E304 Damage Assessment of Fibre Ropes
- Lloyds Register Rules for Classification: Floating Units at Fixed Location – Part 3
- DNVGL Noble Denton: 0032 / ND 'Guidelines for Moorings'
- ABS Guide for Building and Classification of Floating Production Installations
- Offshore Installation Moorings - Offshore Safety Directive Regulator - Offshore Information Sheet 4/2013 (last reviewed May 2022)
- LMA (Lloyd's Management Association) website link where up to date and archived JNRC documents can be downloaded for free:

  https://www.lmalloyds.com/LMA/Underwriting/Marine/JRC/scope_jrc.aspx

*Although the versions and revisions of standards listed at the time of writing are correct these are subject to updating, withdrawal and amendments. The referenced organisation should be consulted for the latest documents.

Appendix 2: Summary Report Format (for guidance)

Asset and Location		
Field Operator / Assured		
Assessment Level(s) / Type(s)		
Assessor (Company / Senior Individual)		
Assessment date & duration / Report No.		
Inspection date & duration / Report No.		
Mooring / Station-Keeping Description		
Present mooring age and design life		
Approx water depth and total line length (m)		

Area of assessment	**Force**	**Return period**	**Speed**	**Comments**
Environment	Wind:	100yr		
		10yr		
	Current:	100yr		
		10yr		
	Waves / Swell:	100yr Hs		
		10yr Hs		
	Seabed:			
Major risks				
Most probable failure mode(s)				
Reported historical incidents				
Commentary on current condition	Capacity:			
	Fatigue:			

	Degradation:	
	Operational status:	
	Mooring design adequacy:	
	Remaining Life Estimate	
	Estimated probability of loss of station in next 12 months	

Consequential potential damage	**Consequence level**	**Low/Mid/High**
Connected subsea architecture		
Nearby infrastructure (surface, water column and seabed)		

Commentary on future mooring arrangements	
Other Comments	
Recommendations	

Appendix 3: FUMA – Mooring Guidelines and Documents Published since FUMA Rev 1 (for Consideration)

Originating Body	Title	Date	Key Points / Overview of the Document	Comments
OCIMF (Oil Companies International Marine Forum)	**Guidelines on the Marine Assessments of F(P)SOs**	**2019**	Robust method for assessing the marine aspects of F(P)SO operations. Does not include moorings. Addresses mooring monitoring in one question: Are the moorings' systems safe operating conditions defined and have mooring system mooring procedures been implemented? E.g. max and min mooring leg tensions, mooring chain angles and FPSO position offset.	Systematic approach to addressing FPSO and FSU marine operations. Moorings are not a specific focus. Include in references noting non-mooring focus
Class NK	**Guidelines for Floating Offshore Facilities for LNG/ LPG Production, Storage, Offloading and Regasification**	**2015**	Class Society document	Class guidance on mooring assessment
Bureau Veritas BV **Rule Note NR493 R04**	**Classification of Mooring Systems for Permanent and Mobile Offshore Units**	**2021**	The present Note provides requirements for the classification of the mooring system (station-keeping system) of: • floating offshore units with permanent installations (disconnectable or not) as defined • mobile units as defined • units moored at a jetty This Note covers, in general terms, the station keeping of any free-floating body by means of a principally passive system. This Note is to be considered during the classification activities based on «Ship Rules» and «Offshore Rules»	Class approach to moorings – Include as a reference.
BV NI604 (BV Document associated with the above Rule Note)	**Fatigue of Top Chain of Mooring Lines due to In Plane and Out of Plane Bending**	**Oct 2014**	This Guidance Note provides the methodologies, requirements and recommendations to be considered in the evaluation of top chain combined fatigue under tension loading, in-plane bending loading and out-of-plane bending loading for the classification of permanently moored offshore units	Technical document focused on IP and OOP bending of mooring chain and how to analyse.

BSEE (Bureau of Safety and Environmental Enforcement)	**Study on Mooring System Integrity Assessment for Floating Structures**	**04.08.2015**	Gap analysis of US v International Standards e.g. API RP2Sk Emphasises the need for a MIM (Mooring Integrity Management) Plan 22no recommendations made across broad themes • Mooring integrity management system • Installation verification • Mooring monitoring systems • Periodic inspection • Additional recs • Thruster assisted moorings and in particular capability in complete blackout	Include document as reference
API (American Petroleum Institute)	**API RP 2MIM Mooring Integrity Management**	**09.10.2019**	This recommended practice (RP) provides guidance for the integrity management (IM) of mooring systems connected to a permanent floating production system (FPS) used for the drilling, development, production, and/or storage of hydrocarbons in offshore areas. The scope of this RP extends from the anchor to the connection to the floating unit (e.g. chain stopper) and includes components critical to the mooring system (e.g. turret bearings, fairleads, chain stoppers, anchors, suction piles). Specific guidance is provided for the inspection, monitoring, evaluation of damage, fitness-for-service assessment, risk reduction, mitigation planning, and the process of decommissioning. This RP incorporates and expands on the IM recommendations found in API 2I and API 2SK. In the event of any discrepancy between API 2MIM and API 2I/API 2SK, API 2I/API 2SK will govern. This RP is not intended for: - structural steelwork of turret systems and TLP tendons, which are addressed by API 2FSIM;- thrusters, power generation, or control system;- mobile offshore drilling unit (MODU) or other temporary moorings that are deployed and	Issued as part of a suite of 3 API documents. Include in references

			retrieved frequently- vessels holding station via a dynamic positioning (DP) system, without the use of mooring.	
API	**API RP 2FSIM Floating Systems Integrity Management**	**01.09.2019**	Floating Systems Integrity Management This recommended practice (RP) provides guidance for floating system integrity management (FSIM) of floating production systems (FPSs), which include tension leg platforms (TLPs), used by the petroleum and natural gas industries to support drilling, production, storage, and/or offloading operations. FPSs described in this recommended practice are governed by local regulatory requirements and recognized classification society (RCS) rules (if classed). No specific regulatory compliance or RCS requirements are restated in this RP. The requirements of this RP do not apply to mobile offshore drilling units (MODUs) or to mobile offshore units (MOUs) used in support of construction operations. For integrity management (IM) considerations, these units are typically governed by RCS rules. This RP does not address moorings or risers; these are addressed separately by API 2MIM and API 2RIM, respectively. Dynamic positioning is not covered in this RP.	Issued as part of a suite of 3 API documents
API	**API RP 2RIM Integrity Management of Risers from Floating Production Facilities**		This recommended practice (RP) provides guidance for the integrity management (IM) of risers connected to a permanent floating production system (FPS) used for the drilling, development, production, and storage of hydrocarbons in offshore areas. For the purposes of this recommended practice, a riser has a top boundary that is somewhere at or above the point where it transfers load to the platform structure, and a lower boundary where it transfers load into a foundation, which could be a wellhead, pipeline or subsea structure. The scope of this RP includes: — structural components of the riser; — riser top hang-off assembly (i.e. stress joint, flexible joint, tensioner system/air can, bend stiffener); — appurtenances attached to the riser that are critical to its integrity, including VIV suppression devices and buoyancy modules used to support the riser in any	Issued as part of a suite of three API documents along with API RP 2MIM and API RP 2FSIM

			capacity; — corrosion protection systems; — insulation; — other components in the load path or supporting the riser.	
APPEA now AEP (Australian Energy Producers)	**MODU Mooring in Australian Tropical Waters Rev 2**	**18.12.2019**	This guideline has been developed by industry to provide a consistent and common approach to MODU mooring exposed to cyclonic conditions in Australian tropical waters. Industry participants include Oil & Gas Operators through APPEA drilling industry steering group (DISC), MODU mooring contractors through International Association of Drilling Contractors (IADC), mooring equipment and engineering contractors. The guideline is to be read in conjunction with the NOPSEMA information paper MODU Mooring systems in cyclonic conditions [18], company mooring standards and procedures and well-known industry codes (e.g. API, DNV GL).	Include as a reference
NOPSEMA (National Offshore Petroleum Safety & Environmental Management Authority – Australia) **N-09000-IP1631 A461468**	**MODU Mooring in Cyclonic Conditions**	**14.08.2023**	NOPSEMA is aware of four incidents between 2004 and 2015 where the impact of cyclone activity has resulted in the loss of position of a moored MODU in Australian waters. Furthermore, there are six documented instances where MODU operators have failed to execute their plans to de-man facilities in the face of a cyclone threat NOPSEMA conducted an investigation into an incident that occurred on 12 March 2015 approximately 100 nautical miles north-west of Dampier where a moored semi-submersible MODU was blown some three nautical miles off location during Cyclone Olwyn. The purpose of this information paper is to help duty holders understand their obligations with respect to effectively managing the risks of a moored MODU mooring failure in cyclonic conditions. Only once all location-specific mooring system related hazards have been identified and the associated risks have been assessed will duty holders be able to reduce the risks of a mooring system failure to ALARP	Issued in conjunction with the APPEA document. Include as a reference
IADC (International Association of Drilling Contractors)	**Deepwater Well Control Guidelines 2nd Edition cost c**	**2015**	MODU (semi-sub) focused guidelines: 6 key chapters including emergency response	More focused on DP/ thruster operations as opposed to moored. Highlights issues re reduced thruster efficiency

				during a 'gas boil' Useful coverage of contingency planning
WFO World Forum Offshore Wind	**Mooring Systems for Floating Offshore Wind: Integrity Management, Concepts, Risks and Mitigation**	**May 2022**	This document is the result of one year's worth of monthly discussions between participating WFO members during meetings of WFO's Floating Offshore Wind Committee on the topic of 'Mooring Systems for Floating Offshore Wind'.	Floating Offshore Wind Focused
Catapult	**Failure Implications of Different Mooring Spreads and Lines – Public Summary Report**	**15.4.2024**	In floating offshore wind (FOW) mooring systems a component or system failure may have a broad variety of consequences ranging from a relatively minor change in performance all the way up to complete loss of station keeping and damage to other units within the array. The loss of revenue, disruption and expense of recovery and repair would likely be harmful to the business and reputation of numerous stakeholders (developers, manufacturers, operators and end-users). The potential interaction between neighbouring platforms in a commercial FOW farm and other water users means that the risk of mooring failure and the implications of that must be assessed ultimately at a farm level, e.g., the requirements for platform separation in accidental limit states (ALS). There also exists the possibility that serviceability limit states (SLS) are exceeded that affect generation without gross mooring system failure.	Floating Offshore Wind focused
HSE (UK)	**North Sea Floating Unit Integrity - Document in Preparation**	**Expected 2025**	No content sheet available – should hopefully address Hull and Mooring integrity issues that are the subject of recent Safety Notices on the HSE website.	Potential for Lloyds Library presentation to the insurance market.

JDM

Rev 2 13th Nov.2024

Rev 3 21st Nov.2024

Appendix 4: Abbreviations

API RP2SK	American Petroleum Institute Recommended Practice on Design and Analysis of Station Keeping Systems for Floating Structures (API RP 2SK)
ALARP	As Low as Reasonably Practicable
BI	Business Interruption
CALM	Catenary Anchor Leg Moorings
CoC	Conditions of Class
CoG	Centre of Gravity
CoP	Code of Practice
DP	Dynamic Positioning
FOWS	Floating Offshore Wind Substations
FOWT	Floating Offshore Wind Turbines
FPSO	Floating Production Storage & Offloading Systems
FSU	Floating Storage Units
FPU	Floating Production Units
FUMA	Floating Unit Mooring Assessment
GSoW	Generic Scope of Work
GVI	General Visual Inspection
HD 3D	High Definition 3D video
HP	High Pressure
ISP	Initial Screening Process
JNRC	Joint Natural Resources Committee
LAT	Lowest Astronomical Tide
LIDAR	LIght Detection And Ranging
LMA	Lloyd's Management Association
LOH	Loss of Hire
MA	Mooring Assessment/ Mooring Assessors
MI	Mooring Inspector
MIMS	Mooring Integrity Management System
MODU	Mobile Offshore Drilling Unit
MOPU	Mobile Offshore Production Unit
O&GUK	Oil and Gas UK
OEUK	Offshore Energies UK
PD	Property Damage
PSSoW	Project Specific Scope of Work
QA	Quality Assurance
QC	Quality Control
SALM	Single Anchor Leg Moorings
SPM	Single Point Mooring
SoW	Scope of Work
TAMS	Thruster Assisted Mooring Systems
TLP	Tension Legged Platform
TRS	Tropical Revolving Storms