**2TECHNICAL REPORT**

Presented by: IntelliSIMS

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| --- |
| For: <<[report.Operator.CompanyName]>> |
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|  |
| **Structural Integrity Management Program**  **<<[report.CurrentYear]>> In-Service Inspection Plan  and Long Term Plan** |
|  |
| **IntelliSIMS Document No.:** **C080R001 Rev 1 November 16** |
| |  |  | | --- | --- | | Prepared by: | For the attention of: | | Justin Bucknell  Managing Partner  iSIMS LLC d/b/a IntelliSIMS  900 Town & Country Lane, Ste. 303  Houston, TX 77024  USA | <<[report.Operator.ResponsiblePerson]>>  <<[report.Operator.Role]>>  <<[report.Operator.CompanyName]>>  <<[report.Operator.Address]>>  <<[report.Operator.City]>> - <<[report.Operator.State]>>  <<[report.Operator.ZIP]>> <<[report.Operator.Country]>> | |

**REVISION DETAILS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Revision | Date | Description | Author | Checked | Approved |
| A | November 16 | Generated using [www.isims-app.com](http://www.isims-app.com) |  |  |  |

**DESCRIPTION OF CHANGES**

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| --- | --- | --- |
| Revision | Section | Change |
| A | All | Generated using [www.isims-app.com](http://www.isims-app.com) |
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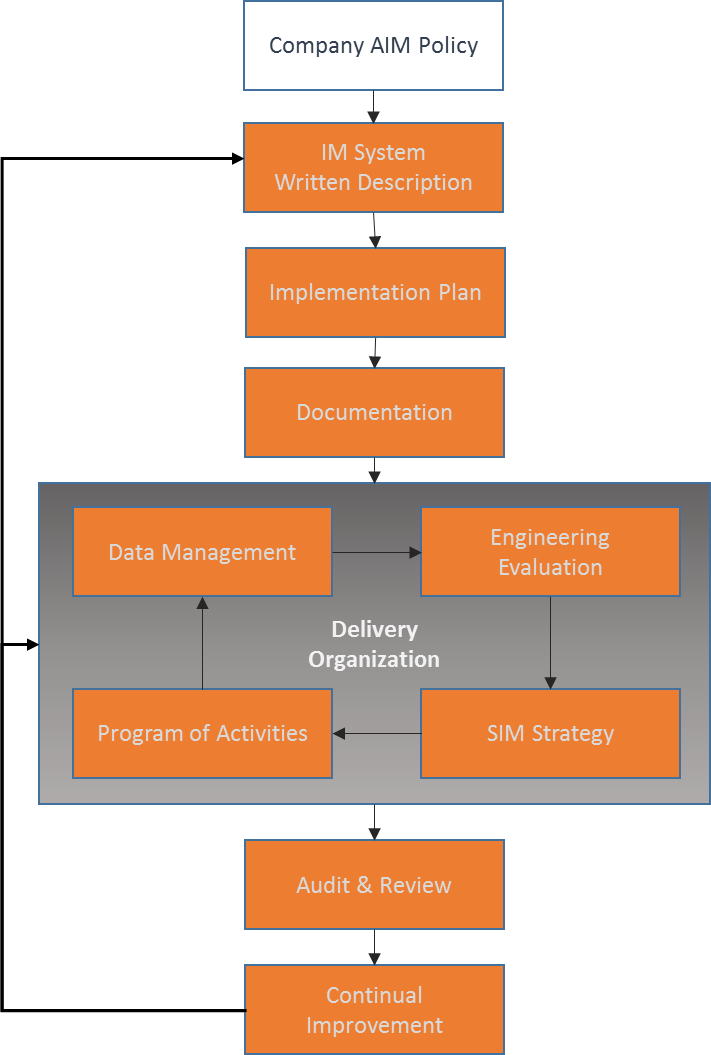
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# introduction & overview

iSIMS LLC d/b/a IntelliSIMS (IntelliSIMS) has prepared this Technical Report for <<[report.Operator.CompanyName]>>. IntelliSIMS was engaged by <<[report.Operator.CompanyAbbreviation]>> to develop a risk-based plan for the future; <<[report.CurrentYear]>>and beyond, routine underwater inspections of the <<[report.Operator.CompanyAbbreviation]>> owned and operated offshore structures in the US Gulf of Mexico (GOM). The Structural Integrity Management (SIM) framework within which the risk-based plan was developed is illustrated in Figure 1-1. In prior years <<[report.Operator.CompanyAbbreviation]>> has followed the API default consequence-based inspection planning process.

**Figure 1‑1: Structural Integrity Management (SIM) Process [1, 2]**

The SIM process begins with the collation of data necessary to understand the structural integrity of the platforms. The key SIM related data and its collation and validation by competent SIM engineers for use in the study is described in Section 3.1.

The second step in the process is the engineering evaluation of the validated data by competent structural integrity engineering specialists within IntelliSIMS. This process results in a consequence assessment of the platforms and an assessment of the probability of structural failure during the operation of the platform. The consequence assessment and, the determination of the probability of failure (PoF) using the IntelliSIMS methodology are described in Section 3.2.

The next step is the application of the IntelliSIMS risk-based underwater inspection strategy. This is a strategy that has been approved by, and is endorsed by BSEE, in their efforts to encourage industry to more proactively understand and apply SIM to reduce risk to life safety and the environment. The key elements of the strategy encompass the risk based inspection interval and the associated risk based inspection scope of work. These two elements are discussed in Section 3.3.

***The final step in the plan development is the application of the new risk based intervals to generate the long-term underwater inspection plan. The first year of the long-term plan represents the <<[report.CurrentYear]>> in-service inspection plan (ISIP). The <<[report.CurrentYear]>> ISIP as presented herein is submitted to BSEE for approval.***

# Competency

Both API [1&2] and ISO [3] SIM related documents require that all activities described herein are executed by suitably competent personnel.

API RP 2SIM defines competency as the experience gained through formal education and a combination of training, qualifications, understanding, and practicing skills. The engineer (or group of engineers) involved in developing a risk-based SIM process shall have specific specialist knowledge, expertise and experience in the SIM process and each of its elements. Specifically they shall be knowledgeable on:

* offshore structural integrity engineering and with the specific platform(s) under consideration
* offshore construction, repair and installation techniques and technologies
* deterioration, damage evaluation, and mitigation
* the differences between design and assessment engineering
* risks to offshore structures
* offshore inspection and construction planning, tools and techniques
* the general inspection findings in the offshore industry
* anomalies that may trigger additional inspection or analysis
* regulations pertaining to the SIM plan

The resumes highlighting the competencies and qualifications of the key IntelliSIMS staff, responsible for leading the implementation of the <<[report.Operator.CompanyAbbreviation]>> risk based SIM Program, are attached; see Attachment 4. The <<[report.Operator.CompanyAbbreviation]>> SIM Program Owner <<[report.Operator.ResponsiblePerson]>> has reviewed the plan at each stage of its development and provided technical endorsement and approval. His internal technical assurance process included blind spot-checks of the IntelliSIMS Robustness Methodology (Attachment 3) predicted RSRs as compared to results from known structural assessment ultimate strength analyses results. The comparison exercise/validation is discussed in Section 3.2.

# SIM – Risk Based Inspection Planning

## Data

The SIM process begins with the collation of data necessary to understand the structural integrity of the platforms. The key data that was collated and validated for use in the study was as follows:

* Most recent (2015) OSTS report.
* Most recent (2015) Topsides (API Level 1) Inspection Reports
* Most recent Underwater (API Level II/III/IV) Inspection Report(s)
* Where already available, true site-specific metocean data that has been generated by a competent metocean specialist in accordance with the methodology described in API RP 2MET. In lieu of this the site-specific long term N-year metocean data is generated by IntelliSIMS metocean/hydrodynamic specialists in accordance with the provisions of API RP 2INTMET. It is recognized that API RP 2MET now supersedes 2INT MET however for assessment of existing structures the curves for criteria development in 2MET are unduly conservative compared to site-specific data. Further the 2MET document provides no means to transition criteria between different regions across the GOM. For these reasons the provisions of 2 INT MET are considered better representation of actual site-specific data while still maintaining a suitable degree of conservatism.
* Where already available, structural assessment reports for platforms that have been assessed and RSR’s developed. It is necessary that the platform failure mechanism is properly understood and documented.
* Platform structural characteristic, functional and appurtenance data (permits/drawings etc. where available).
* <<[report.Operator.CompanyAbbreviation]>>’s consequence definitions for their GOM owned/operated platforms.

All SIM data including inspection and assessment reports are uploaded to and managed within the IntelliSIMS in-house iSIM-app for immediate retrieval and review by the evaluating structural integrity engineer(s).

## Evaluation

The second step in the SIM process is the engineering evaluation of the validated data by competent structural integrity engineering specialists within IntelliSIMS. This evaluation process is specific to the probability of failure assessment and relates to every platform. It is in addition to the prior year topsides and underwater inspection evaluations used to develop the OSTS report.

### Consequence Assessment

The consequence assessment of the platform was initially carried out in accordance with API recommended practice [1]. Guidance in determination of thresholds for life-safety, environmental and other consequences is taken from BSEE published guidelines and in accordance with the IntelliSIMS Procedure for Underwater Inspection Planning (see Attachment 3). The consequence assessment confirmed platform API consequences (Exposure Categories) to be consistent with those reported in the 2015 OSTS report. Per API practice and BSEE reporting convention each platform is assigned an Exposure Category, as follows:

L1: High consequence

L2: Medium consequence

L3: Low consequence

### Probability of Failure (PoF) Assessment

The probability of failure (PoF) of the platform is determined for both the sudden hurricane; where the platform may be manned during the event, and for the full population hurricane, where the platform is un-manned during the event. For all platforms the PoF is estimated using the IntelliSIMS iSIM-App. The PoF methodology integrated within the iSIMS-App is described in the iSIMS Procedure for Underwater Inspection Planning [4]. The methodology has been developed through industry experience with failures and survivals of platforms during extreme storm and hurricane events. The methodology combines the most recent 2015 update to a widely adopted qualitative rule-based robustness estimate with a platform specific extreme hazard curve representing the load on the platform from the extreme full-population and sudden hurricane events. The methodology takes explicit account of the critical wave-in-deck loading on the structure. Application of the methodology requires a detailed evaluation of the condition of the platform to determine if existing deterioration, damage and/or anomalies are collectively significant enough to warrant a downgrading of the PoF of the platform. Table 3.2‑2 notates if the platform has a condition penalty due to significant damage. This relies on the expert judgement of the IntelliSIMS structural integrity specialists and is validated through dialogue with the owner/operator.

Where structural assessments of platforms have been carried out the results of these studies are evaluated by IntelliSIMS assessment analyses specialists, led by Dr. Kaisheng Chen, see attached resume. In cases where the results were adequately reported and considered to be representative of the structural failure mechanism of the platform the RSR is used to override the rule-based methodology within the iSIM-App.

The results of the IntelliSIMS assessment of the structural PoF for full-population hurricane and sudden hurricane events are given in Table 3.2‑2. The table shows the rule-based robustness score for the structure (A thru E), the associated calibrated RSR range, the RSR override where a validated assessment analysis exists and the resulting estimate of the structural PoF for the FPH. Also shown is the RSR where the wave hits the deck (WID). The SH PoF is also shown in the table for all structures, however since it relates to life-safety risk it is only applicable to manned structures.

| Platform | Robustness Grade | Robustness Score | RSR Range | RSR Override | WID | FPH PoF | Manned (yes/no) | SH PoF | Condition Penalty |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| <<foreach [in report.Platforms]>><<[Name]>> | <<[RobustnessGrade]>> | <<[RobustnessScore]>> | <<[RSRRange]>> | <<[RSROverride]>> | <<[WID]>> | <<[FPH\_POF]>> | <<[Manned]>> | <<[SH\_POF]>> | <<[ConditionPenalty]>><</foreach>> |

**Table 3.2‑2: Platform PoF Summary**

As shown in the Table above, the PoF for the FPH is higher than the PoF for the SH. This is a result of the fact that the SH occurs less frequently and has a lower probability or developing into a major hurricane. In the US GOM risk to life-safety during the FPH is managed through evacuation of personnel from the platform ahead of the event. For the SH this is not possible. For this reason life-safety risk must be represented separately on the risk matrix to other (environmental and financial) risk. Figure 3.2‑1 and Figure 3.2‑2 show the risk matrices for life-safety and for ‘other’ consequences, respectively. The numbers in the bins in the matrices indicate numbers of platforms in each. Table 3.2‑3 and Table 3.2‑4 show the list of platforms for the corresponding bin. Figure 3.2‑1 showing life-safety risk includes only those platforms that are manned and are therefore high consequence regardless of the API Exposure Category.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
| Consequence of Failure | High | <<[report.SHMatrix.High6]>> | <<[report.SHMatrix.High5]>> | <<[report.SHMatrix.High4]>> | <<[report.SHMatrix.High3]>> | <<[report.SHMatrix.High2]>> | <<[report.SHMatrix.High1]>> |
| Medium | <<[report.SHMatrix.Medium6]>> | <<[report.SHMatrix.Medium5]>> | <<[report.SHMatrix.Medium4]>> | <<[report.SHMatrix.Medium3]>> | <<[report.SHMatrix.Medium2]>> | <<[report.SHMatrix.Medium1]>> |
| Low | <<[report.SHMatrix.Low6]>> | <<[report.SHMatrix.Low5]>> | <<[report.SHMatrix.Low4]>> | <<[report.SHMatrix.Low3]>> | <<[report.SHMatrix.Low2]>> | <<[report.SHMatrix.Low1]>> |
|  |  | **6 Rare** | **5 Remote** | **4 Unlikely** | **3 Seldom** | **2 Occasional** | **1 Likely** |
| **< 1/2500** | **> 1/2500** | **> 1/1000** | **> 1/300** | **> 1/100** | **> 1/25** |
|  |  | Probability Of Failure | | | | | |

**Figure 3.2‑1: Sudden Hurricane (SH) Risk Matrix**

| Platform | PoF | CoF |
| --- | --- | --- |
| <<foreach [in report.SHMatrixDetails]>><<if [POFLevel ==1 && Characteristics.SH\_COF == “HIGH” ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. SH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==1 && Characteristics.SH\_COF == “MEDIUM”) || (POFLevel ==2 && Characteristics.SH\_COF == “HIGH”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. SH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==1 && Characteristics.SH\_COF == “LOW”) || (POFLevel ==2 && Characteristics.SH\_COF == “MEDIUM”) || (POFLevel ==3 && Characteristics.SH\_COF == “HIGH”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. SH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==2 && Characteristics.SH\_COF == “LOW”) || (POFLevel ==3 && Characteristics.SH\_COF == “MEDIUM”) || (POFLevel ==4 && Characteristics.SH\_COF == “HIGH”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. SH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==3 && Characteristics.SH\_COF == “LOW”) || (POFLevel ==4 && Characteristics.SH\_COF == “MEDIUM”) || (POFLevel ==5 && Characteristics.SH\_COF == “HIGH”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. SH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==4 && Characteristics.SH\_COF == “LOW”) || (POFLevel ==5 && Characteristics.SH\_COF == “MEDIUM”) || (POFLevel ==6 && Characteristics.SH\_COF == “HIGH”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. SH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==5 && Characteristics.SH\_COF == “LOW”) || (POFLevel ==6 && Characteristics.SH\_COF == “MEDIUM”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. SH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==6 && Characteristics.SH\_COF == “LOW”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. SH\_COF]:upper>><</if>><</foreach>> |

**Table 3.2‑3: Sudden Hurricane Matrix Details**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
| Consequence of Failure | High | <<[report.FPHMatrix.High6]>> | <<[report.FPHMatrix.High5]>> | <<[report.FPHMatrix.High4]>> | <<[report.FPHMatrix.High3]>> | <<[report.FPHMatrix.High2]>> | <<[report.FPHMatrix.High1]>> |
| Medium | <<[report.FPHMatrix.Medium6]>> | <<[report.FPHMatrix.Medium5]>> | <<[report.FPHMatrix.Medium4]>> | <<[report.FPHMatrix.Medium3]>> | <<[report.FPHMatrix.Medium2]>> | <<[report.FPHMatrix.Medium1]>> |
| Low | <<[report.FPHMatrix.Low6]>> | <<[report.FPHMatrix.Low5]>> | <<[report.FPHMatrix.Low4]>> | <<[report.FPHMatrix.Low3]>> | <<[report.FPHMatrix.Low2]>> | <<[report.FPHMatrix.Low1]>> |
|  |  | **6 Rare** | **5 Remote** | **4 Unlikely** | **3 Seldom** | **2 Occasional** | **1 Likely** |
| **< 1/2500** | **> 1/2500** | **> 1/1000** | **> 1/300** | **> 1/100** | **> 1/25** |
|  |  | Probability Of Failure | | | | | |

**Figure 3.2‑2: Full Population Hurricane (FPH) Risk Matrix**

| Platform | PoF | CoF |
| --- | --- | --- |
| <<foreach [in report.FPHMatrixDetails]>><<if [POFLevel ==1 && Characteristics.FPH\_COF == “HIGH” ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. FPH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==1 && Characteristics.FPH\_COF == “MEDIUM”) || (POFLevel ==2 && Characteristics.FPH\_COF == “HIGH”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. FPH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==1 && Characteristics.FPH\_COF == “LOW”) || (POFLevel ==2 && Characteristics.FPH\_COF == “MEDIUM”) || (POFLevel ==3 && Characteristics.FPH\_COF == “HIGH”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. FPH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==2 && Characteristics.FPH\_COF == “LOW”) || (POFLevel ==3 && Characteristics.FPH\_COF == “MEDIUM”) || (POFLevel ==4 && Characteristics.FPH\_COF == “HIGH”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. FPH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==3 && Characteristics.FPH\_COF == “LOW”) || (POFLevel ==4 && Characteristics.FPH\_COF == “MEDIUM”) || (POFLevel ==5 && Characteristics.FPH\_COF == “HIGH”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. FPH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==4 && Characteristics.FPH\_COF == “LOW”) || (POFLevel ==5 && Characteristics.FPH\_COF == “MEDIUM”) || (POFLevel ==6 && Characteristics.FPH\_COF == “HIGH”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. FPH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==5 && Characteristics.FPH\_COF == “LOW”) || (POFLevel ==6 && Characteristics.FPH\_COF == “MEDIUM”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. FPH\_COF]:upper>><</if>> |
| <<if [(POFLevel ==6 && Characteristics.FPH\_COF == “LOW”) ]>><<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[POFLevel]>> | <<[Characteristics. FPH\_COF]:upper>><</if>><</foreach>> |

**Table 3.2‑4: Full Population Matrix Details**

## Strategy

### Inspection Frequency and Planning

Using as a guide the routine periodic inspection interval ranges provided in API RP 2A [1] and 2SIM [2], IntelliSIMS has developed risk-based inspection intervals. These intervals are shown in Figure 3.3‑1. From an understanding of the consequence of failure of the structure and the associated failure probability (PoF) each platform can be allocated to a bin in the risk matrix representing its risk-based inspection interval.

As discussed in Section 2, manned platforms have separate risk ratings for the FPH and the SH events. For purposes of inspection planning the more onerous of these i.e. shorter inspection interval, is used.

Application of the SIM strategy described herein permits the development of the current year ISIP and LTP. This is based on the addition of the risk-based inspection interval to the most recent (qualifying) underwater inspection. This provides the next inspection date. The LTP assumes the risk-based inspection interval remains constant, however, in reality the interval is re-evaluated each year to reflect any significant change in either the consequence or probability of failure of the structure.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
| Consequence of Failure | High | **12 yrs** | **10 yrs** | **7 yrs** | **5 yrs** | **3 yrs** | **Mitigate** |
| Medium | **15 yrs** | **12 yrs** | **10 yrs** | **7 yrs** | **5 yrs** | **3 yrs** |
| Low | **Incident Driven** | **15 yrs** | **12 yrs** | **10yrs** | **7yrs** | **5 yrs** |
|  |  | **6 Rare** | **5 Remote** | **4 Unlikely** | **3 Seldom** | **2 Occasional** | **1 Likely** |
| **< 1/2500** | **> 1/2500** | **> 1/1000** | **> 1/300** | **> 1/100** | **> 1/25** |
|  |  | Probability Of Failure | | | | | |

**Figure 3.3‑1: Risk-based Routine Inspection Intervals**

### Baseline Inspections

It is noted that the use of a risk-based interval is contingent on the existence of a baseline inspection of the structure. The baseline inspection shall be completed at an interval not-to-exceed the default consequence-based interval provided in API [2, 3]. This is because prior to the baseline inspection the as-installed condition of the structure is unknown. Experience suggests most structural damage occurs in the early life of the platform.

### API RP 2SIM Stipulations

In API RP 2SIM [2] paragraph 6.5.2.2 it states “The setting of intervals between inspections greater than 10 years requires the operator/owner to demonstrate that the platform is unmanned, that risk of platform failure has been quantified through an ultimate strength analysis, that inspection trends are understood, and that annual Level I CP readings are performed and are acceptable. This interval is only applicable to structures designed to API 2A-WSD, 20th Edition and later. This criteria has been adopted and is reflected in the inspection planning presented herein.

### Non-redundant Structures

Based upon dialogue with BSEE there is a concern that in lieu of a specific basis to otherwise assure that fatigue cracks might exist at critical locations the inspection interval for non-redundant structures e.g. caissons and some minimum facilities should not exceed their API default maximum intervals. This criteria has been adopted and is reflected in the inspection planning presented herein.

### Corrosion Protection

The risk-based strategy relies on the effective use of regular periodic API Level 1 inspections (above water) to monitor and manage the structural corrosion protection systems. This includes the coating of above water structures and structural components, any corrosions allowance through the splashzone and confirmation of the effective operation of the subsea cathodic protection (CP) system. If the CP system is found to be ineffective this will trigger a retrofit of the anodes. This subsea activity will include the risk-based inspection scope including monitoring for possible corrosion. The subsequent engineering evaluation of the inspection data will be used to update the RBUI strategy and reset the inspection interval and possibly the future inspection scope for the facility.

### Inspection and Preventative Maintenance Scope of Work

Of equal importance to the frequency of inspection is the scope of work executed during the inspection. IntelliSIMS develops risk-based work scopes using the technology developed by the IntelliSIMS personnel during a ground breaking GOM JIP [5] and subsequent updates based on inspection findings since that time. The IntelliSIMS work scope strategy is fully consistent with that documented in the JIP Final Report [5]. The methodology to develop risk-based SOWs is described in the IntelliSIMS Procedure for Structural Inspection Planning [4].

## Program

### Long Term Plan

Comparison of the risk-based long term inspection plan with the default API consequence based plan shows that overall the average inspection interval for all platforms increases from approximately 5-years to 8-years. This is generally consistent with IntelliSIMS experience with the implementation of our risk-based methodology. As should be expected, the consequence-based intervals, which ignore the PoF, better correlate with a worst-case PoF scenario. The engineered SIM plan where the PoF has been calculated provides an understanding of where this worst-case is applicable and where this assumption is overly conservative. Thus the opportunity is provided to focus valuable integrity resources where they can most effectively mitigate and manage risk of structural failures. The <<[report.Operator.CompanyAbbreviation]>> long-term plan is shown in Table 3.4‑1.

This improved focus of resources was one objective of API in the development of API RP 2SIM [2], which introduces risk based SIM. BSEE too has identified internally that improved focus of limited resources can help better manage life-safety and environmental risk. The BSEE OSTS is supportive of encouraging owner/operators in this same direction.

| Platform | Prior Qualifying Inspection | Default API/BSEE Interval | FPH Inspection Interval | SH Inspection Interval | Risk based Inspection Interval [[1]](#footnote-1) [[2]](#footnote-2) [[3]](#footnote-3) | Next Routine Inspection |
| --- | --- | --- | --- | --- | --- | --- |
| <<foreach [in report.LTPList]>> <<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[Characteristics.PYU]>> | <<[InspectionInterval. DefaultInterval]>> | <<if [InspectionInterval.APIDefault]>>N/A<<else>><<if [InspectionInterval. SHIntervalOriginal ==null || InspectionInterval. FPHIntervalOriginal <=0]>>N/A<<else>><<[InspectionInterval. FPHIntervalOriginal]>><</if>><</if>> | <<if [InspectionInterval.APIDefault]>>N/A<<else>> <<if [Characteristics.Quarters == null || Characteristics.Quarters == false || InspectionInterval. SHIntervalOriginal ==null || InspectionInterval. SHIntervalOriginal<=0]>>N/A<<else>><<[InspectionInterval. SHIntervalOriginal]>> <</if>><</if>> | <<if [InspectionInterval.APIDefault]>>N/A<<else>><<[InspectionInterval. FinalInterval]>> <<if [Characteristics.PYU == null]>>3<<else>><<if [InspectionInterval. FinalInterval ==10]>><<if [Characteristics.NumberLegs >3] >>2<<else>>1<</if>><</if>><</if>><</if>> | <<[InspectionInterval. NYU]>><</foreach>> |
| **Structures not included in RBUI program with API Default Intervals** | | | | | | |
| <<foreach [in report.LTPAPIDefaultList]>> <<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[Characteristics.PYU]>> | <<[InspectionInterval. DefaultInterval]>> | <<if [InspectionInterval.APIDefault]>>N/A<<else>><<[InspectionInterval. FPHIntervalOriginal]>><</if>> | <<if [InspectionInterval.APIDefault]>>N/A<<else>><<[InspectionInterval. SHIntervalOriginal]>> <</if>> | <<if [InspectionInterval.APIDefault]>>N/A<<else>><<[InspectionInterval. FinalInterval]>> <</if>> | <<[InspectionInterval. NYU]>><</foreach>> |

**Table 3.4‑1: LTP Including Comparison of Various Inspection Intervals**

### <<[report.CurrentYear]>> In-Service Inspection Plan (ISIP)

The LTP assumes the risk-based inspection interval remains constant, however, in reality the interval is re-evaluated each year to reflect any significant change in either the consequence or probability of failure of the structure. This is the process of evaluating new data as it becomes available and modifying the strategy and hence the program accordingly. *This is the SIM Process in effect; refer to Figure 1-1*.

The first, or current year of the LTP is the most accurate as it has been developed from competent evaluation of the most recent and up to date data available. This becomes the current year In-Service Inspection Plan (ISIP) for the owner/operator. The <<[report.Operator.CompanyAbbreviation]>> <<[report.CurrentYear]>> risk-based underwater ISIP is shown in Table 3.4-2.

| Platform | Platform Type | Exposure Category | Water Depth | Manned | Next Routine Inspection | Inspection Class[[4]](#footnote-4) |
| --- | --- | --- | --- | --- | --- | --- |
| <<foreach [in report. LTPCurrentYearList]>> <<[Characteristics.AR]>> <<[Characteristics.BLK]>> <<[Characteristics.STNAME]>> | <<[Characteristics.STRTYP]>> | <<[Characteristics.FPH\_COF]>> | <<[Characteristics.WD]>> | <<if [Characteristics.Quarters!=null && Characteristics.Quarters.Value]>>Yes<<else>>No<</if>> | <<[InspectionInterval. NYU]>> | <<[InspectionInterval. InspectionClass]>><</foreach>> |

**Table 3.4‑2: <<[report.Operator.CompanyAbbreviation]>> <<[report.CurrentYear]>> Risk Based In-Service Inspection Plan (ISIP)**

# summary

IntelliSIMS was engaged by <<[report.Operator.CompanyAbbreviation]>> to develop a risk-based plan for the future; <<[report.CurrentYear]>> and beyond, routine underwater inspections of the <<[report.Operator.CompanyAbbreviation]>> owned and operated offshore structures in the US Gulf of Mexico.

The SIM process, as reported herein is illustrated in Figure 1‑1. This process has been adhered to throughout. Accurate data has been collated and validated. The data has been subjected to detailed engineering evaluation to determine structural risk. The IntelliSIMS risk based strategy for underwater inspection planning has been applied to develop a program of inspection activities for the current year.

The IntelliSIMS engineers involved in developing this risk-based SIM plan have the necessary specific specialist knowledge, expertise and experience in the SIM process and each of its elements to satisfy the requirements of both API and BSEE.

Per API practice and BSEE reporting convention each platform is assigned a consequence of failure (CoF) as follows: L1: High consequence; L2: Medium consequence and L3: Low consequence. This API default has been overridden using the more rigorous <<[report.Operator.CompanyAbbreviation]>> CoF methodology with specific account of business consequence as well as HSE consequences.

The probability of failure (PoF) of the platform is determined for both the sudden hurricane; where the platform may be manned during the event, and for the full population hurricane, where the platform is un-manned during the event. Risk matrices are presented for both life-safety and “other” (health, environmental and business) consequences.

Comparison of the long term (10-year) risk-based inspection plan with the default API consequence-based plan shows that overall the average inspection interval for all platforms increases from <<[report.LastAverageInterval]>> years to <<[report.CurrentAverageInterval]>> years. This is consistent with IntelliSIMS experience with the implementation of the iSIM risk-based methodology. As should be expected, the consequence-based intervals, which ignore the PoF, better correlate with a worst-case PoF scenario. The engineered SIM plan where the PoF has been calculated provides an understanding of where this worst-case is applicable and where this assumption is overly conservative. Thus the opportunity is provided to focus valuable integrity resources where they can most effectively mitigate and manage risk of structural failures.

**The <<[report.Operator.CompanyAbbreviation]>> risk based ISIP for <<[report.CurrentYear]>> is shown in Table 3.4.2 herein and is presented with the supporting evidence documented in this report and its attachments for the approval of the BSEE Office of Structural and Technical Support (OSTS).**

# References

* 1. Recommended Practice for Planning Designing and Constructing Fixed Offshore Platforms - Working Stress Design. API Recommended Practice 2A-WSD 21st Edition, December 2000. Errata and Supplement 1, December 2002; Errata and Supplement 3, October 2005; Errata and Supplement 3, March 2008.
  2. Structural Integrity Management of Fixed Offshore Structures. ANSI/API Recommended Practice 2SIM First Edition, November 2014.
  3. Petroleum and Natural Gas Industries – Fixed Steel Offshore Structures. International Standard ISO 19902 First Edition 2007-12-01
  4. IntelliSIMS Procedure for Structural Inspection Planning. iSIMS-STR-PRO-001-04, 2016.
  5. Rationalization and Optimization of Underwater Inspection Planning Consistent with API RP2A Section14. Joint Industry Project Final Report Doc. Ref. CH104R006 Rev 0 November 2000.
  6. Derivation of Metocean Design and Operating Condition. API Recommended Practice 2MET 1st Edition, November 2014.
  7. Interim Guidance on Hurricane Conditions in the Gulf of Mexico. API Bulletin 2INT-MET, May 2007.
  8. In-Service Inspection Intervals for Fixed Platforms. NTL No. 2009-G32, November 4, 2009.

**ATTACHMENT 1: <<[report.Operator.CompanyAbbreviation]>> <<[report.CurrentYear -2]>> & <<[report.CurrentYear -1]>> OSTS Report**

**ATTACHMENT 2: <<[report.Operator.CompanyAbbreviation]>> Long-Term Plan**

**ATTACHMENT 3: IntelliSIMS SIM Procedure for Structural Inspection Planning**

**ATTACHMENT 4: resumes of key personnel**

1. *RP2 SIM 10-year cap (see Section 3.3.3)* [↑](#footnote-ref-1)
2. *Non redundant 10-year cap (see Section 3.3.4)* [↑](#footnote-ref-2)
3. *No baseline inspection has been performed yet (see Section 3.3.2)* [↑](#footnote-ref-3)
4. *4 See Section 7.2 in iSIMS' Sim Procedure for Structural Inspection Planning [4]* [↑](#footnote-ref-4)