

PROCEDURE GUIDE FOR THE CONSTRUCTION AND MAINTENANCE
OF FIXED OFFSHORE PLATFORMS

SECTION I
P L A N N I N G

1.1 PREAMBLE: Legal Provisions and Scope

This guide is issued, pursuant to the provisions of Regulations (36) and (39) of the Petroleum (Drilling and Production) Regulations 1969 and it shall be applicable to all fixed offshore platforms constructed for the following purposes:

- (a) Drilling Operations
- (b) Oil and Gas Production, Handling and Treatment
- (c) Materials Handling and other Operational Support Services
- (d) Living Quarters
- (e) A combination of any of the functions in (a) - (d)

1.1.2. It shall apply to both manned and unmanned platforms.

1.1.3. Its effective date shall be specified by the Director on its final approval and introduction for use by the Industry

1.1.4. Existing platforms that have been constructed before the introduction of the guide shall be given a reasonable period for their operation and maintenance to comply with the applicable provisions of the guide.

1.2. VARIOUS STAGES OF APPROVALS FOR THE DESIGN,
CONSTRUCTION AND COMMISSIONING OF PLATFORMS

The following approvals shall be obtained on the presenta-

tion of satisfactory information and details on the applicable requirements.

1.2.1. Conceptual Design of Platform

This shall follow the process of presentation and review of the conceptual drawings, the general project concept and scope. These drawings shall be in the format specified in Section (2.3.1.). Approval of the project concept shall be followed by the preparation of the detailed design drawings for submission and approval before commencement of construction. These drawings shall be in the format specified in Section (2.3.2.). In addition, the coordinates of the proposed geographic location of the platform shall be forwarded to the Department for appropriate clearance from the relevant Maritime Control Agencies of Government.

Also, a Qualitative/Quantifiable Risk Analysis of the platform shall be carried out at this stage of the project and presented to the Department for study.

1.2.2. Platform Construction

This shall include the stages of preparation of fabrication drawings, yard fabrication, transportation to location and erection.

1.2.3. Commissioning

This shall consist of the process of final inspection, and functional test of the platform equipment and instruments.

SECTION II

2.1 DESIGN CONSIDERATIONS

These shall generally follow the specifications and prescribed procedures outlined in the latest edition of API Recommended Practice 2A (RP2A) titled "Recommended Practice for Planning, and Construction of Fixed Offshore Platforms", (or its intrnationally recognised equivalent) which shall subsequently be referred to as API RP2A in this Procedure Guide.

2.1.1. Conventional Fixed Platform Types

The following shall be regarded as conventional platforms which do not required special considerations for approval, outside those contained in this guide:

- (a) Template type platforms
- (b) Tower Platforms
- (c) Gravity Positioned Platforms
- (d) Caissons
- (e) Guyed Tower Structures
- (f) Tension Leg Platforms
- (g) Compliant Tower Platforms

All other types apart from those listed in (a) - (g) above shall be subject to special design considerations.

2.1.2. Operational Considerations

The functions to be performed by the platform shall be clearly identified and stated. The features to be

incorporated in the platforms and the necessary ancillary facilities shall also be outlined. Also, possible sources of external static and dynamic loads on the platform during operations shall be indentified and their magnitudes estimated. All these shall be furnished at the time of consideration of the platform design.

2.1.3. Environmental and Safety Considerations

2.1.3.1. Environmental Factors

These shall include all available meteorological and oceanographic parameters, such as the prevailing winds, waves, tides, currents, sea floor conditions and load bearing capacity, anticipated marine - growth rate and other sea bottom foundation information.

- (a) All environmental parameters shall be obtained from site survey or data gathering and shall be properly documented.
- (b) Sea bottom foundation investigation for pile supported structures shall provide enough engineering data to determine the axial capacity of piles in tension and compression, the load - deflection characteristics of axially/laterally loaded piles, pile drive-ability characteristics and mudmat load bearing capacity.
- (c) Platform structures shall be designed on the basis of 100-year oceanographic criteria but where a shorter

recurrence interval is desired, the basis of this choice shall be presented to the Director for special consideration.

2.1.3.2. Environmental Protection

- (a) There shall be an Environmental Impact Assessment (EIA) study near/shore area as provided for in the National Environmental Guidelines and Standards for the Petroleum Industry, before commencement of construction.
- (b) The general layout location and construction programme of the platform shall comply with all the applicable conditions in the National Environmental Guidelines and Standards for the Petroleum Industry in Nigeria issued by the Ministry.
- (c) The platform shall be equipped with adequate provisions for containing, and handling spillages and potential contaminants.
- (d) The platform decks shall be configured in such a way that, there will be an efficient deck drainage system with adequate provisions for handling and disposing drained liquids in accordance with the Environmental Guidelines.
- (e) All the systems and components of the platform shall be designed to withstand any anticipated extremes of environmental phenomena on location.
- (f) The platform shall be equipped with adequate effluent treatment systems to the specifications contained in the Environmental Guidelines and Standards issued by the Ministry.

2.1.3.3. Safety Factors

- (a) All Living Quarters Platforms that will accommodate more than twenty(20) persons at any given time, shall preferably be laterally separated by a bridge of 50 metres minimum, from that carrying the oil and gas process facilities, gas compressor facilities or gas turbine generators.
- (b) The Living Quarters deck of manned platforms containing process facilities shall be isolated from that on which process facilities are installed by fire and explosion proof materials.
- (c) There shall be provided, a minimum of two access ways to each manned platform deck level and the route of these accesses shall be clearly marked with arrows and illuminated signs at strategic locations on the deck.
- (d) The number of emergency evacuation vessels in the form of survival capsules, boats and, or dinghies shall be commensurate with the maximum workforce anticipated to be present at a time on the platform and these shall be adequately positioned.
- (e) Adequate navigational warning signs shall be provided around the platform for both day and night warnings to other marine traffic around the location.
- (f) Unmanned platforms shall be provided with intruder detection device backed up by an effective protection response arrangement where practicable.
- (g) Flare stack design shall generally conform with the provisions of API RP14C, specifically, it shall be so

located that the maximum heat radiation exposure of personnel at the nearest point of the deck to the flare shall not be more than 1170 BtU/Sq.ft/hr. inclusive of that from solar source.

- (h) The noise level at any point on the platform deck emanating from engines and fluid velocities in the pipings shall not exceed 90 dBA. In areas of the platform where this level is exceeded, wearing of earmuffs shall be mandatory.
- (i) All emergency shut down and alarm systems shall have a dual circuit actuation device. Preferably of independent pneumatic and electronic type trigger systems or of other acceptable fail-safe designs.
- (j) Fire sensors and gas detection , and alarm systems shall be provided at strategic points of the platform decks.
- (k) A platform isolation valve shall be provided below the deck of the platform and it shall be maintained in operational condition at all times.

2.2 DESIGN PARAMETER AND PROCEDURES

2.2.1. Design Loads

These shall include all the dead, live and transient loads to which the structure will be subjected throughout its operational life.

To this end, the definition of loads specified in API RP2A

or approved equivalent standards shall be acceptable.

All load calculations shall be documented and the sources of derivation of environmental loads shall be specified and presented at the detailed design stage.

(a) Imposed Forces During Construction

These shall include all anticipated forces to be imposed on the structure during fabrication in the yard, load-out and transportation to the location, launching, installation and erection at location.

The consideration given to these forces shall be in accordance with the fabrication and installation procedure to be used and this shall be outlined at the time of detailed design of the platform.

Any review of this procedure and the corresponding design criteria during project implementation, shall be notified appropriately.

(b) Fatigue Failure Considerations

(i) Definition

This is failure occasioned by imposition of cyclic stresses on members of the structure.

(ii) Fatigue Stresses

These will mostly be stresses imposed on the structure by waves. Consequently, a detailed wave analysis of the platform location and water depth shall be carried out for accurate establishment of the appropriate fatigue design

life of the platform. This information shall be provided along with the submission of the detailed design parameters.

2.2.2. Foundation Consideration

General Provisions

- (i) Selection of foundation criteria shall follow a process of soil investigations in the immediate neighbourhood of the platform location. Possibility of sea floor movement or differential settlement of structures shall also be investigated, for those sites where these conditions are expected.

(ii) Pile and Gravity Based Foundations

These being the commonest way of fixed offshore platform construction shall be regarded as the conventional method while all other designs shall be subject of special presentation to the Director before approval is granted after appropriate consideration of such peculiar foundation design. In the application of this conventional foundation design method, pile design load bearing capacity, pile materials selection and pile performance shall comply at the very minimum, with the specifications in API RPA2A or other internationally recognised equivalents. Since all platforms shall be actively in use for either drilling or production operations, load conditions for pile design, shall be with the application of a factor of safety of 2 in all cases.

(iii) Other Foundation Design

These shall be designs classified as shallow foundations for which the depth of their embedment is less than the minimum lateral dimension of the foundation element.

Such designs will be subject of a special presentation for the consideration of the Director with adequate information on the static and hydraulic forces of the environment and any other relevant technical information to justify that type of foundation design selection.

2.2.3. Structural Steel Materials

(i) General Provisions

The allowable stresses in all the structural members shall be proportioned as specified in the recommended practice API RP2A and those in the codes and specifications of the "American - Institute of Steel Construction (AISC)".

These considerations shall apply to the determination of maximum allowable axial tensile and compressive forces, shear and hoop stresses, and those due to any combinations of these stresses.

All connections and joints shall be subjected to appropriate stress analysis as specified in the recommended practice such that their load bearing and transfer capacity shall be compatible with the stresses developed in the members being connected.

(ii) Steel Materials

The structural steel plates, shapes and pipes shall conform with the appropriate ASTM specifications or other internationally recognised equivalents for the desired purposes.

2.2.4 Electrical and Instrumentation Design

(a) General Provisions

These shall generally be in accordance with the codes, specifications and recommended practice of AIEE, API, IEE or other internationally recognised equivalents of these codes.

(b) Power Specifications

All base load power utilisation on the platform shall be in accordance with the Nigerian National Electrical Grid Standards. To this end, the appropriate Federal Government Agency should be approached for all the relevant information.

(c) Control Systems

All automatic control systems for emergency shut-down of all static or critical equipment on the platform such as separators, surge vessels, pipeline end manifolds (PLEM), compressors and pumps shall either be tied to a dual circuit actuator or other acceptable fail safe logic designs.

2.3. ENGINEERING DRAWINGS AND SPECIFICATIONS

2.3.1. Conceptual Drawings

These shall show the general concept of the project in the form of block and line diagrams. The following features shall be shown in the conceptual drawings:

- (i) Layout of facilities and the interconnecting pipelines with their capacities, and location of main valves.
- (ii) General equipment layout, simple process and mechanical flow diagrams.

- (iii) Metering manifold and its ancillary facilities where necessary with throughput capacity indicated.

2.3.2. Bid Drawings and Specifications

These drawings shall form the basis of detailed consideration of platform design before fabrication approval is granted. These drawings shall illustrate the following and shall be presented in the form of pipeline, process and instrumentation diagrams (PP&IDs).

- (i) Total facility with its configuration and dimensions sufficiently detailed, for an accurate definition of the project scope.
- (ii) Sketches of the structural drawings showing overall dimensions, deck arrangements, operational loading pattern and the proposed type of construction.
- (iii) Equipment layout for each deck in line and block diagram form.
- (iv) Foundation parameters and all design load considerations shall be incorporated in the form of a documentary annex.

2.3.3. Other Engineering Drawings

Fabrication and shop drawings shall be prepared by the Contractor on the basis of the approved bid drawings.

and specifications. Installation and as-built drawings shall be prepared at the relevant stages of the platforms construction.

2.3.4. Hazard and Operability Reviews (HAZOP)

Platform designs shall be subjected to SAFE Chart and HAZOP reviews at the following stages of the design and development:

- (i) At the completion of the bid drawings and engineering specifications.
- (ii) At the completion of the detailed engineering design and specifications.

Accredited representatives of the Department shall be present at all SAFE Chart and HAZOP reviews and it shall be mandatory for each of these stages of engineering design to successfully scale through the appropriate HAZOP reviews.

For this purpose, a minimum of four weeks notice shall be given to the Department of arrangements made for the participation of its representatives at those review meetings with all relevant PP&IDs made available for appropriate in house review and consideration.

2.3.5. Model Studies

Should the operator desire to carry out model studies on either the platform construction materials or the scaled model of the platform itself, it shall notify the Department,

four weeks before such studies are due to take place, giving information on the location and scope of the studies. The Department shall reserve the right to participate in all aspects of the model studies and the subsequent data interpretation.

2.4. CORROSION CONTROL

The corrosion control system of all fixed offshore platforms shall generally follow the codes and specifications outlined in the NACE Standards RP0176-83 (National Association of Corrosion Engineers) and its subsequent revisions or other internationally acceptable equivalents. For this purpose, the classification of platform structures into atmospheric, splash and submerged zones respectively shall apply.

However, the environmental factors for the design of cathodic protection for the platform shall be as derived from the study of the area, under local conditions.

2.4.1. Atmospheric Zone

This consists of all the portions of the platform above the splash zone, which being subjected to atmospheric weather conditions of sun, rain, and wind, its corrosion control is by application of protective coating system.

Usage of other special materials that are resistant to atmospheric corrosion, as specified in the NACE reference standards or its equivalent shall be an acceptable method.

2.4.2. Splash Zone

This being the zone of the platform that is alternately submerged in and out of water due to tidal and wind influence, it is subjected to both atmospheric attack and steel wear, occasioned by constant abrasion by debris - laden sea water.

Acceptable corrosion control measures shall be by provision of additional steel thickness for all structural members located in this zone. Other measures outlined in the NACE reference Standards or its equivalent shall be acceptable.

2.4.3. Submerged Zone

This is the zone of the platform that is permanently in water. For adequate protection of all the structural members that are exposed to water in this zone, applicable cathodic protection systems shall be as specified in NACE RP0176-83 or its equivalent, and their subsequent renewals shall be provided. Protective coatings shall also be applied to these members during the fabrication stage as an additional protection measure.

SECTION III

CONSTRUCTION, COMMISSIONING AND MAINTENANCE

3.1. CONSTRUCTION

- (i) This comprises of fabrication, installation and erection stages.

- (ii) The Company to be selected to carry out the fabrication and installation of the platform shall be one that has been duly accredited as competent and eligible to render such services as required by the provisions of Regulation 1(e) of the Petroleum (Drilling and Production) (Amendment) Regulations 1988. Non compliance with this provision shall attract appropriate sanctions.

3.1.1. Fabrication

- (a) All fabrication and welding procedures shall generally follow the relevant specifications in the underlisted documents or their internationally recognised equivalents.

- (i) American Welding Society - Structural Welding Code A.W.S. D1.1-88 and its subsequent revisions.

- (ii) American Institute of Steel Construction (AISC) - specification for the Design, Fabrication and Erection of Structural Steel for Buildings, its eighth and other subsequent editions.

- (iii) API Standards 1104 - Seventeenth and subsequent editions for welding of pipelines and related facilities.

- (b) The Operator shall provide the Director with the following information before the commencement of fabrication:

- (i) The name of the Contractor and the fabrication programme.

- (ii) The yards in which all the platform decks, jackets and ancillary facilities would be fabricated.
- (iii) The arrangements made for the statutory monitoring of the various stages of the fabrication by officials of the Ministry.

The name and job references of the company appointed as quality control inspectors for the job and the curriculum vitae (CV) of its principal technical staff.
- (c) At the completion of fabrication, the quality control inspecting Company shall compile a report confirming that all materials used were strictly in accordance with approved specifications as verified through steel mill certificates and that all the processes of fabrication were in accordance with the approved standards and codes of practice. The report shall also include all equipment functional tests carried out in the yard and test results as available.

The approved inspection method shall be by the Non-Destructive Examination (NDE).

Consequently, inspection and certification of all welded parts of the structure shall be by any of the following techniques as applicable viz:
 - (i) Dye Penetrant Technique
 - (ii) Magnetic Particle Technique
 - (iii) Radiographic Technique
 - (iv) Ultrasonic Technique

A comprehensive report of the inspection so carried out shall be forwarded to the Department through the operator.

3.1.2. Installation and Erection

- (a) These shall comprise the processes of load out to location, transportation and site erection. The methods and procedures to be used in carrying out these operations shall be in accordance with the provisions of the appropriate Section of API RP2A or other internationally recognised equivalent codes.
- (b) The Department shall be formally notified of, the approximate date of completion of erection for the conduct of the statutory pre-commissioning inspection.

3.2. COMMISSIONING

3.2.1. Application for Approval to Commission

An application for approval to commission the platform shall be lodged after completion of erection on site and the conduct of functional tests of all the equipment. The application shall be accompanied by the following information:

- (i) Fabrication inspection report as outlined in 3.1.1.(C).
- (ii) A brief outline of all the equipment functional tests carried out and performances results as available.
- (iii) Other precommissioning tests and verifications carried out on the platform structures and its ancillary facilities. A pre-commissioning inspection of the platform shall be carried out as the final statutory technical verification exercise before the grant of approval for the operational commissioning of the platform.

3.3. MAINTENANCE

It shall be mandatory for the platform to be surveyed to monitor the adequacy of the corrosion protection system and determine the condition of the structure throughout its operational life. To this end, three levels of survey shall be observed as described below:

3.3.1. First Level Survey

This shall comprise of tests on the effectiveness of the corrosion protection systems of the sections of the platform above water. Consequently, this survey level shall be by visual inspection to detect paint coating deterioration; formation of corrosion scales, distorted or missing members and other visual structural deformities. The structural members in the splash zone shall also be inspected to ascertain the conditions of deck legs, griders, trusses and other critical areas.

This survey shall be carried out annually and adequate records of observations shall be maintained on the platform for verification during the routine statutory inspection of the platform by officials of the Ministry.

3.3.2. Second Level Survey

This survey shall cover all the underwater areas of the platform otherwise referred to as the submerged zone.

It shall either be through visual inspection by divers or with the use of remote operated vehicles (ROVs) with camera attachment. The purpose shall be to detect the following defects:

- (a) Excessive corrosion
- (b) Accidental or environmental overloading leading to structural defects.
- (c) Scour, seafloor instability, differential settlement or other foundation failures.
- (d) Fatigue damage
- (e) Accumulation of debris
- (f) Excessive marine growth.

Survey of this type shall be conducted once every five years of the platform operational life and reports arising therefrom shall be forwarded to the Department along with proposals on any remedial maintenance or further detailed survey that is considered due after the interpretation of the survey results.

3.3.3. Third Level Survey

This shall focus on suspect areas identified from the second level survey. The selected areas from that survey shall be thoroughly cleaned of marine growth and corrosion scales. They shall thereafter be carefully examined visually, and any areas of confirmed or suspected to have been damaged shall be subjected to underwater non-destructive testing. Adequate records of such tests and any repair works carried out shall be maintained.

SECTION IV

ABANDONMENT AND DISPOSAL OF PLATFORMS

- 4.1. Five years prior to the end of the economic life of the field, (as evaluated by the operator and agreed to by the Department), the operator shall submit a comprehensive disposal plan for the offshore field facilities for approval.
- 4.2. The Operator shall be fully responsible for implementing the approved disposal plan which shall be carried out to the satisfaction of the Director.

DEFINITIONS

Ministry: Ministry of Petroleum and Mineral Resources

Department: Department of Petroleum Resources

Director: Director of Petroleum Resources

Manned Platform: A platform which is actually and continuously occupied by persons accommodated thereon.

Unmanned Platform: A platform upon which persons may be employed at any one time, but upon which no living accommodations or quarters are provided.

Operator: The firm, corporation or other organisation employed by owners to conduct operations on the platform.

Offshore: From the Continental Shelf Zone to the Exclusive Economic Zone of Nigeria, and inclusive of all Nigeria's Territorial waters.

MINISTRY OF PETROLEUM & MINERAL RESOURCES
LAGOS.

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