(ii) API Spec Q1, Specification for Quality Programs.

(3) All SSV's and USV's must meet the technical specifications of API Spec 6A and 6AV1. All SSSV's must meet the technical specifications of API Spec 14A.

(b) *Use of noncertified SPPE.* (1) Before April 1, 1998, you may continue to use and install noncertified SPPE if it was in your inventory as of April 1, 1988, and was included in a list of noncertified SPPE submitted to MMS prior to August 29, 1988.

(2) On or after April 1, 1998:

(i) You may not install additional noncertified SPPE; and

(ii) When noncertified SPPE that is already in service requires offsite repair, remanufacturing, or hot work such as welding, you must replace it with certified SPPE.

(c) *Recognizing other quality assurance programs.* The MMS will consider recognizing other quality assurance programs covering the manufacture of SPPE. If you want MMS to evaluate other quality assurance programs, submit relevant information about the program and reasons for recognition by MMS to the Chief, Engineering and Operations Division; Minerals Management Service; Mail Stop 4700; 381 Elden Street; Herndon, Virginia 20170–4817.

[62 FR 42671, Aug. 8, 1997. Redesignated at 63 FR 29479, May 29, 1998, as amended at 63 FR 37068, July 9, 1998]

§ 250.807 Hydrogen sulfide.

Production operations in zones known to contain hydrogen sulfide (H_2S) or in zones where the presence of H_2S is unknown, as defined in § 250.417 of this part, shall be conducted in accordance with that section and other relevant requirements of subpart H, Production Safety Systems.

[53 FR 10690, Apr. 1, 1988. Redesignated and amended at 63 FR 29479, 29485, May 29, 1998]

Subpart I—Platforms and Structures

§ 250.900 General requirements.

(a) The lessee shall design, fabricate, install, use, inspect, and maintain all platforms and structures (platforms) on the Outer Continental Shelf (OCS) to assure their structural integrity for the safe conduct of drilling, workover, and production operations, considering the specific environmental conditions at the platform location.

(b) All new fixed or bottom-founded platforms (i.e., platforms or other structures, e.g., single-well caissons, artificial islands), shall be designed, fabricated, installed, inspected, and maintained in accordance with all the requirements of this section and §§ 250.901 and 250.904 through 250.914 of this subpart. Applications submitted pursuant to § 250.901 shall require the approval by the Regional Supervisor prior to platform installation.

(c) All new platforms which meet any of the conditions listed below shall be subject to the Platform Verification Program and shall be designed, fabricated, and installed in accordance with the requirements of §§ 250.901 through 250.914 of this part.

(1) Platforms installed in water depths exceeding 400 feet,

(2) Platforms having natural periods in excess of 3 seconds,

(3) Platforms installed in areas of unstable bottom conditions,

(4) Platforms having configurations and designs which have not previously been used or proven for use in the area, or

(5) Platforms installed in seismically active areas.

(d) Major modification to any platform shall be subject to the requirements of this subpart and shall require the approval of the Regional Supervisor. Major modification means any structural changes which materially alter the approved plan or causes a major deviation from approved operations.

(e)(1) Major repairs of damage to any platform shall require the prior approval of the Regional Supervisor. Major repairs of damage means corrective operations involving structural members affecting the structural integrity of a portion or all of the platform.

(2) Under emergency conditions, repairs to primary structural elements may be made to restore an existing permitted condition without prior approval. The Regional Supervisor shall

be notified within 24 hours of the damage that occurred and repairs that were made. The Regional Supervisor's approval for repairs shall be obtained.

(f) The requirements for an application for approval for the reuse or conversion of the use of an existing fixed or mobile platforms shall be determined on a case-by-case basis. An application shall be submitted to the Regional Supervisor for approval and shall include location, intended use, and demonstrate the adequacy of the design and structural condition of the platform.

(g) In addition to the requirements of this subpart, platform design, fabrication, and installation shall conform to API RP 2A, Recommended Practice For Planning, Designing, And Constructing Fixed Offshore Platforms, or American Concrete Institute (ACI) 357R, Guide for the Design and Construction of Fixed Offshore Concrete Structures, as appropriate. Alternative codes or rules may be utilized with approval of the Regional Supervisor. The requirements contained in these documents (API RP 2A and ACI 357R) are incorporated herein insofar as they do not conflict with other provisions of this subpart.

[53 FR 10690, Apr. 1, 1988. Redesignated and amended at 63 FR 29479, 29485, May 29, 1998; 64 FR 9065, Feb. 24, 1999]

§ 250.901 Application for approval.

(a) All applications under the provisions of this subpart shall be submitted to the Regional Supervisor for approval. All significant changes or modifications to approved applications shall be submitted to the Regional Supervisor for approval.

(b) Applications for all new platforms or major modifications shall be submitted in triplicate and shall contain the following information:

(1) General platform information including the following:

(i) The platform designation, lease number, area name, and block number;

(ii) Longitude and latitude coordinates, Universal Transverse Mercator grid-system coordinates, state plane coordinates in the Lambert or Transverse Mercator Projection system, and a plat drawn to a scale of 1 inch = 2,000 feet showing surface location of the platform and distance from the nearest block lines;

(iii) Drawings, plats, front and side elevations of the entire platform, and plan views that clearly illustrate essential parts, i.e., number and location of well slots, design loadings of each deck, water depth, nominal size and thickness of all primary load-bearing jacket and deck structural members, and nominal size, makeup, thickness, and design penetration of piling;

(iv) Corrosion protection or durability details which consist of the corrosion-protection method; expected life; and durability criteria for the submerged, splash, and atmospheric zones; and

(v) In the Alaska OCS Region, the following additional information shall be submitted:

(A) Slope protection and berm elevation for manmade islands,

(B) Wall thickness with size and placement of major steel reinforcement for concrete-gravity structures,

(C) Shell thickness with size and location of major reinforcement members for steel-gravity structures, and

(D) A plan for periodic inspections of the installed platforms in accordance with § 250.912 of this part.

(2) A summary of environmental data, as addressed in § 250.904 of this part, which has a bearing on the platform's design, installation, and operation, e.g., wave heights and periods, current, vertical distribution of wind and gust velocities, water depth, storm and astronomical tide data, marine growth, snow and ice effects, and air and sea temperatures;

(3) Foundation information including the following:

(i) A geotechnical investigation report containing a brief summary of the major strata encountered at the location by bore holes presented in tabular form, a detailed subsurface profile illustrating results of field and laboratory testing, a listing of field and laboratory investigations and tests with a basic summary of resultant determinations, the identification of properties and conditions of the seabed and the subsoil, and the identification of any manmade hazards or obstructions;

(ii) A description of the effect of the environmental and functional loads on the foundation;

(iii) A determination, with supporting information, of the susceptibility of the area to soil movement and, if susceptible, an analysis of slope and soil stability;

(iv) A summary of the foundation design criteria as specified in § 250.909 of this part; and

(v) A summary of the seafloor survey results specified in § 250.909(b)(2) of this part.

(4) Structural information including the following:

(i) The design life of the platform and the basis for such determination.

(ii) A summary description of the design load conditions and design load combinations, taking into consideration the worst environmental and operational conditions anticipated over the service life of the platform.

(iii) A listing and description of the appropriate material specifications.

(iv) A description of the design methodologies, e.g., elastic, inelastic, and ultimate strength, used in design of the platform.

(v) A summary of pertinent derived factors of safety against failure for major structural members, e.g., unity check ratios exceeding 0.85 for steel-jacket platform members, indicated on ''line'' sketches of jacket sections.

(vi)(A) In the Alaska, Atlantic, and Pacific OCS Regions, a summary of the fatigue analysis as specified in §§ 250.905 through 250.909 of this part. The specific requirements for a fatigue analysis shall be determined by the Regional Supervisor on a case-by-case basis to determine the adequacy of the design and to assure the structural integrity of the platform.

(B) In the Gulf of Mexico OCS Region, a summary of the fatigue analysis as specified in §§ 250.905 through 250.909 of this part. A fatigue analysis shall be performed for each steel template, pile-supported platform with natural periods greater than 3 seconds, and for each platform to be fabricated of high-strength steel (i.e., over 50 thousand pounds per square inch minimum yield) where components of high-strength steel are subjected to cyclic loading. The specific requirements for a fatigue analysis for other platforms shall be determined by the Regional Supervisor on a case-by-case basis to determine adequacy of the design and to assure the structural integrity of the platform.

(c) The information shall be submitted with or subsequent to the submittal of an Exploration Plan or Development and Production Plan. Additional detailed data and information may be required by the Regional Supervisor when needed to determine the adequacy of the design.

(d) The lessee shall have detailed structural plans as called for in paragraph (b)(1)(iii) of this section and specifications for new platforms or other structures and major modifications certified by a registered professional structural engineer or civil engineer specializing in structural design. The lessee shall also sign, date, and submit the following certification: Lessee certifies that the design of the structure/modification has been certified by a registered professional structural or a civil engineer specializing in structural design, and the structure/modification will be fabricated, installed, and maintained as described in the application and any approved modification thereto. Certified design and as built plans and specifications will be on file at———.

(e) The lessee shall notify the Regional Supervisor at least 1 week prior to transporting the platform to the installation site.

[53 FR 10690, Apr. 1, 1988. Redesignated and amended at 63 FR 29479, 29485, 29486, May 29, 1998; 64 FR 9065, Feb. 24, 1999]

§ 250.902 Platform Verification Program requirements.

(a) *Requirements.* These requirements apply to the design, fabrication, and installation of new, fixed, bottom-founded, pile-supported, or concrete-gravity platforms. The applicability of these requirements to other types of platforms shall be determined by the MMS on a case-by-case basis. For all new platforms or major modifications which meet any of the conditions contained in § 250.900(c) of this part, the lessee shall submit the design, fabrication, and installation verification plans to the Regional Supervisor for approval

in accordance with paragraph (b) of this section. The design plan shall be submitted with or subsequent to the submittal of an Exploration Plan or Development and Production Plan. The fabrication and installation plans shall be submitted and approval obtained before such operations are initiated.

(b) *Verification plan requirements.* (1) *General plan requirements.* Each verification plan shall be submitted in triplicate and include the following:

(i) A nomination of a Certified Verification Agent (CVA) who shall conduct specified reviews in accordance with § 250.903 of this part,

(ii) The CVA qualification statement consisting of the following:

(A) Previous experience in third-party verification or experience in the design, fabrication, and/or installation of offshore oil and gas platforms, manmade islands, or other marine structures;

(B) Technical capabilities of the individual or the primary staff to be associated with the CVA functions for the specific project;

(C) Size and type of organization or corporation;

(D) In-house availability of, or access to, appropriate technology, i.e., computer programs and hardware and testing materials and equipment;

(E) Ability to perform the CVA functions for the specific project considering current commitments; and

(F) Previous experience with MMS requirements and procedures.

(iii) The level of work to be performed by the CVA, and

(iv) A list of documents to be furnished to the CVA.

(2) *Design verification plan requirements.* The design plan shall also include the following:

(i) All design documentation specified in § 250.901(b) of this part, and

(ii) Abstracts of the computer programs used in the design process.

(3) *Fabrication verification plan requirements.* The fabrication plan shall also include fabrication drawings and material specifications for artificial island structures, major members of concrete- and steel-gravity structures, all the primary load-bearing members included in the space-frame analysis for jacket structures, and a summary description of the following:

(i) Structural tolerances,

(ii) Welding procedures,

(iii) Material (concrete, gravel, or silt) placement methods,

(iv) Fabrication standards,

(v) Material quality-control procedures,

(vi) Methods and extent of nondestructive examinations (NDE) for welds and materials, and

(vii) Quality assurance procedures.

(4) *Installation verification plan requirements.* Additionally, the installation plan shall include a summary description of the planned marine operations, contingencies considered, alternate courses of action, and the inspections to be performed including a graphical identification of areas to be inspected and the acceptance/rejection criteria.

(c) *Requirements for resubmittal.* All such plans or the appropriate part affected shall be resubmitted for approval if the CVA is changed, if the CVA's or assigned personnel's qualifications change, or if the level of work to be performed changes. The summary of technical details need not be resubmitted, unless changes are made in the technical details.

(d) *Combining of plans.* For manmade islands or platforms fabricated and installed in place, the fabrication and installation verification plans shall be combined.

[53 FR 10690, Apr. 1, 1988. Redesignated and amended at 63 FR 29479, 29486, May 29, 1998]

§ 250.903 Certified Verification Agent duties and nomination.

(a) *CVA duties.* The CVA nominated by the lessee and approved by the Regional Supervisor shall conduct the appropriate reviews in accordance with the following:

(1) *Design phase.* (i) The CVA shall conduct the design verification to ensure that the proposed platform or major modification has been designed to withstand the maximum environmental and functional load conditions anticipated during the intended service life at the proposed location.

(ii) The design verification shall be conducted by, or be under the direct

supervision of, a registered professional civil or structural engineer.

(iii) The CVA shall consider the applicable provisions of §§ 250.904 through 250.911 of this part and use good engineering practice in conducting an independent assessment of the adequacy of all proposed planning criteria, environmental data, load determinations, stress analyses, material designations, soil and foundation conditions, safety factors, and other pertinent parameters of the proposed design.

(iv) Interim reports shall be submitted by the CVA, as appropriate, to the Regional Supervisor and the lessee.

(v) Upon completion of the design verification, a final report shall be prepared which summarizes the material reviewed by the CVA and the findings and includes a recommendation that the Regional Supervisor either accept, request modification(s), or reject the proposed design. In addition, the report shall include the particulars of how, by whom, and when the independent review was conducted and any special comments considered necessary. The final report shall be submitted to the lessee and, in triplicate, to the Regional Supervisor within 6 weeks of the receipt of the design data or from the date the approval to act as a CVA was issued, whichever is later.

(2) *Fabrication verification.* The CVA shall monitor the fabrication of the platform or major modification to ensure that it has been built in accordance with the approved design plans and specifications and the fabrication plan, including the following:

(i) Periodic onsite inspections shall be made while fabrication is in progress. The following of the fabrication items, as appropriate, shall be verified:

(A) Quality control by lessee and builder,

(B) Fabrication site facilities,

(C) Material quality and identification methods,

(D) Fabrication procedures specified in the approved plan and adherence to such procedures,

(E) Welder and welding procedure qualification and identification,

(F) Structural tolerances specified and adherence to those tolerances,

(G) The NDE requirements and evaluation results of the specified examinations,

(H) Destructive testing requirements and results,

(I) Repair procedures,

(J) Installation of corrosion-protection systems and splash-zone protection,

(K) Erection procedures to ensure that overstressing of structural members does not occur,

(L) Alignment procedures,

(M) Dimensional check of the overall structure, and

(N) Status of quality-control records at various stages of fabrication.

(ii) The CVA shall consider the applicable provisions of §§ 250.904 through 250.911 of this part and use good engineering practice in conducting an independent assessment of the adequacy of the fabrication of the platform or major modification.

(iii) Interim reports shall be submitted by the CVA, as appropriate, to the Regional Supervisor and the lessee.

(iv) If the CVA finds that fabrication procedures are changed or design specifications are modified, the lessee shall be informed. If the lessee prefers to accept the modifications as informed by the CVA, the Regional Supervisor shall also be informed.

(v) A final report shall be prepared by the CVA covering the adequacy of the entire fabrication phase giving details of how, by whom, and when the independent monitoring activities were conducted and providing any special comments considered necessary. The final report is not required to cover aspects of the fabrication already included in interim reports. The final report shall describe the CVA's activities during the verification process, summarize the findings, contain a confirmation or denial of compliance with the design specifications and the approved fabrication plan, and a recommendation to accept or reject the fabrication. The report shall be submitted to the lessee and, in triplicate, to the Regional Supervisor immediately after completion of the fabrication of the platform.

(3) *Installation phase.* The CVA shall witness the loadout of the jacket, deck(s), and piles from the fabrication

site(s); review the towing records; conduct an onsite survey after transportation to the approved location; witness the actual installation of the platform or major modification; determine that the platform has been installed at the approved location in accordance with the approved design and the installation plan; and shall comply with the following:

(i) The CVA shall consider the applicable provisions of §§ 250.904 through 250.911 of this part and use good engineering practice in conducting an independent assessment of the adequacy of the installation activities. The following parts of the overall installation process, as appropriate, shall be verified:

(A) Loadout and initial flotation operations, if any;

(B) Towing operations to the specified location;

(C) Launching and uprighting operations;

(D) Submergence operations;

(E) Pile installation; and

(F) Final deck and/or component installation.

(ii) The CVA shall observe the installation activities, spot-check equipment, procedures, and recordkeeping, as necessary, to determine compliance with §§ 250.904 through 250.911 of this part and the approved plans, and immediately report to the Regional Supervisor and the lessee any discrepancies or damage to structural members. Approval for modified installation procedures or for major deviation from approved installation procedures shall be obtained from the Regional Supervisor.

(iii) Interim reports shall be submitted by the CVA, as appropriate, to the Regional Supervisor and the lessee.

(iv) A final report shall be prepared by the CVA covering the adequacy of the entire installation phase giving details of how, by whom, and when the independent monitoring activities were conducted and providing any special comments considered necessary. The final report shall describe the CVA's activities during the verification process, summarize the findings, contain a confirmation or denial of compliance with the approved installation plan, and a recommendation to accept or reject the installation. The report shall be submitted to the lessee and, in triplicate, to the Regional Supervisor within 2 weeks of completion of the installation of the platform.

(4) All data provided to the CVA shall be handled in the strictest confidence and not be released by the CVA without the consent of the lessee.

(5) Individuals or organizations acting as CVA's for a particular platform shall not function in any capacity other than that of a CVA for that specific project, whenever the additional activities would create a conflict, or appearance of a conflict of interest.

(b) *CVA nomination.* (1) *Nomination.* Individuals or organizations shall be nominated by the lessee planning to use their services. The lessee shall specify whether the nomination is for the design, fabrication, or installation phase of verification; for two phases; or for all three phases.

(2) *Qualifications.* Qualification submissions shall contain sufficient information to determine compliance with § 250.902(b)(1)(ii) of this part.

[53 FR 10690, Apr. 1, 1988. Redesignated and amended at 63 FR 29479, 29486, May 29, 1998]

§ 250.904 Environmental conditions.

(a) *General.* The performance standards of this section pertain to all platforms covered by these requirements regardless of the fabrication material.

(1) *Environmental considerations.* All environmental phenomena appropriate to the areas of fabrication, transportation, and installation of an offshore platform shall be considered and their influence on the platform accounted for. Such phenomena shall include wind, waves, current, temperature, tide, marine growth, chemical components of air and water, snow and ice, earthquakes, tsunami, seiche, and other appropriate phenomena.

(2) *Environmental data.* Statistical data and defensible statistical and mathematical models shall be employed to describe the range of pertinent expected variations of environmental phenomena. Defensible data supplied by meteorologists, oceanographers, or other appropriate specialists are acceptable as the basis for design. Where possible, environmental phenomena shall be described by the

characteristic parameters most relevant in the evaluation of effects on the platform.

(b) *Statistical methods.* (1) When statistical methods are employed in the determination of parameters characterizing environmental phenomena, the statistical methods and distributions employed shall be appropriate to their application as evidenced by relevant statistical tests, confidence limits, and other measures of statistical significance.

(2) Short-term and long-term variations of environmental phenomena such as wind, waves, and current shall be described by statistical distributions relevant to the parameter considered. Defensible statistical modeling techniques shall be used in the prediction of extreme values.

(3) When hindcasting techniques are employed to approximate environmental parameters, the validity of the model used shall be defensible.

(c) *Design considerations.* (1) *General.* A thorough assessment of the environment in the vicinity of the installation site shall be made to determine the conditions expected to occur at the site over the life of the platform.

(2) *Design environmental condition.* (i) ''Design environmental condition'' means the environmental factors producing the most unfavorable effects on the platform. Parameters describing the design environmental condition are given in paragraphs (c)(2)(ii) (A), (B), and (C) of this section.

(ii) The design environmental condition shall reflect the various environmental events that individually or collectively represent the most severe conditions the platform is anticipated to experience. Such conditions shall be formulated with a set of parameters that describe the relevant environmental events, including the following:

(A) The maximum wave corresponding to a selected recurrence period together with the associated wind, current, and appropriate ice and snow effects;

(B) The minimum air and sea temperatures appropriate to the event being treated; and

(C) The maximum water level due to tide and storm surge.

(iii) Consideration shall be given to other combinations of the parameters specified in paragraph (c)(2)(ii)(A) of this section involving either maximum wind, maximum current, or maximum ice load which may cause a greater response of the platform.

(iv) In general, the recurrence period chosen for the events specified in paragraphs (c)(2)(ii) (A) and (C) of this section shall primarily be based on the design service life of the platform. For platforms designed for a service life of 20 years, the recurrence period chosen for the determination of these events shall not be less than 100 years. For other service lives, the design event recurrence interval shall generally be adjusted to provide for a risk of occurrence which does not exceed the risk of occurrence for the 20-year/100-year combination.

(v) For installation sites located in seismically active areas, see paragraph (d)(8) of this section.

(3) *Operating environmental conditions.* Operating environmental conditions means the set of characteristic parameters of environmental conditions associated with a normal function or operation to be conducted on the platform. For each such intended normal function or operation, the lessee shall determine a set of characteristic parameters of environmental conditions.

(d) *Specific environmental conditions.* (1) Waves information including the following:

(i) Wave conditions considered for design shall be described by defensible statistical and/or deterministic methods.

(ii) Parameters characterizing design environmental waves shall be based on wave statistics or the results of defensible analytic prediction methods such as hindcasting techniques.

(iii) When using probabilistic analyses, the probability of occurrence of various wave-height groups classified by directionality and for a wide range of possible periods (i.e., tables of exceedance) shall be determined. Where required by the method selected to predict extreme values, the average duration of various wave-height groups (i.e., persistence data) shall be determined. All extrapolations and long-

term wave data analyses shall use defensible techniques, and available data on extreme values measured in the vicinity of the site shall be included in the long-term prediction.

(iv) When using deterministic methods, waves shall be described by the parameters, height, period, and other relevant shape characteristics. The design-wave formulation used shall be valid for the problem considered.

(v) Breaking-wave criteria appropriate to the installation site shall be determined using defensible formulations.

(vi) If spectral wave data are established for the dynamic analysis of structural response to waves, such data shall be derived in accordance with defensible methods. If spectral data are not available in adequate quantities for the intended application, defensible mathematical formulations that best fit the available data shall be used.

(2) Wind information including the following:

(i) Wind velocities shall be classified on the basis of their duration. Wind velocities having a duration of less than 1 minute are referred to as gust winds. Wind velocities having a duration equal to or greater than 1 minute are referred to as sustained winds. The reference elevation is 33 feet above still-water level.

(ii) Wind conditions considered for design shall be described by defensible statistical or deterministic methods.

(iii) Wind profiles shall be determined on the basis of defensible statistical or mathematical models. Corrections of wind velocity data to averaging periods other than those employed in the collections of data shall be based on defensible methods.

(iv) Distribution of the direction and speed of wind approach to the platform shall be determined, or alternatively, winds shall be considered to approach from any direction.

(3) Current information including the following:

(i) Current velocities to be used in design shall be determined on the basis of the best statistics available. Tidal current, wind-generated current, density current, circulation current, and river-outflow current shall be combined on the basis of their probability of simultaneous occurrence in arriving at current velocities to be used in design.

(ii) Current velocity profiles shall be determined on the basis of site-specific studies or defensible empirical relationships. Unusual profiles due to bottom currents and stratified effects in regions near the mouth of large rivers shall be accounted for.

(iii) Directional data on currents which exist in the absence of waves shall be described for each month or by season. Unless a detailed study of current directions is made, currents shall be assumed to run in any direction.

(4) Tide information including the following:

(i) The design storm-tide elevation shall be identified for the installation site. For design purposes, the design environmental wave height shall be superimposed on the storm-tide elevation.

(ii) Variations in the elevation of the daily lunar tide shall be used in determining the elevations of boat landings, barge fenders, and the corrosion-prevention treatment of platforms in the splash zone (see §250.906(c)(5) of this part).

(iii) The assumed maximum or storm tide shall include astronomical tide, wind tide, and pressure-induced storm surge. Minimum-tide estimates shall be based on either the astronomical or lunar tide only. The water depth shall be referenced to a datum (e.g., mean low/water or mean low low/water) consistent with all other references to elevations and depths.

(iv) If data directly applicable to the installation site are not available, the best estimate based on data for nearby locations shall be used.

(5) Temperature information including the following:

(i) Extreme values of low temperatures shall be expressed in terms of the most probable, lowest values with their corresponding recurrence periods;

(ii) Air, sea surface, and seabed temperatures shall be accounted for in describing the environment and in justifying the temperatures used in design.

(6) Snow and ice information including the following:

(i) If the platform is to be located in an area where sea ice may develop or drift, ice conditions shall be accounted

for. Data shall be derived from actual field investigations, laboratory analyses, or other appropriate analogous sources;

(ii)(A) Relevant statistical and physical data on the sea-ice and snow conditions shall be described with particular attention to the following:

(*1*) Concentration and distribution of ice and snow,

(*2*) Morphology of sea ice (e.g., ice floes, ice ridges, or rafted ice),

(*3*) Mechanical properties of ice (mode of failure),

(*4*) Drift speed and direction,

(*5*) Thickness of ice and keel depth of pressure ridges, and

(*6*) Probability of encountering icebergs, ice floes, ice-floe fragments, and hummocks.

(B) The weight of the maximum snow and ice anticipated to accumulate on the platform shall be determined.

(*7*) Marine growth information including the following:

(i) When assessing the potential for marine growth, account shall be taken of relevant observations and experience in the area. In the absence of such information, defensible analytical techniques shall be employed to assess the potential for marine growth. These techniques shall take into account salinity, oxygen content, hydrogen-ion concentration value, current, temperature, water turbidity, and other appropriate factors.

(ii) Consideration shall be given to the selection of surface coatings which resist breakdown by micro-organisms which reduce the onset of corrosion.

(iii) Particular attention shall be paid to the effects that marine growth has on surface roughness characteristics of submerged structural members.

(8) Earthquake information including the following:

(i) The effects of earthquakes on platforms located in areas known to be seismically active shall be addressed.

(ii) Except for the provision of § 250.905(d)(5)(ii) of this part, the seismicity of the site shall be determined. Preferably, this shall be based on site-specific data. However, regional data shall be deemed acceptable for use when site-specific data are not available and the regional data are interpreted in a manner to produce the most adverse effect on a platform at the specific site. The following data shall be obtained:

(A) Recurrence interval of seismic events appropriate to the design life of the structure,

(B) Proximity to active faults,

(C) Type of faulting,

(D) Attenuation of ground motion between the faults and the site,

(E) Subsurface soil conditions, and

(F) Records from past seismic events at the site or from analogous sites.

(iii) The use of available data to describe the seismic characteristics of the site is permitted where it can be shown that such data are consistent with the requirements of paragraph (d)(8)(ii) of this section.

(iv) The seismic data shall be used to establish a quantitative design earthquake criterion describing the design earthquake-induced ground motion. In addition to ground motion and as applicable to the installation site, the following earthquake-related phenomena shall be taken into account:

(A) Liquefaction of subsurface soils,

(B) Submarine slides,

(C) Tsunamis, and

(D) Fluid motions in tanks.

[53 FR 10690, Apr. 1, 1988; 53 FR 26067, July 11, 1988. Redesignated and amended at 63 FR 29479, 29486, May 29, 1998]

§ 250.905 Loads.

(a) *Introduction.* This section covers the identification, definition, and determination of the loads to which a fixed offshore platform may be exposed during and after its transportation and installation. The requirements contained in paragraphs (b) through (d) of this section apply to both steel-piled platforms and concrete-gravity platforms. Additional requirements covering steel-piled platforms are contained in paragraph (e) of this section. Additional requirements covering concrete-gravity platforms are contained in paragraph (f) of this section.

(b) *General.* (1) All types of loads specified in paragraphs (c)(1) through (c)(5) of this section shall be accounted for in the design and operation of the platform.

(2) Where applicable, the effects of increased dimensions and weight due to

marine growth and snow and ice accumulation shall be addressed in the design.

(c) *Load definition.* (1) *Dead loads.* Dead loads associated with the platform are loads that do not change during the mode of operation under consideration. Dead loads include the following:

(i) Weight in the air of the platform (refer to paragraphs (e)(1) and (f)(1) of this section for itemizations of weight for pilefounded platforms and gravity platforms, respectively).

(ii) Weight of permanent ballast and the weight of permanent machinery including liquids at operating levels.

(iii) External hydrostatic pressure and buoyancy in calm sea conditions calculated on the basis of the design waterline.

(iv) Static earth pressure.

(2) *Live loads.* Live loads associated with the normal operation and use of the platform are loads that could change during the mode of operation considered. Live loads acting after fabrication or installation include the following:

(i) Weight of drilling and production equipment that can be removed such as derrick, draw works, mud pumps, mud tanks, separators, and tanks.

(ii) Weight of crew and consumable supplies such as mud, chemicals, water, fuel, pipe, cable, stores, drill stem, and casing.

(iii) Weight of liquids in storage tanks.

(iv) Forces exerted on the platform due to drilling, e.g., the maximum derrick reaction when placing or pulling casing.

(v) The forces exerted on the platform during the operation of cranes and vehicles.

(vi) The forces exerted on the platform by vessels moored to the platform.

(vii) The forces exerted on the platform by helicopters during takeoff and landing or while parked on the platform. When applicable, the dynamic effects on the platform of the forces specified in paragraphs (c)(2) (iv) through (vii) of this section shall be taken into account. Live loads occurring during transportation and installation shall be determined for each specific operation involved, and the dynamic effects of such loads shall be addressed (see §250.910 of this part).

(3) *Deformation loads.* Deformation loads are loads due to deformations imposed on the platform. For an itemization of deformation loads applicable to steel-piled platforms and concretegravity platforms, see paragraphs (e)(2) and (f)(2) of this section, respectively.

(4) *Accidental loads.* Consideration shall be given to accidental loadings; and where such loadings are determined to be a factor, they shall be quantified and incorporated into the design. Accidental loads are loads that could occur as the result of an accident or exceptional conditions, such as the following:

(i) Extreme impact loads caused by supply boats, barges, and other craft anticipated to work in the vicinity of the platform;

(ii) Impact loads caused by dropped objects, such as drill collars, casing, blowout-preventer stacks;

(iii) Loss of internal pressure required to resist hydrostatic loading and to maintain buoyancy during the installation of the platform;

(iv) Explosion;

(v) Effects of fire; and

(vi) Iceberg collision.

(5) Environmental load information including the following:

(i) Environmental loads are loads due to wind, waves, current, ice, snow, earthquake, and other environmental phenomena.

(ii) The characteristic parameters defining an environmental load shall be appropriate to the installation site as determined by the studies required by §250.904 of this part. Operating environmental loads are loads derived from the parameters characterizing operating environmental conditions (see §250.904(c)(3) of this part). Design environmental loads are loads derived from the parameters characterizing the design environmental condition (see §250.904(c)(2) of this part).

(iii) Environmental loads shall be applied to the platform from directions producing the most unfavorable effects on the platform unless site-specific studies allow for a less stringent requirement.

(iv) The combination and severity of design environmental loads shall be consistent with the likelihood of their simultaneous occurrence. The simultaneous occurrence of environmental loads shall be modeled by appropriate superposition methods.

(v) Earthquake loads and loads resulting from accidental or rare environmental phenomena need not be combined with other environmental loads unless site-specific conditions indicate that such combination is appropriate.

(d) *Determination of environmental loads.* (1) Wave load information including the following:

(i) Wave-induced loads shall be calculated using defensible methods or shall be obtained from adequate model or field test data;

(ii) A sufficient range of waves and wavecrest positions relative to the platform shall be investigated to ensure an accurate determination of the maximum wave load on the platform;

(iii) Wave impact loads on structural members below the design wave crest elevation shall be accounted for by defensible theoretical methods or relevant model test of full-scale data;

(iv) Where applicable, the possibility of dynamic excitation of the platform due to flow-induced cyclic loading shall be addressed;

(v) For additional requirements pertaining to steel-piled platforms and concrete gravity-platforms, see paragraphs (e)(3) and (f)(3) of this section, respectively; and

(vi) Where applicable, additional hydrostatic loading effects shall be addressed.

(2) Wind load information including the following:

(i) Wind loads, local wind pressures, and wind profiles shall be determined on the basis of defensible analytical methods or wind tunnel tests on a representative model of the platform,

(ii) In determining design environmental loads on the overall platform, wind loads calculated on the basis of the design-sustained wind velocity shall be combined with other design environmental loads,

(iii) The design gust wind load shall be used in the design of local structure unless the effects of the load combination described in paragraph (d)(2)(ii) of this section are more severe,

(iv) Where appropriate, the dynamic effects due to the cyclic nature of gust wind and cyclic loads due to vortex shedding shall be taken into account. Both the drag and lift components of loads due to vortex shedding shall be taken into account.

(v) Where appropriate, flutter and load amplification due to vortex shedding shall be addressed.

(3) Current load information including the following:

(i) Current-induced loads on immersed members of the platform shall be accounted for by defensible methods or the results of model test or site-specific data,

(ii) The lift and drag coefficients used in the determination of current loads shall be appropriate to the current velocity and structural configuration,

(iii) Current velocity profiles used in design shall be appropriate to the installation site,

(iv) For determination of loads induced by the simultaneous occurrence of wave and current fields, the total velocity field shall be computed by defensible methods before computing the total force, and

(v) Where appropriate, flutter and load amplification due to vortex shedding shall be addressed.

(4) Ice and snow load information including the following:

(i) For platforms located in areas associated with ice movement, contact loads caused by floating ice shall be determined according to defensible theoretical methods, model test data, or full-scale measurements;

(ii) In locations where platforms are subject to ice and snow accumulation, the additional weight of snow and ice on the platform shall be addressed;

(iii) The effects of ice accumulation and ice jam, including the effects of changes in configuration due to adhesion, shall be accounted for in the determination of the total environmental load; and

(iv) The incident pressure due to pack ice, pressure ridges, and where appropriate, ice island fragments impinging on the platform shall be addressed.

(5) Earthquake load information including the following:

(i) For platforms located in seismically active areas, design earthquake-induced ground motions shall be determined on the basis of seismic data applicable to the installation site. Design earthquake ground motions shall be described by either applicable ground motion records or response spectra consistent with the recurrence period appropriate to the design life of the platform.

(ii) Available and defensible standardized spectra applicable to the region of the installation site are acceptable if such spectra reflect those site-specific conditions affecting frequency content and energy distribution. These conditions include the type of active faults in the region, the proximity of the site to the potential source faults, the attenuation or amplification of ground motion between the faults and the site, and the soil conditions at the site.

(iii) Ground-motion descriptions shall consist of three components corresponding to two orthogonal horizontal directions and the vertical direction. All three components shall be applied to the platform simultaneously.

(iv)(A) When the response spectrum method is used for structural analysis, input values of ground motion (spectral acceleration representation) shall not be less severe than the following:

(*1*) One hundred percent in a principal horizontal direction,

(*2*) Sixty-seven percent in the orthogonal horizontal direction, and

(*3*) Fifty percent in the vertical direction.

(B) The horizontal components shall also be applied in the alternative orthogonal horizontal directions.

(v) If the time history method is used for structural analysis, at least three sets of ground-motion time histories shall be employed. The manner in which the time histories are used shall account for the potential sensitivity of the platform's response to variations in the phasing of the ground-motion records.

(vi) When applicable, effects of soil liquefaction and/or loads resulting from submarine slides or creep, tsunamis, and earthquake motions shall be addressed.

(e) *Loads on steel pile-supported platforms.* The following requirements apply to loads on steel pile-supported platforms and shall be applied together with the requirements in paragraphs (b), (c), and (d) of this section:

(1) The dead load of the platform shall include, as appropriate, the weight in air of the jacket, piling, grout, superstructure modules, stiffeners, decking, piping, heliport, and any other fixed structural part less buoyancy, with due allowance for flooding.

(2) Where appropriate, the deformation loads to be accounted for are those resulting from temperature variations leading to thermal stresses in the platform, and those resulting from soil displacements (e.g., differential settlements or lateral displacements).

(3) Wave load information including the following:

(i) For platforms composed of members having diameters that are negligible in relation to the wave lengths considered, semiempirical formulations accounting for wave-induced drag and inertia forces based on the water particle velocities and accelerations on an undisturbed, incident flow field are acceptable;

(ii) When a method as described in paragraph (e)(3)(i) of this section is used, the wave field shall be described by a defensible wave theory appropriate to the wave heights, wave periods, and water depth at the installation site;

(iii) The coefficients of drag and inertia used in calculating wave loads shall be determined on the basis of model test results, published data, or full-scale measurements appropriate to the structural configuration, surface roughness, and wave field; and

(iv) For platforms composed of members whose diameters are not negligible in relation to the wave lengths considered and for structural configurations that will substantially alter the undisturbed, incident flow field, diffraction forces and the hydrodynamic interaction of structural members shall be taken into account.

(f) *Loads on concrete-gravity platforms.* The following requirements apply to loads on concrete-gravity platforms and shall be applied together with the

requirements described in paragraphs (b), (c), and (d) of this section.

(1) The dead load of the platform shall include, as appropriate, the weight in air of the foundation, skirts, columns, superstructure modules, decking, piping, heliport, and any other fixed structural part less buoyancy with due allowance for flooding. Weight calculations based on nominal dimensions and mean values of density are acceptable.

(2) The deformation loads to be accounted for are those due to prestress, shrinkage and expansion, creep, temperature variations, and differential settlements.

(3) Wave load information including the following:

(i) For platforms composed of large gravity bases and one or more columns whose diameters are not negligible in relation to the wave lengths considered, defensible wave-load theories which account for the drag, inertia, and diffraction forces on the platform shall be employed;

(ii) For complex structural configurations, the hydrodynamic interaction of large, immersed structural members shall be addressed;

(iii) When diffraction forces and hydrodynamic interaction are negligible, only semiempirical formulations comparable to those mentioned in paragraphs (e)(3) (i) and (iii) of this section accounting for drag and inertia forces are acceptable; and

(iv) The undisturbed, incident flow field shall be addressed by a defensible wave theory appropriate to the wave heights, wave periods, and water depth at the installation site.

[53 FR 10690, Apr. 1, 1988; 53 FR 26067, July 11, 1988. Redesignated and amended at 63 FR 29479, 29486, May 29, 1998]

§ 250.906 General design requirements.

(a) *General.* This section specifies the general concepts and methods of analysis to be incorporated in the design of a platform.

(b) *Analytical approaches.* (1) Structural response information including the following:

(i) Methods of analysis employed in association with the specifications of these requirements shall treat geometric and material nonlinearities in a defensible manner. When nonlinear methods of analysis are used to assess collapse mechanisms, it shall be demonstrated that the platform has sufficient ductility to develop the required resistance or structural displacements.

(ii) Where theoretically based analytical procedures covering the platform or parts thereof are unavailable or not well defined, model studies shall be utilized. The acceptability of model studies depends on the procedures employed, including enumeration of the possible sources of errors, the limits of applicability of the model test results, and the methods of extrapolation to full-scale data.

(2) Loading format information including the following:

(i) Either a deterministic or spectral format shall be employed to describe various load components. When a static approach is used, it shall be demonstrated, where appropriate, that the general effects of dynamic amplification were addressed. The influence of waves other than the highest waves shall be investigated for their potential to produce maximum peak stresses resulting from possible resonance with the platform.

(ii) When considering the design earthquake as discussed in § 250.905 of this part, a dynamic analysis shall be performed. A dynamic analysis shall also be performed to assess the effects of environmental or other types of loads if significant dynamic amplification is expected.

(iii) For fatigue analysis, the long-term distribution of the stress range, with proper consideration of dynamic effects, shall be obtained for relevant loadings anticipated during the design life of the platform (see §§ 250.907(c)(6) and 250.908(c)(6) of this part).

(3) Combinations of loading components information including the following:

(i) Loads imposed during and after installation shall be taken into account. Of the various loads described in § 250.905, of this part, those loads to be considered for design shall be combined in a manner consistent with their probability of simultaneous occurrence. However, earthquake loadings shall be applied without consideration of other

environmental effects unless conditions at the site necessitate their inclusion. The direction of applied environmental loads shall be that producing the highest possible influences on the platform, considering the platform's orientation and location with respect to bottom topography, direction of fetch, and nearby land masses.

(ii) While it is required to obtain and use those loading components which produce realistic maximum effects on the platform, loading combinations corresponding to conditions after installation shall reflect both operating and design environmental loadings. Sections 250.907, 250.908, and 250.909 of this part give the minimum load combinations to be considered.

(iii) The operating environmental conditions and the maximum tolerable environmental loads during installation shall be specified.

(c) *Overall design considerations.* (1) *Design life.* The design service life of the platform shall be specified as prescribed in §250.904(c)(2)(iv) of this part.

(2) *Air gap.* An air gap of 5 feet shall be provided between the maximum crest elevation of the design wave (including tidal effects) and the lowest portion of the platform upon which wave forces have not been included in the design. After accounting for the initial and long-term settlements resulting from consolidation and subsidence, the elevation of the crest of the design wave shall be based on the elevation of the mean low-water line, astronomical and storm tides, wave runup, the tilting of the platform, and where necessary, tsunamis.

(3) *Long-term and secondary effects.* The following effects shall be addressed, as appropriate, for the planned platform:

(i) Local vibration due to machinery, equipment, and vortex shedding;

(ii) Stress concentrations at critical joints;

(iii) Secondary stresses induced by large deflections (P-Δ effects);

(iv) Cumulative fatigue;

(v) Corrosion;

(vi) Marine growth; and

(vii) Ice abrasion.

(4) *General arrangement.* The platform and equipment shall be arranged to minimize the potential of structural damage and personal injury resulting from accidents. In this regard, the consequences of the arrangement or placement of the following components and their effects shall be addressed:

(i) Equipment and machinery—noise and vibration,

(ii) High-pressure piping—leakage in closed spaces,

(iii) Lifting devices—dropped loads, and

(iv) Vessel mooring devices—line breakage and tripping quick-release mechanisms.

(5) *Corrosion-protection zones.* Measures taken to mitigate the effects of corrosion as required by §§250.907(d) and 250.908(c)(5) of this part shall be specified and described in terms of the following definitions for corrosion-protection zones:

(i) Submerged zone—that part of the platform below the splash zone,

(ii) Splash zone—that part of the platform between the highest and lowest water levels reached by sea states exceeded for 1 percent of the time annually when superimposed on the highest and lowest levels of tide with due allowance for high and low installation of the platform,

(iii) Atmospheric zone—that part of the platform above the splash zone,

(iv) Ice zone—that part of the platform which can reasonably be expected to come into contact with floating or submerged ice annually.

[53 FR 10690, Apr. 1, 1988; 53 FR 26067, July 11, 1988. Redesignated and amended at 63 FR 29479, 29486, May 29, 1998; 63 FR 34597, June 25, 1998]

§250.907 Steel platforms.

(a) *Materials*—(1) *General.* (i) This section covers specifications for materials used for the construction of steel pile-supported platforms. Steels shall be suitable for their intended service as demonstrated by testing under relevant service conditions or previous satisfactory performance under service conditions similar to those intended. Steels shall be of good commercial quality, defined by specification, and free of injurious defects.

(ii) Steels shall exhibit satisfactory formability and weldability characteristics and fracture toughness satisfactory for the intended applications. Materials for structural members which are fracture critical or for members which sustain significant tensile stress and whose fracture would pose a threat to the survival of the platform shall have sufficient toughness to guard against brittle fracture. Materials selected for members which are subjected to significant tensile stress shall have toughness suitable to their intended application.

(iii) In cases where principal loads from either service or weld residual stresses are imposed normal to the plate, appropriate precautions shall be taken to avoid lamellar tearing parallel to the plate surface.

(2) Material selection information including the following:

(i) Steels for structural members shall be selected according to criteria that take into account the required yield strength, fracture toughness, service temperature (see paragraph (a)(3) of this section), and intended application;

(ii) Bolts and nuts shall have mechanical and corrosion properties comparable to the structural elements being joined. Materials for bolts and nuts shall be defined by and tested in accordance with material standards compatible with those for the joined structural members;

(iii) When new alloys are used, the adequacy of fracture toughness shall be supported by appropriate fracture tests; and

(iv) When materials other than steel are used for structural purposes, the mechanical and durability properties necessary for their intended function shall be designated, including toughness and fatigue characteristics, where necessary.

(3) *Service temperature.* Service temperature means the temperature that the material is expected to achieve in the operational environment.

(i) For material at or below the waterline, the minimum service temperature shall be the lowest average daily water temperature applicable to the particular depth. For material above the waterline, the minimum service temperature shall be the lowest 1-day average daily atmospheric temperature over a 10-year period, unless the material is warmed by auxiliary heating.

(ii) In all cases where material temperature is reduced by localized cryogenic storage or other cooling means, such factors shall be accounted for in establishing minimum service temperature.

(4) *Classification of applications.* When considering the welding requirements given in subsequent sections, materials shall be considered as ''Weld Class A'' if the members are critical or special structural elements, ''Weld Class B'' if the members are primary load-carrying members of the platform, or ''Weld Class C'' if the members are secondary structural elements.

(5) *Material designation.* All material employed in platform construction shall be described and designated by a material specification.

(b) *Fabrication and welding*—(1) *General.* (i) Welding shall be performed in accordance with the applicable provisions of the American Welding Society (AWS) publication, AWS D1.1, Structural Welding Code—Steel, or other appropriate welding codes.

(ii) Fabrication other than welding shall be performed in accordance with American Institute of Steel Construction (AISC) publication, Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design, or other appropriate codes. The code to be followed during fabrication and construction shall be specified on design documents.

(2) *Welding.* (i) Welding procedures and filler metals shall be selected to produce sound welds, and the filler metal shall have strength and toughness compatible with the base metal. Workmanship shall be in compliance with paragraph (b)(1)(i) of this section.

(ii) Forming processes shall not degrade the base metals below their minimum required properties. A heat treatment shall be employed to provide the required properties, where necessary.

(iii) Misalignment between parallel (abutting) members shall be minimized. Weld size for fillet welds shall be sufficient to compensate for the gap

between faying surfaces of the members. Lapped joints shall possess sufficient overlaps. Both edges of an overlap joint shall have continuous fillet welds.

(iv) When arc-air gouging is employed, the carbon buildup and burning of the weld or base metals shall be minimized.

(v) Peening shall not be used for single-pass welds or for the root or cover passes of multipass welds. Peening shall be used only after cleaning of weld passes. Fairing by heating, flame shrinking, or other methods, when applied to Weld Class A or B structural elements, shall be performed without damaging the base metals. Such corrective measures shall be kept to a minimum when treating high-strength steels.

(3) *Quality assurance.* A documented inspection plan shall be prepared and followed and shall cover the following items:

(i) A suitable system for material identification and quality control during all stages of construction,

(ii) Requirements for welding procedures and welder qualifications,

(iii) The extent of weld inspection (including nondestructive examination methods) and the criteria for weld acceptance or rejection, and

(iv) Necessary dimensional tolerances.

(4) *Weld nondestructive examination.* (i) All welds shall be subjected to visual examination. Nondestructive examination shall be conducted to the extent indicated in paragraph (b)(4)(ii) of this section after all forming and postweld heat treatments have been completed. Weld examination procedures shall be adequate to detect delayed weld cracking in cases involving high-strength steels or high-hydrogen welding processes.

(ii) As called for in paragraph (b)(3)(iii) of this section, a plan for nondestructive examination of the welds shall be prepared and followed. The extent of inspection of Weld Classes A and B structural elements shall be consistent with the applications involved. Important welds of Weld Classes A and B structural elements are those inaccessible or very difficult to inspect in service. Important welds shall be subjected to an increased level of nondestructive examination during fabrication.

(iii) If the proportion of unacceptable welds becomes excessive, the frequency of nondestructive examination shall be increased.

(c) *Design and analysis*—(1) *General.* (i) Steel platforms shall be adequately designed and analyzed to withstand the loads to which they are likely to be exposed during their design life. The effects on the platform shall be determined for a minimum set of loading conditions by using a defensible method to ensure that the resulting responses do not exceed the safety criteria appropriate to the methods employed.

(ii) The use of design methods, other than those specifically covered in this section, and their associated safety criteria are allowed if it can be demonstrated that such alternative methods will result in a structural safety level equivalent to that provided by the direct application of these requirements.

(iii) Sections 250.905 and 250.906 of this part shall be consulted regarding definitions and requirements pertinent to the determination of loads and general design requirements.

(2) *Loading conditions.* (i) Appropriate loading conditions that produce the most adverse effects on the platform during and after fabrication and installation shall be considered;

(ii) Loadings corresponding to conditions after installation shall include at least those relating to both the operating and design environmental conditions, combined with other pertinent loads in the following manner:

(A) Operating environmental conditions combined with dead and live loads appropriate to the function and operation of the platform;

(B) Design environmental conditions combined with dead and live loads appropriate to the function and operation of the platform;

(C) Design environmental conditions combined with dead loads and minimum live loads appropriate to the function and operation of the platform; and

(iii) For platforms located in seismically active areas, loads induced by

earthquake ground motions shall be combined with dead and live loads appropriate to the operation and function of the platform.

(3) *Methods of design and analysis.* (i) The nature of loads and loading combinations as well as the local environmental conditions shall be considered in the selection of design methods. Methods of analysis and their associated assumptions shall be compatible with the overall design principles.

(ii) Linear, elastic methods (working stress methods) of design and analysis are acceptable if proper measures are taken to prevent general and local buckling failure. Regarding structural instability as a possible mode of failure, the effects of initial stresses and geometric imperfection shall be taken into account.

(iii) Dynamic effects shall be accounted for if the wave energy in the frequency range of the structural resonance frequencies is of sufficient magnitude to produce significant stresses in the platform. The determination of dynamic effects shall be accomplished either by computing the dynamic amplification effects in conjunction with a deterministic analysis or by a random dynamic analysis based on a spectral formulation. In the latter case, the analysis shall be accompanied by a statistical description and evaluation of the relevant input parameters.

(iv) The interaction of the soil with the platform's piles shall be included in the analytical model used to obtain the structural response (see § 250.909(d)(1)(ii) of this part).

(v) For static loads, plastic methods of design and analysis shall be employed only when the properties of the steel and the connections exclude the possibility of brittle fracture and allow for formation of plastic hinges with sufficient plastic rotation capacity and adequate fatigue resistance.

(vi) Whenever plastic analysis is used, it shall be demonstrated that the collapse mode (mechanism) corresponding to the smallest loading intensities has been used for the determination of the ultimate strength of the platform. The effect of buckling and other destabilizing nonlinear effects shall be taken into account in the plastic analysis of platforms with compressive forces. Whenever nonmonotonic or repeating loads are present, it shall be demonstrated that the structure will not fail by incremental collapse or fatigue.

(vii) Under dynamic loads when plastic strains may occur, the considerations specified in paragraph (c)(3)(v) of this section shall be satisfied and any buckling and destabilizing nonlinear effects shall be taken into account.

(4) *Allowable stresses and load factors.* (i) When the design is based on a working-stress method (see paragraphs (c)(1)(ii) and (c)(3)(ii) of this section), the safety criteria shall be expressed in terms of appropriate basic allowable stresses in accordance with requirements specified in paragraphs (c)(4) (ii) through (vi) of this section.

(ii) For structural members and loadings covered by AISC publication, Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design, with the exception of earthquake loadings (see paragraph (c)(4)(v) of this section) and tubular structural members under the combined loading of axial compression and bending, the basic allowable stresses of the members shall be obtained using the AISC specification. For tubular members subjected to the aforementioned interaction, stress limits shall be set in accordance with a defensible formulation.

(iii) Where stresses in members listed in paragraph (c)(4)(ii) of this section are shown to result from forces imposed by the design environmental conditions acting alone or in combination with dead and live loads (see paragraph (c)(2)(ii) of this section), the basic allowable stresses cited in paragraph (c)(4)(ii) of this section, modified by a factor of four-thirds, are permitted for the design environmental load contribution if the resulting structural member sizes are not less than those required for dead and live loads plus operating environmental conditions without the one-third increase in allowable stresses.

(iv) For any two- or three-dimensional stress fields within the scope of the working-stress formulation, the equivalent stress (e.g., the von Mises stress intensity) shall be limited by an

appropriate allowable stress less than the yield stress, with the exception of stresses of a highly localized nature. In the latter case, local yielding of the structure is acceptable if it can be demonstrated that such yielding does not lead to progressive collapse of the overall platform and that the general structural stability can be maintained.

(v) When considering loading combinations on individual members or on the overall platform, which include loads defined as accidental (see §250.905(c)(4) of this part), or in pursuing structural analysis for earthquake loads (see paragraph (c)(2)(iii) of this section), the allowable stress set at a level of the minimum yield or buckling strength of the material shall be considered appropriate.

(vi) Whenever elastic instability, overall or local, may occur before the compressive stresses reach the minimum specified yield strength of the material, appropriate allowable buckling stresses shall govern.

(vii) Whenever the ultimate strength of the platform is used as the basis for the design of its members, the safety factors or the factored loads shall be formulated in accordance with the requirements of AISC publication, Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design, or an equivalent code. The capability of the primary structural members to develop their predicted ultimate load capacity shall be demonstrated.

(viii) For details of high-stress concentration, consideration shall be given to safety against brittle fracture and to material quailty-control procedures.

(5) *Structural response to earthquake loads.* (i) Platforms located in seismically active areas shall be designed to possess adequate strength and stiffness to withstand the effects of an earthquake which has a reasonable likelihood of not being exceeded during the lifetime of the structure (see paragraph (c)(2)(iii) of this section) and remain stable during rare motions of greater severity;

(ii) The adequacy of structural strength shall be demonstrated by analysis to verify that no significant structural damage occurs; and

(iii) Platforms shall also possess adequate ductility to withstand a rare intense earthquake.

(6) *Fatigue assessment.* (i) Structural members and joints for which fatigue is a probable mode of failure and for which past experiences are insufficient to ensure safety from possible cumulative fatigue damage shall be analyzed. Emphasis shall be given to joints and members in the splash zone, those that are difficult to inspect and repair after the platform is in service, and those susceptible to corrosion-accelerated fatigue, and

(ii) For structural members and joints which require a detailed analysis of cumulative fatigue damage, the results of the analysis shall indicate a minimum calculated life of twice the design life (see §250.906(c)(1) of this part) of the platform if there is sufficient structural redundancy to prevent catastrophic failure of the platform as a result of fatigue failure of the member or joint under consideration. If such redundancy does not exist or if the desirable degree of redundancy is significantly reduced as a result of fatigue damages, the results of a fatigue analysis shall indicate a minimum calculated life of three times the design life of the platform.

(d) *Corrosion protection.* All materials shall be protected from the effects of corrosion by a corrosion-protection system. The design of such systems shall take into account the possible existence of stress corrosion, corrosion fatigue, and galvanic corrosion. If the intended sea environment contains unusual contaminants, any special corrosive effects of such contaminants shall also be considered. Protection systems shall be designed in accordance with the National Association of Corrosion Engineers (NACE) publication, NACE Standard RP–01–76, Recommended Practice, Corrosion Control of Steel, Fixed Offshore Platforms Associated With Petroleum Production, or other comparable standards.

(e) *Connection of piles to structure.* The attachment of the jacket structure to the piles shall be accomplished by positive, controlled means. Such attachments shall be capable of withstanding

the static and long-term cyclic loadings to which they will be subjected.

[53 FR 10690, Apr. 1, 1988; 53 FR 26067, July 11, 1988, as amended at 61 FR 60025, Nov. 26, 1996. Redesignated and amended at 63 FR 29479, 29486, May 29, 1998]

§ 250.908 Concrete-gravity platforms.

(a) *General.* (1) This section covers the materials, analysis, design, and construction of reinforced and/or prestressed concrete-gravity platforms.

(2) Materials, structural systems, methods of design, and methods of construction that do not conform to the requirements of this section shall not be used unless it is shown that they will result in a safety level at least equivalent to that provided by the direct application of the requirements of this section.

(b) *Materials*—(1) *General.* All materials shall be selected with due attention to their strength and durability in the marine environment. All material tests shall be performed in accordance with the latest, applicable standards of the American Society for Testing and Materials (ASTM).

(2) *Cement.* (i) Cement must be equivalent to Type I, II, or III portland cement as specified by ASTM Standard C 150–99, Standard Specification for Portland Cement, or portland-pozzolan cement as specified by ASTM Standard C 595–98, Standard Specification for Blended Hydraulic Cements. However, the suitability of Type III cement to serve its intended function must be demonstrated.

(ii) The tricalcium aluminate content of the cement shall be such as to enhance the corrosion protection of reinforcing steel without impairing the durability of concrete.

(iii) If oil storage is planned and the oil is expected to contain soluble sulfates in amounts that may impair the durability of concrete, the tricalcium content shall be reduced or a suitable coating employed to protect the concrete.

(3) *Water.* (i) Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or steel.

(ii) If nonpotable water is used, the proportions of materials in the concrete shall be based on test concrete mixes using water from the same source. The strength of mortar test cubes made with nonpotable water shall not be significantly below the strength of similar cubes made with potable water.

(iii) Water for reinforced or prestressed concrete or grout shall not contain chlorides and sulfates in amounts detrimental to the durability of the platform.

(4) *Aggregates.* (i) Aggregates must conform to the requirements of ASTM Standard C 33–99a, Standard Specification for Concrete Aggregates. Lightweight aggregates conforming to ASTM Standard C 330–99, Standard Specification for Lightweight Aggregates for Structural Concrete, will only be permitted if they do not pose durability problems and where they are used according to the applicable provisions of the ACI publication, ACI Standard 318, Building Code Requirements for Reinforced Concrete, plus Commentary.

(ii) Marine aggregates shall be washed with fresh water before use to remove the surface and soluble chlorides and sulfates so that the total chloride and sulfate content of the concrete mix water does not exceed the limits of paragraph (b)(3)(iii) of this section.

(iii) The maximum size of the aggregate shall be such that the concrete can be placed without voids.

(5) *Admixtures.* The admixture shall be shown capable of maintaining essentially the same composition and performance throughout the work as the product used in establishing concrete proportions. Admixtures containing chloride ions shall not be used in prestressed concrete or in concrete containing aluminum embedments.

(6) *Reinforcing and prestressing systems.* (i) Reinforcing and prestressing systems shall conform to the requirements of ACI 318; and

(ii) Structural steel used in composite structures shall conform to the requirements of § 250.907 of this part.

(7) *Concrete.* The concrete shall be designed to ensure sufficient strength and durability. The quality control of

concrete shall conform to ACI 318. The mixing, placing, and curing of concrete shall conform to the requirements of paragraph (e) of this section. The water-cement ratio shall be strictly controlled and in no case shall it exceed 0.45.

(8) *Grout for bonded tendons.* (i) Grout for bonded tendons shall conform to ACI 318; and

(ii) The maximum allowable contents of chlorides and sulfates determined in accordance with paragraph (b)(3)(iii) of this section shall also apply to grout mixes.

(9) *Post-tensioning ducts.* Post-dentioning ducts shall conform to the requirements of ACI 318. Ducts and duct splices shall be watertight and grout-tight and shall be of suitable thickness to prevent crushing, deformation, and blockage.

(10) *Post-tensioning anchorages and couplers.* Post-tensioning anchorages and couplers shall conform to the requirements of ACI 318.

(c) *Design requirements*—(1) *General.* (i) The strength of the platform shall be adequate to resist failure of the platform or its components. Among the modes of possible failure that shall be considered are the following:

(A) Loss of overall equilibrium,

(B) Failure of critical sections, and

(C) Instability (buckling).

(ii) Additionally, the following items shall be considered in relation to their potential influences on the platform:

(A) Cracking or spalling,

(B) Deformations,

(C) Corrosion of reinforcement or deterioration of concrete, and

(D) Vibrations.

(2) *Required strength.* The required strength shall conform to requirements of ACI 357R.

(3) *Design strength.* The design strength shall conform to requirements of ACI 318 and ACI 357R.

(4) *Other design requirements.* (i) In considering those items listed in paragraph (c)(1)(ii) of this section, the ability of the platform to withstand unfactored loads in the following combination shall be demonstrated:

$$D+T+L+E_0$$

where L represents the most unfavorable live load; D, the dead load; T, the deformation load; and E_o, the operating environmental load, and

(ii) Crack control design shall be achieved by limiting the crack width in concrete subjected to tension or by limiting the tensile stress in reinforcing steel and prestressing tendons.

(5) *Durability.* (i) Materials, design, construction procedures, and quality control shall be such as to produce satisfactory durability of platforms in a marine environment, and

(ii) The following items shall be considered in the four zones of exposure (see § 250.906(c)(5) of this part):

(A) Submerged zone—chemical deterioration of the concrete, corrosion of the reinforcement and hardware, and abrasion of the concrete;

(B) Splash zone—freeze-thaw durability, corrosion of the reinforcement and hardware, the chemical deterioration of the concrete, and fire hazards;

(C) Atmospheric zone—freeze-thaw durability, corrosion of reinforcement and hardware, and fire hazards; and

(D) Ice zone—mechanical deterioration resulting from the abrasive action of moving ice.

(6) *Fatigue.* Platforms for which fatigue is a probable mode of failure shall be designed to limit the effects of cumulative material fatigue. The effects of fatigue induced by normal stress and those resulting from shear and bond stress shall be considered. Particular attention shall be given to submerged areas subjected to the low-cycle, high-stress components of the anticipated loading history. If an analysis of the fatigue life is performed in lieu of employing other methods to obviate the possibility of fatigue damage, the calculated fatigue life of the platform shall be at least twice the design life (see § 250.906(c)(1) of this part).

(d) *Analysis and design*—(1) *General.* (i) The analysis of platforms shall be pursued under the assumptions of linearly elastic materials and linearly elastic structural behavior, except as listed in paragraphs (d)(1) (ii) and (iii) of this section.

(ii) The inelastic behavior of concrete, based on the true variation of the modulus of elasticity with stress, shall be taken into account whenever its effect reduces the strength of the platform.

(iii) The geometric nonlinearities and the effect of initial deviation of the platform from the design geometry shall be taken into account whenever their effects reduce the strength of the platform.

(iv) Where appropriate, dynamic effects shall be taken into account. The dynamic response shall be determined by a defensible method that includes the effects of the foundation—platform interaction and the effective mass of the surrounding water.

(v) The material properties used in the analysis shall be based on actual laboratory tests or shall follow the appropriate sections of ACI 318.

(2) *Analysis of frames.* The analysis of frames shall be performed by a defensible method of structural mechanics. The buckling strength of the frame shall be assessed, and the safety against buckling failure shall be ensured to a degree consistent with the requirements in paragraphs (c)(2) and (c)(3) of this section.

(3) *Analysis of plates, shells, and folded plates.* The buckling strength of these plates shall be determined and a sufficient safety margin against instability shall be ensured.

(4) *Determination of deflections.* Deflections shall be determined by a defensible method. In addition to the immediate (instantaneous) deflections, the long-term deflections due to creep shall be accounted for.

(5) *Analysis and design for bending and axial loads.* The provisions of ACI 318 shall apply to the analysis and design of members subject to flexure or axial loads or to combined flexure and axial loads.

(6) *Analysis and design for shear and torsion.* The provisions of ACI 318 shall apply to the analysis and design of members subject to shear or torsion or to combined shear and torsion.

(7) *Analysis and design of prestressed concrete.* The analysis and design of prestressed concrete members and structures shall comply with ACI 318. In addition, the safety requirements of paragraph (c) of this section shall be satisfied.

(8) *Details of reinforcement and prestressing systems.* Details of reinforcement and prestressing systems shall conform to the requirements of ACI 318 with special attention given to the fatigue resistance and ultimate behavior of offshore structures.

(9) *Minimum reinforcement.* The minimum amount of reinforcement shall conform to the requirements of ACI 318. Additionally, sufficient reinforcement shall be provided to control crack growth, especially at surfaces exposed to severe hydraulic pressures.

(10) *Concrete cover of reinforcement and prestressing tendons.* The concrete cover of reinforcement and prestressing tendons shall be sufficient to provide for corrosion protection of the steel.

(11) *Seismic analysis.* A dynamic analysis shall be performed to determine the response of the platform to design-earthquake loading. The platform shall be designed to withstand this loading without damage. In addition, a ductility check shall also be performed to ensure that the platform has sufficient ductility to experience deflections more severe than those resulting from the design-earthquake loading without the collapse of the platform or its foundation or any primary structural component.

(12) *Seismic design.* The design of structural members and details of platforms subjected to seismic loading shall ensure maximum ductility at critically loaded sections.

(e) *Construction*—(1) *General.* (i) Construction methods and workmanship shall conform to the provisions of ACI 318 and to the following requirements.

(ii) At each stage of construction, i.e., fabrication, initial flotation, towing, and installation in situ, the forces acting on the platform shall be kept within the safety limits listed in paragraph (c) of this section. Appropriate static and/or dynamic analysis shall be performed for the operating loading conditions of each of the construction operations mentioned above. Buoyancy and stability shall be considered during all phases of construction.

(2) *Mixing, placing, and curing of concrete.* (i) Mixing of concrete must conform to the requirements of ACI Standard 318 and ASTM Standard C 94/C 94M–99, Standard Specification for Ready-Mixed Concrete;

(ii) When concreting in cold weather, the temperature of the fresh concrete shall be maintained sufficiently above

freezing until the process of hardening is well in progress;

(iii) In hot weather, the temperature of the fresh concrete shall be controlled so that it does not impair attainment of the desired strength and durability;

(iv) The methods for curing concrete shall ensure maximum compressive and tensile strength, durability, and a minimum of cracking; and

(v) The location and workmanship of construction joints shall not impair the strength, crack resistance, and watertightness of the platform.

(3) *Reinforcement.* (i) Reinforcement shall be free from loose rust, grease, oil, deposits of salt, or any other material that may adversely affect the strength, durability, or bond of the reinforcement. The specified cover of reinforcement shall be maintained accurately. The cutting, bending, and fixing of reinforcement shall ensure that it is correctly positioned and rigidly held.

(ii) The welding of reinforcement shall conform to the requirements of AWS publication, AWS D1.4, Structural Welding Code— Reinforcing Steel.

(4) *Prestressing tendons, ducts, and grouting.* (i) Steps shall be taken to ensure that the achieved prestressing force is that specified in the design.

(ii) Tendons and ducts shall be in a condition that ensures the required strength, durability, and bond.

(iii) The grouting procedures shall produce the required bond strength of the tendons and provide permanent corrosion protection for the tendons. Anchorages shall also be protected adequately against corrosion.

[53 FR 10690, Apr. 1, 1988, as amended at 61 FR 60025, Nov. 26, 1996. Redesignated and amended at 63 FR 29479, 29486, May 29, 1998; 65 FR 15864, Mar. 24, 2000]

§ 250.909 Foundation.

(a) *General*—(1) *Coverage.* Soil investigations, design considerations for the supporting soil, and the influence of the soil on the foundation structure are addressed in this section, including criteria for the strength and deformation characteristics of the foundation employed by both pile founded and gravity platforms.

(2) *Guidelines.* (i) The degree of design conservatism shall reflect prior experience under similar conditions, the manner and extent of data collection, the scatter of design data, and the consequences of failure;

(ii) For cases where the limits of applicability of any method of calculation employed are not well defined or where the soil characteristics are quite variable, the use of more than one method of calculation or a parametric study of the sensitivity of the important design variables shall be considered, and

(iii) A listing of design parameters, necessary calculations, and test results shall be retained by the designer.

(b) *Site investigation*—(1) *General.* (i) The actual extent, depth, and degree of precision to be obtained in the site investigation program shall reflect the type and intended use of the platform, characteristics of the site, similarity of the area based on previous site studies or platform installations as well as the consequences of a failure of the foundation. The site investigation program shall generally consist of three major phases as follows:

(A) Shallow hazards (see paragraph (b)(2) of this section) to obtain relevant geophysical data.

(B) Geological survey (see paragraph (b)(3) of this section) to obtain data of a regional nature concerning the site.

(C) Subsurface investigation and testing (see paragraph (b)(4) of this section) to obtain the necessary geotechnical data. The results of these investigations shall be the basis for the additional site related studies specified in paragraph (b)(5) of this section.

(ii) A complete site-investigation program shall be furnished for each platform. The positioning devices used on the vessel employed in the site investigation as well as those used during the installation of the platform shall have sufficient accuracy to ensure that the data obtained are pertinent to the actual final location of the platform.

(2) *Shallow hazard survey.* (i) Consistent with the objectives of paragraph (b)(1)(i) of this section, a high-resolution or acoustic-profiling survey shall be performed to obtain information on the conditions existing at and near the surface of the seafloor; and

(ii) The information to be obtained from this survey shall include the following items, as appropriate, for the planned platform:

(A) Contours of the sea bed,

(B) Presence of any seafloor surface or near-surface anomaly or obstructions which would adversely affect platform installation at the site,

(C) Shallow faults,

(D) Gas seeps,

(E) Slump blocks,

(F) Occurrence of shallow gas, and

(G) Ice scour of seafloor sediments.

(3) *Geological survey*. (i) Background geological data shall be obtained to provide regional information that can affect the design and siting of the platform. The data shall be considered in planning the subsurface investigation.

(ii) Where necessary, the seismic activity at the site shall be assessed. Fault zones, the extent and geometry of faulting, and attenuation effects of conditions in the vicinity of the site shall be identified.

(iii) For platforms located in a producing area, the possibility of seafloor subsidence shall be considered.

(4) *Subsurface investigation and testing.* (i) The primary objective of the subsurface investigation and testing program shall be the attainment of reliable geotechnical data concerning the stratigraphic and engineering properties of the soil. These data shall be used to properly design the foundation to the desired structural safety level.

(ii) The subsurface investigation and soil testing program shall consist of adequate in situ testing, boring, and sampling to examine all important soil and rock strata. The testing program shall reveal the necessary strength, classification, and deformation properties of the soil. Further tests, as needed, shall describe the dynamic characteristics of the soil.

(iii) At least one borehole having a minimum depth of the anticipated length of the pile plus a zone of influence shall be drilled at the installation site for a pile-supported platform. Previously gathered borehole data may be used on a case-by-case basis, when approved by the Regional Supervisor. The zone of influence shall be sufficient to ensure that punch through failures will not occur. Additional boreholes of a lesser depth shall be required by the Regional Supervisor if discontinuities in the soil are indicated to exist in the area of the platform.

(iv) For a gravity-type platform foundation, the required depth of the borehole shall be equal to at least the depth of the zone of influence which the structure imposes on the supporting soil. Where possible, in situ tests shall be performed to a depth that will include the anticipated shearing failure zone.

(v) When samples from the field are sent to a laboratory for further testing, they shall be packed carefully and accurately labeled, and the results of visual inspections shall be recorded.

(vi) A summary report showing the results of the soil testing program shall be prepared. The report shall describe briefly the various field and laboratory test methods employed and shall indicate the applicability of these methods as they relate to the quality of the sample, the type of soil, and the anticipated design application.

(vii) The engineering properties of the soil to be used in the design shall be listed for each stratum. The selected design properties shall specify the uncertainties inherent in the overall testing program and in the reliability and applicability of the individual test methods.

(5) *Additional requirements.* Based on the results of the overall site investigation program, studies shall be performed, as applicable, to assess the following effects of the installed platform:

(i) Scouring potential of the seafloor,

(ii) Hydraulic instability and the occurrence of sand waves,

(iii) Instability of slopes in the area where the platform is to be placed,

(iv) Liquefaction and/or possible reduction of soil strength due to increased pore pressures, and

(v) Degradation of subsea permafrost layers.

(c) *Foundation design requirements*—(1) *General.* (i) The loadings used in the design of the foundation shall include those defined in paragraph (c)(6)(ii) of this section.

(ii) Foundation displacements shall be evaluated to ensure that they are

within limits that do not impair the intended function and safety of the platform.

(iii) The soil and the platform shall be considered as an interactive system, and the results of the analysis as required in paragraphs (c)(2) through (c)(6) of this section shall be evaluated from this point of view.

(2) *Cyclic loading effects.* Evaluation of the short-term and long-term effects of cyclic loading with respect to changes in soil characteristics, whether caused by conditions during installation, seismic activity, or storms, shall be accomplished by using defensible methods.

(3) *Scour.* (i) For unprotected foundations, the depth and lateral extent of scouring, as determined in the site investigation program, shall be accounted for in design; and

(ii) If scour is not accounted for in design, either effective protection shall be furnished soon after the installation of the platform or frequent visual inspection shall be carried out, particularly after major storms.

(4) *Settlements and displacements.* (i) Based on the type and function of the platform, tolerable limits shall be established for settlements and lateral deflections. Due consideration shall be given to the effect of these movements on risers, pilings, and other components which interact with the platform;

(ii) Maximum allowable values of platform movements, as limited by these structural considerations or overall platform stability, shall be considered in the design.

(5) *Dynamic considerations.* (i) For dynamic-loading conditions, a defensible method shall be employed to simulate the interactive effects between the soil and the platform, and

(ii) The evaluation of the dynamic response of the platform shall account for, as appropriate, the nonlinear and inelastic characteristics of the soil, the possible deterioration of strength, the increased or decreased damping due to cyclic soil loading, and the influence of nearby platforms.

(6) *Loading conditions.* (i) Loadings producing the worst effects on the foundation during and after installation shall be addressed; and

(ii) In-place platform loadings to be checked shall include at least those relating to both the operating and design environmental conditions, combined in accordance with the following:

(A) Operating environmental conditions with dead and live loads appropriate to the function and operation of the platform,

(B) Design environmental conditions with dead and live loads appropriate to the function and operation of the platform, and

(C) Design environmental conditions with dead and minimum live loads appropriate to the function and operation of the platform.

(d) *Pile foundations*—(1) *General.* The following requirements apply to pile-founded platforms. Pertinent parts of these requirements dealing with steel design shall be consulted regarding the design of the steel piles.

(i) In the design of individual piles and piles in a group, the effects of axial, bending, and lateral loads shall be addressed.

(ii) The design of a pile shall reflect the interactive behavior between the soil and the pile, between the pile and the platform, and between piles in a group.

(iii) Methods of pile installation shall be consistent with the type of soil at the site and the installation equipment available. If unexpectedly high-driving resistance or other conditions lead to a failure of the pile to reach the desired penetration, the pile's capacities shall be reevaluated by considering the actual installation situation.

(iv) Pile driving shall be performed and supervised by qualified and experienced personnel. Driving records which include such information as blowcounts and estimated hammer performance and stoppages shall be retained.

(v) Where necessary, the effects of bottom instability in the vicinity of the platform shall be assessed.

(2) *Axial piles.* (i) For piles in compression, the axial capacity shall be considered to consist of the skin friction, Q_f, developed along the length of the pile and the end bearing, Q_p, at the tip of the pile. The various parameters needed to evaluate Q_f and Q_p shall be

predicted by using a defensible analytical method that employs reliably obtained soil data consistent with the prediction method selected. The acceptability of any method used to predict the components of pile resistance shall be demonstrated by showing satisfactory performance of the method under conditions similar to those existing at the actual site.

(ii) The results of the dynamic pile driving analysis alone shall not be used to predict the axial load capacity of a pile.

(iii) For piles driven through clay, the estimated skin friction developed over any increment of the pile surface shall not exceed the shear strength of the clay.

(iv) The capacity of the internal plug of an open-ended pile shall be considered since it may limit the estimated end bearing to the pile.

(v) When combining side friction and end-bearing effects in determining axial pile capacity, the load deflection response of the soil-pile system shall be addressed.

(vi) For piles subjected to pullout loads, the contribution of the end resistance of the pile to its axial capacity shall not be considered. The possible variation of predicted pile-skin friction between the compressive and tensile modes of the axial-pile loading shall be considered.

(3) *Laterally loaded piles.* (i) In evaluating the pile's behavior when acted upon by lateral loadings, the combined load deflection characteristics of the soil and the pile and the pile and the platform shall be addressed.

(ii) The representation of the soil's lateral displacement when it is subjected to lateral loads shall adequately reflect the deterioration of the lateral load capacity when the soil is subjected to cyclic loading.

(iii) The description of the lateral load versus displacement characteristics for the various soil strata shall be based on constitutive data obtained from suitable soil tests. The use of empirical methods to provide the description of the soil's lateral response shall be permitted if such methods are documented.

(iv) Where applicable, the rapidly deteriorating cyclic lateral load capacity of stiff clays, especially those exhibiting the presence of a secondary structure, shall be addressed in the design.

(v) Calculation of pile deflection and stress induced by lateral loads shall account for the nonlinear interaction between the soil and the pile.

(4) *Pile groups.* Where applicable, the effects of close spacing on the load and deflection characteristics of pile groups shall be determined. The allowable load for a group, both axial and lateral, shall not exceed the sum of the apparent individual pile allowable loads.

(5) *Plastic analysis.* When the design of a platform is based on the formation collapse mechanisms associated with a plastic analysis method, influence of the soil's support on the pile shall be addressed.

(e) *Gravity platforms foundations*—(1) *General.* The following requirements apply to soil foundations for gravity platforms. Section 250.138 of this part shall be consulted regarding the design of the base slab.

(i) The influence of hydraulic and slope instability, if any, shall be determined for the structural loading cases that include the design environmental loading.

(ii) The effects of adjacent platforms and the variation of soil properties in the horizontal direction shall be considered, as appropriate.

(iii) The stability of the foundation with regard to bearing and sliding failure modes shall be investigated by employing the soil shear strengths determined with consideration of paragraphs (b)(4) and (c)(2) of this section.

(iv) When an underpressure or overpressure is experienced by the seafloor under the platform, provisions shall be made to prevent piping that could impair the integrity of the foundation.

(v) Initial, consolidation, and secondary settlements, as well as permanent horizontal displacements, shall be determined.

(vi) If the intended site is not level, the predicted tilt of the overall platform shall be based on the average bottom slope of the seafloor and the tolerance of the measuring device used in the site-investigation program. Differential settlement shall also be calculated and the tilting of the platform

caused by this settlement shall be combined with the predicted structural tilt of the overall platform. Any increased loading effects caused by tilting of the platform shall be addressed in stability requirements specified for the foundation.

(2) *Stability.* (i) The bearing capacity and lateral resistance shall be calculated by considering the most unfavorable combination of loads. The long-term redistribution of bearing pressures under the base slab shall be considered to ensure that the maximum edge pressures are used in the design of the base.

(ii) The lateral resistance of the platform shall be investigated considering various potential shearing planes. The presence of any soft layers shall require special consideration.

(iii) Calculations for overturning moment and vertical forces induced by the passage of a wave shall include the vertical pressure distribution across the top of the foundation and along the seafloor. The foundation shall not lose contact with the soil due to uplift created by the maximum overturning moment.

(iv) The capacity of the foundation to resist a deep-seated bearing failure shall be analyzed.

(v) Where present, the additional effects of penetrating walls or skirts that transfer vertical and lateral loads to the soil shall be investigated for their contribution to bearing load capacity and lateral resistance.

(3) *Soil reaction on the platform.* (i) For conditions during and after installation, the reaction of the soil against all structural members seated on or penetrating into the seafloor shall be determined and accounted for in the design of these members.

(ii) The distribution of soil reactions shall be based on the results obtained in paragraphs (b)(2) and (b)(4) of this section, and the calculations of soil reactions shall account for any deviation from a plane surface, the load-deflection characteristics of the soil, and the geometry of the platform base.

(iii) Where applicable, effects of local soil stiffening, nonhomogeneous soil properties, and boulders and other obstructions shall be addressed in the design. During installation, the possibility of local contact pressures due to irregular contact between the base and the seafloor shall be considered. Contact pressures shall be added to the hydrostatic pressure.

(iv) The penetration resistance of structural elements projecting into the seafloor below the foundation structure shall be analyzed. The design of the ballasting system shall reflect uncertainties associated with achieving the required penetration of the platform.

§ 250.910 Marine operations.

(a) *General*—(1) Marine operations means all activities necessary for the transportation and installation of a platform from the time it enters the marine environment until it is fixed in place at its final destination. Marine operations generally include such activities as follows:

(i) Lifting and mooring,

(ii) Loadout or initial flotation,

(iii) Fabrication afloat,

(iv) Towing,

(v) Launching and uprighting,

(vi) Submergence,

(vii) Pile installation, and

(viii) Final field erection.

(2) The requirements of this section apply to all platforms covered by this subpart, regardless of structural type or material of construction.

(b) *Objective.* The structural strength and integrity of a platform shall not be reduced or otherwise jeopardized by the performance of the activities required to install the platform on site. The type and magnitude of loads and load combinations to which a platform will be exposed during marine operations shall be the subject of an analysis pursuant to paragraph (c) of this section, except where the use of proven and well-controlled methods of fabrication and installation are proposed and justified. Sufficient equipment shall be provided to ensure installation of the platform in a safe and well-controlled manner.

(c) *Analysis.* (1) Analyses shall be performed to determine the type and magnitude of the loads and load combinations to which the platform will be exposed during the performance of marine operations.

(2) Analyses shall be performed to ensure that the structural design is sufficient to withstand the type and magnitude of the loads and load combinations determined, in accordance with paragraph (c)(1) of this section, without loss or degradation of structural integrity.

(3) Analyses shall be performed to ensure that the platform or its means of support has sufficient hydrostatic stability and reserve buoyancy to allow for successful execution of all phases of marine operations.

§ 250.911 Inspection during construction.

(a) *General*—(1) *Coverage.* All pile-supported and gravity platforms covered by this subpart shall be inspected during the construction phase. Additional requirements for steel pile-supported platforms are contained in paragraph (b) of this section, and additional requirements pertaining to concrete-gravity platforms are contained in paragraph (c) of this section. The phases of construction subject to inspection include material manufacture, fabrication, loadout, transportation, positioning, installation, and final field erection.

(2) *Objective.* Inspections during construction are to verify that the platform is constructed in accordance with the approved construction plan. Any unusual or innovative application of materials or methods of construction not adequately covered by the requirements of this section shall receive special attention during compliance inspections relevant to its effect on the integrity of the platform.

(3) *Remedial action.* If construction inspection results reveal that materials, procedures, or workmanship deviate significantly from the approved design, remedial action shall be taken.

(4) *Identification of materials.* The origin of materials used in the platform and the results of relevant material tests for all significant structural materials shall be retained and made readily available for inspection by MMS representatives during all stages of construction. Records shall be kept of the locations throughout the platform of the various heat numbers for such materials.

(b) *Steel pile-supported platforms*—(1) *Scope.* Inspections of steel pile-supported platforms shall address the following topics, as appropriate:

(i) Material quality and forming,

(ii) Welder and welding procedure qualifications,

(iii) Weld inspection,

(iv) Tolerances and alignments, and

(v) Corrosion-control systems.

(2) *Material quality and forming.* Inspection shall verify that all materials employed are of good quality and suitable for their intended service as specified in the approved design. Inspection shall ensure the compliance of materials to the relevant material standards selected in the design of the platform. Inspection shall ensure that formed members satisfy the dimensional tolerances listed in the design.

(3) *Welder and welding-procedure qualifications.* (i) Welders shall be tested and possess a current welder's certification.

(ii) All welding procedures to be employed shall be tested and certified for the production of satisfactory welds. Welding procedures previously tested and certified shall be considered prequalified.

(4) *Weld inspection.* (i) Inspection shall include, but not be limited to, visual inspection of all welds and representative magnetic particle or dye penetrant inspection of welds of Weld Classes A and B materials (see § 250.907(a)(4) of this part) not subjected to ultrasonic or radiographic inspection. The extent of ultrasonic or radiographic inspection shall be specified and shall emphasize, but not be confined to, welds of Weld Class A materials.

(ii) The extent and methods of inspection shall be consistent with the classification of applications (see § 250.907(a)(4) of this part) of the area being examined.

(iii) Any welding not meeting the acceptance criteria specified in the inspection plan shall be rejected and appropriate remedial action taken.

(5) *Tolerances and alignments.* Overall dimensional tolerances, forming tolerances, and local alignment tolerances shall be commensurate with those considered in developing the structural design. Inspections shall ensure that the dimensional tolerance criteria are

being met. Out of roundness of structural elements for which buckling is the anticipated mode of failure shall receive individual inspection.

(6) *Corrosion-control systems.* Corrosion-control systems employed on the platform shall be inspected to ensure that they are installed as specified in the approved design. Inspection shall ensure that proper protection against galvanic effects, especially in locations where nonferrous materials are used in conjunction with steel, has been provided in the corrosion-control system.

(7) *Additional inspection items.* (i) The provisions of paragraphs (b)(2) through (b)(6) of this section relate only to matters directly affecting the onshore construction phases of the platform. Other items relating to the onshore construction site and the construction phases from loadout to final erection shall also be performed.

(ii) The construction site shall be inspected to ensure that adequate consideration has been given to the following items:

(A) Support of the platform during construction,

(B) Employment of a sufficient number of certified welders and inspectors to maintain an adequate quality of work, and

(C) Weathertight storage of welding consumables under conditions specified by their manufacturers.

(iii) Inspection shall verify that the following operations have been accomplished in a manner conforming to approved plans or drawings:

(A) Loadout,

(B) Tie down,

(C) Positioning at the site,

(D) Installation (see §250.909(d)(1)(iv) of this part for piles), and

(E) Final field erection.

(iv) To determine if overstressing of the platform during transportation has occurred, towing records shall be reviewed to ascertain if conditions during towing operations exceeded those employed in the analyses required by §250.910(c) of this part.

(v) When the inspections indicate that overstressing has occurred during loadout, transportation, or installation, the affected parts of the platform shall be surveyed to determine the extent of actual damage, if any. Where necessary, a reevaluation of the structural capacity shall be carried out, considering the results of the survey.

(8) *Records.* The following construction records shall be compiled, retained, and made available for inspection by MMS representatives:

(i) Mill certificates,

(ii) Weld-procedure qualification records,

(iii) Weld inspection records,

(iv) Dimensional tolerance reports,

(v) Towing records, and

(vi) Pile driving records.

(c) *Concrete-gravity platforms*—(1) *Scope.* Inspection of concrete-gravity platforms shall address the following topics, as appropriate:

(i) Preparation for concrete production and placement;

(ii) Batching, mixing, and placing concrete;

(iii) Form removal and concrete curing;

(iv) Pretensioning and grouting;

(v) Joints; and

(vi) Finished concrete.

(2) *Preparation for concrete production and placement.* (i) Inspection shall ensure that the pertinent physical properties of cement, reinforcing steel, prestressing tendons, and appurtenances comply with those specified in the approved design.

(ii) Forms and shoring supporting the forms shall be inspected to ensure that they are adequate in number and type and are located correctly.

(iii) The dimensional tolerances of the forms shall be inspected to ensure that the finished dimensional tolerances are comparable to those allowed for in the approved design.

(iv) Reinforcing steel, prestressing tendons, post-tensioning ducts, anchorages, and any other embedded steel shall be inspected, as appropriate, for size, bending, spacing, location, firmness of installation, surface condition, vent locations, proper duct coupling, and duct capping.

(3) *Batching, mixing, and placing concrete.* (i) Inspections shall be performed to ensure that the procedures for the production and placement of concrete provide a well-mixed and well-compacted concrete. The procedures shall also limit segregation, loss of material,

contamination, and premature initial set during all operations.

(ii) Inspection shall verify that the mix components of each batch of concrete are properly proportioned and within allowable variations specified in the approved design. Inspection shall ensure that the water/cement ratio of each batch is within the limit specified in § 250.908(b)(7) of this part.

(iii) Aggregate gradation, cleanliness, moisture content, and unit weight shall be tested. The frequency of testing shall be determined taking into account the uniformity of the supply source, volume of concrete used, and variations of atmospheric conditions.

(iv) Mix water shall be tested for purity following specified methods and schedules.

(v) Testing during the production of concrete shall be performed to monitor, as a minimum, the following concrete qualities:

(A) Consistency,

(B) Air content, and

(C) Strength.

(4) *Form removal and concrete curing.* (i) Inspection shall ensure that forms and form supports are not removed until the platform has attained sufficient strength to bear its own weight, construction loads, and anticipated environmental loads without undue deformation and that they are removed according to schedule.

(ii) Inspection shall ensure that curing of concrete is accomplished in accordance with the provisions of a predetermined procedure.

(iii) Where the construction procedures require the submergence of recently placed concrete, inspection shall ensure that methods for protecting the concrete from the effects of salt water are properly executed.

(5) *Pretensioning and grouting.* (i) Inspection shall verify that the sequence of tendon tensioning and the resulting elongation and force are in accordance with provisions specified in the approved design.

(ii) Pretensioning or post-tensioning stress shall be determined by measuring both tendon elongation and tendon force. Inspection shall verify that the variation of measurements does not exceed a specified amount.

(iii) Inspection shall verify that grout mix proportions and ambient conditions during mixing are in accordance with provisions designated in the approved design. Tests for grout, viscosity expansion, bleeding, compressive strength, and setting time shall be performed to ensure compliance with design requirements. Procedures shall be observed to ensure that ducts are completely filled.

(iv) Anchorages shall be inspected to ensure that they are located and sized as specified in the design and are provided with adequate cover to mitigate the effects of corrosion.

(6) *Joints.* Where appropriate, leak testing of construction joints shall be performed by using specified procedures. When deciding which joints to inspect, consideration shall be given to the hydrostatic head on the subject joint during normal operation, the consequence of a leak at the subject joint, and the ease of repair once the platform is in service.

(7) *Finished concrete.* (i) The surface of the hardened concrete shall be completely inspected for cracks, honeycombing, popouts, spalling, and other surface imperfections.

(ii) The platform shall be examined by using a calibrated rebound hammer or a similar nondestructive examination device. Inspection shall verify that the results of surface inspection, cylinder strength test, or nondestructive examination are in accordance with the approved design criteria.

(iii) The completed sections of the platform shall be checked for compliance to specified design tolerances of thickness and alignment and, to the extent practicable, the location of reinforcing and prestressing steel and post-tensioning ducts.

(8) *Additional inspection items.* (i) While the provisions of paragraphs (c)(2) through (c)(7) of this section relate only to some matters directly affecting the onshore or nearshore construction phases of the platform, other items relating to such phases and from loadout to final erection shall also be considered.

(ii) Inspection shall ensure that adequate consideration has been given the following items:

(A) Support of the structure during construction,

(B) Employment of a sufficient number of competent workmen and inspectors to maintain an adequate quality of work,

(C) Storage of cement and prestressing tendons in weathertight areas,

(D) Storage of admixtures and epoxies according to manufacturers' specifications, and

(E) Storage of aggregates to limit segregation, contamination by deleterious substances, and moisture variations within the stockpile.

(iii) Inspection shall verify that the following operations, as applicable to the planned platform, have been accomplished in a manner conforming to approved plans or drawings developed for these operations:

(A) Loadout,

(B) Towing arrangements,

(C) Positioning at the site,

(D) Installation, and

(E) Final field erection.

(iv) To determine if overstressing of the platform during transportation has occurred, towing records shall be reviewed to ascertain if conditions during the towing operations exceeded those employed in the analyses required by § 250.910(c) of this part.

(9) *Records.* The following construction records shall be compiled, retained, and made available for inspection by MMS representatives:

(i) Material certificates and test reports;

(ii) Tensioning and grouting records;

(iii) Concreting records including weight, moisture content, mix proportions, test methods and results, ambient conditions during the pour, and test equipment calibration data;

(iv) Deviations from design or fabrication specifications and repairs carried out;

(v) Towing records; and

(vi) Data on initial structural settlements.

[53 FR 10690, Apr. 1, 1988; 53 FR 26067, July 11, 1988. Redesignated and amended at 63 FR 29479, 29486, May 29, 1998; 64 FR 9065, Feb. 24, 1999]

§ 250.912 Periodic inspection and maintenance.

(a) All platforms installed in the OCS shall be inspected periodically in accordance with the provisions of API RP 2A, section 14, Surveys. However, use of an inspection interval which exceeds 5 years shall require prior approval by the Regional Supervisor. Proper maintenance shall be performed to assure the structural integrity of the platform as a workbase for oil and gas operations.

(b) A report shall be submitted annually on November 1 to the Regional Supervisor stating which platforms have been inspected in the preceding 12 months, the extent and area of inspection, and the type of inspection employed, i.e., visual, magnetic particle, ultrasonic testing. A summary of the testing results shall be submitted indicating what repairs, if any, were needed and the overall structural condition of the platform.

[53 FR 10690, Apr. 1, 1988, as amended at 55 FR 51415, Dec. 14, 1990. Redesignated at 63 FR 29479, May 29, 1998]

§ 250.913 Platform removal and location clearance.

(a) The lessee shall remove all structures in a manner approved by the Regional Supervisor to assure that the location has been cleared of all obstructions to other activities in the area.

(b) All platforms (including casing, wellhead equipment, templates, and piling) shall be removed by the lessee to a depth of at least 15 feet below the ocean floor or to a depth approved by the Regional Supervisor based upon the type of structure or ocean-bottom conditions.

(c) The lessee shall verify by appropriate means that the location has been cleared of all obstructions. The results of the location clearance survey shall be submitted to the Regional Supervisor by means of a letter from the company performing the work certifying that the area was cleared of all obstructions, the date the work was performed, the extent of the area surveyed, and the survey method used.

§ 250.914 Records.

The lessee shall compile, retain, and make available to Minerals Management Service representatives for the functional life of all platforms, the as-built structural drawings, the design assumptions and analyses, a summary of the nondestructive examination records, and the inspection results from platform inspections required by § 250.912 of this part.

[53 FR 10690, Apr. 1, 1988. Redesignated and amended at 63 FR 29479, 29486, May 29, 1998]

Subpart J—Pipelines and Pipeline Rights-of-Way

§ 250.1000 General requirements.

(a) Pipelines and associated valves, flanges, and fittings shall be designed, installed, operated, maintained, and abandoned to provide safe and pollution-free transportation of fluids in a manner which does not unduly interfere with other uses in the Outer Continental Shelf (OCS).

(b) An application shall be submitted to the Regional Supervisor and approval obtained prior to the installation, modification, or abandonment of a pipeline which qualifies as a lease term pipeline (see § 250.1001, Definitions) and prior to the installation of a right-of-way pipeline or the modification or relinquishment of a pipeline right-of-way.

(c)(1) Department of the Interior (DOI) pipelines, as defined in § 250.1001, must meet the requirements in §§ 250.1000 through 250.1008.

(2) A pipeline right-of-way grant holder must identify in writing to the Regional Supervisor the operator of any pipeline located on its right-of-way, if the operator is different from the right-of-way grant holder.

(3) A producing operator must identify for its own records, on all existing pipelines located on its lease or right-of-way, the specific points at which operating responsibility transfers to a transporting operator.

(i) Each producing operator must, if practical, durably mark all of its above-water transfer points by April 14, 1999 or the date a pipeline begins service, whichever is later.

(ii) If it is not practical to durably mark a transfer point, and the transfer point is located above water, then the operator must identify the transfer point on a schematic located on the facility.

(iii) If a transfer point is located below water, then the operator must identify the transfer point on a schematic and provide the schematic to MMS upon request.

(iv) If adjoining producing and transporting operators cannot agree on a transfer point by April 14, 1999, the MMS Regional Supervisor and the Department of Transportation (DOT) Office of Pipeline Safety (OPS) Regional Director may jointly determine the transfer point.

(4) The transfer point serves as a regulatory boundary. An operator may write to the MMS Regional Supervisor to request an exception to this requirement for an individual facility or area. The Regional Supervisor, in consultation with the OPS Regional Director and affected parties, may grant the request.

(5) Pipeline segments designed, constructed, maintained, and operated under DOT regulations but transferring to DOI regulation as of October 16, 1998, may continue to operate under DOT design and construction requirements until significant modifications or repairs are made to those segments. After October 16, 1998, MMS operational and maintenance requirements will apply to those segments.

(d) A pipeline which qualifies as a right-of-way pipeline (see § 250.1001, Definitions) shall not be installed until a right-of-way has been requested and granted in accordance with this subpart.

(e)(1) The Regional Supervisor may suspend any pipeline operation upon a determination by the Regional Supervisor that continued activity would threaten or result in serious, irreparable, or immediate harm or damage to life (including fish and other aquatic life), property, mineral deposits, or the marine, coastal, or human environment.

(2) The Regional Supervisor may also suspend pipeline operations or a right-of-way grant if the Regional Supervisor determines that the lessee or right-of-