



نگهداشت و افزایش تولید میدان نفتی بینک  
سطح الارض و ابنیه تحت الارض

عمومی و مشترک



شماره پیمان:

SPECIFICATION FOR ATMOSPHERIC ABOVE GROUND WELDED STEEL TANKS

053 - 073 - 9184

نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادرکننده	بسته کاری	پروژه
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شماره صفحه: 1 از 14

طرح نگهداشت و افزایش تولید 27 مخزن

## SPECIFICATION FOR ATMOSPHERIC ABOVE GROUND WELDED STEEL TANKS

نگهداشت و افزایش تولید میدان نفتی بینک



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Status:



IDC: Inter-Discipline Check  
IFC: Issued For Comment  
IFA: Issued For Approval  
AFD: Approved For Design  
AFC: Approved For Construction  
AFP: Approved For Purchase  
AFQ: Approved For Quotation  
IFI: Issued For Information  
AB-R: As-Built for CLIENT Review  
AB-A: As-Built –Approved

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض</p> <p>عمومی و مشترک</p>																									
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## 1.0 INTRODUCTION

Binak oilfield in Bushehr province, a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.



### GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
EPD/EPC CONTRACTOR:	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of : Hirgan Energy – Design & Inspection(D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	The firm appointed by EPD/EPC CONTRACTOR(GC) and approved by CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by COMPANY rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

## 2.0 SCOPE

This specification describes the minimum technical requirements for the design, erection, prefabrication, inspection and testing of the above ground atmospheric Storage Tanks and it is intended to supplement the Iranian Petroleum Standard IPS-G-ME-100, "General Standard for Atmospheric Above Ground Welded Steel Tank for Oil Storage First Edition November 2004, This standard specification is reviewed and updated by the relevant technical committee on Aug. 2013.

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The Amendments to API standard 650, 12th Edition. ADD. 3 (August 2018), "Welded Tanks for Oil Storage" for the atmospheric storage tanks and it also covers the minimum requirements for the design, fabrication, materials, inspection, testing of Elevated Water Tank. It shall be read in conjunction with tank data sheets, referenced specifications and standards. At the date of call for tender of EPC Contractor, The project facilities shall be designed, engineered, built, installed and commissioned to the latest relevant standard.



### 3.0 NORMATIVE REFERENCES

#### 3.1 LOCAL CODES AND STANDARDS

- IPS-G-ME-100(1) General Standard for Atmospheric Above Ground Welded Steel Storage Tanks
- IPS-G-ME-250(2) General Standard for Pressure & Vacuum Relief Devices
- IPS-E-SF-220 Engineering Standard For Fire Water Distribution And Storage Facilities
- IPS-M-PI-150 Material and Equipment Standard for Flanges & Fittings
- IPS-E-TP-100 Engineering Standard for Paints
- IPS-E-TP-350 Engineering Standard for Linings
- IPS-E-CE-120 Engineering Standard for Foundations
- IPS-E-CE-500 Engineering Standard for Loads
- IPS-E-TP-740 Engineering Standard for Corrosion Considerations in Material Selection
- IPS-E-EL-100 Engineering Standard for Electrical System Design
- IPS-G-GN-210 General Standard for Packing and Packages
- NIOC Standard Drawings
- NIOEC Standard Drawings

#### 3.2 INTERNATIONAL CODES AND STANDARDS



- ASME American Society of Mechanical Engineers
  - B16.9 Steel Butt Welding Fittings
  - B16.11 Forged Steel Fittings, Socket Welding and Threaded
  - B16.21 Non- Metallic Gaskets For Pipe Flanges
  - B16.25 Butt Welding Ends

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- B16.5 Pipe Flanges & Flanged Fittings (NPS 1/2 through 24)
- B16.47 Large Diameter Steel Flanges (NPS 26 through 60)
- Section V Non- destructive Examination
- Section IX Welding & Brazing Qualifications
- API American Petroleum Institute
  - 650 Welded Tanks for Oil Storage (Twelfth Edition, Addendum 3, August 2018)
  - 651 Cathodic Protection of Aboveground Petroleum Storage Tanks
  - 653 Tank Inspection, Repair, Alteration, and Reconstruction
  - 2000 Venting Atmospheric and Low-Pressure Storage Tanks
- ASCE 7-10 American Society of Civil Engineers 7-10
- ISIRI-2800 Iranian Code of Practice for Seismic Resistant Design of Buildings
- AWS American Welding Society
- AWWA D 100 Welded Steel Tanks for Water Storage

### 3.3 THE PROJECT DOCUMENTS

- BK-GNRAL-PEDCO-000-PR-DB-0001 Process Basis of Design
- BK-GNRAL-PEDCO-000-ME-DC-0001 Mechanical Design Criteria
- BK-GNRAL-PEDCO-000-ME-DW-0002 Standard Detail Drawings For Storage Tanks
- BK-GNRAL-PEDCO-000-PI-SP-0004 Specification For Metallic Pipes
- BK-GNRAL-PEDCO-000-PI-SP-0005 Specification For Fittings, Flanges, Gaskets and Bolts
- BK-GNRAL-PEDCO-000-PI-SP-0006 Specification For Painting
- BK-GNRAL-PEDCO-000-PI-SP-0019 Specification For Insulation
- BK-GNRAL-PEDCO-000-PI-SP-0007 Specification for Lining (Internal Protection of Equipment by Painting)
- BK-GNRAL-PEDCO-000-PI-SP-0008 Specification For Material Requirements in Sour Service
- BK-GNRAL-PEDCO-000-PI-SP-0011 Specification For Welding of Plant Piping System
- BK-GNRAL-PEDCO-000-ST-DC-0001 Structural Design Criteria

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- BK-GNRAL-PEDCO-000-ST-SP-0003 Specification For Fabrication of Steel Structures
- BK-GNRAL-PEDCO-000-ST-SP-0005 Specification For Erection of Steel Structures
- BK-GCS-PEDCO-120-PI-RT-0001 Corrosion Study and Material Selection Report
- BK-GNRAL-PEDCO-000-EL-DC-0001 Electrical System Design Criteria
- Piping and Instrumentation Diagrams

### 3.4 ENVIRONMENTAL DATA

Refer to "Process Basis of Design; Doc. No. BK-GNRAL-PEDCO-000-PR-DB-0001".

### 3.5 ORDER OF PRECEDENCE

In case of any conflict between the contents of this document or any discrepancy between this document and other project documents or reference standards, this issue must be reported to the CLIENT. The final decision in this situation will be made by CLIENT.

### 4.0 DELETED

### 5.0 AMENDMENTS AND SUPPLEMENTS TO API 650

This specification gives amendment and supplement to API Std. 650, 12th Edition. ADD. 3 (August 2018), "Welded Tanks for Oil Storage" for the atmospheric storage tanks used in this project.



The amendments / supplement to the related API Standard(s) given in this document are directly related to the equivalent sections or clauses in the API Standard(s). For clarity, the section and paragraph numbering of the API Standard(s) has been used as long as possible. Where clauses in API are referenced within this document, it shall mean those clauses are amended by this document. Clauses in "API" that are not amended by this document shall remain valid as written.

It shall be used in conjunction with data/requisition sheets for present document subject.

(In preparation of such specification, the IPS-G-ME-100 (1) standard has been respected too.)

The following paragraphs specifying the modifications follow the API Standards numbers and each paragraph denotes an addition, modification, substitution or deletion:

- **(Substitution):** The API Std. Clause is deleted and replaced by a new clause .
- **(Deletion):** The API Std. Clause is deleted without any replacement .

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- **(Addition):** A new clause with a new number is added.
- **(Modification):** Part of the API Std. Clause is modified, and/or a new description and/or condition is added to that clause.

(In preparation of such specification, the IPS-G-ME-100 (1) standard has been respected too.)

## 5.1 SECTION4-MATERIAL

4.1.1.1 Materials shall be new and free of pits, scale, laminations, and other defects. All materials including main and miscellaneous parts to be selected and certified to ASTM standard and other equivalent materials shall not be used. (Mod.)

4.1.6 Bottom and shell plates, wind girdles, pipes and flanges require mill chemical analyses and mechanical test certificates. Roof plates and other materials only require mill certificates. (Add.)

4.2.2 ASTM A 36M/A 36 materials are not permitted, except for structural use. (Mod.)

4.2.7.6 Bottom, shell, roof plates, wind girders, pipes and flanges require mill chemical analysis and mechanical test certificate. Other materials only require mill certificates. Mill certificate shall contain all required properties of the material. (Add.)

4.2.7.7 Mill certificates shall show all required properties of the material. (Add.)

4.2.10.3 The lowest one-day mean ambient temperature for each tank will be given in the Tank Data Sheet. (Mod.)

4.6.3 For nominal pipe sizes greater than NPS 24, flanges that conform to ASME B16.47 series A shall be used (Mod).

4.9.1.5 Commissioning & start-up and two-years normal operation spare gaskets shall be considered per attachment 11 of the project EPC tender dossier(sub).



## 5.2 SECTION5-DESIGN

5.2.2.1 Importance Factor 1.25 shall be considered for seismic design, the design metal temperature (based on ambient temperature), the maximum design temperature, the design specific gravity, the corrosion allowance (if any), and other factors are specified on the relevant Data Sheets (Add).

5.2.2.2 Capacities for individual tanks include allowance for freeboard vapor space and inaccessible bottom section of the tank, with no further allowances required in establishing tank sizes. Capacity of floating roof tanks shall be net volume under the roof deck with seals in full operation (Add).

5.2.3.1 The design wind load shall be based on ASCE 7-10 (Add).



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	BK	GNRAL	PEDCO	000	ME	SP	0002	D03

5.2.3.2 The design seismic load shall be based on Appendix E of API Standard 650(Add).

5.3.2.1 The corrosion allowance is specified on the data sheet or relevant drawing. If the corrosion allowance is not stated, the relevant minimum code corrosion allowance shall be used. The corrosion allowance shall be in accordance with the project "Corrosion Study & Material Selection Report; Doc. No. BK-GCS-PEDCO-120-PI-RT-0001"(Mod).

5.3.2.7 For removable internal parts only 50% of the corrosion allowance is required but on each sides(Add).

5.3.2.8 For nozzles necks, the specified nozzle neck corrosion allowance on the relevant Data Sheets shall be added to the minimum calculated thickness required for pressure head and mechanical strength. In no case shall the neck thickness provided be less than the nominal thickness shown on the Table 5.6a and Table 5.6b of API-650 (12<sup>th</sup> Ed. Addendum 3)(Add).

5.3.2.9 For all surfaces of internal support members and fixed internals coming into contact with service media, the full corrosion allowance shall be considered(Add).

5.3.4 The hardness of weld metal and related heat affected zone (HAZ) of all welds shall not exceed 225 brinell (Mod).

5.4.6 Protective plates of sufficient size shall be installed under all internal piping, supports and other appurtenances that could strike or rest on the bottom of the tank. These plates shall be a minimum of 4 mm thick and be welded to the bottom using a continuous fillet weld (Add).



5.4.7 For bottom plates, in contact with the foundation surface, Vendor shall consider proper sealing system with anti-leakage material (Add).

5.5.6 Vendor shall consider annular plate for bottom of tank with diameter more than 10 m (Add).

5.5.7 For bottom / Annular plates, which are in contact with the foundation surface, Vendor shall carry out the abrasive blast cleaning in accordance with the project "Specification for Painting; Doc. No. BK-GNRAL-PEDCO-000-PI-SP-0006"(Add).

5.7.2.11 All nozzle connections in the shell shall have full penetration welds between the nozzle neck and the shell plate, insert plate or reinforcing pads. The reinforcing pad to shell weld, shall also have full penetration into the root of the fillet and full fusion along both legs of the fillet (Add).

5.7.6.1.a Unless otherwise specified, shell nozzle flange, excluding manholes, in sizes NPS 1 ½ through NPS 20 and NPS 24 shall meet requirements of ASME B16.5. For sizes larger than NPS 24 but not greater than NPS 60, flanges shall meet the requirements of ASME B16.47, series A. Bolt holes shall straddle the vertical centerline of the flange (Sub).

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5.8.5.3 Wire netting in the openings of free vents and breather valves shall be a minimum of 6 mm square. Fine mesh screen is not allowed (Mod).

5.8.5.8 Venting of the atmospheric tank roof shall be in accordance with API standard 2000. (Add.)

5.8.11.3 Grounding (Earth) lugs shall be provided in the quantity specified on the Data Sheets and shall comply with related standard drawing (Mod).

5.10.2.2 Roof plates shall have a nominal thickness of not less than 5 mm (3/16 in.). Increased thickness may be required for supported cone roofs. Any required corrosion allowance for the plates of self-supporting roofs shall be added to the calculated thickness unless otherwise specified by the Purchaser. Any corrosion allowance for the plates of supported roofs shall be added to the greater of the calculated thickness or the minimum thickness or [5 mm (3/16 in.)]. (Add).

5.10.2.10 The maximum roof thickness including corrosion allowance shall not be more than 12 mm (Add).

5.10.2.11 Tank roofs with diameter less than 6 m shall be "self-supported" type, tank roofs with diameter of 6 m to 12 m, shall be "rafter-supported" type and tank roofs with diameter more than 12 m, shall be "supported" type (Add) .

5.10.2.12 Imposed loads due to tank roof-mounted mixers, shall be specified on the Tank Data Sheets (Add).

5.10.2.5 The details of the roof-to-shell junction shall be in accordance with "Figure F-2, detail b" of API standard 650, in which the participating area resisting the compressive force is shaded with diagonal lines (Mod).

5.10.2.5.1 For tanks exceeding 12.5m in diameter, roof plates shall not be attached to the roof supporting structure. (Add)



5.10.4.11 Clips that may retain liquid shall be designed for drainage (Add).

5.10.4.12 Any parts (such as structural parts, clips, stiffening rings ...) that may retain liquid shall have proper drain(s) (Add).

### 5.3 SECTION6-DESIGN

6.1.5.1 The back of tank bottom plates shall be thoroughly cleaned and freed from rust and scale by blast cleaning (Mod).

6.1.5.3 Preparation for packing and packages of Storage Tanks shall be in accordance with IPS-G-GN-210 (Add).

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6.2.1 Mill test reports and certificates of compliance shall be furnished to the purchaser's authorized personnel (Mod).

All of the interior and exterior surfaces of tanks shall be coated and painted in accordance with the project "Specification for Painting; Doc. No. BK-GNRL-PEDCO-000-PI-SP-0006"(Add).

#### 5.4 SECTION7-ERECTION

7.2.1.8 Tack weld shall be made with the same type of electrode that is used for depositing the root pass (Mod).

7.2.1.13 Backup rings or strips shall be used only when approved by Purchaser (Add).

7.2.1.14 Peening of butt welds is not permitted (Add).

7.2.1.16 Parts to be joined by fillet welds shall be brought together as closely as practicable (Add).

7.3.2.2 The inner fillet weld from bottom to shell joints shall be inspected prior to welding the outside fillet weld. Inner fillet welds shall be examined for cracks using either a liquid penetrant or magnetic particle method (Mod).

7.3.2.4 Brinell hardness tests for all welds shall be performed on a test plate. The results shall be recorded on the applicable welding procedure specifications (Add).



#### 9.2.2 SECTION9-IMPACT TESTS

9.2.2.9 When required by API-650, Charpy V-notch impact tests of weld and heat affected zones shall meet the minimum requirements specified for the base material (Add).

### 6.0 ELEVATED WATER TANK

#### 6.1 GENERAL

- In addition to the requirements of this specification, the Elevated water tank shall be designed, constructed, inspected and tested in accordance with AWWA D100 standard.
- The tank shall be designed for Dead loads, Water loads, Snow loads, Live loads, Wind loads and Earthquake loads suitable for the zone specified in the tank data sheet. The sloshing effect due to product movement in the tank as a result of earthquake movement shall be taken into account and calculations shall be submitted for client's approval prior to fabrication of tank.
- For earthquake loading, strict consideration shall be given to the requirements of AWWA D100 standard.

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## 6.2 SHELL

The shell plate thickness shall be designed in accordance with the AWWA D100 standard.

## 6.3 BOTTOM

Bottom may be built to either lap-welded or butt-welded construction as per AWWA D100 standard.

## 6.4 ROOF



- Roof plates shall be laid for complete rain water run-off with the lower edge of the plates in any course overlapping the adjacent lower course.
- The thickness of roof plates shall not be less than those given in API 650 standard.
- The following load shall be considered in the design of the tank roof:
  - Live load: minimum 120 Kg/m<sup>2</sup>
  - Snow load: as specified in the tank data sheet
  - Tank vacuum load: as specified in the tank data sheet
  - Dead load

## 6.5 CORROSION ALLOWANCE

Unless otherwise specified on individual tank data sheet, the corrosion allowance shall be 1.5 mm for shell, bottom and roof plates.

## 6.6 MANHOLE/NOZZLE/MAN WAY

- The thickness of manhole and nozzle bodies excluding corrosion allowance shall not be less than that given in API 650 standard. No additional corrosion allowance will be provided on flange facings.
- A roof manhole by 20" (ID) on the tank roof shall be fitted.
- Roof nozzles 3" and over shall have reinforcing pads.
- Minimum distance from bottom of the tank to center-line of shell nozzle or man way shall be in accordance with API 650 standard.

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## 6.7 INTERNALS

When corrosion allowances specified on the data sheet for internals, this allowance shall be added to all exposed liquid and vapor surfaces for non- removable internals, unless otherwise specified.

## 6.8 MATERIAL

- Materials shall conform to data sheet and AWWA D100 standard.
- Material for reinforcing pads shall be the same as the base plate.
- Design metal temperature shall be defined lowest one day mean ambient temperature +15°F.
- The gasket material shall be asbestos free and suitable for service condition involved.
- All gratings, bolts and nuts for structures should be HOT DIP GALVANIZED.

## 6.9 FABRICATION AND ERECTION

- Fabrication and erection of the tank shall be in accordance with AWWA-D100 standard.
- Adequate clearances shall be considered for all appurtenances and internals and for the total structural adequacy and mechanical operation of the completed tank.
- Unless otherwise specified, VENDOR shall supply all plates rolled, bevelled, un-blasted and unpainted for site erection, plates shall be new and un-corroded.
- The tank will be erected on compacted foundations.
- Welding shall be done according to AWWA-D100 standard.

## 6.10 INSULATION



Shall be in accordance with "Specification For Insulation" BK-GNRAL-PEDCO-000-PI-0019.

## 6.11 PAINTING

The tank painting shall be as per "Specification For Painting Doc. No. BK-GNRAL-PEDCO-000-PI-SP-0006".

## 6.12 INSPECTION AND TESTS

- The tank shall be inspected and tested in accordance with AWWA-D100 standard/section 11.

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- Tanks shall be hydrostatically tested in accordance with API STD 650 for a minimum period of 24 hours.
- Hydro-test shall be done full of water.
- Roof manholes shall be open while filling or emptying a fixed roof tank for test purposes, so that excessive vacuum or pressure loading does not damage the tank.
- The Tank Vendor shall furnish all test materials and facilities, including blinds, bolting, and gaskets which are required for Hydrostatic test.
- Supply of treated and qualified water for hydro test shall be considered in tanks erector scope, unless otherwise specified in Purchase Order.
- Potable water shall be considered for Hydro test. Tank Erector is responsible for all requirements subjected for purchaser approval.
- Hydrostatic test of the tank include filling and emptying. The temperature of the test water shall be not lower than 20°C.
- Hydrostatic test media shall be non-corrosive fresh water and free from sands.
- Tank erector shall measure settlement continuously during and after hydro test. The report shall be submitted for contractor review and decision.
- Uneven settlement of the tank on its foundation shall be reported immediately to the Inspector, and filling shall be stopped at any signs of excessive settlement pending a decision by the Inspector on the action to be taken.
- Any tank showing evidence of leakage from the bottom during water test should be emptied immediately. The source of such leaks should be determined and rectified. Where there is risk that the leakage may have caused washout of the foundation material, the foundations are to be inspected. The repair of the foundation should be subject to special consideration and approval by the CONTRACTOR.