GENERAL STANDARD

FOR

AVIATION TURBINE FUEL STORAGE TANKS

FIRST EDITION

SEPTEMBER 2014

FOREWORD

The Iranian Petroleum Standards (IPS) reflect the views of the Iranian Ministry of Petroleum and are intended for use in the oil and gas production facilities, oil refineries, chemical and petrochemical plants, gas handling and processing installations and other such facilities.

IPS are based on internationally acceptable standards and include selections from the items stipulated in the referenced standards. They are also supplemented by additional requirements and/or modifications based on the experience acquired by the Iranian Petroleum Industry and the local market availability. The options which are not specified in the text of the standards are itemized in data sheet/s, so that, the user can select his appropriate preferences therein.

The IPS standards are therefore expected to be sufficiently flexible so that the users can adapt these standards to their requirements. However, they may not cover every requirement of each project. For such cases, an addendum to IPS Standard shall be prepared by the user which elaborates the particular requirements of the user. This addendum together with the relevant IPS shall form the job specification for the specific project or work.

The IPS is reviewed and up-dated approximately every five years. Each standards are subject to amendment or withdrawal, if required, thus the latest edition of IPS shall be applicable.

The users of IPS are therefore requested to send their views and comments, including any addendum prepared for particular cases to the following address. These comments and recommendations will be reviewed by the relevant technical committee and in case of approval will be incorporated in the next revision of the standard.

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GENERAL DEFINITIONS

Throughout this Standard the following definitions shall apply.

COMPANY:

Refers to one of the related and/or affiliated companies of the Iranian Ministry of Petroleum such as National Iranian Oil Company, National Iranian Gas Company, National Petrochemical Company and National Iranian Oil Refinery And Distribution Company.

PURCHASER:

Means the “Company” where this standard is a part of direct purchaser order by the “Company”, and the “Contractor” where this Standard is a part of contract document.

VENDOR AND SUPPLIER:

Refers to firm or person who will supply and/or fabricate the equipment or material.

CONTRACTOR:

Refers to the persons, firm or company whose tender has been accepted by the company.

EXECUTOR:

Executor is the party which carries out all or part of construction and/or commissioning for the project.

INSPECTOR:

The Inspector referred to in this Standard is a person/persons or a body appointed in writing by the company for the inspection of fabrication and installation work.

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 the “Company” rather than by a contractor, supplier or vendor.

MAY:

Is used where a provision is completely discretionary.

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0. INTRODUCTION

The storage tanks covered in this Standard consist of an internal floating deck protected by a fixed-type roof which, while permitting the cover to operate up and down, prevents the ingress of rainwater, sand or snow. In addition the internal floating cover tanks have the following attendant advantages:

- They reduce vapor losses.
- They permit highly volatile products to be stored at atmospheric pressure.
- They promote cleanliness of the product stored.
- They reduce internal corrosion.

Furthermore internal floating cover storage tanks where an internal deck is fitted in a tank containing a liquid such as turbine gasoline which, at ambient temperatures, is liable to form a flammable mixture above the liquid, the interposing of a floating deck between the liquid and the tank space will so reduce vapor evolution that the space is never likely to contain a flammable vapor mixture.

The requirements of this standard specification are supplementary to Annex H of API 650 2013 edition and IPS-G-ME-100 Standard and take precedence where particular requirements differ from those outlined in the above specifications.

For ease of reference API Clause or Paragraph Numbers for items supplemented are mentioned at the beginning of each Clause or Paragraph. Clauses in API 650 Annex H not mentioned remain unaltered.

Note:

This Standard is a revised version and combination of three previous standards IPS-M-ME-120(0) dated May 1993, IPS-C-ME-120(0) dated May 1993 and IPS-E-ME-120(0) dated Aug. 1993. The original (0) edition of three standards is now withdrawn.

For the purpose of this Specification, the following definitions shall hold:

Sub. (Substitution)	: The API Std. Clause is deleted and replaced by a new Clause.
Del. (Deletion)	: The API Std. Clause is deleted without any replacement.
Add. (Addition)	: A new Clause with a new number is added.
Mod. (Modification)	: Part of the API Std. Clause is modified, and/or a new description and/or condition is added to that Clause.

H.1. SCOPE

H.1.1

This Standard covers the minimum requirements for design, material, construction, inspection and testing of aviation turbine fuel storage tanks. Moreover it includes also general requirements about secrecy, packaging, shipment and guarantee of such equipments.

The requirements of this specification are supplementary to Annex H of API Standard 650, 12th edition and take precedence where differ from those outlined in the aforementioned specifications.

This specification is to be used in conjunction with IPS-G-ME-100 “General Standard for Atmospheric above ground welded steel storage tanks”.

In case of conflict between this standard and IPS-G-ME-100, the requirements of this standard specification shall govern. **(Mod.)**

H.1.4 References

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies. **(Add.)**

ASME (AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

ASME B1.1	“Unified Inch Screw Threads (UN and UNR Thread Form)”

API (AMERICAN PETROLEUM INSTITUTE)

API Standard 650	“Welded Tanks for Oil Storage”

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-CE-120	“Engineering standard for Foundations”
IPS-E-GN-100	“Engineering standard for units”
IPS-E-TP-100	“Engineering standard for Paints"
IPS-G-ME-100	“General Standard for Atmospheric Above Ground Welded Steel Tanks for Oil Storage”

H.1.5 Conflicting Requirements

In case of conflict between documents relating to the inquiry or purchase order the following priority of documents, shall apply:

- First priority: purchase order (including attachments) and variations thereto.
- Second priority: data-requisition sheets and drawings.
- Third priority: this specification

All conflicting requirements shall be referred to the purchaser in writing. The purchaser will issue conforming documentation if needed for clarification. **(Add.)**

H.1.6 Units

International system of units (SI) in accordance with IPS-E-GN-100 shall be used. Whenever

reference is made to API/ASME or any other standards, equivalent SI unit system for dimensions, fasteners and flanges shall be substituted. **(Add.)**

H.3 MATERIAL

H.3.5 Mill chemical analysis and mechanical test certificates are required for bottom, roof and shell plates, wind girders, pipes and flanges and seal material. Other materials require mill chemical analysis only. **(Add.)**

H.3.6 Sealing materials, if used, to make joints in panels or sections should be compatible with the product contained. **(Add.)**

H.3.7 All fasteners in contact with the product contained or product vapor shall be of stainless steel or aluminum. **(Add.)**

H.3.8 Bolting

Bolt and nut thread shall conform to ASME B1.1 coarse series Class 2A and 2B respectively.

(Add.)

H.3.9 Connections

Where connections are made to external piping, the material and all other requirements for nozzles, flanges, bolting, gasketing and pipe shall be met as specified in that piping class. **(Add.)**

H.3.10 Secrecy

Refer to Appendix A of this Standard for secrecy requirements. **(Add.)**

H.3.11 Packaging

General requirements for packaging are covered in Appendix B of this Standard. **(Add.)**

H.3.12 Shipment

Refer to Appendix C for general requirements for shipment. **(Add.)**

H.3.13 Guarantee

Appendix D of this Standard covers general requirements for guarantee. **(Add.)**

H.4 REQUIREMENTS FOR ALL TYPES

H.4.1 General

H.4.1.12 Floating covers in fixed-roof are normally used for the following applications:

- **a)** Reduction of ingress of rainwater, sand and snow into the product;
- **b)** Reduction of vapor losses**;**
- **c)** To reduce the hazard of static ignition associated with highly charged liquid surfaces;
- **d)** Reduction of air pollution;

e) As an alternative to floating roofs in open-top tanks, in locations where excessive snow may be experienced. **(Add.)**

H.4.1.13 For design of aviation fuel storage tanks the requirements of Section 5 of IPS-G-ME-100 shall also be fulfilled. **(Add.)**

H.4.7 Design Data

a) Aviation fuel storage tanks shall be of fixed self-supporting cone roof designed with internal metallic floating deck and inverted sloping floor at a gradient of 4% to a central drain sump.

b) The floating covers should be designed to support at least 3 men (300 kg over 3 m^2) anywhere over the surface of the cover in the floating (water testing only) and supported condition.

c) Pump-in rates should be restricted to fluid velocity of 1m/sec. at the inlet nozzle until the floating deck becomes fully buoyant.

d) A floating suction of approved design and compatible with the floating deck is mandatory. The main object of fitting is to minimize the risk of contamination by water.

e) Any part for which no drawing have been prepared shall be designed by Vendor on the basis of the above mentioned reference standards.

f) The design of aviation fuel storage tanks, the type with a floating cover inside a fixed roof tank, designed as a non pressure tank, is recommended to be limited to maximum diameter of 39 meters. **(Add.)**

H.4.8 Bottom Design

Bottom design for aviation turbine fuel storage tanks shall be in accordance with IPS-G-ME-100 Standard. **(Add.)**

H.4.9 Shell Design

Design of shell for aviation turbine fuel storage tanks shall be in accordance with IPS-G-ME-100 Standard. **(Add.)**

H.4.10 Roof Design **(Add.)**

H.4.10.1 Design of roof (fixed and floating) for aviation fuel storage tanks shall be in accordance with IPS-G-ME-100 Standard. **(Add.)**

H.4.10.2 The design should not allow the content to flow on the floating cover. **(Add.)**

H.4.10.3 The floating decks shall be provided with supports for a low level to be specified. The support shall be designed with the following characteristics:

a) The support legs of floating decks shall be set or adjusted so that the bottom of the rim section is just clear of the top of the tank shell manhole(s). This will normally be between 1.12 m and 1.22 m. Other heights may be specified to clear other tank internals.

b) The design should ensure that all internal appurtenances such as side entry mixer, piping, inlet and outlet connections, etc. are clear of the cover in the low position.

c) Supports fixed to the cover or the tank bottom may be used. The supports, attachments and tank bottom should be designed to support a live load of 0.4 kN/m^2.

d) If the load on a support exceeds 2.5 kN, steel pads or other means should be used to distribute the load on the tank bottom. Pads should be continuously welded to the tank bottom to prevent corrosion under the pads. Supports fabricated from pipe shall be provided with a notch at the bottom for drainage. **(Add.)**

H.4.10.4 Floating decks shall be positively buoyant, and shall be of all metallic construction except for the flexible seal. **(Add.)**

H.4.10.5 For aluminum non-contact floating deck design, the minimum pontoon volume shall be sufficient to maintain the roof floating with a buoyancy that will support twice the weight of the roof deck. **(Add.)**

H.4.10.6 The minimum pontoon volume of single and double deck steel floating cover shall be sufficient to maintain the roof floating if the deck and any two pontoons are punctured or flooded.

(Add.)

H.4.10.7 Non-contact floating decks shall have a skirt (vapor seal) around the cover periphery extending 125 mm into the liquid. In addition all openings through all covers shall also have skirts extending 125 mm into the liquid. **(Add.)**

H.4.10.8 Where fixed-roof support column(s) anti-rotation devices or other appurtenances pass through the cover, seals should be provided to ensure a reasonably close fit, taking into account horizontal and vertical movements of the cover. **(Add.)**

H.5 OPENINGS AND APPURTENANCES

Design of appurtenances and accessories for aviation fuel storage tanks shall be in accordance with IPS-G-ME-100 standard. The followings are supplementary requirements: **(Mod.)**

H.5.1.1 Access ladders from the fixed roof to the floating cover are not recommended. Access should be by way of the shell and cover manholes after the tank has been emptied and gas-freed.

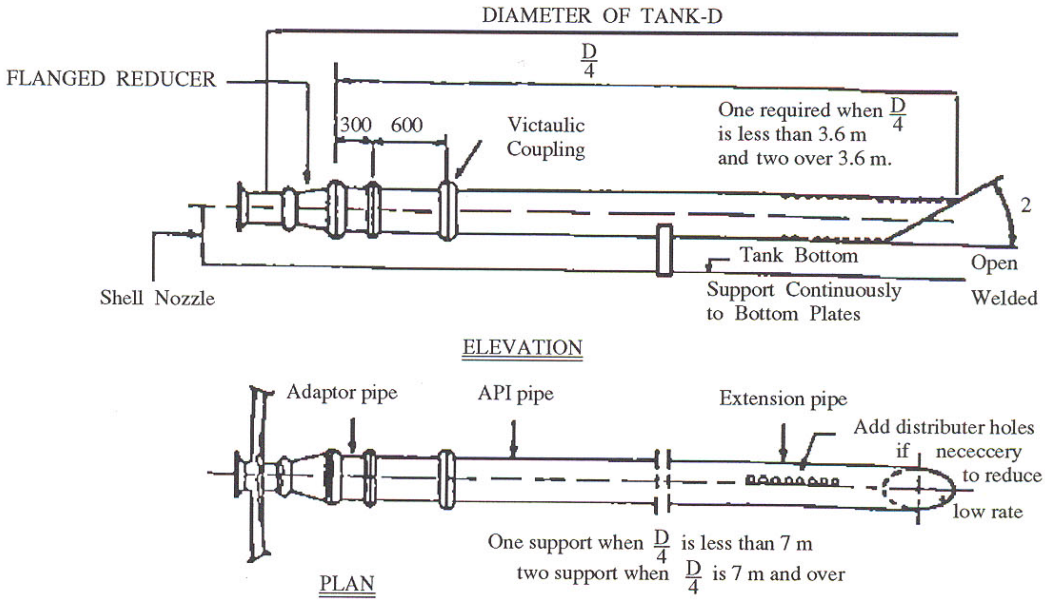
(Mod.)

H.5.2.2.3 Where feasible (as in refineries and process plants) inert gas blanketing should be provided and in such case pressure/ vacuum valves of adequate capacity shall be fitted taking into consideration maximum capacity of gas blanketing control valves. Otherwise the venting requirements of H.5.2 of Annex H of API 650 should be followed. **(Mod.)**

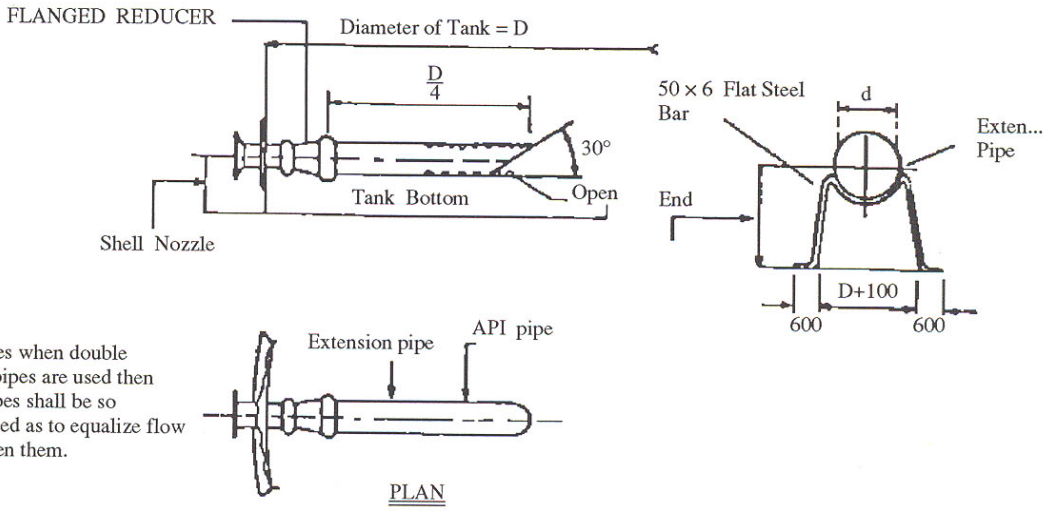
H.5.5.2 Floating decks shall be provided with one manhole with minimum 600 mm ID for decks up to 20 m dia and two manholes with the above ID for tanks over 20 m dia.

The manhole(s) should be designed to be opened from the underside of the cover. Loose covers may be used but the height of the manhole neck should be such that as to prevent the contents flowing on the cover. **(Mod.)**

H.5.6 The tank inlet line shall have an inlet extension pipe according to Fig. 1 of this Standard in order to minimize turbulence during high tank filling rates. **(Mod.)**



INLET EXTENSION PIPE FOR TANKS 7.5 METERS DIAMETER AND OVER



Note: In cases when double filler pipes are used then the pipes shall be so designed as to equalize flow between them.

INLET EXTENSION PIPE FOR TANKS 7.5 METERS DIAMETER AND UND

Pipe Size	Diameter in DN					
Shell Nozzle	75	100	150	200	250	300
Extension Pipe	100	150	200	300	350	460

All dimensions in mm unless otherwise stated.

DETAIL OF MAIN INLET EXTENSION PIPE

Fig. 1

H.5.10 Permanent easily operable water draw-off facilities shall be provided. A DN 40 (1½ in.) sch. 80 drain pipe shall be fitted to siphon water from the sump with provision at drain to observe interface of hydrocarbon and water during water draw-off. Drain-pipe shall be fitted with a non-freeze valve in climates subject to freezing. **(Add.)**

H.5.11 On tanks used for storing aviation fuels, a floating suction of the form of swing pipe e.g. fitted with floats shall be provided. The main object of the fitting is to minimize the risk of contamination by water. **(Add.)**

H.5.12 Roof drains from floating decks to outside of the tank are not required. Emergency drains should be provided. Such drains must be manually operated from the fixed external roof or be automatic. Automatic drains must project into the liquid 125 mm to form a vapor seal. **(Add.)**

H.5.13 Gaging and sampling facilities shall be provided. Additionally, side sampling facilities adjacent to spiral stairway shall be provided for normal operational sampling. Valve shall be as close to tank as possible and located before down-facing bend. **(Add.)**

H.6 FABRICATION, ERECTION, WELDING, INSPECTION, AND TESTING

H.6.1.1 For fabrication of parts to be incorporated into aviation fuel storage tanks, the requirements of IPS-G-ME-100 Standard shall be fulfilled. **(Add.)**

H.6.1.2 Site erection **(Add.)**

H.6.1.2.1 General

Site erection of aviation fuel storage tanks shall be in accordance with IPS-G-ME-100 Standard and the following supplementary requirements:

a) Temporary attachments to assist in erection may be attached to the tank plates by welding provided all such attachments shall ultimately be removed without any noticeable projection of weld metal remaining or any indentation.

b) Erection holes shall not be permitted in plate work.

c) The erection contractor shall inspect and keep stock of all materials delivered and be fully responsible for their safekeeping.

d) All fittings, valves, plates, etc. shall be properly laid down on wooden supports clear of soil. Special care shall be taken that damage does not occur to joint faces of valves or flanges or to beveled ends of fittings.

e) Any damage to materials shall be corrected to the satisfaction of the owner prior to erection, particular attention shall be paid to the removal of buckles and distortions in the shell and bottom plates.

f) Welding electrodes shall be stored in their original packets or cartons in a dry place adequately protected from weather effects. If the electrodes become damp but are not otherwise damaged they may be used only after being dried out in a manner approved by the electrode manufacturers. Any of the electrodes which have areas of the coating broken away or damaged shall be discarded. Hydrogen controlled electrodes shall be stored and baked in accordance with the electrode manufacturer's recommendations. **(Add.)**

H.6.1.2.2 Erection methods

Any proposed method may be used provided the proposed method is approved by the owner. **(Add.)**

H.6.1.2.3 Bottom plating

a) Bottom plating shall be in accordance with the storage tank constructional drawing. Attention shall be paid to erection marks made on bottom plates according to a marking diagram which is supplied by the tank plate fabricator for the use of tank erector.

b) Unless otherwise specified, after the bottom plates are laid down and tacked, they shall be joined by welding the joints in a sequence that the erector has found to result in the least distortion from shrinkage and thus to provide as nearly as possible a plane surface.

c) Manual gas cutting may be used for trimming the corners of bottom plates where two lapped joints intersect and for cutting openings for fittings positioned on site.

d) Lap jointed bottom plates shall be laid, commencing with the center plate and with subsequent plates lapped towards the center of the tank. Layout shall be as indicated in Fig. 2. **(Add.)**

H.6.1.2.4 Shell plating

a) Shell plating and protection of shell during erection for aviation fuel storage tanks shall be as stated in Subsection 7.2.3 of IPS-G-ME-100 Standard.

b) Lugs or other projections on the interior shell surface shall be removed and any sharp-edged projections of weld metal chipped or ground from the plate. Any sharp-edged scars shall be filled with weld metal and ground smooth. **(Add.)**

H.6.1.2.5 Roof erection

a) The method of erection for the internal floating cover shall be submitted to the owner for approval.

b) The requirements of Section 7.2.5 of IPS-G-ME-100 for the erection of fixed roof and internal floating cover shall apply.

c) In the construction of the floating cover, care should be taken to minimize distortion or lack of circularity due to welding or other reasons. The clearance between the periphery of the cover and the tank shell should be uniform and comply with the dimensional requirements specified for the seal. **(Add.)**

H.6.1.3 Welding

Aviation turbine fuel storage tanks and their parts shall be welded according to IPS-G-ME-100 Standard shall be fulfilled. Additional requirements are as follows:

a) All internal bulkhead plates or sheets shall be single fillet welded along their bottom and vertical edges so that they are liquidtight. When pontoon or double deck roofs are required, the top edge of each bulkhead shall also be provided with a continuous single fillet weld so that it is liquidtight.

b) All welding, including tack and attachment welding and repair shall be curried out according to the welding procedure established, and by qualified welders.

c) All seams in the cover shall be vapor tight.

d) Shell plates shall have inside seams which are sufficiently smooth to prevent interference with the movement of the internal floating cover.

e) Joint design for aviation fuel tanks shall be in accordance with Section H.4.3 of Annex H of API Standard 650. **(Add.)**

H.6.1.4 Inspection

I) Shop inspection of materials to be incorporated into aviation fuel storage tanks and inspection of their welding joints shall be in accordance with Sections 6.2 and 8 of API Standard 650-2013 respectively.

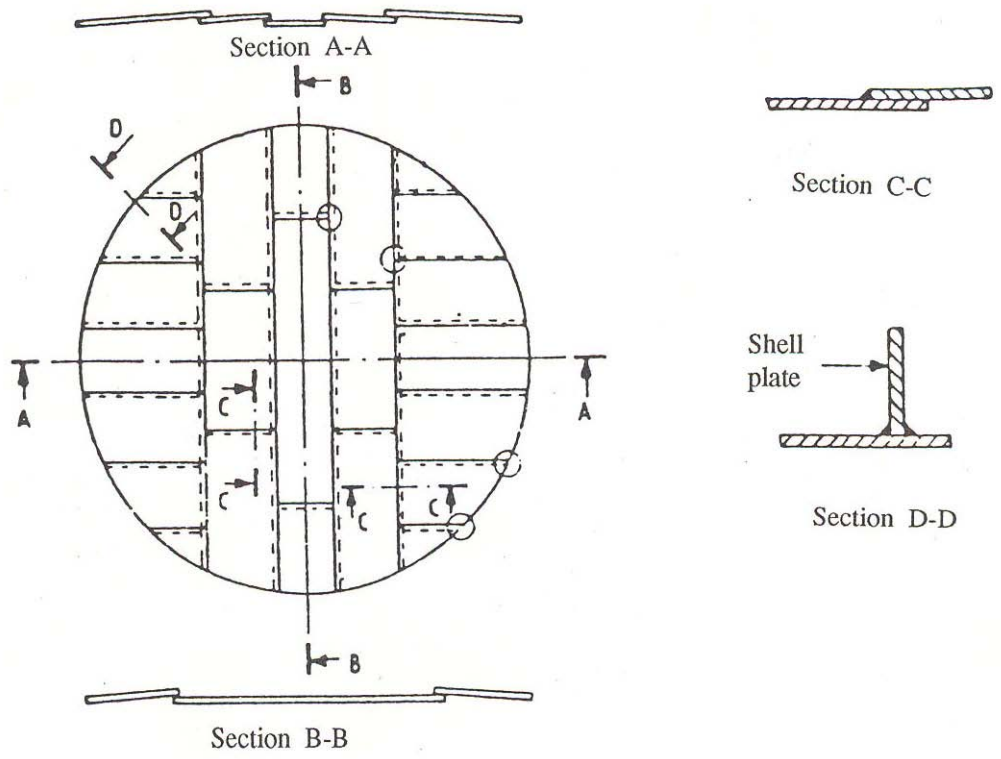
II) Site inspection of aviation fuel storage tanks shall be in accordance with applicable requirements of IPS-G-ME-100 and the following:

a) Before a floating cover is put into operation, it shall be carefully tested for liquid tightness. Lap welded joints in floating covers may be tested by the vacuum box method or by the use of high penetrating oil.

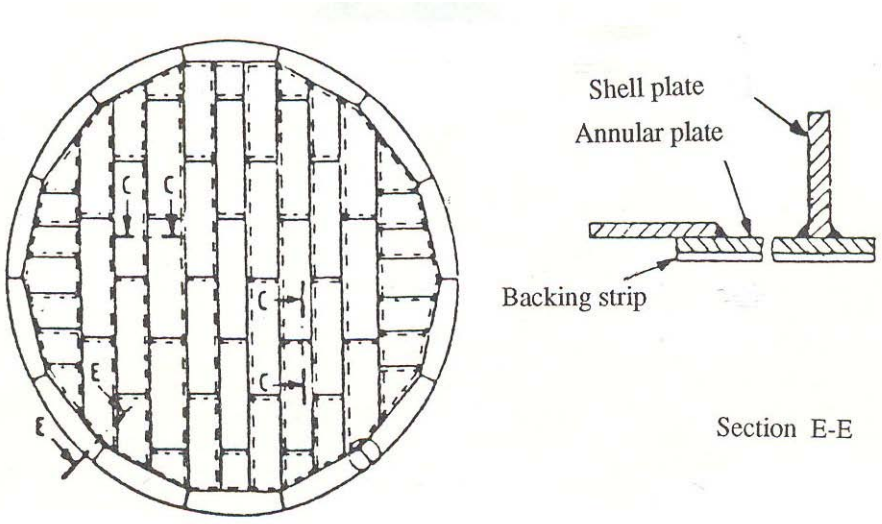
b) Alternatively, when the compartments are completely welded, each completed compartment of pontoon roof shall be individually tested with an air pressure of 7 mbarg, a soapy water solution being applied to all welded joints under pressure which have not been previously tested with penetrating oil.

c) All leaks detected during inspection shall be rectified to the satisfaction of the owner or his representative.

d) All field fabricated pontoons shall be tested for leaks by penetrating oil or by any other approved method consistent with the design. All shop fabricated pontoons (or buoyancy compartments) shall be pressure leak tested with a soap type detecting solution or by any other approved method consistent with the design. **(Add.)**



a) Typical bottom layout for tanks up to and including 12.5m diameter



b) Typical bottom layout for tanks over 12.5m diameter. For layout of plates similar to Section A-A and B-B see a).

TYPICAL BOTTOM LAYOUTS FOR TANKS

Fig. 2

H.7 TANK TESTING

Testing of aviation fuel storage tanks shall be in accordance with the applicable requirements of IPS-G-ME-100 and the followings:

a) On completion, the tank shall be filled with water, to check that the cover and seals travel freely to the full operating height and that the cover is free from leaks.

b) Manholes in the fixed roof shall be kept closed during testing in wet weather, since any ingress of rainwater might lead to false conclusion on water tightness.

c) Any damp spot on the cover should be taken as an indication of a possible leak. Time may be necessary for leaks to become evident and checks should therefore be made at frequent intervals, particulary during the first meter of filling.

d) For aluminum covers, only water having less than 150 ppm chlorides shall be used for hydrostatic testing. Potable water will meet this requirement.

e) All leaks detected during testing shall be rectified to the satisfaction of the owner or his representative. **(Add.)**

H.8 PAINTING

If required, external or internal painting of aviation fuel storage tanks shall be in accordance with Table 1 and Appendix C of Iranian Petroleum Standard No. IPS-E-TP-100 “Engineering Standard for Paints”. **(Add.)**

H.9 TANK FOUNDATIONS

For general requirements on foundation, refer to IPS-G-ME-100 standard. **(Add.)**

H.10 TANK ANCHORAGE

Design of tank anchorage, if required, shall be in accordance with IPS-G-ME-100 Standard. **(Add.)**

APPENDICES

APPENDIX A

SECRECY

Vendor shall not disclose or issue to third parties without the written consent of purchaser any documents, etc. placed at his disposal by purchaser or any documents prepared by himself in connection with inquiries and purchase orders for purposes other than the preparation of a quotation or carrying out such purchase orders.

APPENDIX B

PACKAGING

B.1 When considering the following instructions, due regards shall be paid to handling facilities in transit and at the destination, and also to any special packaging instruction given in the purchase order.

B.2 Structural materials and plates shall be treated as follows:

B.2.1 To prevent damage in transit all roof plates shall be bundled by welded clips as shown in Appendix B Fig. B.1 attached.

The maximum weight of a single bundle shall not exceed approximately 1½ tons.

Bundling shall not take place until the paint is thoroughly dry.

B.2.2 All shell and bottom plates shall be bundled as described under B.2.1 above, except that maximum weight of a single bundle shall not exceed approximately 2 tons.

B.2.3 All structural members, such as roof framing, curb angles, wind girders, hand rails and stair treads, Shall be bundled and secured by bolting or tack welding. To prevent the nuts from loosening during transit, either the threads must be damaged or the nuts spot welded to the bolts. The weight of a single bundle shall not exceed approximately one ton.

B.2.4 All gusset plates, cleats, etc. shall be securely bundled by bolting, each bundle weighing approximately ¼ ton.

B.2.5 All small parts such as bolts, nuts, erection key plates. Shim plates, wedges, etc. shall be bagged and packed separately, and shall be enclosed in stout wooden cases. The minimum thickness of timber used for the cases shall be 22 mm. The total weight of each case shall not exceed approximately ½ ton.

B.3 Roof and shell manholes, nozzles, bottom sumps and clean outs, etc. may be shipped loose. Manhole and clean out cover shall be bolted on with gasket in position. Flange of nozzles, etc. Shall be adequately protected to prevent damage in transit.

Roof vents dip hatches and similar small fittings shall be packed complete with gasket, etc. in stout wooden case, and shall be securely fixed there to prevent damage in transit.

Cases shall be made of timber not less than 22 mm thick strongly battened, and banded with tensioned steel strapping. The weight of any case shall not exceed ½ ton

B.4 All welding electrodes, rods, wires and fluxes shall be packed in such a manner as to keep them in first class condition during transport and storage.

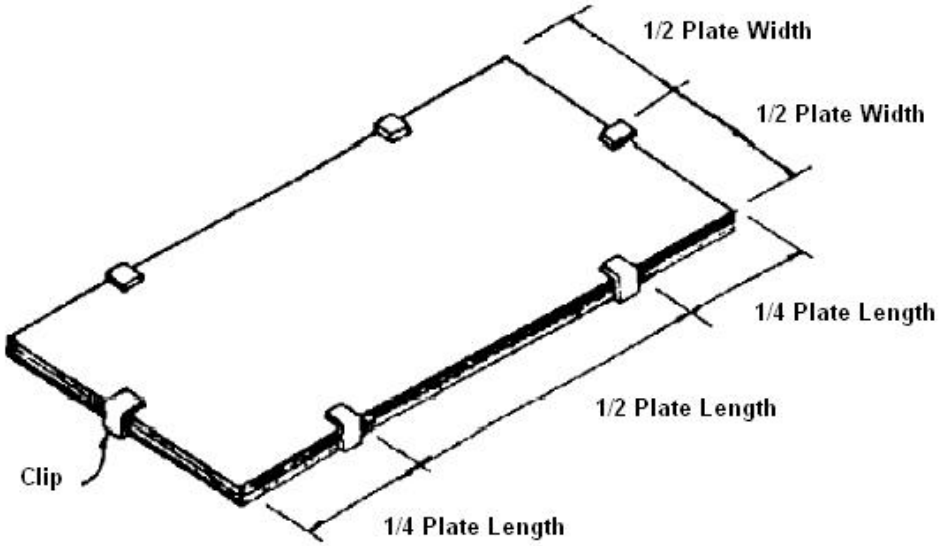
Welding electrodes shall be supplied in containers which give adequate protection against damage and moisture in transit and in storage on site.

The type of packing to be employed shall be specified by the electrode manufacturer.

(to be continued)

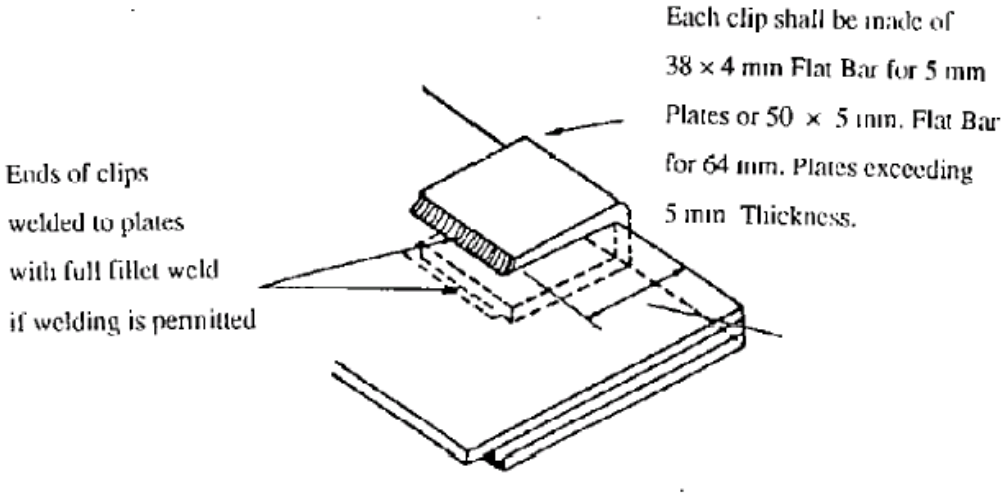
APPENDIX B (Continued)

BUNDLING METHOD



Note 1:

Use 6 numbers of clips for each bundle except where ½ plate length exceeds 4 m in that case use three clips on each side which is 8 clips per bundle.



Note 2:

When welding is not permitted use other safe methods for bundling.

BUNDLING OF ROOF, SHELL AND BOTTOM PLATES

Fig. B.1

APPENDIX C

SHIPMENT

C.1 Plates and storage tank material shall be loaded in such a manner as to ensure delivery without damage.

C.2 Shipping marks shall be provided as follows:

C.2.1 Whenever possible, the shipping marks and any other desired particulars shall be stenciled on each bundle, case or package. Stenciled marks shall be at least 50 mm high. If stenciling cannot be applied, the information shall be suitably stamped on a metal label, securely attached to the package.

Stamped symbols shall be at least 13 mm high.

C.2.2 If any confusion is likely to arise in reception, storing or distribution of the materials (e.g. in the case of purchase orders comprising materials for more than one tank), all parts shall have painted on them a further distinctive mark in addition to any erection or shipping marks. Such additional marking shall consist of a colored band or other mark as agreed with purchaser.

C.2.3 All identification marks shall be applied on at least two sides of each package.

C.3 Each package, case and bundle shall be accompanied with a packing list.

APPENDIX D

GUARANTEE

D.1 Vendor shall guarantee that the materials delivered to be incorporated into storage tank(s) are in accordance with the purchase order and will be free from any defects in design, workmanship and material and that they will give proper service under the operating and design conditions as specified, for a period of 18 months, reckoned from the day on which the tanks are delivered.

D.2 The period of 18 months specified above shall be extended by any period(s) during which the tanks after delivery are out of action as a result of any defect covered by this guarantee.

D.3 In the event of defects covered by this guarantee purchaser shall notify vendor as soon as possible and vendor shall without delay remedy or repair free of charge (cost of labor and transportation not excluded) the tank(s) having such defects, or authorize purchaser to do so. In the latter event vendor shall reimburse to purchaser the actual out of pocket costs, excluding over heads and similar administrative costs.

D.4 Remedying and repairing may be effected by purchaser without prior approval by vendor in cases where it would be unreasonable to demand that prior approval be obtained. In such cases vendor and purchaser shall agree which party shall bear the costs and expenses thereof or in what proportion these costs and expenses shall be divided between them. This guarantee shall remain in effect, provided the remedying and repairing do not result in any detriment to the tank (s).

D.5 In no event will this guarantee cover defect due to normal wear and tear, disregard by purchaser or his consignee of operating instructions, excessive over loading by purchaser or his consignee or unsuitable operating conditions.