


 ICIIC شرکت سرمایه‌گذاری صنایع شیمیایی ایران IRAN CHEMICAL INDUSTRIES INVESTMENT CO	Completing the Remaining Documents of Design and Engineering Services for LAB2 Unit							 شرکت طرح نواندیشان
	MATERIAL REQUISITION FOR MECHANICAL ROOM EQUIPMENTS							
	Pro. Cod	Cons.	Discipline	Unit	Type	Serial	Rev	
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MATERIAL REQUISITION FOR MECHANICAL ROOM EQUIPMENTS

Issued For :

- ☒ Inquiry
☐ Purchase order

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REV	DATE	POI	Prepared By	Checked By	Approved By

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	0	1	2	3	4	5	6		0	1	2	3	4	5	6		0	1	2	3	4	5	6
1	X	X	X	X				31								61							
2	X	X	X	X				32								62							
3	X							33								63							
4	X							34								64							
5	X							35								65							
6	X							36								66							
7	X							37								67							
8	X							38								68							
9	X	X						39								69							
10	X							40								70							
11	X							41								71							
12	X							42								72							
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25	X							55								85							
26	X							56								86							
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29		X		X				59								89							
30								60								90							







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1 INTRODUCTION

Iran Chemical Industries Investment Company (ICIIC) was established in 1984. The executive operation in the area of 3,420,000 square meters in the northwest industrial region of Isfahan began in 1990 to create a Linear Alkyl Benzene (LAB) Complex with 50,000 tons of LAB and 46,000 tons of normal paraffin capacity.

With the increase in domestic consumption and also the improvement of the consumer market in the region, the implementation of the company's development plan for the annual production of 75,000 tons of linear alkyl benzene and 140,000 tons of normal paraffin was strengthened. Utilizing the existing knowledge and applying the scientific and experimental skills of the specialized forces, this company succeeded in successfully completing its development plan in 2003. Iran Chemical Industries Investment Company to reduce the production of Heavy Alkylate By-product (HAB) and also to improve the quality and increase the production of alkyl benzene line (LAB) in cooperation with Sinopec company to successfully operate the selective Hydrogenation of Dyalphins (DSH) in 2008.



2 PURPOSE

This Material Requisition is issued to obtain quotation for design, engineering, procurement and supply of materials, fabrication, quality control, inspection, test, packing and shipment of complete MECHANICAL ROOM HVAC HEATING EQUIPMENT in accordance with requirements of this requisition and all its attachments for "LAB2 UNIT" in SHAHIN-SHAHR , ISFAHAN , IRAN:-

All documents attached hereto are an integral part of this Requisition and shall be taken into consideration.

This requisition includes the following building:

- CHANGE HOUSE
- SUBSTATION NO.05
- PROCESS CONTROL BUILDING NO.03

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- FIRE STATION NO.2

3 DEFINITION AND TERMINOLOGY

OWNER: IRAN CHEMICAL INDUSTRIES INVESTMENT COMPANY (ICIIC)

CONTRACT: Agreement between the OWNER and the ENGINEERING CONTRACTOR and includes documents referred to therein.

MANAGING CONSULTANT (MC): -



ENGINEERING CONTRACTOR: TARHE NO ANDISHAN Consulting engineers (TNA)

PMT: Project Management Team

BEP: Basic Engineering Package

PDP: Process Design Package

CONTRACT NUMBER: 6258

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4 CODES AND STANDARDS

ASHRAE:	American society of heating, refrigerating and air conditioning engineers guide and handbook.
SMACNA:	Sheet metal and air conditioning contractor's national association Inc.
NFPA:	National fire protection association
AMCA:	Air Moving and Conditioning Association
AFI:	American Filtering Institute (Filters)
ADC:	Air Diffusion Council (Air diffusion & tests)
NPC:	National plumbing code
ASTM:	American Society for Testing and Materials.
AHRI:	Air- Conditioning Heating and Refrigeration Institute
IPS:	Iranian petroleum standard
INBC:	Iranian National Building Code
Publication No. 128 of Management and Planning Organization.	

5 ORDER OF PRIORITY

When doubtful or conflicting interpretations arise, precedence shall be determined as follows:

- This Requisition
- Data Sheets
- Design Criteria for HVAC System
- Project Code & Standard List
- International Codes and Standards

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6 REFERENCE DOCUMENTS

For list of documents applicable to the scope of work, refer to clause-12 herein after.

Note:

If safety studies will be requested by the client, this document will be reviewed and edited in accordance with the safety reports.



7 SCOPE OF WORK AND SUPPLY

VENDOR'S scope of work and supply shall include but not limited to items in below tables under requirements stated in this requisition and all of its attachments. The scope of supply must include all necessary components and materials of DOMESTIC HOT WATER GENERATOR, CAST IRON BOILER, and BLADDER EXPANSION TANK, PUMP, BURNER, AIR RELEASE TANK in full compliance to this MR and its attachments, required for all modes of operation and safe and smooth operation of the plant.

7.1 Scope of Work

7.1.1 Inclusion

Main Quotation	Optional	Description
✓	-	Planning, coordination and project control (covering all sub Vendors)
✓	-	Engineering, design and procurement of all material
✓	-	Data sheet and performance data
✓	-	Document control and submissions to Purchaser for review / comments / final filling and updating them progressively
✓	-	Manufacturing and assembling
✓	-	Surface preparation and Painting at shop including primer and finish coats
✓	-	Inspection and tests at shop
✓	-	All on skid wiring terminating at skid edge junction boxes
✓	-	Foundation loading diagram

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Main Quotation	Optional	Description
✓	-	Insulation and personnel protection, if required
✓	-	Shipping and transportation according to delivery condition
✓	-	Packing including export and rust prevention for long term
✓	-	Units Assembly at Factory
-	✓	Supervision for Installation, Pre-Commissioning, Commissioning and Start-Up including time schedule & supervision stages
✓	-	Dimensional outline drawing and anchor bolts position
-	✓	Training (Syllabus, number of man days and duration to be specified in the quotation)
✓	-	Mechanical Guarantee
✓	-	Performance Guarantee
✓	-	All Needed Work and Equipment To Set Up Equipment And Systems
✓	-	All technical data such as equipment manuals, catalogues, and other effective technical brochures.

7.1.2 Exclusion

02



In addition to exclusion items of data sheets, the following shall be considered as exclusion:

- Foundations design
- Civil works

7.2 Scope of Supply

7.2.1 Inclusion

Main Quotation	Optional	Description
✓	-	Burner
✓	-	Supplying and erecting suitable chimney

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✓	-	All standard painting works to be done by vendor along with supply of material
✓	-	All Insulation / cladding material are to be supplied and installed by vendor
✓	-	Stop valve, Range valve(in addition to stop valve), Bypass valves, Auto control valves, safety valves, drain valves, traps etc required are to be supplied and installed by vendor.
✓	-	Thermocouples, Level controllers with indicator, Flow controllers ,solenoid valves, Transmitters etc required are to be supplied and installed by vendor
✓	-	Pressure gauges are to be supplied and installed by vendor.
✓	-	All electrical, Instrumentation, mechanical works along with supply of material will be in the scope of vendor
✓	-	Packing, marking, and Transporting
✓	-	Vendor should submit all specs of boiler, equipment details, PID drawings, performance data etc along with quotation.
✓	-	Temperature gauges are to be supplied and installed by vendor.
✓	-	Electrical panel and designed and supply
✓	-	Electrical motor for all pumps
✓	-	Separated electrical panel for booster pumps



7.2.2 Exclusion

The followings shall not be included in scope of supply:

- In addition to exclusion items of engineering data sheets, the following shall be considered as exclusion.
- Foundations design. (Foundation loading diagram and information shall be provided)
- Civil works except for anchor bolts.

8 TECHNICAL NOTES AND SPECIAL CONSIDERATIONS

Unless otherwise stated in the specification and/or data sheet, the Appendix A shall be followed.

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9 INSPECTION AND TESTING

Inspection and Test shall be carried out at Vendor's shop as per attached "Instruction to Vendor for Inspection", relevant ITP and applicable codes and standard.

10 PRESERVATION AND PROTECTION

VENDOR shall, upon receipt of PURCHASE NOTICE, send a sufficient number of qualified personnel to Client/Purchaser's office (in Tehran) at VENDOR's cost to hold the coordination meeting(s) according to following schedule:

Kick-Off Meeting	for (1) days , (2) weeks after Purchase Notice
Pre-Inspection Meeting	for (1) days as per schedule
Pre-FAT & IFAT Meetings	for (1) days as per schedule
Design Clarification Meeting	will be defined in Kick-Off Meeting (If required)

11 CONFORMITY



VENDOR'S proposal shall be in strict conformity with PURCHASER'S requirements as stated in this Requisition and all of its attachments. Any deviation or exception to Purchaser's requirements shall be raised to Purchaser to obtain prior Approval. Without such Approval any claims will be rejected and Vendor shall correct the non-conformities at his own cost.

Purchaser Approval on Vendor documents shall in no way to relieve Vendor of any of his obligation, responsibility or liability under the condition of this requisition.

12 REQUIREMENTS FOR DOCUMENTS (RFD FORM)

A) VENDOR shall provide list of drawings and documents by one week after order award.

B) VENDOR of equipment / material shall provide all documents and drawings listed in RFD and submit required number of copies.

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C) All Vendor documents shall be categorized either “FOR INFORMATION”, or “FOR REVIEW/COMMENTS” according to RFD. Purchaser will reply according to each categories and return to Vendor documents and Vendor shall take necessary actions in accordance with the steps and manner as described in “INSTRUCTION FOR VENDOR DOCUMENTATION”. All vendor’s documents and drawings shall be submitted in both Native and PDF format upon each issue. Both Native and PDF files of documents shall be searchable.

D) Definition and abbreviations are as follows:

▪ **FINAL BOOK**

Means a collection of documents and drawings that convey the Project closing documentation requirements as defined by Purchaser.



▪ **REVIEW CYCLE**

Means the time duration required by the Purchaser to complete the review of the Vendor documents (10 calendar days from date of receipt). Vendor shall incorporate the comments, update and return the documents within 10 calendar days.

These periods shall be taken into account in scheduling of documents, submissions and manufacturing activities. Status Review Codes are shown in the status review stamp in the documents.



E) Quantity, type and submission date of documents to be as follows:

Description		Final Issue (No. of Weeks Upon NC/NR Status)	Final Book
No. of Copies	Hard Copy (H)		
	Soft Copy (S)		
Submission Date			
Vendor Documents Status Code:		NR: Not Reviewed NC: No Comment	



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F) RFD form to be as follows:



VDRS CODE	SER. NO.	DOCUMENT DESCRIPTION	Before PO.	After PO.					Note	
			Qty.	For Comment			Final Issue Rq' d.	To Be Included in Final Book		
				Qty.	Sub. Date	Purpose				
										S
MANAGEMENT & SCHEDULING										
1	1	Vendor Document List & Schedule (VDLS)	X	X	1	R	-	-		
2	2	Organization Chart	X	-	-	-	-	-		
3	3	Monthly /Weekly Progress Report	-	X	-monthly	R	-	-		
4	4	Engineering, Procurement , Fabrication, Testing and Delivery Schedule	X	X	-monthly	R	-	-		
5	5	Deviation & Clarification List to Standards / Codes / All of Technical Specifications	X	-	-	- R	-	X		
6	6	Vendor Catalogue	X	-	-	-	-	X		
7	7	Final Book Index	-	X	-	R	-	X		
QUALITY INSPECTION & TESTING [PROCUREMENT]										
1	1	Project Quality Assurance Plan	X	-	-	I	-	X		
2	2	QC Inspection & Test Plan	X	X	4	R	X	X		
3	3	Certification Dossier	-	-	-	-	-	X		
4	4	Inspection & Test Report	-	X	*	R	X	X	* 1 week after test	

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			Qty.	For Comment			Final Issue Rq' d.	To Be Included in Final Book	
				Qty.	Sub. Date	Purpose			
				S	S	Week			
	5	Vendor Quality Control Records	-	X	*	R	X	X	* 1 week after inspection
	6	Certificates of materials (including instrument devices)	-	X	*	R	X	X	* 4 week before inspection
	7	Instrumentation Certificates (including: ▪ Ex Classification, ▪ SIL (if any), ▪ Calibrations, ▪ Function Tests, ▪ Routine, Standard & NDT Tests (records), ▪ Inspection, ▪ Declaration of Conformity, ▪ FAT & SAT, ▪ Approvals)	-	X	*	R	X	X	*: in due times before inspection
	8	Certificates of calibrations	-	X	*	R	X	X	* During inspection
	9	Welders' qualification records	-	X	*	R	X	X	* During inspection
	10	Statement of manufacturer's testing capabilities	X	-	-	-	-	X	
	11	Hydrostatic test report	-	X	*	R	X	X	* 1 week after inspection
	12	Performance Test Report	-	X	*	R	X	X	* 1 week after inspection
	13	Certificate for explosion proof electrical equipment and devices	-	X	*	R	X	X	* During inspection
HSE									
	1	HSE Procedures / Policy	X	-	-	I	-	X	

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				Qty.	Sub. Date	Purpose			
				S	S	Week			
ENGINEERING									
	1	Data sheets	X	X	4	R	X	X	
	2	Dimensional outline drawing	X	X	4	R	X	X	
	3	Cross sectional drawings and bill of materials	-	X	10	I	X	X	
	4	Utility Consumption List	X	X	5	I	X	X	
	5	General Arrangement Drawing Including Loading Table/ Information	-	X	4	R	X	X	
	6	Hydro-Test Procedures	-	X		R	X	X	
	7	AS Built Drawings	-	X		R	-	X	
	8	Name Plate Detail Drawing	-	X		R	X	X	
	9	Construction Forms		X		R	X	X	
	10	Cable Schedule		X		R	X	X	
	11	Control System Drawings		X		R	X	X	
	12	I/O List equipment Panel		X		R	X	X	
	13	MTO control System		X		R	X	X	
	14	Panel Logic Diagram		X		R	X	X	
	15	Wiring Diagram		X		R	X	X	
	16	Panel Single Line Diagram		X		R	X	X	

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				S	S	Week			
	1	FAT/SAT test Procedures	-	X	*	R	-	X	* 6 weeks before test
ELECTRICAL									
	2	Motor speed–torque curve	X	X	4	R		X	
	3	Motor speed–current curve	X	X	4	R		X	
	4	Electrical load list	X	X	6	R	X	X	
	5	Electrical Final MTO	-	X	15	I		X	
	6	Electrical Signal List between package and MCC	-	X	10	R	X	X	
	7	Electrical Cable Lists	-	X	7	R	X	X	
	8	Single line diagram	-	X	10	R	X	X	
	9	Electrical Equipment List	-	X	15	I		X	
	10	Motor terminal box drawing	-	X	7	R	X	X	
	11	Local Push button station drawings		X	7	R	X	X	
PROCUREMENT									
	1	Sub-Vendor List (including all accessories & sub-ordered components)	X	-		-	-	X	
	2	Un-priced Copy of Final Technical Main Order and Sub-Orders	-	X		I	-	X	
	3	Detailed Packing List (-	X		R	X	X	

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				Qty.	Sub. Date	Purpose			
				S	Week	I / R			
TRANSPORTATION, INSPECTION, OPERATION AND MAINTENANCE MANUALS									
	1	Installation Procedure	-	X		I	-	X	
	2	Operation and Maintenance Instruction	-	X		I	-	X	
	3	List of special tools supplied and required for installation, calibration, configuration, site tests and maintenance	X	X		I	-	X	
	4	Spare Parts List (Installation, Pre-commissioning, Commissioning & Start-Up)	X	-		-	-	X	
	5	Spare Parts List (Two Years Operation)	X	-		-	-	X	
	6	Spare Parts SPIR Form	-	X		R	X	X	
	7	Shipping Volume Information and arrangement	X	-		-	-	-	
	8	Shipping List	-	-		-	X	-	
	9	Trouble shooting diagram	-	X		I	X	X	
	10	Lifting, Loading, Unloading & Transportation Procedures Handling and Transport Protective Measures at Site	-	X		I	X	X	

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				S	Week	I / R			
	11	Preservation procedures [Long term storage procedure/ Preparation for storage at job site before installation/ Weather protection at job site]	-	X		I	X	X	

Notes:



- H= Hard Copy, S=Soft Copy
- R=Issued for Review/Comment, I=Issued for Information

13 LIST OF REFERENC DOCUMENTS (ATTACHED TO THIS MR)



No.	Doc. Title	Doc. Number
1	HVAC DESIGN CRITERIA	LRP-TNA-HV-99-SPC-0001
2	HVAC & PLUMBING DESIGN SPECIFICATION	LRP-TNA-HV-99-SPC-0002
3	HVAC EQUIPMENT SPECIFICATION	LRP-TNA-HV-99-SPC-0003
4	STANDARD DRAWING FOR HVAC & PLUMBING SYSTEM	LRP-TNA-HV-99-STD-0001
5	SYMBOL & ABBREVIATION FOR HVAC & PLUMBING SYSTEM	LRP-TNA-HV-99-STD-0002
6	SUBSTATION NO.05 HVAC CALCULATION	LRP-TNA-HV-19-CAL-0001

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No.	Doc. Title	Doc. Number
7	SUBSTATION NO.05 HVAC EQUIPMENT DATA SHEETS	LRP-TNA-HV-19-DSH-0001
8	SUBSTATION NO.05 HVAC ROOF PLAN	LRP-TNA-HV-19-DWG-0001
9	SUBSTATION NO.05 HVAC DUCTING PLAN AND SECTION	LRP-TNA-HV-19-DWG-0002
10	SUBSTATION NO.05 PLUMBING PLAN & ISOMETRIC	LRP-TNA-HV-19-DWG-0003
11	SUBSTATION NO.05 HVAC MATERIAL TAKE OFF	LRP-TNA-HV-19-MTO-0001
12	SUBSTATION NO.05 HVAC P&ID	LRP-TNA-HV-19-PID-0001
13	SUBSTATION NO.05 HVAC EQUIPMENT SCHEDULE	LRP-TNA-HV-19-LIS-0001
14	PROCESS CONTROL BUILDING NO.03 HVAC CALCULATION	LRP-TNA-HV-19-CAL-0002
15	PROCESS CONTROL BUILDING NO.03 HVAC EQUIPMENT DATA SHEETS	LRP-TNA-HV-19-DSH-0002
16	PROCESS CONTROL BUILDING NO.03 HVAC ROOF PLAN	LRP-TNA-HV-19-DWG-0004
17	PROCESS CONTROL BUILDING NO.03 HVAC DUCTING PLAN AND SECTION	LRP-TNA-HV-19-DWG-0005
18	PROCESS CONTROL BUILDING NO.03 PLUMBING PLAN & ISOMETRIC	LRP-TNA-HV-19-DWG-0006
19	PROCESS CONTROL BUILDING NO.03 HVAC MATERIAL TAKE OFF	LRP-TNA-HV-19-MTO-0002
20	PROCESS CONTROL BUILDING NO.03 HVAC P&ID	LRP-TNA-HV-19-PID-0002
21	PROCESS CONTROL BUILDING NO.03 HVAC EQUIPMENT SCHEDULE	LRP-TNA-HV-19-LIS-0002
22	FIRE STATION NO.2 HVAC CALCULATION	LRP-TNA-HV-15-CAL-0001
23	FIRE STATION NO.2 HVAC EQUIPMENT DATA SHEETS	LRP-TNA-HV-15-DSH-0001
24	FIRE STATION NO.2 HVAC ROOF PLAN	LRP-TNA-HV-15-DWG-0001
25	FIRE STATION NO.2 HVAC DUCTING PLAN AND SECTION	LRP-TNA-HV-15-DWG-0002
26	FIRE STATION NO.2 PLUMBING PLAN & ISOMETRIC	LRP-TNA-HV-15-DWG-0003
27	FIRE STATION NO.2 HVAC MATERIAL TAKE OFF	LRP-TNA-HV-15-MTO-0001



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No.	Doc. Title	Doc. Number
28	FIRE STATION NO.2 HVAC P&ID	LRP-TNA-HV-15-PID-0001
29	FIRE STATION NO.2 HVAC EQUIPMENT SCHEDULE	LRP-TNA-HV-15-LIS-0001
30	ALL BUILDING ARCHITECTURAL DRAWINGS	-
*Note: The last version and approved issue of all documents shall be considered by vendor.		

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APPENDIX A1

Equipment Specification

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14 DOMESTIC HOT WATER GENERATOR

14.1 Storage Tank

Tank shall have 150 psi or 160 psi operating pressure, an ASME section VIII construction, 11"x15" manhole, cement, or epoxy lining.

The storage tank shall be furnished with a factory installed heavy steel jacket finished with a baked acrylic enamel finish. The storage tank shall be completely encased in a minimum of 2" thick, high density polyurethane foam insulation to meet the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard. The tank shall be supplied with a drain valve.

Tank shall be built to ASME section lined and furnished with an ASME temperature & pressure relief valve.

14.2 Heating Coil



The heating coil shall be constructed and stamped according to section VIII of ASME code. The tube bundles shall be constructed of 3/4" O.D. 20 GA. deoxidized drawn copper tubing. The unit will be completely factory assembled and furnished with the following standard components.

14.3 Control

Control packages include isolation valves, 2-way self-operated temperature regulator, inlet wye strainer and all necessary piping.

14.4 Tank Lining Options

Stainless steel tank lining designed to provide effective corrosion resistance against the chemicals and conditions experienced in the storage of potable water at elevated temperatures.

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15 CAST IRON BOILER

15.1 General

This specification, together with the documentation listed on the requisition defines the requirements governing the design, supply of materials, fabrication, inspection, testing, acceptance standards, painting, preparation for shipment and documentation of shop assembled cast iron boiler units and related equipment.

The Supplier shall be responsible for obtaining all necessary certification from the appropriate authority covering the design, fabrication, inspection and pressure testing of the equipment and shall perform tasks defined in the code as being the responsibility of the Supplier.

The certification of the complete boiler unit shall be to ASME Boiler and Pressure Code Section I Power Boilers requirements and shall be stamped with the code symbol.

15.2 Codes & Standards

The Boiler package shall be designed, fabricated, inspected and tested in accordance with the Codes of Practice and Standards listed below:

National Fire Protection Association (NFPA)

NFPA 85B / NFPA 85D Prevention of furnace explosions in natural gas burner boiler furnaces.

NFPA 54 National Fuel Gas Code



NFPA 58 Storage and Handling of Liquefied Petroleum Gases

NFPA 70 National Electrical Code

American Society of Mechanical Engineers

ASME B16.1, Cast Iron Pipe Flanges and Flanged Fittings

ASME B16.5, Pipe Flanges and Flanged Fittings

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ASME Boiler and Pressure Vessel Codes

American Gas Association (AGA)

AGA Directory of Certified Appliances and Accessories

AGA Z21.13 Gas-Fired Low-Pressure Steam and Hot Water Boilers

American Society of Mechanical Engineers (ASME)

ASME BPVC Boiler and Pressure Vessel Code, Construction Sec IV of Heating Boilers

ASME BPVC Boiler and Pressure Vessel Code, Construction Sec VIII of Pressure Vessels

15.3 Test Data

Assemble of cast iron sections conforming to ASME Code requirements and tests for maximum working pressure of 100 kPa 200 kPa water

15.4 CONSTRUCTION

Flue passages shall be readily accessible without use of special tools. Provide adequate clean out and access doors, and openings including observation ports and relief openings.

Provide structural steel base with front plate, removable panels and lifting lugs.



Insulate casing with readily removable 2-inch (50-mm) thick glass-fiber blanket insulation covered by sectional, preformed minimum 18 gauge (1.2 mm) sheet-metal jacket, finished with factory-applied baked enamel.

Provide combination water pressure and temperature gauge, and ASME rated pressure relief valves.

Provide low water cut off with manual reset to automatically prevent burner operation when boiler water falls below safe level.

Operating temperature controller [with outdoor reset] shall control burner operation to maintain boiler water temperature. [Controller shall be electronic].

Limit temperature controller shall control burner to prevent boiler water temperature from exceeding safe system temperature.

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Provide boiler air vent tapping.

Provide structural-steel base with front plate, removable panels, and lifting lugs.

Provide low-water cutoff with automatic reset integral with water column to prevent burner operation automatically when boiler water falls below safe level. Provide a probe-type auxiliary low-water cutoff, manual reset type.

Auto reset type shall control burner operation to maintain boiler water temperature.

Provide high-limit-temperature controller with manual reset for burner to prevent boiler water temperature from exceeding safe system temperature.

15.5 FUEL BURNING SYSTEM

General: Burner operation shall be [on off] [hi low] [modulating] [with low fire position for ignition].

Gas Burner: Atmospheric or power type with electric ignition and gas pressure regulator.

Collector and Draft Hood: Provide atmospheric gas fired boiler with natural draft operation equipment as regularly supplied by boiler manufacturer.



Controls: Prewired, factory assembled electronic controls in control cabinet with flame scanner or detector, programming control, relays and switches. Provide pre purge and post purge ignition and shut down of burner in event of ignition pilot and main flame failure with manual reset.

15.6 Bladder Expansion Tanks

Bladder expansion tank should have a totally replaceable bladder and are often referred to as replaceable diaphragm.

Tank must be equipped with large service openings that allow the bladder to be replaced without having to remove the tank from its mounting.

Bladder tanks are required in a closed loop heating or chilled water HVAC system to absorb the expanding fluid and limit the pressure within a heating or cooling system. A properly sized tank will

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accommodate the expansion of the system fluid during the heating or cooling cycle without allowing the system to exceed critical pressure limits.

The expansion tank uses compressed air or N2 gas to maintain system pressures by accepting and expelling the changing volume of water as it heats and cools.

Tank designs incorporate a diaphragm or bladder to isolate the expanded water from the pressure controlling air cushion, which is pre-charged at the factory and can be adjusted in the field to meet critical system requirements.

15.7 Description

Tanks are ASME removable bladder type pre-charged expansion tanks. They are designed to absorb the expansion forces and control the pressure in heating/cooling systems. The system's expanded water (fully compatible with water/glycol mixtures) is contained in a full acceptance heavy duty butyl bladder that prevents tank corrosion and waterlogging problems. The expansion tanks can be installed vertically or horizontally.

15.8 Construction

Shell: Carbon Steel



Bladder: Heavy Duty Butyl

System Connection: Carbon Steel

15.9 Performance Limitations

Maximum Design Temperature: 240°F

Maximum Design Pressure: 125 PSIG*

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16 WATER PUMPS

16.1 Classification

16.1.1 Types

The centrifugal water pumps are classified as follows:

- End suction centrifugal
- In-line centrifugal

16.1.2 Applicable ranges

Note:

The vendor shall select a pump that has design flow and head intersecting at a point on the pump curve that is within the "peak efficiency" range of the pump.

16.2 General (End suction centrifugal)



The pumps shall be factory assembled and tested and cleaned, and painted. The size, speed, capacity flow and pressure drop and power input of each pump shall be as listed in the pump schedule.

The maximum operating limitation for the temperature range shall be up to 232°C (450°F) and for the pressure range up to 10134 k Pa (20 bar).

16.3 Material specification

16.3.1 Pump casing

- The pump casing shall be cast iron, bronze fitted.
- The thickness of casing shall be suitable to withstand stresses and strains at full operating pressures at pumping temperature. The design stress that is applicable to the cast iron material shall comply to Section VIII "Unfired Pressure Vessel" of the ASME Boiler and Pressure Vessel Code.

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c) The relevant ANSI standard shall be applicable to the flanged suction and discharge. Pump attachments such as vent tap, petcock and drain connections shall be with minimum size of 12 mm ($\frac{1}{2}$ " NPT).

16.3.2 Impeller

The impeller shall be enclosed type, statically and dynamically balanced hydraulic design, according to standard relevant impeller material shall be stainless steel according to EN/DIN1.4301

16.3.3 Shaft and shaft sleeve

Shaft shall be replaceable type to protect the shaft passing through the stuffing box.

The pump shaft shall be provided with a replaceable sleeve to cover all wetted areas of the shaft under the sleeve.



Shaft shall be made from stainless steel material according to EN/DIN1.4305.

16.3.4 Mechanical Seal

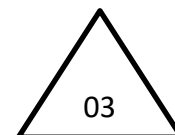
Pumps shall be equipped with self-lubricated mechanical sealing arrangement of carbon on ceramic or tungsten carbide, and suitable for the temperature range 0 to 232°C (450°F). (Integral type of mechanical seals is not acceptable except for "close coupled" pumps).

The mechanical seal with all metal parts shall be 303 stainless steels with "Buna-N" elastomers, nickel resistant seal and carbon washer.

The mechanical seal for horizontal or vertical split case pumps, single or double stage shall be stuffing-box type with impregnated fibers packing plus lantern ring for flushing.

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17 CONDENSING BOILERS



Condensing boiler should be contained(not limited to):

- The heat exchanger should be made of stainless steel.
- The condensing boiler should be equipped with a "pre-mix" system.
- The fan should be equipped with a variable speed system, like "EBM" manufacturing.
- The condensing boiler should be equipped with an electrical gas control valve like "HONEYWELL" or "DUNGS" manufacturing.
- The Control system should be like "SIEMENS" manufacturing.
- The condensing boiler should be able to work from 20% to 100 of the load.
- The condensing boiler should be equipped with an ambient temperature sensor.