

**HUDSON PRODUCTS CORPORATION**

SPECIFICATION

Page <b>1</b>	of <b>8</b>
Spec. No. <b>IFH-1</b>	
Proj/Job No.	

SPECIFICATION TITLE <b>INDIRECT FIRED HEATERS</b>				SPECIFICATION NO <b>IFH-1</b>
CUSTOMER				JOB NO
ORIGINATOR <b>BOB GIAMMARUTI</b>				DATE OF ISSUE <b>NOVEMBER 9, 1998</b>
REV NO	DATE	BY	CHECKED	REVISION
<b>1</b>	<b>10-MAR-00</b>	<b>RJG</b>		<b>General Update</b>

**TABLE OF CONTENTS**

	<u>Page</u>
1.0 Scope.....	2
2.0 General.....	2
3.0 Codes and Specifications .....	2-3
4.0 Design .....	3
4.1 General .....	3
4.2 Burners .....	4
4.3 Tubes and Tube Supports .....	5
4.4 Stack .....	5
4.5 IFH Structure.....	5
4.6 Instruments and Auxiliary Connections .....	5-6
5.0 Hudson Data Requirements .....	6
6.0 Quality Assurance Requirements.....	6-7
7.0 Preparation for Shipment .....	7
8.0 Start-Up.....	7
9.0 Proposal.....	8

Date Issued: \_\_\_\_\_  
Date Revised: \_\_\_\_\_

Page	of
2	8
Spec. No.	
<b>IFH-1</b>	
Proj/Job No.	

## HUDSON PRODUCTS CORPORATION

### 1.0 SCOPE

- 1.1 This specification covers the general requirements for the design and fabrication of indirect fired heating equipment.
- 1.2 Hudson shall mean Hudson Products Corporation.
- 1.3 Owner shall mean the purchaser and/or end user of the equipment.
- 1.4 Specific flame arrestor and burner requirements shall be referenced, if required.

### 2.0 GENERAL

- 2.1 Indirect fired heaters (IFH) shall be supplied in accordance with the contents of this specification, which shall include all the applicable sections of codes, etc., listed herein.
- 2.2 Unless otherwise specified, where there is conflict between the contents of this specification and the detailed engineering drawings or within the contents of this specification, the Owner shall be called upon to make a binding final decision.
- 2.3 The data sheet, which is part of this specification, shall be completed by Hudson and returned to the Owner for approval.
- 2.4 Hudson shall comply with the contents of all changes and/or additions incorporated in the most recent issue or edition of codes, etc., listed in this specification issued up to the time of award of contract.
- 2.5 Where there is conflict between any additions or changes to codes, as specified in Paragraph 2.4, and the contents of this specification, the changes shall apply.
- 2.6 Components manufactured or assembled to make up the flame arrestor or burner configurations or controls shall meet the requirements of this specification.

### 3.0 CODES AND SPECIFICATIONS

- 3.1 IFH shall be designed and constructed in accordance with all applicable sections of:

ASME	American Society of Mechanical Engineers
ANSI	American National Standard Institute
AISC	American Institute of Steel Constructors
CSA	Canadian Standards Association
CNBC	Canadian National Building Code
TEMA	Tubular Exchanger Manufacturer's Association
ASTM	American Society for Testing and Materials

Date Issued: \_\_\_\_\_  
Date Revised: \_\_\_\_\_

**HUDSON PRODUCTS CORPORATION**

SPECIFICATION	
Page 3	of 8
Spec. No. <b>IFH-1</b>	
Proj/Job No.	

3.2 All of the pertinent code requirements referenced in the main body of this specification are applicable.

4.0 DESIGN

4.1 General

4.1.1 IFHs shall be fired with natural gas and shall be designed for a net process efficiency of between 45 to 75% based on the fuel higher heating value and the application.

4.1.2 All parts of the IFH shall be designed to permit thermal expansion at maximum of operating temperature.

4.1.3 The maximum measured outside tube surface temperature on any one tube shall not exceed:

Material Heated	Parameter	Maximum Tube OD Temperature	Application
Asphalt	N/A	550°F	Storage Tank
Oil	Oil API ≤ 20	250°F	Storage Tank
Oil	Oil API > 20	350°F	Storage Tank
Oil	W.C. ≤ 20%	350°F	Treater
Oil	W.C. 20% < WC ≤ 60%	400°F	Treater
Oil	W.C. > 60%	450°F	Treater

W.C. = Water Cut

4.1.4 All structural fabrication for the IFH and stack shall meet the requirements of the Canadian National Building Code or the specifications of the American Institute of Steel Construction.

4.1.5 Fuel gas piping systems shall not contain malleable iron, cast iron, or brass fittings. Forged steel pipefittings of 2,000lb (14,000kPa) minimum rating shall be used.

4.1.6 All IFH assemblies shall include an approved flame failure shutdown device capable of shutting down the main fuel supply.

4.1.7 Flame cells (arrestors) will meet or exceed the flameproof requirements of the Canadian Explosive Atmospheric Laboratory or the US equivalent depending upon location of the IFH.

Date Issued: \_\_\_\_\_  
Date Revised: \_\_\_\_\_

Page 4	of 8
Spec. No. <b>IFH-1</b>	
Proj/Job No.	

**HUDSON PRODUCTS CORPORATION**

## 4.2 Burners

- 4.2.1 Burners shall be designed such that the IFH shall operate efficiently from 30% to 125% of design heating load with 200% to 400% excess air.
- 4.2.2 Sufficient burners shall be supplied to achieve uniform temperatures in the firing section of the IFH.
- 4.2.3 Each burner shall be equipped with a pilot. Fuel to the pilot shall by-pass the burner fuel control valve but not the fuel shut-off valve.
- 4.2.4 Devices for the admission of air to the burners shall be adequately protected against variations in external wind pressure, unbalanced fires, and outside burning so there is no danger of flame "blow back" through the burners.
- 4.2.5 The burner housing shall be of a removable type joined to the tube bundle by a mechanical non-gasketed seal.
- 4.2.6 The flame cell shall be seal welded into the plenum to provide a non-leak joint.
- 4.2.7 Hudson shall supply a two-inch (50.8-mm) OD viewing port complete with a sealed, tempered, high temperature glass.
- 4.2.8 Burners shall be cast iron port type with vertical venturi tubes and orifice for use with natural gas, propane or casing (solution) gas.
- 4.2.9 Burner housing assemblies with cast aluminum alloy bodies are not allowed.
- 4.2.10 The main burner heads shall be situated directly below the tube bundle and perpendicular to the bundle tubes. Burner assemblies shall be removable.
- 4.2.11 The pilot shall be situated at the front of the right burner row, directly adjacent and flush with the burner ports.
- 4.2.12 As per good engineering design, the flame cells (arrestors) shall be sized to allow proper combustion airflow to the burners per 4.2.1.
- 4.2.13 The burner fuel gas piping will contain a drain nipple for periodic condensate, knockout, collection and removal.

Page 5	of 8
Spec. No. <b>IFH-1</b>	
Proj/Job No.	

**HUDSON PRODUCTS CORPORATION**

- 4.3 Tubes and Tube Supports
- 4.3.1 All tube welds shall be designed per ASME Section VIII, Division 1, but not pneumatically pressure tested unless requested by the Owner.
- 4.3.2 Tube and tube support shall be designed with the proper material for the service conditions as per the pertinent codes in Section 3.
- 4.3.3 Horizontal tube support spacing shall not be greater than every eight (8) feet of tube bundle length for both evaporator and condenser sides.
- 4.4 Stack
- 4.4.1 The stack shall be designed to provide adequate height and diameter to carry out the total exhaust under maximum firing conditions.
- 4.4.2 The stack shall be self-supporting, and shall be of such material and thickness that it shall withstand the corrosive action of the stack gases. A minimum corrosion allowance of 1/8" shall be provided.
- 4.5 IFH Structure
- 4.5.1 The IFH structure shall be designed for the governing conditions of the following:
- Dead load of structure plus hydrostatic test loads of equipment, plus possible live loads.
  - Dead load of structure empty, plus horizontal force due to wind.
  - Dead load of structure plus horizontal force due to wind plus possible live load.
- 4.5.2 The self-supporting stack shall be designed, reinforced, and braced to withstand a wind velocity as stated on the specification sheet.
- 4.6 Instruments and Auxiliary Connections
- 4.6.1 A shutdown device shall be provided on each burner to be activated in the event of flame failure.
- 4.6.2 Flue gas sample connections shall be provided at the base of the stack(s).
- 4.6.3 A pilot light safety shutdown system is required.

Page 6	of 8
Spec. No. <b>IFH-1</b>	
Proj/Job No.	

**HUDSON PRODUCTS CORPORATION**

4.6.4 The main burner gas supply pressure shall be regulated through a Fisher regulator. The pilot gas supply pressure shall further be regulated through a Fisher regulator. Balance of controls per technical specification sheet and control diagram.

## 5.0 HUDSON'S DATA REQUIREMENTS

- 5.1 Hudson shall supply four (4) prints of all equipment, drawings, systems, etc. for approval by Owner prior to any fabrication. The Owner's approval of these drawings shall not relieve the supplier from his responsibility of supplying trouble-free equipment and implied guarantee.
- 5.2 Two (2) prints and one (1) reproducible shall be supplied by Hudson of all final certified drawings of all equipment, system, and all other drawings.
- 5.3 The fabrication schedule shall be provided with first submission of drawings for approval. Hudson shall indicate long term delivery items.
- 5.4 Progress reports shall be made at specified intervals. The reports shall include any difficulties and their impact on the schedule.
- 5.5 Hudson shall supply a minimum of three (3) copies of installation, start-up, operation, and maintenance manuals which shall include all final drawings, operational data, installation requirements, maintenance requirements, spare parts lists, etc.

## 6.0 QUALITY ASSURANCE REQUIREMENTS

## 6.1 Procedures

The following applicable procedures shall be furnished by Hudson:

- Welding procedure.
- Repair welding procedure.
- Surface preparation and protective coating procedures.
- Other procedures required by Owner's inspector.

## 6.2 Inspection and Testing

- 6.2.1 Owner reserves the right to inspect the equipment at any reasonable time in Hudson's or Hudson's sub-contractor's plant. Such inspection does not relieve the manufacturer of any responsibility of the design, material or workmanship unless specifically agreed to by Owner.
- 6.2.2 Owner shall reserve the right to reject any equipment which does not adhere to the specifications or purchase order.

Date Issued: \_\_\_\_\_  
Date Revised: \_\_\_\_\_

Page 7	of 8
Spec. No. <b>IFH-1</b>	
Proj/Job No.	

**HUDSON PRODUCTS CORPORATION**

6.2.3 Owner shall reserve the right to reject any fabrication which does not comply with the requirements of the approved construction drawings, specifications, or purchase order. Fabrication which is not completed to acceptable industrial standard shall be subject to rejection.

6.2.4 Other testing may be required by inspector and charged to Owner's account.

## 6.3 Guarantee

6.3.1 Hudson guarantees the unit(s) furnished will meet the Owner's requirements with regard to thermal and mechanical performance as stated in the technical specification sheet.

6.3.2 Approval or release for shipment does not relieve Hudson of responsibility to meet this guarantee.

## 7.0 PREPARATION FOR SHIPMENT

7.1 All openings shall be coated with rust preventative and shall be further protected with a wood or metal cover to prevent damage or entrance of water and other foreign matter.

7.2 Shipping notices shall be forwarded to the Owner as directed in the purchase order.

7.3 Materials which are included as part of the fabrication shall be installed and supported, or tied down, as required.

7.4 Flame cell (arrestor) and burner assemblies may be shipped loose if shipping restrictions apply.

7.5 All manifold burner piping assemblies including valves, controls, etc., shall be pre-piped for field attachment by unions.

7.6 Hudson shall ensure that all openings are adequately plugged and that loading is done in a manner which shall prevent shipping damage.

7.7 Tagging shall be according to purchase order information or additional information, as required by the Owner.

## 8.0 START-UP

8.1 Hudson shall be responsible for complete start-up until the Owner accepts unit as operational. Hudson shall be responsible for the supply of a competent serviceman for the duration of the checking, start-up, and run-in period.

Date Issued: \_\_\_\_\_  
Date Revised: \_\_\_\_\_

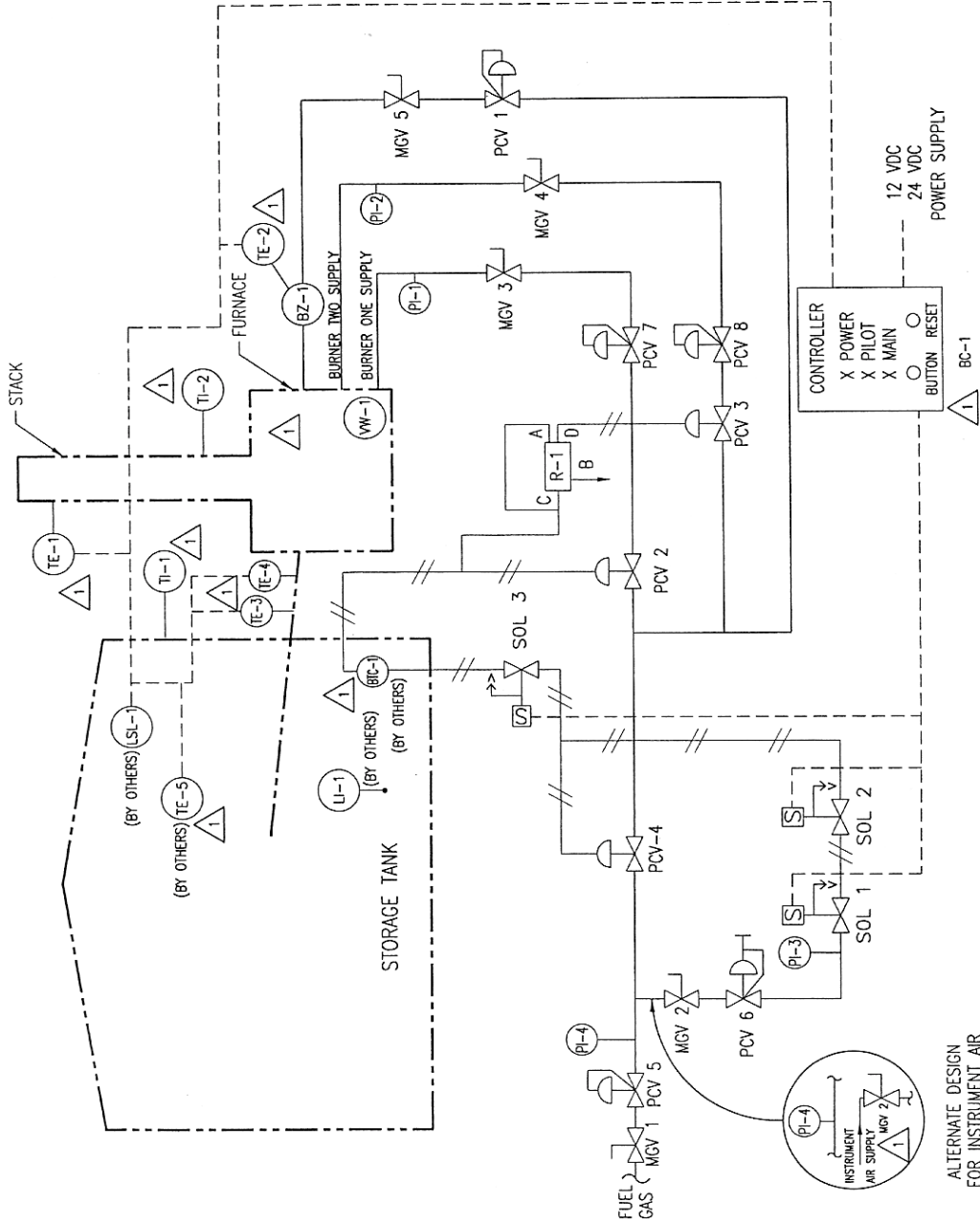
**HUDSON PRODUCTS CORPORATION**

Page	of
8	8
Spec. No.	<b>IFH-1</b>
Proj/Job No.	

## 9.0 PROPOSAL

- 9.1 The proposal shall include a minimum of one (1) copy of the complete detailed bid, including prices, exceptions, deliveries, detailed data sheets as provided by Hudson, basic performance curves, spare parts lists, etc.
- 9.2 The proposal shall specify separately all transportation costs to the installation site F.O.B. Beasley, Texas or F.O.B. Hudson subcontractor.
- 9.3 Hudson shall supply complete spare parts lists of all equipment, complete with recommendation of parts to stock by Owner and parts stocked by Hudson, including recent prices. These parts lists shall form part of the proposal.
- 9.4 The proposal shall include completed copies of the Owner requested data sheets.

1	<b>Hudson Products Corporation</b>				Item No.		
2	<b>thermflo™</b> Heater Specification Sheet				Job No.		
3					Proposal No.		
4	Customer		No. Units per Item				
5	Location		Total No. of Items				
6	Cust. Ref. No.		Fired Duty (Btu/Hr)				
7	Cust. PO No.		Input Duty (Btu/Hr)				
8	Service		Net Thermal Efficiency (%)				
9	Model Number						
10	<b>PERFORMANCE DATA - BURNER SIDE</b>						
11	Combustion Air Inlet Temperature (Deg F)		<b>FURNACE, AIR INTAKES &amp; STACK</b>				
12	Combustion Air Relative Humidity (%)		<b>FURNACE</b>				
13	Barometric Pressure (in. Hg)		Furnace Model				
14	Altitude (Ft.)		Max. Burner Capacity (Btu/Hr)				
15	Fuel Rate (SCFH)		Min. Burner Capacity (Btu/Hr)				
16	Fuel HHV (Btu/ Lbm)		<b>STACK</b>				
17	Fuel LHV (Btu/ Lbm)						
18	Excess Combustion Air (%)		Stack Diameter (Inch)				
19	Flue Gas Mass Flow Rate (Lbm/Hr)		Stack Height (Feet)				
20	Flue Gas Inlet Temperature (Deg F)		Stack Draft Control (Yes/No)				
21	Flue Gas Outlet Temp (Deg F)		Stack Draft Control Type				
22	Furnace Pressure Drop (In. H2O Gage)		Rain Cap Required (Yes / No)				
23	Stack Draft (In. H2O Gage)		Rain Cap Type				
24							
24			<b>FLAME CELL</b>				
26			Flame Cell Size (Inch)				
27	Fouling Factor (Hr.Sqft.F/Btu)		Number of Cells				
28	Acid Dew Point (Deg F)						
29	Water Dew Point (Deg F)						
30	Min Tube Temp (Deg F)						
31	Rows Below Acid Dew Pt. / Water Dew Pt.		<b>PILOT</b>				
32	FLUE GAS COMPOSITION -- % Vol / % Wt.		Pilot Gas Input (SCFH)				
33	Nitrogen		Pilot Heat Input (Btu/Hr)				
34	Carbon Dioxide						
35	Water Vapor						
36	Oxygen						
37	Sulfur Dioxide (ppm)						
38	Other						
39	Total						
40	<b>PERFORMANCE DATA - TANK/VESSEL SIDE</b>						
41	Fluid Name		<b>Thermal Properties</b>		Bulk	Film	Surface
42	Degree API		Fluid Temperature (Deg F)				
43	Total Fluid Entering (Lbm/Hr)		Density (Lbm/Cuft)				
45	Oil (Lbm/Hr)		Specific Heat (Btu/Lbm F)				
46	Water (Lbm/Hr)		Thermal Cond. (Btu/Hr Ft F)				
47	Gas (Lbm/Hr)		Kinematic Viscosity (cSt)				
48	Fluid Pressure (psig)		Dyn. Viscosity (Lbm/FtHr)				
49	Coking Temperature (Deg F)						
50							
51	<b>REMARKS</b>						
52							
53							
54							
55	NO.	DATE	REVISION		NO.	DATE	REVISION
56							
57							



1	GF / CORRECTED SPELLING	12, 22, 99	HS
	PE & GENERAL REV.		
	REV. BY	DESCRIPTION	ECN DATE APP.
COPYRIGHT © HUDSON PRODUCTS CORPORATION ALL RIGHTS RESERVED			
HUDSON PRODUCTS CORPORATION HOUSTON, TEXAS			
TITLE :			
FOR :			
THERMFLO HEATER WITH BURNER MANAGEMENT SYSTEM TH-2000, HI-3000, HI-4000, HI-5000			
THIS PRINT IS THE PROPERTY OF SCALE THIS DATE			
HUDSON PRODUCTS CORPORATION AND ALL RIGHTS RESERVED. IT IS TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION SYSTEMS WITHOUT PERMISSION IN WRITING FROM HUDSON PRODUCTS CORPORATION.			
	DATE	DATE	DATE
	12-2-99	12-2-99	12-2-99
	FE	GM/MS	SH
	CHICAGO	APPROVED	GM
	ENGINEER	12-2-99	
	CUSTOMER'S P.O. No.	JOB No.	DWG. No.
			THGA3