INTERORGANIZATION CORRESPONDENCE

Spec. 4102-62

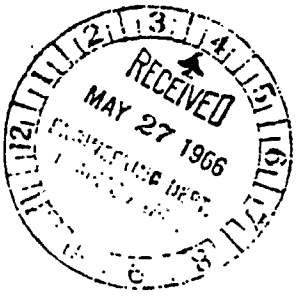
UNITED STATES STEEL CORPORATION

TO Mr. F. H. Barnes
Director
Control, Design and Construction

DATE

FROM Mr. J. E. Duffy
Manager-Design

SUBJECT Insulation of Piping and Equipment
Keystone Project
535-4102



With reference to the above subject, the following papers are herewith forwarded for processing through the regular channels:

1. Three copies of Specification Transmittal
2. Five copies of Specification No. 535-4102-62

The engineering data in this Specification have not been reviewed by Engineering Services.

Original Signed by
J. E. DUFFY



CC:bl

Enclosures

cc: Mr. R. W. Holman

bcc: R. L. Fellers
J. H. Graubard
W. J. Shuck, Clairton Works/ Copy of Specification

PLAINTIFF'S
EXHIBIT
USX-91

UNITED STATES STEEL CORPORATION
DESIGN ENGINEERING - PITTSBURGH
225 GULF BUILDING
PITTSBURGH, PENNSYLVANIA 15230

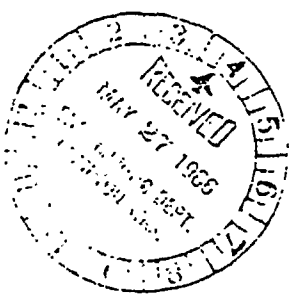
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SPECIFICATION NO. 535-4102-62 MAY 13, 1966

INSULATION FOR PIPING AND EQUIPMENT
KEYSTONE PROJECT

I. All of the following parts considered as whole shall comprise the complete Specification. They are complementary and anything called for by one and not by others shall be considered as binding as though called for by all.

1. Frontispiece
2. Information Sheets, pages 1 through 14
3. Drawings as listed on Information Sheets
4. Insulation Specifications INS-1, INS-2 and INS-3
5. Bidding Instructions, pages 1 and 2
6. Special Conditions - Group III, pages 1 through 4
7. Questionnaire, pages 1 and 2
8. Proposal Form, pages 1 and 2



II. Definitions:

The words "Purchaser" and "Owner" are used herein and in the contract documents interchangeably to refer to United States Steel Corporation. All questions relating to this Specification and any contract made in pursuance thereof shall be discussed with the United States Steel Corporation.

The word "Engineer" refers to Purchaser's designated Engineer.

The word "Bidder" refers to the person or company offering to furnish the work called for by this Specification.

Where the word "contract" is used, it shall be understood to refer either to a purchase order placed by the Purchaser and accepted by the Contractor together with this Specification and all other documents referred to in such purchase order or to a formal contract executed by the Purchaser and the Contractor together with this Specification and all other documents referred to in such formal contract.

The words "Seller" and "Contractor" are used herein and in the contract documents interchangeably to refer to the person or company contracting with United States Steel Corporation to furnish the "work" called for by the contract.

The word "Sub-contractor" refers to the person or company contracting directly with the Contractor and not with United Stated Steel Corporation to furnish the Contractor with any portion of the "work" called for by the contract.

Where the word "work" is used, it shall be understood to mean and include any and all the labor, supervision, services, materials, machinery, equipment, tools, supplies and facilities called for by the contract.

UNITED STATES STEEL CORPORATION
DESIGN ENGINEERING - PITTSBURGH
225 GULF BUILDING
PITTSBURGH, PENNSYLVANIA 15230

INFORMATION SHEETS

SPECIFICATION NO. 535-4102-62 MAY 13, 1966

INSULATION FOR PIPING AND EQUIPMENT
KEYSTONE PROJECT

1. SCOPE OF WORK

1.1 The work to be performed under the terms of this Specification shall consist of furnishing and installing insulation and insulation coverings for piping and equipment for the Keystone Project at Clairton Works, Clairton, Pennsylvania, as shown on the drawings and specified herein.

1.2 The intent of this Specification is to prescribe a complete work which the Contractor undertakes to do in full compliance with the contract documents. Although every required item of work is not explicitly called for in the Specification, it is the Purchaser's intention to have the Contractor provide everything necessary for or incidental to making the work complete and ready for use with the exception of those specific items of work to be furnished by the Purchaser as listed under WORK BY PURCHASER.

2. TIME SCHEDULE

Work on this contract shall commence immediately after the Contractor has received notice from the Purchaser to proceed and shall be prosecuted with sufficient personnel, equipment and material, based on a forty (40) hour week, to complete the work in the time indicated in the Contractor's proposal or agreed to at the time of award of the contract in writing between the Contractor and Purchasing Agent of the Purchaser.

3. WORK BY CONTRACTOR

The Contractor shall:

3.1 Furnish all supervision, labor, materials, tools, equipment and incidentals necessary to insulate all piping, mechanical equipment, vessels, heat exchangers, cold boxes and storage tanks as shown on the drawings and as specified herein.

3.2 Furnish all cutting, removing and patching of the insulation on existing connecting facilities as required to complete the job.

3.3 Receive, unload, handle, store and protect all materials, tools, equipment and supplies required for the work.

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3. WORK BY CONTRACTOR (Continued)

3.4 Load, haul and dispose of all refuse and debris at a disposal site designated by the Engineer. The disposal site will be approximately six (6) miles round-trip distance from the work site.

3.5 Furnish on the site of work during construction an experienced Superintendent duly authorized to represent and act for the Contractor in all matters pertaining to the work covered by this Specification.

3.6 Work in close cooperation with the Engineer.

3.7 Before starting any work, contact the Construction Engineer for proper clearance and shall be governed by the Engineer's instructions.

3.8 Obtain water and electricity for construction purposes from existing plant outlets as designated by the Engineer and provide for extension of same to the construction site.

3.9 Provide compressed air for his own use during construction.

3.10 Make repairs to Purchaser's roads, walks, buildings, landscaping or other facilities which may be damaged by the Contractor.

3.11 Abide by all local and plant laws and regulations.

3.12 Comply with the "Contractor's Safety Responsibilities" manual and other plant safety regulations.

3.13 Furnish, erect, equip and maintain his own construction office, tool and storage sheds, utilities and any other construction facilities which he may find necessary on a site designated by the Engineer. The number of such structures shall be kept to a minimum and no structure shall be erected on the Purchaser's property by the Contractor without permission of the Engineer. The Contractor shall, at his own expense, promptly dismantle and remove from the Purchaser's property any structures, equipment or materials when so instructed by the Engineer.

3.14 Maintain the site of work in an orderly manner.

3.15 Furnish to the Engineer in writing a daily record showing all Contractor's personnel at the site.

3.16 Not perform any additional or temporary work for Purchaser's account unless on specific written orders signed by the Purchasing Agent of the Purchaser and only in the amounts of the various types of work specified in said orders.

3.17 Not be permitted to keep within Purchaser's buildings any stock of gasoline, kerosene, diesel fuel or similar flammables. All such flammables shall be stored in areas assigned to the Contractor and in a manner approved by the Engineer. All flammables shall be transported in trucks or containers approved by the Engineer.

USEI000358

3. WORK BY CONTRACTOR (Continued)

3.18 Not be permitted to burn any material on the plant site.

4. WORK BY PURCHASER

The Purchaser will:

4.1 Furnish an area within the plant, where designated by the Engineer, for Contractor's temporary construction buildings and storage of materials and equipment.

4.2 Furnish sanitary and drinking water facilities for Contractor's personnel.

4.3 Furnish, free of charge, from existing plant outlets as approved by the Engineer, the following utilities for Contractor's use during construction:

Electric power	- 440 volt, 3 phase, 60 cycle
	- 110 volt, 1 phase, 60 cycle
Limed river water	- 20 PSIG

4.4 Inspect the work during its progress.

5. ENGINEERING DATA

5.1 General

5.1.1 Insulation shall be furnished and installed in strict accordance with this Specification to produce a first-class high-quality job. Materials shall be the best of their respective kinds conforming to this Specification and shall safely withstand the specified temperatures and service conditions without cracking, disintegration, loss of insulating value or other failure. Where installation procedures are not specified herein, Contractor shall install insulation in strict accordance with approved manufacturer's recommendations.

5.1.2 Insulation shall be applied only on clean, dry surfaces and only after all tests of facilities to be insulated have been completed. Contractor shall obtain the Engineer's approval before starting installation of insulation on any facility.

5.2 Types of Insulation

5.2.1 Three (3) types of insulation shall be furnished as follows:

Specification INS-1 - Cold Insulation Specification for Piping, Vessels and Equipment

Type INS-1 is for cold insulation using a base insulation media of Foamglas. Cold insulation shall be in complete accordance with attached detailed Specification INS-1.

The Contractor may quote an alternate where applicable using Styrofoam insulation in lieu of Foamglas. The Styrofoam

USEI000359

5. ENGINEERING DATA (Continued)

5.2 Types of Insulation (Continued)

5.2.1 (Continued)

Specification INS-1 (Continued)

alternate, if quoted, shall be based on an equivalent thermal conductivity with an application procedure as recommended by Dow Chemical Company or approved equal.

Specification INS-2 - Insulation for Cryogenic Temperatures

Type INS-2 is for slag wool and perlite insulation for installation into both single and double-wall cold boxes. Both of these materials shall be in complete accordance with attached detail Specification INS-2.

Specification INS-3 - Insulation of Hot Piping, Vessels and Equipment

Type INS-3 is for warm insulation using a base insulation media of "Unibestos" as manufactured by Pittsburgh Corning or approved equal. This insulation shall be in complete accordance with attached detail Specification INS-3.

5.2.2 Detailed Specifications INS-1, INS-2 and INS-3 show the pertinent data required for insulation of each facility and an estimated quantity take-off. These quantities are for guidance only and in no way relieve the Contractor of the complete responsibility for furnishing and installing the actual quantities of insulation required to complete the installation as described herein.

5.2.3 Detailed specifications show a notation of "partial" for lines that must be insulated for personnel protection. These lines shall be insulated for a distance of seven (7) feet from floor level, platforms, walkways, stairs or any other area when man can come in contact with the line. These lines shall be insulated to maintain a maximum of 150° F. skin temperature and, in no case, shall less than one (1) inch of insulation be applied.

5.2.4 Detailed specifications show a notation of "freeze" for lines that must be partially or, in some cases, completely insulated for freeze protection. These lines are outdoors and must be insulated to prevent freezing due to ambient temperature of -10° F. during conditions of no-flow in the line. Only the dead leg portion of these lines shall be insulated.

5.3 Vessels, Exchangers and Equipment Insulation

All vessels, exchangers and mechanical equipment shall be insulated in strict accordance with the applicable sections of Specifications INS-1, INS-2 and INS-3. Those items that require insulation are listed on the attached draw-

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5. ENGINEERING DATA (Continued)

5.3 Vessels, Exchangers and Equipment Insulation (Continued)

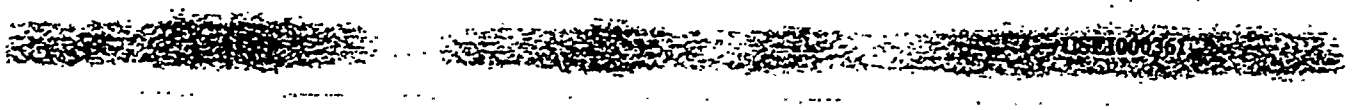
ing lists. The thickness of insulation required must be determined by the operating temperature shown on the drawing and the table referring to such that is included in the Specifications INS-1, INS-2 and INS-3. The mechanical equipment is to be insulated for personnel protection only and is to be insulated to maintain a maximum of 150° F. skin temperature.

6. DRAWINGS ACCOMPANYING SPECIFICATION

The following drawings form a part of this Specification:

Areas 2, 3, 4 and 5

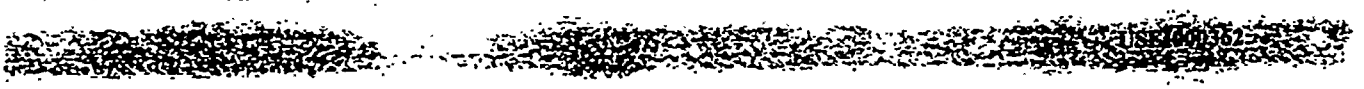
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W-21091	1	4-6-66
W-21123	1	4-7-66
W-21190	4	4-22-66
W-21360	2	2-8-66
W-21361	2	2-8-66
W-21362	2	2-10-66
W-21363	1	2-3-66
W-21364	2	3-5-66
W-21365	2	3-5-66
W-21366	3	3-17-66
W-21379	2	1-22-66
W-21380	4	1-22-66
W-21381	1	12-29-65
W-21382	1	12-10-65
W-21383	3	1-6-66
W-21464	2	3-19-66
W-21465	8	3-24-66
W-21466	3	3-19-66
W-21467	2	3-19-66
W-21452	7	3-12-66
W-21481	7	3-16-66
W-21487	6	3-17-66
W-21499	7	3-17-66
W-21505	2	3-23-66
W-21506	1	3-17-66
W-21507	1	3-17-66
W-21508	1	3-17-66
W-21509	1	3-17-66
W-21510	1	3-17-66
W-21511	2	3-28-66
W-21519	0	2-16-66
W-21542	3	3-21-66



6. DRAWINGS ACCOMPANYING SPECIFICATION (Continued)

Areas 2, 3, 4 and 5 (Continued)

Drawing No.	Revision No.	Date
W-21543	2	12-3-65
W-21544	4	3-21-66
W-21545	2	3-21-66
W-21546	4	1-29-66
W-21547	2	3-19-66
W-21548	3	3-19-66
W-21564	6	3-22-66
W-21565	0	2-21-66
W-21579	3	3-19-66
W-21587	2	1-29-66
W-21607	3	4-25-66
W-21632	3	4-22-66
W-21646	0	3-5-66
W-21654	2	3-22-66
W-21655	1	1-24-66
W-21656	1	1-24-66
W-21720	1	12-13-65
W-21724	1	2-9-66
W-21732	0	2-21-66
W-21734	2	2-3-66
W-21736	3	2-25-66
W-21738	3	2-9-66
W-21747	0	3-1-66
W-21754	0	12-14-65
W-21758	1	4-18-66
W-21807	4	3-2-66
W-21808	1	2-21-66
W-21826	0	8-3-65
W-21829	0	8-24-65
W-21850	0	3-5-66
W-21879	0	3-11-66
W-21885	2	4-7-66
W-21897	1	4-11-66
W-21898	0	3-5-66
W-21928	3	4-22-66
W-21934	6	3-8-66
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W-21936	5	3-8-66
W-21937	5	4-4-66
W-21938	4	2-19-66
W-21947	2	2-16-66
W-21988	1	1-10-66
W-21992	2	3-31-66
W-21993	1	3-17-66
W-21994	1	3-10-66
W-21995	1	3-10-66
W-21996	1	3-10-66
W-21997	1	3-9-66



6. DRAWINGS ACCOMPANYING SPECIFICATION (Continued)

Areas 2, 3, 4 and 5 (Continued)

Drawing No.	Revision No.	Date
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W-21999	1	3-9-66
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W-24686	3	4-6-66
W-24767	1	4-11-66
W-24768	0	3-3-66
W-24789	1	4-12-66
W-24856	0	3-9-66
W-24932	0	3-4-66

Area 8

Drawing No.	Revision No.	Date
W-22097	1	4-21-66
W-22110	3	12-21-65
W-22111	3	12-21-65
W-22112	3	12-21-65
W-22113	3	12-21-65
W-22114	3	1-20-66
W-22115	3	1-25-66
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W-22119	3	4-21-66
W-22120	3	11-12-65
W-22124	4	2-7-66
W-22135	3	11-5-65
W-22136	3	12-21-65
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W-22142	5	3-17-66
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W-22146	4	3-23-66
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W-22149	6	2-28-66
W-22150	4	1-27-66
W-22151	4	2-18-66
W-22152	2	11-23-65
W-22153	3	1-25-66
W-22155	1	12-10-65
W-22156	3	2-18-66
W-22157	1	12-30-65
W-22158	2	12-22-65
W-22159	2	12-22-65
W-22163	2	12-22-65
W-22164	2	1-20-66

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6. DRAWINGS ACCOMPANYING SPECIFICATION (Continued)

Area 8 (Continued)

Drawing No.	Revision No.	Date
W-22165	2	1-20-66
W-22166	2	1-20-66
W-22167	2	11-12-65
W-22170	1	11-23-65
W-22171	1	12-30-65

Vessels

Drawing No.	Revision No.	Date
W-20024	I	6-8-65
W-20025	G	8-4-65
W-20026	F	8-4-65
W-20027	I	6-8-65
W-20817	4	3-7-66
W-20818	4	3-7-66
W-20819	2	3-7-66
W-20820	6	3-25-66
W-20821	5	3-29-66
W-20822	4	3-7-66
W-21450	2	7-9-65
W-21451	2	7-9-65
W-21454	2	4-22-65
W-21512	2	4-22-65
W-21552	3	7-27-65
W-21584	2	4-22-65
W-21929	1	2-12-66
S-3549	C	4-21-65
S-6523	1	11-27-65
S-6524	2	12-28-65
S-6526	2	12-28-65
S-6527	2	12-28-65
S-6530	3	2-15-66
S-6531	2	12-28-65
S-6532	0	7-22-65
FP-30485	1	9-8-65
FP-30578	2	9-8-65
FP-30592	2	12-10-65
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FP-30642	3	10-28-65
FP-30704	1	10-4-65
FP-30933		
FP-31009	0	12-2-65
FP-31011	0	12-2-65
FP-31136	1	2-25-66
FP-31314	1	2-25-66
FP-31315	2	3-31-66
FP-31326	2	3-25-66

USEI00036

6. DRAWINGS ACCOMPANYING SPECIFICATION (Continued)

Vessels (Continued)

Drawing No.	Revision No.	Date
FP-31368	1	3-16-66
FP-31369	1	4-4-66
FP-31370	1	4-5-66

Area 7

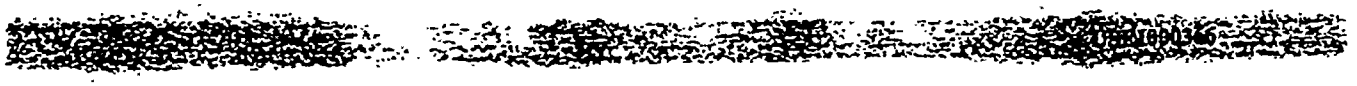
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W-20581	1	3-4-66
W-20582	1	3-18-66
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W-20586	1	4-15-66
W-20587	1	4-15-66
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W-20627	2	4-1-66
W-20628	2	4-1-66

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6. DRAWINGS ACCOMPANYING SPECIFICATION (Continued)

Area 7 (Continued)

Drawing No.	Revision No.	Date
W-20629	5	3-31-66
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W-20634	4	4-1-66
W-20635	4	4-1-66
W-20636	2	3-11-66
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W-20692	3	3-15-66
W-20693	3	3-15-66
W-20694	3	3-15-66
W-20695	3	3-15-66



6. DRAWINGS ACCOMPANYING SPECIFICATION (Continued)

Area 7 (Continued)

Drawing No.	Revision No.	Date
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W-20701	3	4-8-66
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W-24606	1	2-21-66
W-24607	1	2-21-66
W-24608	1	2-21-66
W-24609	1	2-21-66
W-24610	1	2-21-66
W-24611	1	2-21-66
W-24612	2	3-30-66

USKI000367

6. DRAWINGS ACCOMPANYING SPECIFICATION (Continued)

Mechanical Equipment

Drawing No.	Revision No.	Date
W-20516	3	10-1-65
W-20517	2	5-10-65
W-20518	3	9-3-65
W-20519	2	6-18-65
W-20520	2	6-18-65
W-20521	2	6-18-65
W-20522	4	2-25-66
W-20524	9	2-25-66
W-20525	7	10-22-65
W-20526	5	12-1-65
W-20527	7	2-25-66
W-20537	4	10-15-65
W-22175	2	9-2-65
FP-30087	4	12-21-65
FP-30088	9	12-28-65
FP-30345	2	1-3-66
FP-30361-1	6	12-21-65
FP-30426	3	2-17-66
FP-30474	2	12-8-65
FP-30861	D	12-22-65
FP-30916	3	2-1-66
FP-31153		
FP-31154		
FP-31160		
15-672	0	9-29-64
0-3975 Sheet 1	0	1- -65
0-3975 Sheet 2	0	1- -65
0-3975 Sheet 3	0	3-5-65
0-3975 Sheet 4	0	3-5-65
0-3975 Sheet 5	0	3-5-65
0-4420		
0-3976	0	1-11-65
0-5084		
10.1.3956 Sheet 26	0	1-21-65
1-9296		
2-14195		
2-14196		
0-3167 Sheet 1	0	3-22-65
0-3167 Sheet 2	0	3-22-65
0-3167 Sheet 3	0	3-22-65
0-3167 Sheet 4	0	3-22-65
0-3167 Sheet 5	0	2-18-65
0-3167 Sheet 6	0	2-18-65
10.1.3956 Sheet 14	0	1-22-65
1-9095	1	12-15-64
1-9096	1	12-18-64
0-4942		
2-14016		

TVA 1000365

6. DRAWINGS ACCOMPANYING SPECIFICATION (Continued)

Mechanical Equipment (Continued)

Drawing No.	Revision No.	Date
2-14026		
2-14028		
2-14039		
2-14040		
2-14051		
2-14052		
2-14053		
2-14054		
2-14086		
2-14087		
2-14120		
1-9263		
2-14121		
2-14132		
2-14138		
2-14139		
2-14230		
2-14485		
2-14859		

7. CONSTRUCTION AND STORAGE FACILITIES

Contractor shall furnish all necessary facilities for storage and protection of materials for construction work covered by these Specifications.

8. DAILY LOG

Contractor shall furnish the Engineer a daily log of his operations in the plant showing the number of men employed on that day and a detailed report of progress made. This log shall be in Purchaser's possession within twenty-four (24) hours of the day reported.

9. TRUCK SHIPMENTS

Contractor shall receive, unload, store, handle and protect in accordance with the manufacturer's instructions all material and equipment required to complete the work covered by this Specification.

10. SPECIAL CONDITIONS

Items 2, 3 and 6 of attached Special Conditions - Group III shall not apply to this Specification.

11. CHANGES IN SPECIFICATION

Purchaser reserves the right to make such changes in specifications and design as may be necessary or desireable after this purchase order is issued. Any difference in contract price resulting from any such change shall be agreed upon in

USK1000369

11. CHANGES IN SPECIFICATION (Continued)

writing by the Purchasing Agent of the Purchaser before the work is begun. Before proceeding with any work involving possible claims by Seller for extra compensation above the contract price, Seller shall submit in writing to Purchaser a detailed estimate of the price for such work. Where Purchaser desires to have the work done and where the price is agreed upon, the matter will be covered by a written order issued to the Seller by the Purchasing Agent of the Purchaser. Seller shall not proceed with any such work before receiving such a written order.

12. GUARANTEE

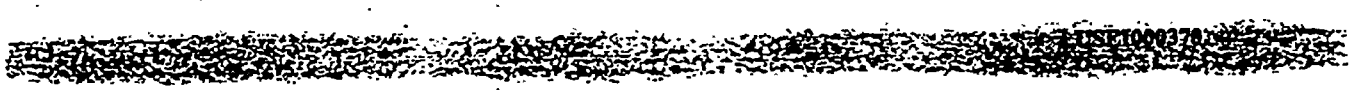
Seller guarantees that all work furnished under this order will perform the required functions in a manner satisfactory to the Purchaser and agrees to pay all costs for removing and replacing any part or parts thereof which prove defective within one (1) year after being placed in regular operation.

13. PAYMENT

Payment for all work covered by this Specification will be made on the basis of a total lump-sum price.

Terms of payment will be as arranged by the Purchasing Agent of the Purchaser.

All invoices shall be submitted in triplicate to the Works Auditor of Clairton Works, Attention: Accounts Payable.



COLD INSULATION SPECIFICATION

FOR

PIPING, VESSELS AND EQUIPMENT

INS-1

1. General

(a) The Insulation Contractor shall be referred to as the "Contractor". Contractor shall furnish all labor, material, scaffolding, necessary tools and equipment for the complete application of insulation to designated piping, vessels and equipment.

(b) The insulation shall be applied by mechanics skilled in applying the insulation, in a manner recognized as proper and suitable by industrial concerns customarily engaged in work of the chemical plant nature.

(c) Contractor shall handle all unloading and protection and storage of materials. All materials shall be protected against the weather during all stages of application until the final weatherproof coat is applied and cured. Before final acceptance of the work, Contractor shall dismantle all scaffolding used by him and shall remove all materials, equipment and insulation debris, leaving the job site clean and neat in appearance.

(d) Contractor shall guarantee his work for a period of twelve months, after final acceptance, to be suitable for the range of operating conditions specified or shown on drawings (i.e., atmospheric temperatures during shutdown to maximum operating temperatures, exposure to weather, etc.) Any defects due to faulty workmanship, method of application or selection of materials, shall be corrected at the Contractor's expense.

(e) Prior to application of insulation, all surfaces to be insulated shall be cleaned of all dirt, oil, loose scale and foreign matter. No insulation shall be applied to damp surfaces. Protective measures shall be taken to prevent moisture from working underneath or into partially applied insulation.

(f) Insulation thicknesses noted are nominal thicknesses or primary insulation and do not include finish and weatherproofing.

(g) All insulation shall be installed with proper allowance for expansion and contraction.

(h) Contractor shall obtain permission from field construction superintendent before performing any welding.

(i) All communications regarding insulation materials, method of application or any other matter concerning the subject of this specification shall be directly with the U. S. Steel-designated Engineer.

USEI000371

2. Work Not Included - Cold Application

(a) Piping, vessels and equipment normally operating above 70° F. (21° C.) for these applications, see INS-3.

(b) Painting external insulation surface. This does not include coating on metal surface for corrosion control.

(c) Valve bodies beyond the packing gland.

(d) Any support attachment and the like beyond 4 times the insulation thickness from the normally cold surface.

3. Application - Piping

(a) All FOAMGLAS surfaces contacting metal or FOAMGLAS, except for joint areas of outer layer, shall receive a thin coat (to fill the open surface cells only) of Anti-Abrasive Compound 1A and allowed to dry before application to the piping. Application of the first layer shall be made with no sealer in the longitudinal and end joints. Apply joints tightly butted and butt joints staggered. The first layer shall be held in position by PVC or fiber glass tape on 9" centers. Piping designated for dual temperature operation (cold as well as hot) and those operating below 20° F. shall be insulated as noted above except that a 1" thick fiberglass blanket (2.5 lb. density) shall first be installed.

(b) All layers of FOAMGLAS insulation shall be applied with all joints fitted to eliminate voids. Voids shall not be filled with vapor seal coating but eliminated by refitting or replacing insulation.

(c) Application of the second layer shall be made after the longitudinal and end joints have been buttered with a thin coat of Pittseal 111. Apply the second layer over the first with joints drawn together so that a very thin vapor seal separates the insulation sections. The second layer shall be applied with longitudinal and end joints staggered over joints of the preceding layer. The second layer shall be secured with stainless steel insulation straps on 9" centers.

(d) Contraction joints shall be installed in the pipe covering on both horizontal and vertical straight run piping. On center spacing of contraction joints shall coincide with each 1/2" contraction of pipes. Joints shall be loosely filled with cushioning material. Contraction should be provided by and in the flange cover of flanged joints when they occur in the line.

(e) FOAMGLAS insulation on flanges, valves and other fittings shall consist of prefabricated pipe covers of the same material and nominal thickness specified for pipe covering. Fitting covers shall be applied in the same manner as pipe insulation. Stainless steel insulation straps will be so located that maximum strength and securement shall be obtained. Fitting cover fillers are not necessary, provided all joints are properly sealed. Protruding metal parts such as valve stems shall be thoroughly sealed.

3. Application - Piping (Contd)

(f) Hangers shall be located on the outside of the insulation and shall not be in direct contact with the pipe, unless the operating temperature is above 20° F. Curved metal shields shall be used between the hangers and the bottom of the insulation. Finish shall be applied to pipe insulation at shield location before shield is positioned.

(g) The finish for straight, insulated outdoor piping shall consist of factory or field applied 0.010" thick Type 304 stainless steel weatherproofing jacket. All banding shall be on 9" centers. Indoor weatherproofing for straight insulated piping shall be Johns-Manville Asbestos Firetard Jacket or approved equal, furnished in rolls of 108 square feet and weighing 55 pounds.

(h) The finish and weatherproofing for irregular surfaces such as valves, flanges, fittings and expansion joints shall be two (2) 1/16" thick spray or trowel coats of PC Pittcote 300 reinforced with an open weave 10 x 20 mesh glass fabric membrane laid smooth and thoroughly embedded in the coating.

4. Application - Vessels & Equipment

(a) For vessel surfaces, apply first a 1" thick, 2.5 lb. density, fiber glass blanket. This blanket shall not be part of the total insulation thickness but merely act as a cushion for the FOAMGLAS. Attach blanket to vessel or equipment by means of PVC or fiber glass tape. When FOAMGLAS is applie the blanket shall be compressed to about one-half inch.

(b) FOAMGLAS insulation shall be curved sidewall segments fabricated to fit th diameter of the equipment. Application shall be made in two or three laye depending on the total thickness with each layer fabricated to fit the outside of the preceding layer.

(c) Prior to application, all surfaces of each insulation segment, except for joints and outside face of outer layer, shall be sprayed or brushed with a thin coat of Anti-Abrasive Compound 1A to fill surface cells and allowed to dry.

(d) The first layer shall be applied with no sealer in the side or end joints. Insulation segments shall be tightly butted with vertical joints in staggered position and secured with .020 x 3/4" stainless steel bands on 9" centers where contour of equipment permits firm and effective attachment. On irregular surfaces where use of insulation straps is impractical, FOAMGLAS insulation shall be secured with 16 BWG stainless steel wire.

(e) Additional layer or layers of FOAMGLAS shall be applied in the same manner as the first layer with side and end joints staggered over joints of preceding layer so that no two joints coincide. All butt edges and ends of outermost layers shall be sealed with a thin coat of Pittseal 111. Each layer shall be secured in place with .020 x 3/4" stainless steel bands on 9" centers or 16 BWG stainless steel wire.

4. Application - Vessels & Equipment (Contd)

(f) Head insulation, as well as insulation around manholes and other connections, may be fastened in place using a floating ring of steel rod. One end of each band is fastened to the floating ring and the other end is anchored to an extra band or bands placed around the sidewall insulation. Bands on the heads shall be spaced on 12" centers around the perimeter of the extra band or bands.

(g) Provision for contraction shall be made at connections or protrusions to the equipment.

(h) Straight sections of vessels, exchangers, etc., shall be weatherproofed with C.010" thick, Type 304 stainless steel sheeting, pre-rolled to the curvature of the insulation. All lapping shall be a minimum of 3" and located to shed water. Fasten into place with 0.020" x 3/4" wide stainless steel banding on 9" centers and as required to firmly secure the sheeting.

The finish and weatherproofing for all irregular, insulated surfaces of vessels and equipment shall consist of two (2) 1/16" thick spray or trowel coats of PC Pittcote 300, reinforced with an open weave 10 x 20 mesh glass fabric membrane laid smooth and thoroughly embedded in the coating. The dry finish, for both coats, shall have a minimum thickness of 3/32".

5. Insulation Thickness Charts for Piping & Vessels

(a) The attached chart of insulation thicknesses gives the minimum thickness of FOAMGLAS required to prevent surface condensation at 68° F. still air with a relative humidity of 85%. Density of P-C "FOAMGLAS" is 9 lbs. per cu.ft. K=0.35 BTU-in./hr., sq.ft., ° F., at 0° F. Mean Temp.

6. Supports for Insulated Piping

Pipe supports for insulated piping shall be pipe saddles and variations as shown on U.S.S. Corp. Drawings W-20576, W-20577, W-20578, W-20579 and 21802.

INSULATION APPLICATION NOTES

1 - Pittsburgh Corning "PC" Anti-Abrasive Compound 1A or approved equal brush or spray applied coat to the insulation, 250 sq.ft. per gal. Temperature range minus 320° F. to plus 300° F.

2 - PC Pittseal 111 or approved equal for bedding and sealing cellular insulation. Apply 1/8" troweled coat. Coverage 13 sq.ft. per gal. Temperature range minus 100° F. to plus 300° F.

3 - 1/16" thick Neoprene rubber strip wrapped around FOAMGLAS expansion joints and over a wet coat of joint sealer, Pittseal 111. The strip shall be at least 9" wide to allow ends to be lapped about 4".

4 - Banding & Fasteners

(a) 1/2" x 0.020" thick stainless steel banding and fasteners on about 9" centers for insulated lines 10" O.D. and smaller, Gerrard or approved equal.

(b) 3/4" x 0.020" thick stainless steel banding and fasteners on about 9" centers for insulated lines greater than 10" O.D. and vessels, Gerrard or approved equal.

5 - Compressible insulation, loose mineral wool or equal.

6 - Factory or field applied 3 ply vapor sealing jacket.

7 - 0.010" thick, Type 304 stainless steel sheeting for weatherproofing.

8 - PC Pittcote 300 or approved equal solvent cutback for sealing and weatherproofing. Trowel a 1/16" coat or spray at the rate of about 10 sq.ft. per gal. When coat is tacky apply a glass fabric membrane tightly over surface overlapping all seams a minimum of 4 inches. Cover fabric with a second coat. The total dry thickness shall not be less than 3/32".

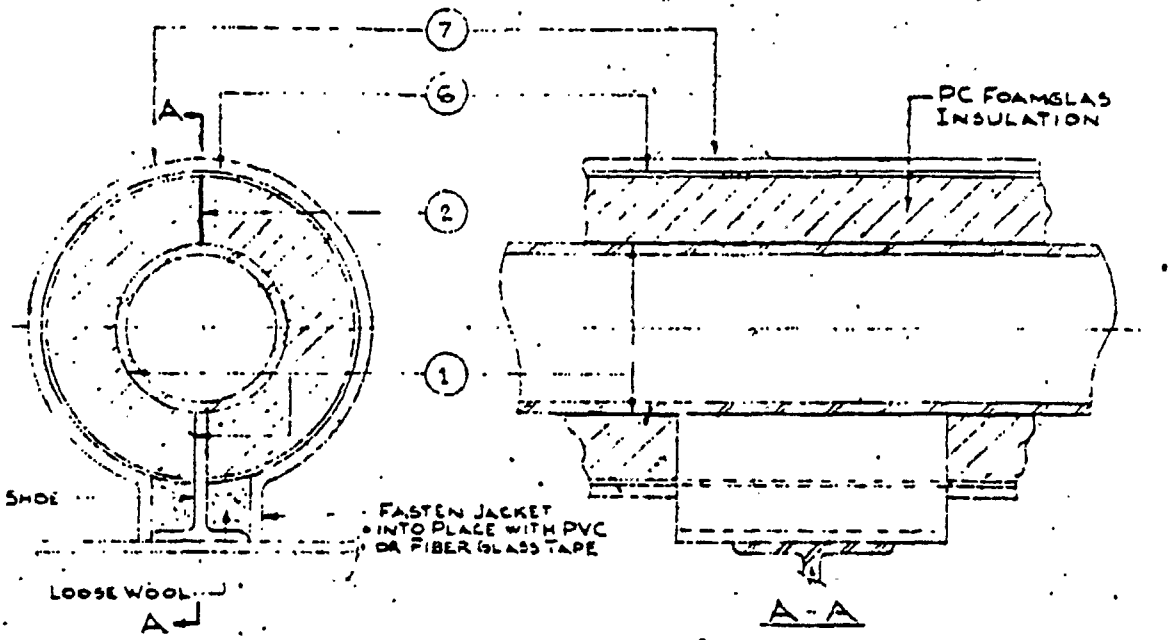
9 - 1" thick fiber glass blanket insulation, 2.5 lb. density, used as cushion for FOAMGLAS insulation. Attach to vessel, equipment by means of fiber glass tape. When FOAMGLAS is attached, the blankets shall be compressed to about 3/4". This cushion of fiberglass will be required only for dual temperature operation and for cold service operating below 20° F.

10 - 1/4" dia. galvanized iron wire for use as a floating ring for vessel heads.

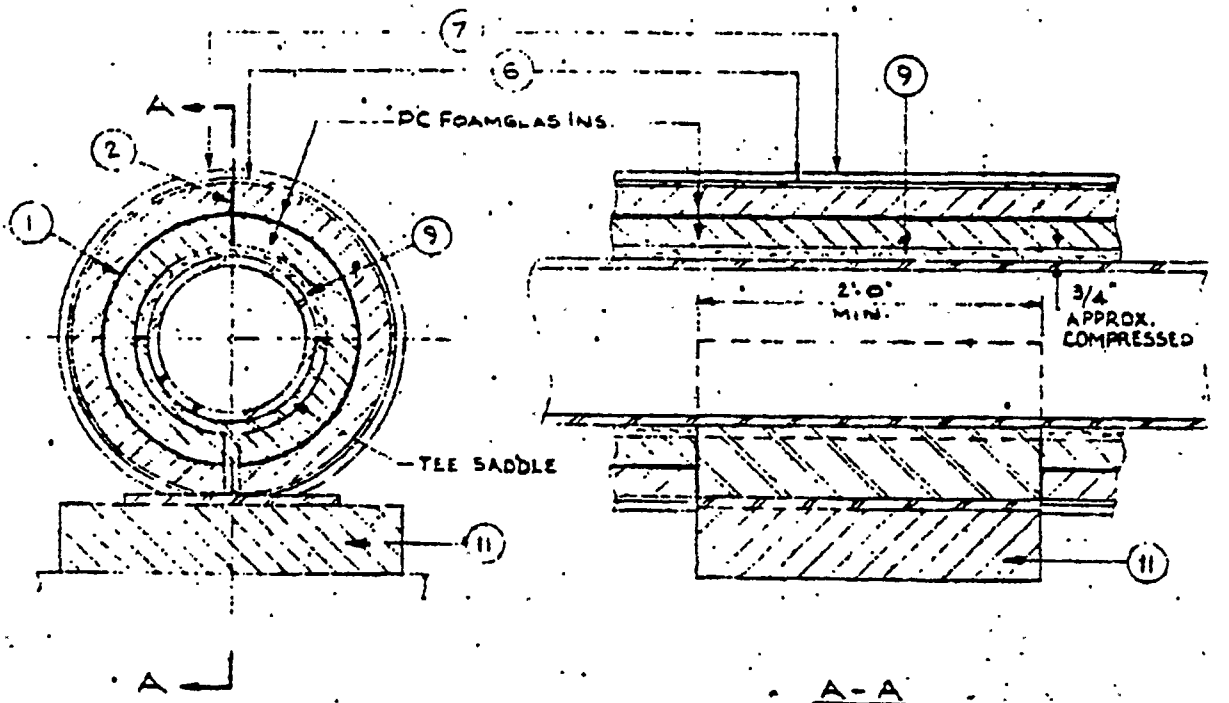
Note: For piping supports, see page 4, item 6.

11 - Textolite insulation for pipe supports.

COLD PIPING INSULATION



PIPING INSULATION AT SUPPORTS FOR 20°F AND HIGHER

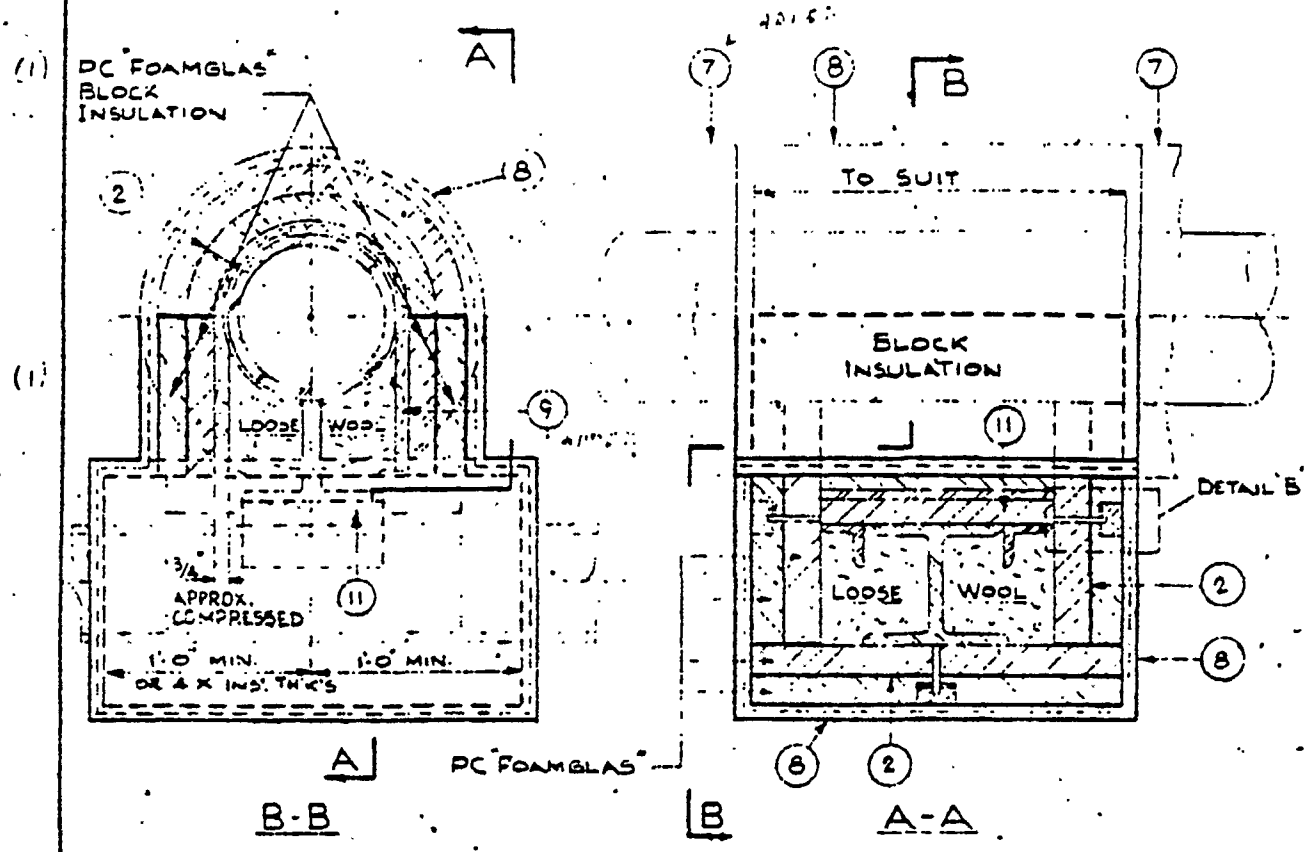


PIPING INSULATION AT SUPPORTS FOR LOWER THAN 20°F

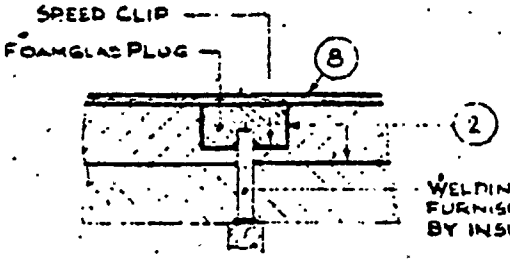
FOR DESCRIPTION OF CIRCLED NUMBERS SEE PAGE 5.

USEI000376

COLD PIPING INSULATION



TYPICAL ANCHOR SUPPORT INSULATION FOR OPERATING TEMPERATURES BELOW 20°F



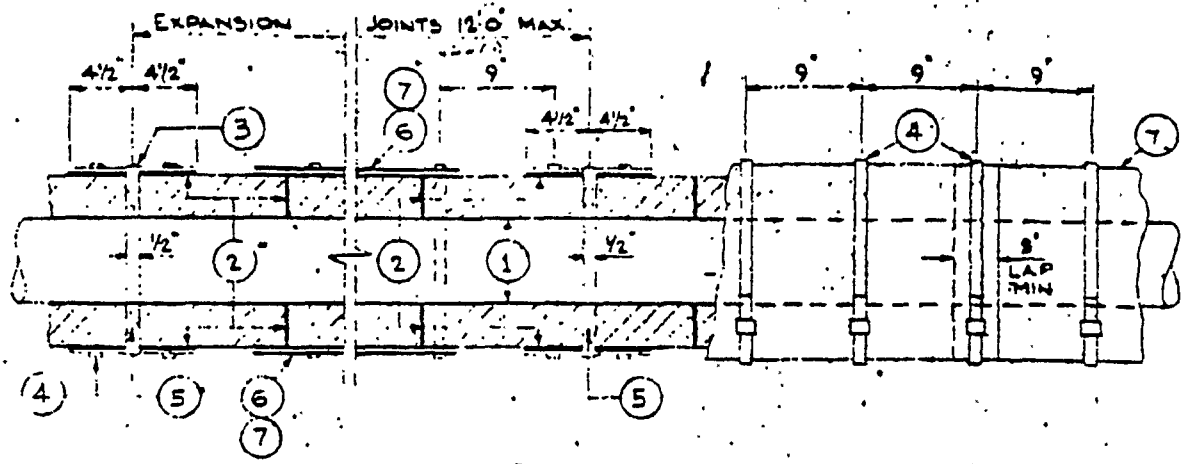
DETAIL 'B'

NOTE: FOR VESSELS OPERATING AT 20°F & ABOVE, OMIT ITEM (9) AND APPLY ITEM (1) TO INSIDE OF FOAMGLAS SURFACE.

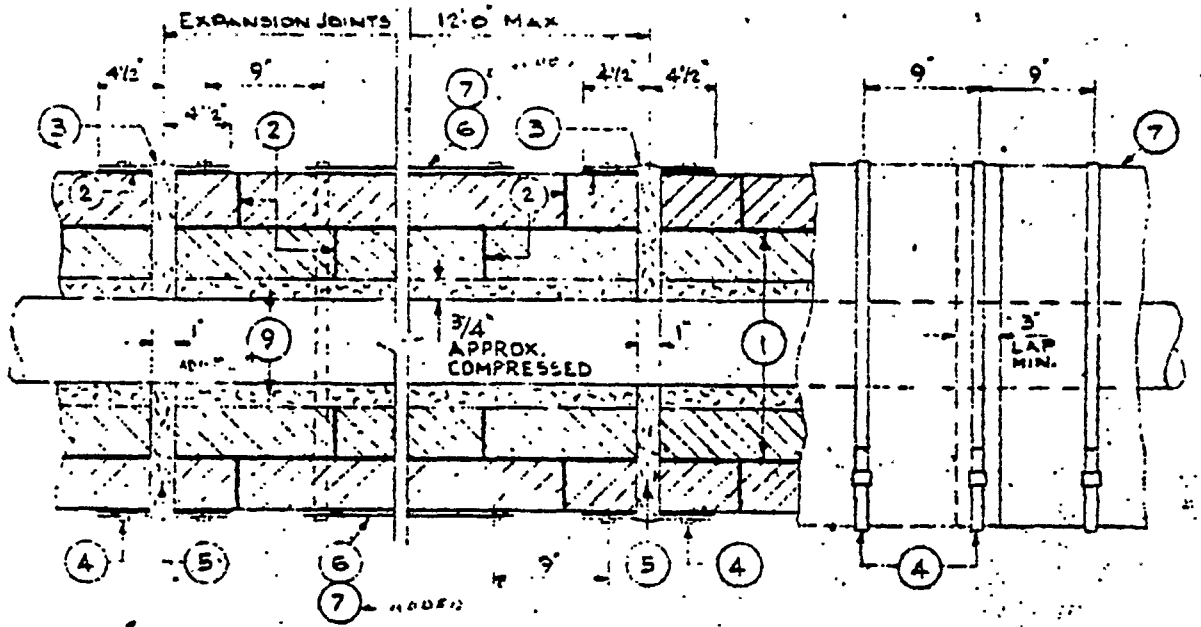
FOR DESCRIPTION OF CIRCLED NUMBERS SEE PAGE 5

USEI000377

COLD PIPING INSULATION



SINGLE LAYER "FOAMGLAS" APPLICATION
OPERATING TEMPERATURES 20°F & ABOVE



MULTI-LAYER "FOAMGLAS" APPLICATION
OPERATING TEMPERATURES BELOW 20°F

FOR DESCRIPTION OF CIRCLED NUMBERS SEE PAGE 5

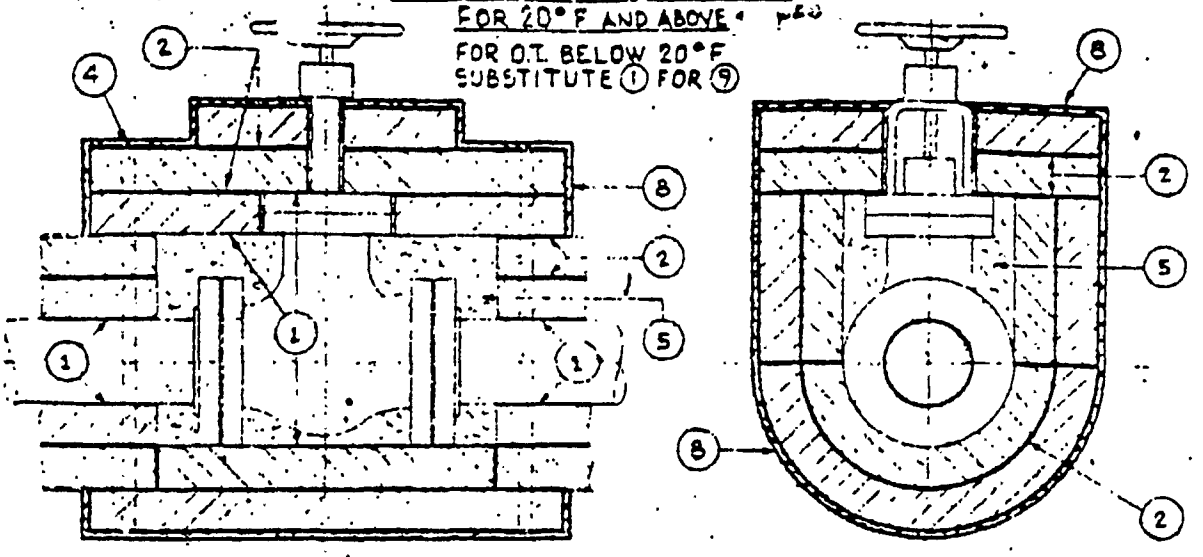
USEI000378

(1)

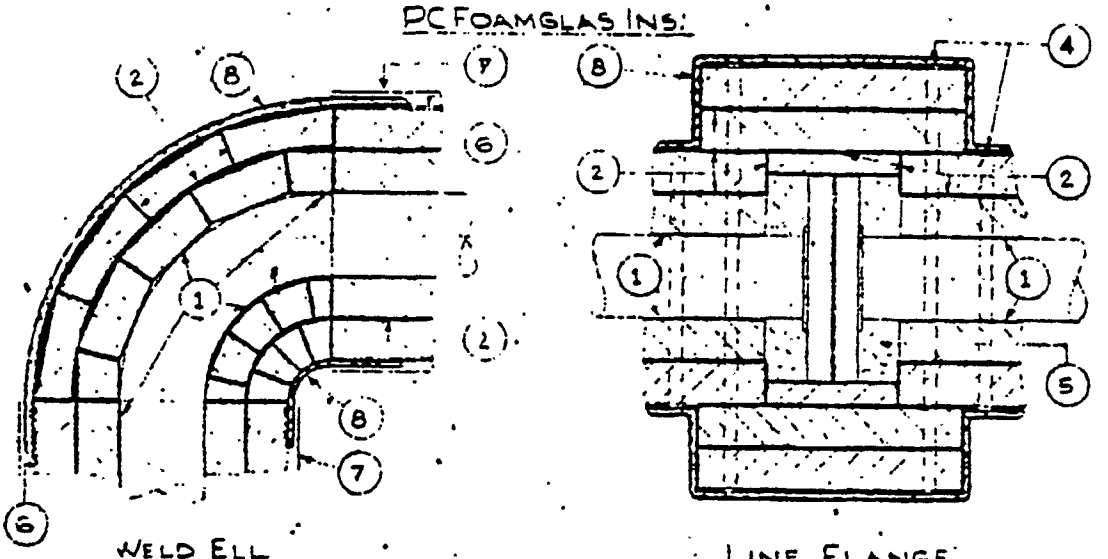
COLD PIPING INSULATION

FOR 20° F AND ABOVE

FOR O.T. BELOW 20° F SUBSTITUTE (1) FOR (9)



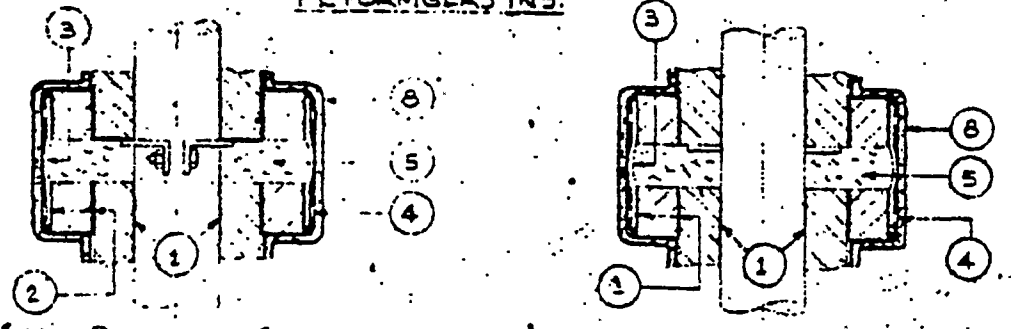
FLANGED VALVE
PC FOAMGLAS INS.



WELD ELL

LINE FLANGE

PC FOAMGLAS INS.

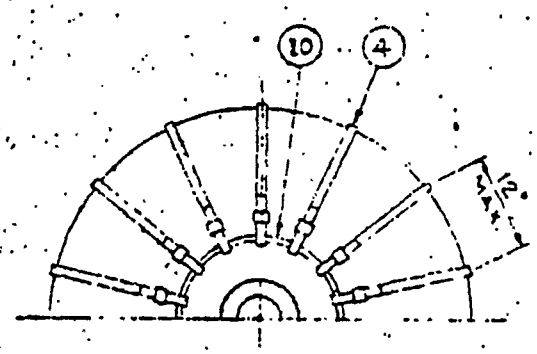


USE REMOVABLE COLLAR WHEN WELDING IS FORBIDDEN

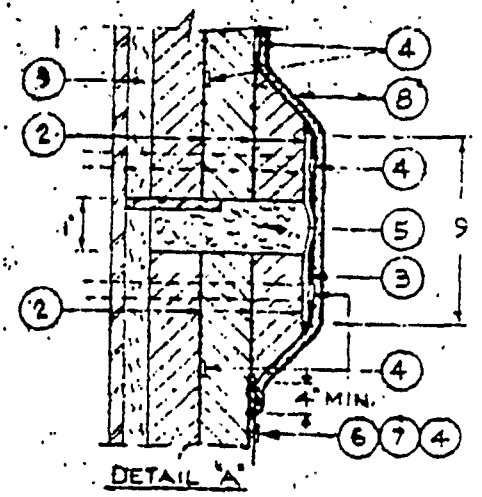
USE WELDED LUGS WHEN WELDING IS ALLOWED

FOR DESCRIPTION OF CIRCLED NUMBERS SEE PAGE 5

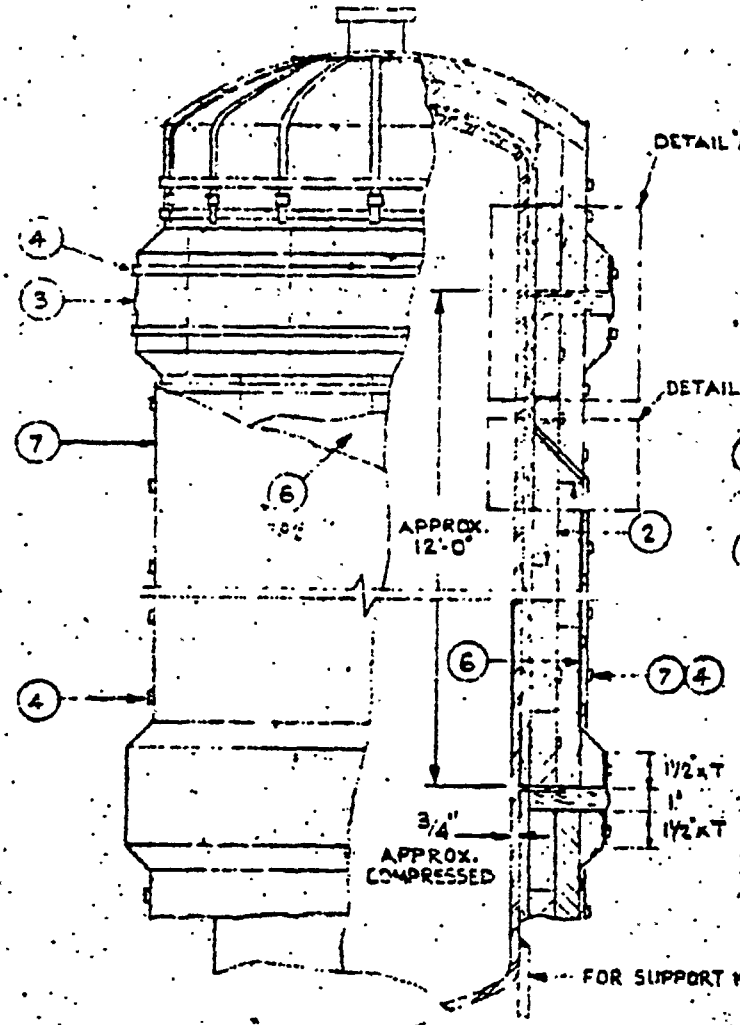
USEI000379



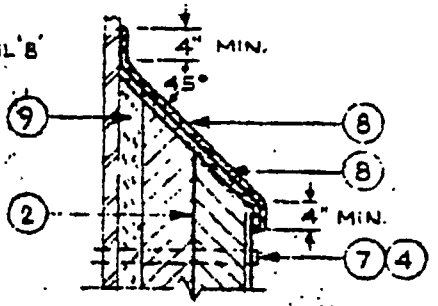
VESSEL HEAD INSULATION



DETAIL "A"



NOTE: FOR VESSELS OPERATING AT 20°F & ABOVE, OMIT ITEM (9) AND APPLY ITEM (1) TO INSIDE OF FOAMGLAS SURFACE.



DETAIL "B"

FOR VESSELS REQUIRING NO INSULATION ON UPPER SECTION - FOR L.O. REGENERATORS R-582, 4, 6 & 8.

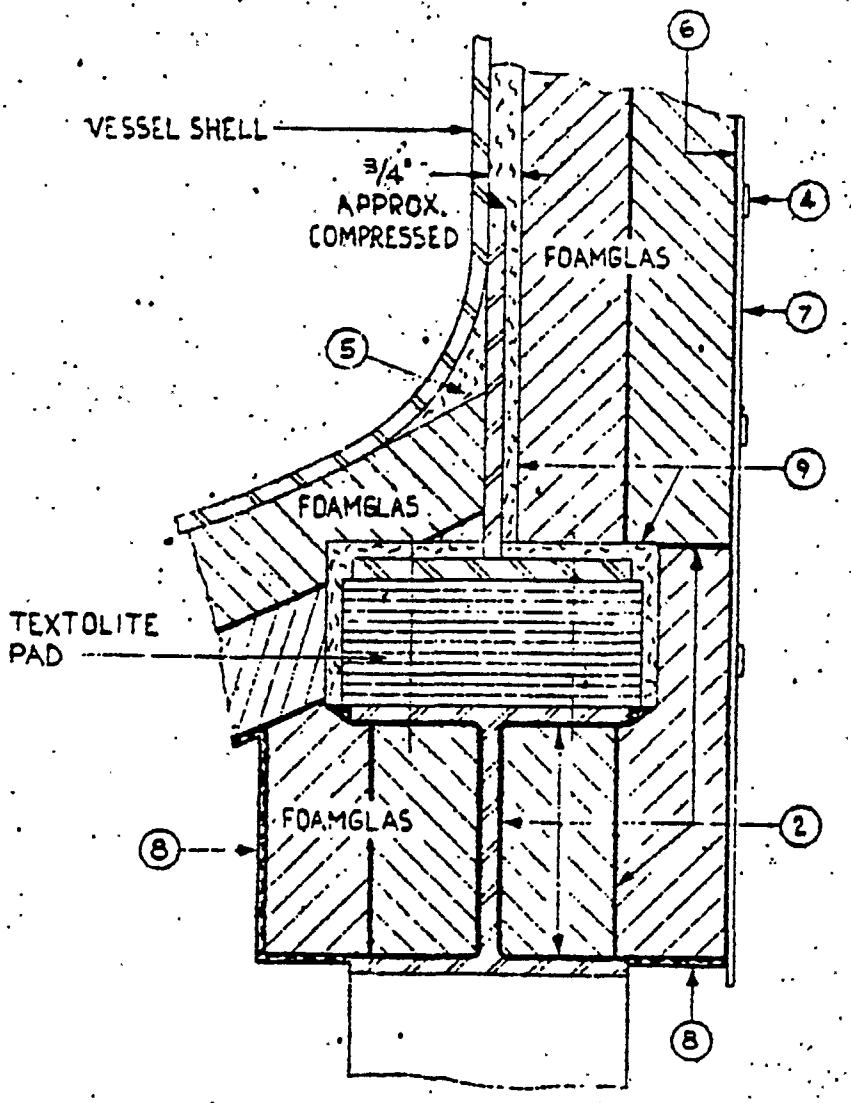
(1)

(1)

MULTI-LAYER "FOAMGLAS" APPLICATION FOR VESSELS - BELOW 20°F

FOR DESCRIPTION OF CIRCLED NUMBERS SEE PAGE 5

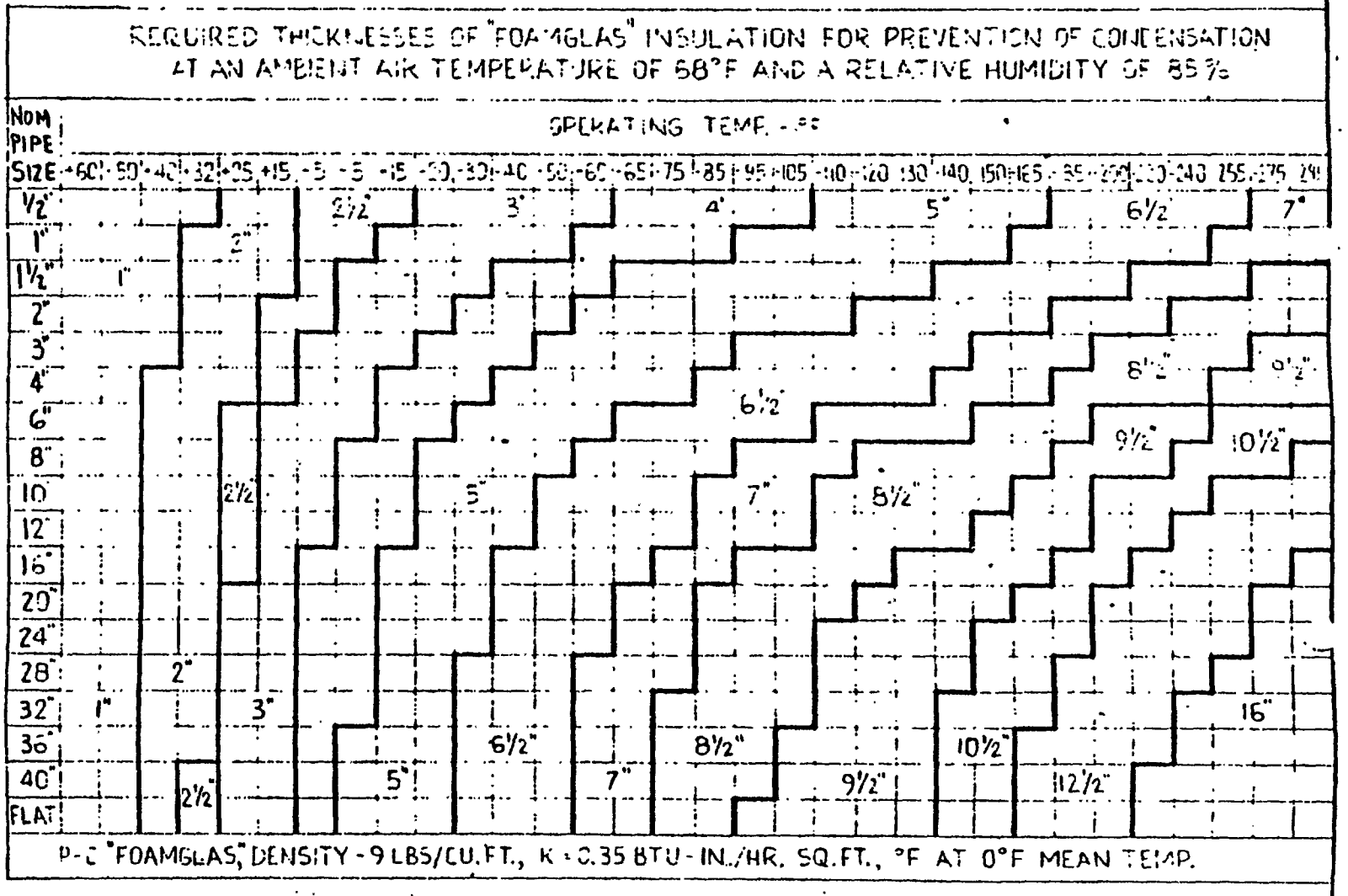
USEI000380



FOAMGLAS SUPPORT INSULATION
FOR LIGHT OIL REGENERATORS
R-582, 4, 6 & 8

FOR DESCRIPTION OF CIRCLED NUMBERS SEE PAGE 5

USEI000381


REQUIRED THICKNESSES OF "FOAMGLAS" INSULATION FOR PREVENTION OF CONDENSATION
AT AN AMBIENT AIR TEMPERATURE OF 68°F AND A RELATIVE HUMIDITY OF 85%
NOM PIPE SIZE
OPERATING TEMP. - °F
+60 +50 +40 +32 +25 +15 -5 -15 -30 -40 -60 -65 -75 -85 -95 -105 -110 -120 -130 -140 -150 -165 -185 -200 -220 -240 -255 -275 -29
½" 1" 1½" 2" 3" 4" 6" 8" 10" 12" 16" 20" 24" 28" 32" 36" 40" FLAT
1"
2"
2½"
3"
4"
5"
6½"
7"
8½"
9½"
10½"
11½"
16"
P-C "FOAMGLAS" DENSITY - 9 LBS/CU.FT., K - 0.35 BTU - IN./HR. SQ.FT., °F AT 0°F MEAN TEMP.

USE100382

VESSELS TO BE INSULATED WITH "FOAMGLAS" INSULATION

Tag No. New	Tag No. Old	Dwg. No.	Oper. Temp.	Insul. Thickness
D-603		W-20818	(Note 1.)	10-1/2"
D-576		W-20821	+ 53° F.	2"
D-624		W-20821	+ 23° F.	2-1/2"
D-754		K-290147	- 67° F.	7"
D-726	(D-703A)	S-3549C (Linde)	- 58° F. (Note 2) (Note 4)	7"
D-727	(D-703B)	S-3549C (Linde)	- 58° F. (Note 2) (Note 4)	7"
E-721	(E-701)	S-3552B (Linde)	+ 25° F.	3"
E-722	(E-702A)	S-3553B (Linde)	- 58° F. (Note 3)	7"
E-724	(E-702B)	S-3553B (Linde)	- 58° F. (Note 3)	7"

Note 1. Operating temp. plus 80° F. at bottom, minus 291° F. at feed, minus 118 at top. Design temperature is minus 298° F.

Note 2. Cyclic operation with max. temp. plus 392° F. and lowest temp. minus 58° F.

Note 3. Cyclic operation with max. temp. plus 90° F. and lowest temp. minus 58° F.

Note 4. Contractor shall furnish and install two (2) 1/4" diameter length of stainless steel breather tubes in the insulation at the bottom of each vessel and located 180° apart. The upper end of each tube shall touch the vessel wall at the knuckle radius of bottom vessel head and the lower end of tube shall extend 1/2 inch through final insulation cover.

EXCH[illegible]GERS TO BE INSULATED WITH "FOA[illegible]AS" INSULATION

Tag No.	Dwg. No.	Operating Temp. Channel In ° F.	Channel Out ° F.	Shell In ° F.	Shell Out ° F.	Chan. Insul. Thick's	She Ins Thic
E-634	D-66-92	100	54	40		2"	2"
E-635	" " "	100	54	40		2"	2"
E-637	" " "	400	54	40		2"	2"
E-638	" " "	400	54	40		2"	2"
E-641	D-66-93	100	23	-15		2-1/2"	2-1
E-642	" " "	100	23	-15		2-1/2"	2-1
E-764	ET-224	158	-13	-28		5"	6-1
E-765	ET-225	-13	-58	-67		7"	7"
E-767	C-810	-40	+50	365		6-1/2"	2"

LIGHT OIL REGENERATORS WITH "FOAMGLAS" INSULATION

Tag No.	Dwg. No.	Oper. Temp.	Insul. Thick's
R-582	W-20025	-204° F.	10-1/2"
R-584	"	-204° F.	10-1/2"
R-586	"	-204° F.	10-1/2"
R-588	"	-204° F.	10-1/2"

INSULATION FOR CRYOGENIC TEMPERATURES

INS-2

1. General

   a. The Insulation Contractor shall be referred to as the "Contractor". Contractor shall furnish all labor, material, scaffolding, necessary tools and equipment for the complete application of insulation to designated vessels and equipment.

   b. The insulation shall be applied by mechanics skilled in applying the insulation in a manner recognized as proper and suitable by industrial concerns customarily engaged in work of the chemical plant nature.

   c. Contractor shall handle all unloading and protection and storage of materials. All materials shall be protected against the weather during all stages of application. Before final acceptance of the work, Contractor shall dismantle all scaffolding used by him and shall remove all materials, equipment and insulation debris, leaving the job site clean and neat in appearance.

   d. Contractor shall guarantee his work for a period of 12 months, after final acceptance, to be suitable for the range of operating conditions specified or shown on drawings. Any defects due to faulty workmanship, method of application or selection of materials, shall be corrected at the Contractor's expense.

   e. Prior to application of insulation, all surfaces to be insulated shall be cleaned of all dirt, oil, loose scale and foreign matter. No insulation shall be applied to damp surfaces.

   f. Contractor shall obtain permission from Field Construction Superintendent before performing any welding.

   g. All communications regarding unsulation materials, method of application or any other matters concerning the subject of this Specification shall be directly with the prime Construction Contractor.

2. Scope

   This Specification covers two (2) types of insulation:

   a. Perlite insulation
   b. Wool insulation

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   Chemical and physical properties and minimal installation requirements are included in the following pages for both types of insulation. In addition, sketches, volumes to be filled and design drawing references are attached, covering the enclosures into which the insulation is to be placed. The quantities given are estimated quantites and the Contractor is responsible for furnishing and installing the actual quantities as shown on the respective drawings showing where the insulation is to be installed.

3. Perlite Insulation - Properties

a. Material - expanded siliceous volcanic rock, properly graded for particle size, non-sparking and with safe, acceptable moisture and solvent content. Silbrico Corporation - Ryolex, Grade 3S or approved equal.

b. Particle Size -

At least 95% by weight will pass a 16 mesh sieve
At least 85% by weight be retained on a 100 mesh sieve

c. Average Density -

Loose fill: 2.5 lbs. cu.ft.
Compacted: 3.75 lbs. cu.ft., average
Compacted: 4.25 lbs. cu.ft., maximum

d. Maximum Free Moisture - 0.5%

e. Hydrogen Ion Concentration (pH) - 6.6 to 8.0%

f. Thermal Conductivity at minus 115° F., mean temperature -

K = 0.21 BTU - inch/hr., sq.ft., ° F. for 4 lbs. cu.ft.

g. Color - white

h. Cryogenic Insulation Design Temperature - 85° F. ambient at 85% RH

4. Perlite Insulation - Application

Since Perlite insulation is loosely deposited into annular and void spaces of vessels, boxes, ducts, etc., no other insulation materials such as coatings, fasteners and weatherproofing will be required.

The most common method of installation is the dumping of expanded and bagged Perlite into the required void spaces through manholes or specific openings spaced around the top of vessels, equipment or cold boxes.

An alternate and probably preferred method is the fabrication of expanded Perlite at the job site by means of portable equipment and installing same into the void spaces while still hot and dry.

The completed Perlite application must guarantee quality control, proper compaction and low conductivity and the Contractor must state in his proposal the method to be used to assure a proper installation.

5. Wool Insulation - Properties

a. Material - mineral (rock) wool made from smelted stones or slag wool made from liquid slag, as manufactured by Baldwin Ehret-Hill, Trenton, New Jersey; Dravo Corporation, Pittsburgh, Pa.; Johns-Manville, or approved equal.

b. Bulk Density -

Laboratory test:

Under pressure of 1.4 lbs./sq.in.: less than 13 lbs./cu.ft.

Box test:

Less than 20 lbs./cu.ft.

Use a 30 cu.ft. box: 2' x 3' base x 6' in height shall be filled with about 100 lbs. of wool and the wool then to be tramped down with a man. Additional volumes of bulk wool shall be added to the box and tramped down until the box is full. The bulk density is determined by dividing the net weight of stuffed wool by the volume of the box.

c. Contents -

Sinter pearls and thick end fibers (more than 0.01" dia.): less than 30%

d. Height of Water Rise -

In 1 hr. at density established in laboratory test: less than 8"

e. Thermal Conductivity -

At 32° F. normal moisture content and a density of 19 lbs./cu.ft.: less than 0.030 BTU/ft., h. ° F.

f. Combustibel Carbon - Content - less than 0.3%

g. Ingredients Soluble in Trichloroethylene - Content - less than 0.3%

h. Sulfide - Content - less than 0.9%

6. Wool Insulation - Application

The wool insulation shall be carefully installed to fill all void spaces and cavities. Stuffed density shall approximate 19 lbs./cu.ft.

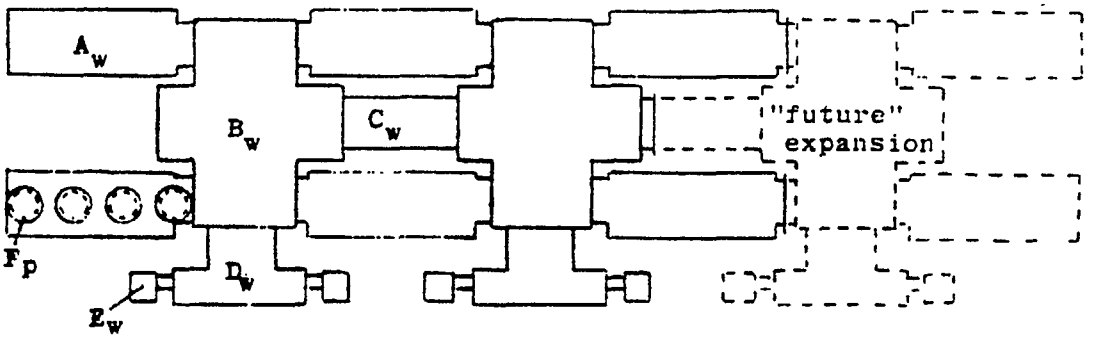
Great care must be taken to avoid distortion or damage to instrument wiring and piping and other small pipe systems.

The compacted wool application must guarantee quality control, proper compaction and conductivity.

MAIN REGENERATORS

Estimated Volumes*

Equipment Reference Drawings



System Plan View

w = wool insulation
p = Perlite insulation

Title	Item	Equipment Reference Drawings***	Present		Future****	
			No. of Items	Est. Total Vol., ft^3*	No. of Items	Est. Total Vol., ft^3*
Regen. Box**	A_w	W-20516 thru W-20521	6	55,100	2	18,400
Sep. Box	B_w	W-20524 thru W-20527	2	35,400	1	17,600
Pipe Channel	C_w	W-20522	1	4,500	1	4,500
Turbine Pipe Box	D_w	Same as B_w	2	11,300	1	5,700
Turbine Box	E_w	15-672	4	750	2	310
Regen. Jacket	F_p	W-20537	24	59,400	8	19,800

NOTES:

*Void space volume to be filled with insulation

**Double wall box - insulate between shell & inner box. Insulate annular space between oval sleeve & regen. skirt & from regen. bottom head to top of inner box roof.

***Supplementary ref. drawings showing typical piping within boxes = W-20602, 3, 6, 8, 9, 23 & W-20750.

**** CONTRACTOR IS NOT TO DO ANY WORK MARKED "FUTURE"

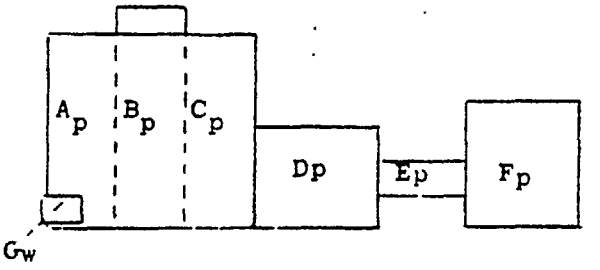
Page 1

HYDROGEN PLANT

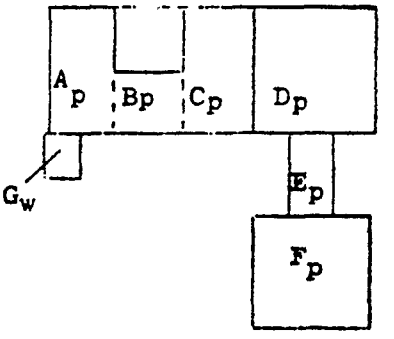
Estimated Volumes*

Equipment Reference Drawings

System Elevation View



System Plan View



w = wool insulation

p = Perlite insulation

Title	Item	Equipment Reference Drawings	No. of Items	Estimated Total Vol., ft.^{3}*
Box	A_p	SEE SHEET Nº 8 FOR REFERENCE DRAWING LIST	1	22,400
Box	B_p		1	23,500
Box	C_p		1	22,800
Box	D_p		1	16,500
Box	E_p		1	925
Box	F_p		1	18,700
Pump Box	G_w		1**	1,000

NOTES:

*Void space volume to be filled with insulation

**Includes small valve compartment boxes (575 ft.^{3}) within main boxes. Customer's field personnel to designate locations.

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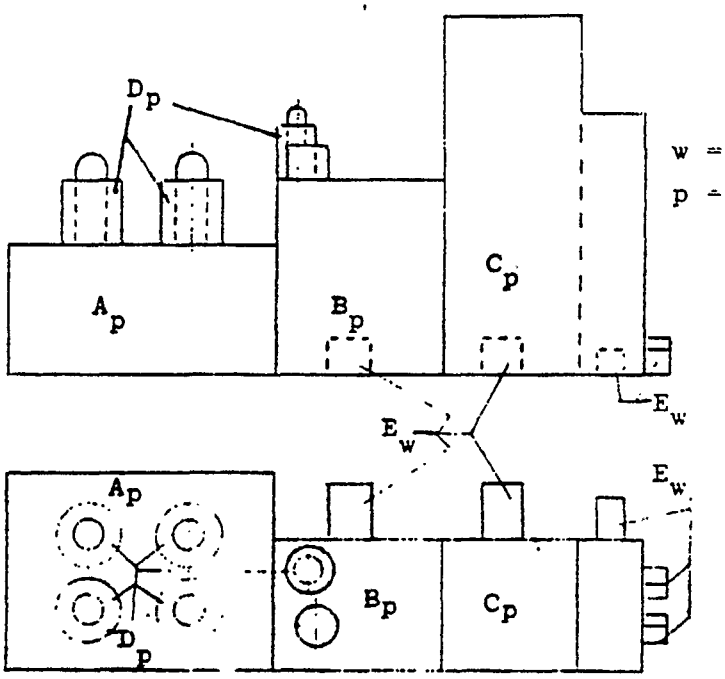
AIR SEPARATION PLANT

Estimated Volumes*

Equipment Reference Drawings

System Elevation View

System Plan View



w = wool insul.'n
p = Perlite insul.

Title	Item	Equipment Reference Drawings	No. of Items	Estimated Total Vol..ft³*
Box	A_p	SEE SHEET Nº 9 & 10 FOR REFERENCE DRAWING LIST	1	20.500
Box	B_p		1	11,700
Box	C_p		1	27,900
Vessel Jackets	D_p		5	5.300
Turbine & Pump Boxes	E_w		5**	1.450

NOTES.

*Void space volume to be filled with insulation.

**Includes small compartment boxes (discharge of the adsorber). Customer's field personnel to designate locations.

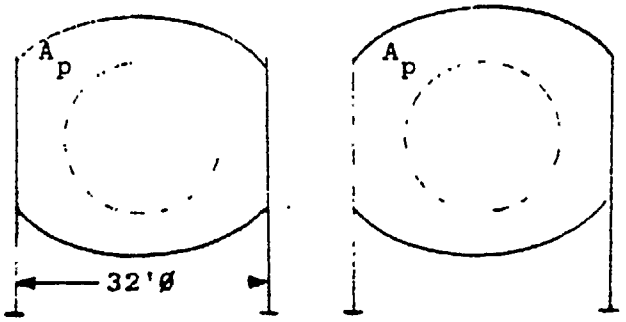
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LIQUID NITROGEN STORAGE SPHERES

Estimated Volumes*

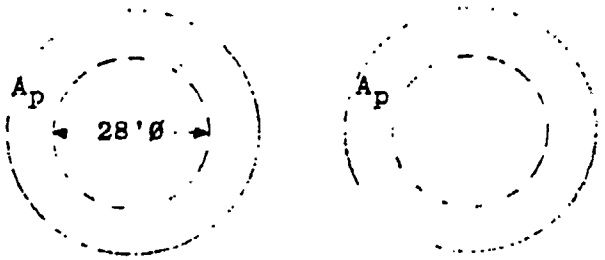
Equipment Reference Drawings

Elevation View



TAG: V-842 V-844

Plan View



p = Perlite insulation

A_p = Perlite insulation fill, annular space between inner and outer shells.

Reference Drawings: C.B.& I. 9-3196 Drawing 1

Estimated Total Vol., ft^3* = 19,800 (9,900 each sphere)

NOTE:

*Void space volume to be filled with insulation

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HYDROGEN SEPARATION PLANT

Item	Designation	Dwg. No.	Insulated With	Volume C.F. Approx.
1	Hydrogen Box (Box I, II, III and IV)	0-3975/1-5	Perlite	84970
2	Pipe Connection Box (Box V)	0-4420	Perlite Slagwool Mats	925 Linde Supply
3	Hydrogen Reg. Box (Box VI)	0-3976	Perlite	18615
4	Liquid N_2 Pump Box (Box VII)	0-5084	Slagwool Slagwood Mats	425 Linde Supply
5	5 - Insulation Boxes for Valves (Inside Hydrogen Box)	10.1.3956/26	Slagwool	420
6	2 - Insulation Boxes for Valve Boxes	1-9296	Slagwool	80
7	4 - Insulation Boxes for Reg. Nozzle	2-14195 2-14196	Slagwool	50
8	Openings in Dividing Walls for Piping		Slagwool Mats	Linde Supply

AIR SEPARATION PLANT

Item	Designation	Dwg. No.	Insulated With	Volume C.F. Approx.
1	Nitrogen Box Regen. Part (Box I)	0-3167/5.6	Perlite	20485
2	Nitrogen Box Exch. and Column - Part (Box II and III)	0-3167/1-4	Perlite	33555
3	Regen. and Exchanger Insulation Jacket (Box IV)	0-3167/5 10.1.3956/14	Perlite	5300
4	3 - Turbines		Slagwool	880
5	3 - Turbine Connect. Boxes	1-9095 and 1-9096	Slagwool Slagwool Mats	530
6	2 - LOX Pump Boxes	0-4942	Slagwool Slagwool Mats	385 Linde Supply

(Continued on Sheet 10)

AIR SEPARATION PLANT

Item	Designation	Dwg. No.	Insulated With	Volume C.F. Approx.
7	Insulation Boxes for Valves, Valve Boxes, and Absorber Nozzles (Inside Nitrogen Box)	2-14016 2-14026 2-14028 2-14039 2-14040 2-14051 2-14052 2-14053 2-14054 2-14086 2-14087 2-14139 1-9263	Slagwool	1350
		2-14120) 2-14121) 2-14230) 2-14485)	Slagwool	140
		2-14132) 2-14138)	Slagwool	40
8	4 - Insulation Boxes for Regen. Nozzles	2-13859	Slagwool	15
9	Openings in Dividing Walls for Piping		Slagwool Mats	Linde Supply

SPECIFICATIONS

FOR

INSULATION OF HOT PIPING, VESSELS AND EQUIPMENT

INS-3

1. General

(a) The Insulation Contractor shall be referred to as the "Contractor". Contractor shall furnish all labor, material, scaffolding, necessary tools and equipment for the complete application of insulation to designated piping, vessels and equipment.

(b) The insulation shall be applied by mechanics skilled in applying the insulation in a manner recognized as proper and suitable by industrial concerns customarily engaged in work of the chemical plant nature.

(c) Contractor shall handle all unloading and protection and storage of materials. All materials shall be protected against the weather during all stages of application until the final weatherproof coat is applied and cured. Before final acceptance of the work, Contractor shall dismantle all scaffolding used by him and shall remove all materials, equipment and insulation debris, leaving the job site clean and neat in appearance.

(d) Contractor shall guarantee his work for a period of 12 months, after final acceptance, to be suitable for the range of operating conditions specified or shown on drawings (i.e., atmospheric temperatures during shutdown to maximum operating temperatures, exposure to weather, etc.). Any defects due to faulty workmanship, method of application or selection of materials, shall be corrected at the Contractor's expense.

(e) Prior to application of insulation, all surfaces to be insulated shall be cleaned of all dirt, oil, loose scale and foreign matter. No insulation shall be applied to damp surfaces. Protective measures shall be taken to prevent moisture from working underneath or into partially applied insulation.

(f) Hot surfaces exceeding 150° F. not requiring insulation for heat conservation, shall be insulated for the purpose of protecting personnel at locations adjacent to operating areas. For piping, the personnel protection shall be up to 8'-0" above grade or floor level and 2'-0" beyond. All personnel insulation thicknesses shall be as shown on the thickness chart and finished to match adjacent insulation. Contractor shall be responsible of locating these lines using for reference the Line Index and Piping Drawings.

(g) Steam traced lines shall be insulated.

1. General (Contd)

(h) Piping shall be insulated for the operating temperatures noted in the Line Index. Line Index will indicate lines to be insulated.

(i) Insulation thicknesses noted herein are nominal thicknesses or primary insulation and do not include finish and weatherproofing.

(j) All insulation shall be installed with proper allowance for expansion and insulation exposed to the weather shall be installed with proper flashing and expansion joints so as to keep the insulation dry at all times. Contractor shall submit sketches on flashing and expansion for approval.

(k) Contractor shall obtain permission from Field Construction Superintendent before performing any welding.

(l) All communications regarding insulation materials, method of application or any other matter concerning the subject of this Specification shall be directly with the U. S. Steel-designated Engineer.

2. Hot Piping Insulation Materials

(a) Insulation for piping, valves, flanges and fittings - Molded pipe covering, Pittsburgh Corning Unibestos, or approved equal.

(b) Finishing cement for irregular surfaces shall be 2 parts by weight, J-M #352 or equal and 1 part, by weight, Portland cement.

(c) Banding and fasteners for insulation and weatherproofing shall be as follows:

(1) 1/2" x 0.020" thick stainless steel banding and fasteners on about 9" centers for insulated lines 10" O.D. and smaller, Gerrard or approved equal.

(2) 3/4" x 0.020" thick stainless steel banding and fasteners on about 9" centers for insulated lines greater and 10" O.D. and vessels, Gerrard or approved equal.

(3) For irregular surfaces, where banding is not suitable, fasten insulation with #16 ga. galvanized iron wire.

(d) Outdoor weatherproofing for straight insulated piping shall be 0.010" thick, Type #304 stainless steel sheeting, factory-applied or rolled in field to suit piping insulation.

Indoor weatherproofing for straight insulated piping shall be Johns-Manville Asbestos Firetard Jacket, or approved equal, furnished in rolls of 108 sq.ft. and weighing 55 lbs.

2. Hot Piping Insulation Materials (Contd)

(e) Weatherproofing for irregular surfaces shall be J-M Insulkote ET or approved equal.

(f) Reinforcing Mesh, #20 ga. 1" hexagonal netting, galvanized after weaving.

3. Piping Insulation Application

(a) All valves, fittings and flanges in insulated lines shall be insulated.

(b) Pipe insulation shall be staggered and tightly butted together and held in place with stainless steel banding on 9" centers.

(c) Vertical lines shall have plate or angle insulation supports, their width being 1/2" less than the insulation thickness, welded to the pipe on 12 foot centers. For stainless steel piping, the insulation supports shall be removable and clamped on the pipe.

(d) All piping insulation shall be carefully pointed up and all voids and cracks filled with finishing cement.

(e) Outdoor weatherproof straight insulated piping with 0.010" thick, Type #304 stainless steel sheeting with all ends lapped a minimum of 2 inches. Indoor weatherproof straight insulated piping shall be covered with J-M "Firetard" or approved equal with all ends lapped a minimum of 2 inches. The horizontal lap shall be on the side with the top section flashing the bottom section.

(f) Irregular surfaces (valves, flanges, fittings, etc.) shall be weatherproofed with one 1/4" thick coat (when wet) of J-M Insulkote ET or approved equal reinforced with #20 ga. galvanized 1" hex. mesh laced into place with #16 ga. galvanized iron wire.

4. Hot Vessels and Equipment Insulation Materials

(a) Insulation - segmental or block type, Pittsburgh Corning Unibestos or equal.

(b) Finishing cement - 2 parts, by weight, J-M #352 or approved equal and 1 part, by weight, Portland cement.

(c) Banding and fasteners for insulation and weatherproofing shall be as follows:

(1) For vessels 6'-0" O.D. and smaller - 3/4" x 0.020" thick, flat, stainless steel banding and fasteners.

(2) For vessels above 6'-0" O.D. - 3/4" x 0.020" thick stainless steel, corrugated banding and fasteners - Gerrard or approved equal.

4. Hot Vessels and Equipment Insulation Materials (Contd)

(d) Reinforcing mesh, #20 ga. 1" hexagonal neeting, galvanized after weaving.

(e) Lacing wire, #16 ga., galvanized iron wire.

(f) Weatherproofing for straight sides of vessels, .010" thick Type 304 stainless steel sheeting.

(g) Weatherproofing for vessel heads and other irregular surfaces, J-M Insulkote ET, or equal.

(h) Floating ring for vessel heads - 1/4" diam. annealed, galvanized steel rod.

5. Vessel and Equipment Insulation Application

(a) Equipment flanges shall not be insulated except that flanges at steam connections shall be insulated.

(b) Insulation on manway necks shall be applied in such a manner that covers may be unbolted without disturbing the insulation.

(c) Heat exchangers, tanks, drums, towers and similar regular surfaces shall be insulated with block or molded pipe covering. For vessels up to 24" diameter, use molded pipe covering. For vessels between 2'-0" and 6'-0" diameter, use curved blocks and for vessels over 6'-0" in diameter, use flat blocks. Use 3" - 18" flat blocks for heads of all equipment.

(d) The insulation for vessel shells shall be held in place with 3/4" x .020" stainless steel, Type 304 banding with seals spaced on 12" centers. All joints of insulation shall be staggered. Suitable insulation supports will be provided on vessel shells by others.

(e) An approved type of expansion joint, without additional insulation contract costs, shall be furnished at each insulation support ring. Contractor shall furnish details of proposed expansion joint for approval before proceeding with the work.

(f) Block insulation on vessel heads shall be held in place by 3/4" x .020" Type 304 stainless steel banding spaced 12" on the circumference. At the bend line of the vessel straps shall be attached to a special insulation support which will be furnished with the vessel. At the top of the head, straps shall be fastened to a floating ring made of 1/4" dia. annealed, galvanized steel rod placed around the nozzle.

(g) All insulation shall be carefully pointed up and all voids and cracks filled with finishing cement.

5. Vessel and Equipment Insulation Application (Contd)

(h) Weatherproof straight sides of vessels with 0.010" thick, Type #304 stainless steel sheeting rolled to suit contour of insulation and lapped a minimum of 3". Fasten weatherproofing to insulation by means of 3/4" x 0.020" stainless steel banding on 9" centers.

(i) Vessel heads and other irregular surfaces shall be weatherproofed with 1/4" thick (when wet) J-M Insulkote ET or approved equal, reinforced with #20 ga. 1" hex. mesh laced into place with #16 ga. galvanized iron wire.

(j) Provide openings in insulation to expose nameplates, insurance company's inspection stamps, identifying tags, etc. on sides of vessels. Bevel edges to drain openings and seal edges with insulating cement or specified finish. Where opening would provide a non-drainable depression, Contractor shall cover with insulation but he shall first make a list showing all the data appearing on nameplate, etc. and also make sketches of vessels with dimensioned location of all covered nameplates. The list of sketches shall be given to U. S. Steel's Construction Superintendent upon completion of the insulation work.

6. Pumps and Turbines - Insulation Materials

(a) Plastic insulation - J-M #450 or approved equal.

(b) Finishing cement - 2 parts, by weight, J-M #352 or approved equal and 1 part, by weight, Portland cement.

(c) Reinforcing mesh, #20 ga. 1" hexagonal netting, galvanized after weaving.

(d) Lacing wire, #16 ga. galvanized iron wire.

(e) Weatherproofing, J-M Insulkote ET or approved equal.

7. Pumps, Turbines and Compressors - Insulation Application

(a) Pumps, turbines and compressors shall be insulated with plastic insulation, J-M #450 or approved equal. Each 1" layer shall be reinforced with #20 ga. 1" hexagonal netting laced tightly into position by means of #16 ga. galvanized wire. The first layer shall always be allowed to dry before the second layer is applied. When insulation is dry, apply a 3/8" layer of hard finishing cement. When the finishing is dry, cover surface with hex. mesh netting, tightly laced with #16 ga. wire. Weatherproof surface with 1/4" thick wet coat of J-M Insulkote ET or approved equal.

INSULATION FOR HOT PIPING, VESSELS AND EQUIPMENT (Contd)

Insulation Thicknesses for Hot Piping

Pipe Sizes	Up to 400° F.	401° to 600° F.	601° to 750° F.
1/2"	1"	1"	1-1/2"
3/4"	1"	1"	1-1/2"
1"	1"	1"	1-1/2"
1-1/4"	1"	1"	1-1/2"
1-1/2"	1"	1"	1-1/2"
2"	1"	1-1/2"	1-1/2"
2-1/2"	1"	1-1/2"	1-1/2"
3"	1"	1-1/2"	1-1/2"
4"	1"	1-1/2"	2"
5"	1"	1-1/2"	2"
6"	1"	1-1/2"	2"
8"	1-1/2"	2"	2"
10"	1-1/2"	2"	2"
12"	1-1/2"	2"	2-1/2"
14" and over	1-1/2"	2"	2-1/2"

Insulation Thicknesses for Vessels and Equipment

Temp. Range	Insul. Thickness
Up to 250° F.	1"
251° to 600° F.	2"
601° to 750° F.	2-1/2"

VESSELS TO BE INSULATED WITH HOT TYPE INSULATION

Tag No.	Dwg. No.	Oper. Temp.	Insul. Thick's.
V-604	W-20817	150° F.	1"
V-605	W-20817	150° F.	1"

NOTE: Channel End of Exchangers in above vessels are to be insulated for 365° F.

EXCHANGERS TO BE INSULATED WITH HOT TYPE INSULATION

		Operating Temp.					
		Channel		Shell		Channel Insul.	Shell Insul.
Tag No.	Dwg. No.	In °F.	Out °F.	In °F.	Out °F.	Thick's	Thick's
E-424	D-819	-	-	365	365	None	2"
E-430	D-814	365	365	-	212	2"	1"
E-763	D-812	489	489	437	437	2"	2"
E-820	C-813	365	365	-	212	2"	1"
E-831	ES-226	489	489	-	356	2"	2"

UNITED STATES STEEL CORPORATION
DESIGN ENGINEERING - PITTSBURGH
225 GULF BUILDING
PITTSBURGH, PENNSYLVANIA 15230

BIDDING INSTRUCTIONS

SPECIFICATION NO. 535-4102-62 MAY 13, 1966

INSULATION FOR PIPING AND EQUIPMENT
KEYSTONE PROJECT

1. Bidder shall submit his signed proposal in quintuplicate or as requested in letter of inquiry, stating in three copies only of the Proposal Form the price for which he, as Contractor, will agree to furnish the work as covered by these Specifications. The other two copies of the Proposal shall be complete except for prices.

2. Bidder shall furnish with each copy of the Proposal:

   The data called for on Questionnaire accompanying and forming part of these Specifications.

   The price information called for on Proposal Form (on three copies only). Should Bidder's internal policies preclude using the Proposal Form as his formal bid, he must submit a completed Questionnaire Form indicating thereon the specific exceptions contained in his bid including but not limited to such items as different general terms and conditions and all specific engineering exceptions. He must also indicate on the Purchaser's Proposal Form the page of his bidding form where price information requested is to be found.

3. In addition to quoting on work as outlined in this Specification, the Bidder is requested to submit an alternative quotation or quotations covering the work which the Bidder believes will satisfactorily fulfill the requirements of the Purchaser. A Bidder may also propose alternate details or materials which he believes to be equally satisfactory or better than those specified. When submitting alternative proposals, the Bidder must indicate the price information on three copies of the Proposal Form in addition to stating all variations from the Purchaser's specifications in the Questionnaire.

   Alternatives are desirable where a manufacturer's standard product, similar to the one specified, can be furnished.

4. In submitting his Proposal, the Bidder shall base it on providing whatever personnel, equipment and material may be required (if and when he becomes the Contractor) to meet the Time Schedule specified in the INFORMATION SHEETS.

   If it should become necessary or desirable to work extra time beyond that agreed upon under the terms of this contract and only when such overtime is ordered by the Purchaser in writing, such premium time will be paid for on the basis of established local rates of premium time plus applicable insurance and taxes but not including any overhead expense or profit or any other charges whatsoever.

5. Bidder shall visit the site of the work in order to become familiar with the conditions concerning the proposed work. Within one (1) week after date of inquiry, Bidder shall contact Mr. J. W. Logan, Jr., 324 Gulf Building, Pittsburgh, Pennsylvania 15230, Telephone No. 391-2345, Extension 4067, for arrangement of the site visitation.

UNITED STATES STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

SPECIAL CONDITIONS - GROUP XXI

DATED: NOVEMBER 30, 19

1. Information Regarding Contracts

No information relative to this contract shall be published or given out by Contractor without first obtaining the written consent of the Purchasing Agent of Purchaser.

2. Starting-up Losses

Contractor shall be responsible for any and all damage resulting from the starting up of the work covered by this contract.

3. Safety Devices

Contractor shall equip the work covered by this contract with all proper safety devices for the protection of workmen and shall provide suitable, removable safety guards for all exposed moving parts, such as gears, roller chains, belts, brake wheels, couplings and the like. Contractor warrants that the work will meet the requirements of and be in conformity with any and all applicable federal, State and local laws, rules, regulations and ordinances.

4. Unloading of Railroad Cars and Trucks

Contractor shall unload all materials and equipment pertaining to this contract, unless otherwise specified. Should demurrage accrue on cars or trucks due to neglect or failure of Contractor to unload same within the free period, such demurrage shall be paid by the Contractor. In the event the charges for such demurrage shall have been paid by Purchaser, Contractor shall reimburse Purchaser therefore.

5. Tracks, Sidings and Roadways

Existing tracks, sidings and roadways will be made available for Contractor when and where Purchaser may so designate and Contractor shall keep such traffic lanes free from congestion at all times.

6. Use of Purchaser's Overhead Cranes

Subject to Purchaser's prior approval, Contractor may have the use of existing overhead cranes for occasional lifts at such times and locations as will not interfere with plant operations. No charge will be made for such use of the cranes while the mill is operating and crane operators must be on the job in any event but, if Contractor desires to use a crane during mill shutdown periods and it is necessary to provide a crane operator for the sole benefit of Contractor, Contractor will be charged at the rate of $5.50 per hour and the minimum charge therefore shall be that for four (4) hours' time.

USEI000404

7. Receipt of Meterials and Loss of Tools, Equipment, etc.

Purchaser may receive, for account of Contractor, any and all material assigned to Contractor at Purchaser's plant or work site. Contractor shall bear all loss and damage to tools, equipment, appliances, materials and supplies, not owned by Purchaser, which are used or are to be used by Contractor in the prosecution of the work covered by this contract, however such loss or damage may be caused or occasioned.

8. Utilities Furnished by Purchaser

When electric current, water, gas or other utilities are furnished by Purchaser, Purchaser assumes no responsibility or liability for loss of or damage to the equipment or materials of Contractor or Sub-contractors, if any, resulting directly or indirectly from the use of same by Contractor or Sub-contractors, if any.

9. Connection to Permanent Plant Installations

No piping or electrical connections to the existing plant lines and no structural connections to existing plant structures shall be made without first securing the specific authorization of Purchaser's Engineer and such connections must be made under the supervision of the Engineer and at such times as he may designate. All temporary connections must be made under the supervision of the Engineer and at such times as he may designate. All temporary connections shall be protected and installed in accordance with Purchaser's Safety Regulations.

10. Cleaning-up of Premises

During the progress of the work, Contractor shall store materials and equipment in an orderly manner and shall keep the premises, at all times, free from debris and obstructions. Upon completion of the work, Contractor shall remove all temporary buildings or facilities erected by Contractor and his Sub-contractors, all construction equipment, surplus materials and supplies belonging to Contractor or Sub-contractors and shall leave the premises and the work in perfect order, clean and ready for use.

11. Accounting Records

Contractor shall furnish a list showing the total price sub-divided as requested by Purchaser for use in property accounting records.

12. Identification of Contractor's Employees

Contractor shall make arrangements with the Engineer for the ingress and egress of his employees.

13. Treating Injuries Sustained by Employees of Contractor

Before proceeding with the work under this contract, Contractor shall make and shall require Contractor's Sub-contractors, if any, to make such arrangements as may be necessary to provide adequate first-aid, medical, surgical and hospital treatment for injuries sustained by any employee of Contractor or by any employee of a Sub-contractor, if any, on or in connection with the work to be performed under this contract. Contractor and Contractor's Sub-contractors, if any, may,

USEI000405

13. Treating Injuries Sustained by Employees of Contractor (Continued)

if they so desire, make arrangements with Purchaser for use of any of its first-aid and hospital equipment which is available at the site of the work to be performed hereunder and may make private and independent arrangements for the services of any physician or surgeon who may also be employed at such site, provided, however, that prompt written notice of the desire for such arrangements shall be given to the Purchasing Agent of Purchaser. In the event any hospital facilities, equipment or service, including ambulance service, are furnished to Contractor or his Sub-contractors, or any of his or their employees, the Contractor and his Sub-contractors shall indemnify Purchaser against any claim for damages arising from alleged negligence of any employees, agent or servants of Purchaser in connection therewith. Wherever practicable, Contractor and his Sub-contractors shall arrange for outside ambulance service. Charges for such medical services shall be made by such physician or surgeon for his own account direct to Contractor and his Sub-contractors. Charges for the use of Purchaser's first-aid and hospital equipment shall be made by Purchaser and paid by Contractor or his Sub-contractors at the following rates:

(a) For the use of hospital facilities on the first and each subsequent visit (as determined for each case upon occurrence, by Industrial Relations Department Medical Division). . . . . $1.00 to $3.00

(b) For use of X-Ray facilities, depending upon number and size of plates . . . . . $1.50 to $25.00

(c) For ambulance service and driver when Purchaser's equipment is available and used . . . . . $20.00, flat rate per trip

NOTE: "Purchaser's equipment" is not necessarily confined to a regular ambulance vehicle; therefore, rate applies irrespective of type of vehicle employed when performing the service.

If any additional attendant employed by Purchaser is required to accompany ambulance, charge will be made based upon pay period average earnings of such attendant times period of time consumed. If outside ambulance service is used, arrangements should be made by Contractor or his Sub-contractors direct with the operator of the ambulance. If this is not possible and the charge for use of ambulance is made to Purchaser, Purchaser will bill Contractor or his Sub-contractors at cost.

It is understood that no pre-employment physical examination of employees of Contractor or his Sub-contractors will be made in Purchaser's hospital.

14. Corporation Materials

Contractor shall use materials manufactured by Purchaser or its subsidiary companies in all instances in which materials of the kind, type, size and grade manufactured by Purchaser or its subsidiary companies are required for the performance of this contract, including construction work and the manufacture and installation of equipment and facilities.

USEI000406

15. Authority of Engin

Work under this Specification shall be subject to the approval of the Engineer, who shall determine the quantity, quality, acceptability and fitness of each kind of work and material to be furnished hereunder and who shall decide all questions which may arise as to measurement of quantities, the fulfillment of the requirements of the Specification and the order of precedence of the various parts of the work. His decision shall be final.

16. Contractor's Understanding

It is understood and agreed that the Contractor has, by careful examination, fully satisfied himself as to the nature and location of the work, the conformation and character of the ground, the character, quality and quantity of the materials required, the kind of equipment and facilities needed preliminary to and during the prosecution of the work, the general and local conditions and all other matters which can, in any way, affect the work under this contract.

17. Safety

The Contractor shall conduct his work in accordance with United States Steel Corporation's manual entitled "Contractors' Safety Responsibilities", dated November 1, 1958. Copies of this manual will be furnished each Bidder as required during site visitation in preparation of his bid. The successful Bidder will receive additional copies as required when he reports for work.

18. Reporting Accidents

Contractor shall immediately report to the Engineer all accidents and injuries involving Contractor's employees while on Purchaser's premises. In those cases where accident reports are furnished to local and/or state bureaus, as applicable, Contractor shall also furnish a copy to the Engineer.

USEI000407

UNITED STATES STEEL CORPORATION
DESIGN ENGINEERING - PITTSBURGH
225 GULF BUILDING
PITTSBURGH, PENNSYLVANIA 15230

QUESTIONNAIRE

SPECIFICATION NO. 535-4102-62 MAY 13, 1966

INSULATION FOR PIPING AND EQUIPMENT
KEYSTONE PROJECT

The data called for below are to be furnished by the Bidder and, in case the Bidder becomes the Contractor, the data shall form part of the contract covering the work.

1. Name or trade name of Bidder. State whether quotation is made by a corporation, partnership or individual. If one of the latter two cases, the name(s) of all persons involved shall be stated.

_____ _____

_____ _____

2. Date of proposal _____

3. Proposal number _____

4A. Does Bidder fully understand that any general terms or conditions of sale contained in his proposal will not become a part of any resulting contract? Yes____ No____

4B. Is it the Bidder's intention, if awarded the contract, to comply fully and in all respects with the Purchaser's Specifications covering the work and Purchaser's standard contractual document, as indicated in inquiry letter? Yes____ No____

4C. Does Bidder fully understand that, if awarded the contract, he will be required to use material manufactured by Purchaser or its subsidiary companies in all instances in which materials of the kind, type, size and grade manufactured by Purchaser or its subsidiary companies are required for the performance of this contract including construction work and the manufacture and installation of equipment and facilities? Yes____ No____

4D. If "No" is answered to any of the above questions, the Bidder shall state the exceptions in detail.

5. Time within which Bidder agrees to furnish all of the work in accordance with these Specifications, i.e., elapsed time in calendar days from date of accepting a purchase order or date of notice to proceed. _____days

USEI000408

6. Terms of payment _____

7. Are quoted prices firm? Yes_____ No_____

USEI000409

NOTE: In case the answers to the above questions are submitted as a document separate from the Bidder's formal proposal, Bidder shall sign each copy in the following form:

Date _____ Bidder _____

By _____

Title _____

UNITED STATES STEEL CORPORATION
DESIGN ENGINEERING - PITTSBURGH
225 GULF BUILDING
PITTSBURGH, PENNSYLVANIA 15230

PROPOSAL FORM

SPECIFICATION NO. 535-4102-62 MAY 13, 1966

INSULATION FOR PIPING AND EQUIPMENT
KEYSTONE PROJECT

...; carefully examined the Specification and being familiar with the various condi-...s affecting the work, the Undersigned offers to perform the work specified in the ...e-numbered Specification for the prices quoted below:

1. Total lump-sum price for furnishing and installing all insulation for the Keystone Project, complete as specified $_____

   1.1 Price addition to Item 1 for furnishing and installing Type 316 stainless steel jacketing (.010" thickness) in lieu of Type 304 stainless steel jacketing as specified $_____ Add

   1.2 Price deduction from Item 1 for furnishing and installing Johns-Manville "Firetard" jacketing or approved equal in lieu of Type 304 stainless steel jacketing as specified $_____ Deduct

   1.3 Price change to Item 1 for furnishing and installing STYROFOAM insulation in lieu of FOAMGLAS as specified in INS-1 using an equivalent thermal conductivity and an installation procedure as specified by Dow Chemical Company, or approved equal $_____ Add / Deduct

2. Total lump-sum price for furnishing and installing the formed insulation portion of the Keystone Project as described by INS-1 and INS-3 and the accompanying attachments $_____

   2.1 Price addition to Item 2 for furnishing and installing Type 316 stainless steel jacketing (.010" thickness in lieu of Type 304 stainless steel jacketing as specified $_____ Add

   2.2 Price deduction from Item 2 for furnishing and installing Johns-Manville "Firetard" jacketing or approved equal in lieu of Type 304 stainless steel jacketing as specified $_____ Deduct

USEI000410

1. (Continued)

2.3 Price change to Item 2 for furnishing and installing STYROFOAM insulation in lieu of DOUGLAS as specified in INS-1 using an equivalent thermal conductivity and an installation procedure as specified by Dow Chemical Company, or approved equal

Add / Deduct $_____

4. Total lump-sum price for furnishing and installing the bulk Perlite portion of the Keystone Project as described by INS-2 and the accompanying attachments

$_____

Total lump-sum price for furnishing and installing the bulk slag wool portion of the Keystone Project as described by INS-2 and the accompanying attachments

$_____

5. Additional Work beyond the Scope of the Specification:

Work by Contractor, which Owner may authorize, which is of indeterminable nature and is in addition to that covered by the specification, shall be performed by Contractor on an hourly-rate basis and such added work shall be only when specifically authorized by Owner's Purchasing Agent and in writing.

A. _____% mark-up shall be added to the prevailing basic straight-time, hourly rates established by Union agreements of the trades required. This percentage shall be all-inclusive and shall cover taxes, travel and vacation allowances, all other fringe benefits, tools having a value of $500.00 or less, expendable materials, supervision, etc.

B. If it should become necessary or desirable to perform such additional work during premium-time hours (in excess of 8 hours per day or in excess of 40 hours per week) and such premium-time work is authorized as above, the rate per hour shall be that as established in "A" above plus the applicable premium-time differentials as established by Union agreements of the trades required plus applicable insurance and taxes but excluding any overhead expense or profit or any other charges whatsoever.

C. All equipment required by the Engineer for such above added work shall be paid at applicable unit rental rates as listed in the latest edition of "Equipment Rental Rates" published by the Associated Equipment Distributors, less _____%. Fuel, oil and any required maintenance shall be included in this rate.

These rates shall be applicable only to work which is outside of and in addition to the original scope of work for this project.

Under no condition will these rates be used for changes and/or modifications, if any are required, to the scope of work herein defined.

_____ Firm Name _____

Signed by _____

USEI000411

Title _____

Area Code _____ Telephone No. _____