PDM-62

PITTSBURGH-DES MOINES STEEL COMPANY

General Contractors For
Altitude Wind Tunnel and Ice Tunnel

INVITATION FOR BIDS FOR ICE TUNNEL HEAT EXCHANGER & EQUIPMENT

Ice Tunnel Specification No. 1 - Sept. 21, 1942

Advertisement

Bids for the heat exchanger equipment for the Cleveland, Ohio Ice Tunnel will be received at the Field Office, N.A.C.A.-A.E.R.L., Brookpark & Grayton Roads, Cleveland, Ohio, of the Pittsburgh-Des Moines Steel Company, September 28, 1942. The right is reserved to reject any or all bids or to award contract to the bidder whose proposition is, in the opinion of the general contractor and the N.A.C.A. most favorable to the United States government.

SECTION I

1. Description of Project

(A) This specification covers the requirements of the National Advisory Committee for Aeronautics for furnishing f.o.b., cars Berea, Ohio all of the necessary equipment, designs and supplies for installation by others for the heat exchanger for an Ice Tunnel, to be operated in conjunction with the refrigeration equipment of the Altitude Wind Tunnel, which will produce a suction pressure corresponding to a temperature of - 62°F., at the point of attachment of the Ice Tunnel suction lines to the Altitude Wind Tunnel suction lines. The heat exchanger for the tunnel shall be designed by the bidder so as to give the best possible performance under the conditions in the tunnel and meeting the performance requirements. The size of the coils, number of tubes, and number of fins per inch, etc., shall be proportioned so as to permit a maximum time of tunnel operation before the coils have iced to the point where the maximum allowable pressure drop is attained at the maximum air velocity. The performance which will be required of the heat exchanger shall be as tabulated below:-

Number of tons of refrigeration	1500
Refrigeration system	Direct expansion of Freon-12 with excess of liquid and feed pump.
Suction temperature at Coil	-60° F.
Leaving air temperature	-40° F.
Size of tunnel at exchanger	29'-2" wide x 26'-2" high

Maximum tunnel air velocity at exchanger	1800' per minute
Maximum allowable pressure drop through exchanger	3" water
Tunnel pressure at exchanger	Atmospheric

Defrosting to be accomplished by hot refrigerant gas.

Coils to be so designed that the variation of air temperature over the tunnel cross-section downstream of the coil shall not be greater than the variation in temperature over the tunnel cross-section upstream of the coil.

Coils to be designed for operation over the range from maximum load to ten per cent of maximum load.

2. Scope

(A) This contract shall include all services, labor, material, designs, drawings and information for furnishing f.o.b., cars Berea, Ohio an Ice Tunnel heat exchanger, in a complete and satisfactory manner, in strict accordance with the drawings and specifications hereinafter listed, for the National Advisory Committee for Aeronautics.

(B) The Contractor shall furnish, not later than 6 weeks after the day of award of contract, final and certified correct drawings of piping, equipment layout, and heat-exchanger as described hereafter. This information is to enable the tunnel structure contract to proceed to completion with the least delay.

(C) The contractor shall furnish all pipe, fairing, supports, expansion joints, valves, and fittings from the heat exchanger coils to the points at which connection are made with the refrigeration system piping for the Altitude Wind Tunnel and shall finish within six (6) weeks after award of contract a detail piping layout so complete that without additional drawing the piping may be properly installed by others.

(D) The coils are to be of the tube and plate fin type with either three or four fins per inch and one test section of both the three fin per inch and the four fins per inch shall be manufactured and tested by the contractor in the presence of an National Advisory Committee for Aeronautics engineer, and the right is reserved to accept either. Cost of tests to be included in the contractors proposal.

(E) The contractor is to order all necessary material immediately after award of contract, and before the test is made.

(F) The following drawings are hereby made a part of these specifications:-

Drawing No.	Title
I.T. 100	Plan
A.D. 167	Plot Plan
A.D. 150,151,161,&162	Ice Tunnel

3. Time of Completion

(A) The time of completion of this Ice Tunnel project is for National Defense reasons of the highest urgency. Each bidder shall, therefore, state for each item or group of items the number of days after award of contract in which he will agree to make shipment. It is the intention of the government to complete this contract by April 1, 1943, and bidders should, therefore, quote on types of equipment which will be available for shipment in time to be installed by the above date.

(B) The heat exchanger contractor shall keep the general contractor informed as to the progress of the work and the probable shipping date of the various items or groups of items. If, in the opinion of the contracting officer of the N.A.C.A., it becomes apparent that any items of equipment will not be shipped by the dates specified by the bidder the general contractor reserves the right to cancel such items and obtain them elsewhere, charging the cost of any items so purchased to the refrigeration contractor.

4. Priority Rating

The contract for this project will carry a priority rating of AA-3.

SECTION II
GENERAL PROVISIONS

1. Spirit and Intent

It is the spirit and intent of these specifications, and the drawings forming part of them, to provide that the work and all parts thereof shall with the portions specified to be furnished by others be fully completed, interconnected and placed in operation, and be suitable in every respect for the purpose intended. This specification is, in effect and intent, a performance type specification and as such makes no attempt to itemize, interconnect or describe in detail the every piece of equipment needed to install and properly operate a system as specified herein. However, sufficient detail is included to describe the needs and certain definite characteristics of the

system requested; consequently, the every detail of this specification shall be rigidly adhered to by the heat exchanger contractor. It is intended that the heat exchanger contractor furnish all equipment, labor, materials, designs, drawings and instructions, except such as may be specifically shown on drawings or stated herein to be supplied by others and shall do all work which is described or may reasonably be implied to be a part of the contract, regardless of whether or not it is shown on the drawings or mentioned in the specifications. All work shall be delivered in a complete and undamaged state. The Contracting Officer will advise and cooperate with the contractor in every way possible to the end that the progress of the work may be expedited and that the work as a whole may be satisfactorily completed; and it is expected that the heat exchanger contractor will facilitate and recriprocate such advise and cooperation.

2. The Terms "Contracting Officer", "Government", "Contractor" and "General Contractor"

(A) The term "Contracting Officer" as used herein shall include the Contracting Officer of the National Advisory Committee for Aeronautics or his duly authorized representative. The term "as directed" as used herein shall be interpreted to mean as directed by the Contracting Officer or his duly authorized representatives.

(B) The term "government" as used herein shall refer to the "Contracting Officer" of the National Advisory Committee for Aeronautics or his duly authorized representative.

(C) The term "Contractor" as used herein shall refer to the Contractor for the specific item in question, or his duly authorized representative.

(D) The term "General Contractor" as used herein shall refer to the Pittsburgh-Des Moines Steel Company or to their duly authorized representative.

3. Drawings Accompanying Specifications

(A) The drawings accompanying these specifications are solely the property of the government and shall not be used for any purpose other than that contemplated by the specifications. Wherever "as shown" "as indicated" or words of similar import are used, it shall be understood that reference is made to the drawings enumerated herein unless otherwise specified.

(B) All dimensions and elevations shown and indicated on drawings shall be checked for accuracy by the Contractor before he proceeds with construction and the ordering of materials.

The Government does not guarantee the accuracy of dimensions given on drawings. The contractor shall be fully reponsible for the proper connecting, tying, or fitting in of all work.

(C) The drawings forming a part of these specifications show typical details of the construction, but the government desires to profit by the experience of the contractor and will allow minor modifications provided the resulting structure meets the requirements, and provided the modifications meet the specific approval of the Contracting Officer.

(D) All connections or details not shown on drawings or described in the specifications, but necessary to properly complete this contract, shall be designed and completed in a satisfactory manner by the contractor. This shall apply with equal force to details not shown or specified, but necessary to alter or to add to any existing structure or to provide connection for any future building. All parts designed by the contractor shall be amply strong to withstand without excessive deflection any load or pressure to which it is likely to be subjected. In no case shall a design external wind pressure load of less than 30 (thirty) pounds per square foot be used on vertical surfaces. In no case shall the contractor use construction weaker than that shown on drawings. All designs and details made by the Contractor shall be in accordance with the best standard practice and shall meet with the approval of the Contracting Officer.

4. Design, Drawings and Test Data Required From Contractor

(A) The Contractor shall submit in quadruplicate as part of, and with, his bid drawings of the proposed equipment and general piping layouts (isometric or three-view but not merely schematic), heat exchanger and performance charts, detailed drawings of special structures, particularly the heat exchanger and its foundation and supports, and such other details, diagrams, drawings and data that may be necessary for the Government to have a full and complete knowledge of that which is proposed to be installed under the terms of this specification.

(B) In addition, the Contractor shall submit, after completion of tests, sufficient data and calculations to cover the determination of heat transfer, air pressure drop, refrigerant circulation and distribution, and structural strength of the heat exchanger proposed. The data and calculations submitted on the performance of the proposed heat exchanger shall be sufficiently complete and reliable to satisfy the Contracting Officer regarding the basic soundness of the proposed design, but shall not relieve the Contractor of responsibility for the performance of the heat exchanger, in accordance with the requirements of this specification.

The Contractor shall furnish the results of tests determining the heat transfer rate and air pressure drop for various

accumulations of ice or frost.

(C) Similarly, the performance of each, or any piece of equipment not previously established through satisfactory and trouble-free use or application in the service intended, must be so established to the full satisfaction of the Government, by means of data from recognized authorities or special tests, such data to accompany the bid.

(D) The Contractor shall furnish, not later than six weeks after the day of award of contract, final and certified piping drawings (showing all points where piping and supports pierce the tunnel structure, equipment layout, heat-exchanger and support. The Government requires this information in order to proceed with the construction and completion of the tunnel structure, with a minimum of alteration and the least delay.

(E) The Contractor shall prepare all working drawings, shop drawings, and details that are necessary to enable him to fabricate all parts of the work, in conformity with the contract drawings and specifications.

(F) All drawings shall be submitted to the General Contractor in quadruplicate accompanied by a letter of transmittal which shall list the numbers of the drawings submitted; one set will be returned by the General Contractor approved, or showing the changes or corrections required. Quadruplicate copies shall be submitted after each correction until they are approved. The Contractor shall furnish eight sets of paper blueprints of the approved drawings, for the use of the General Contractor on the work.

(G) All drawings must be marked with the name of the project, the name of the Contractor, and shall be numbered consecutively. All drawings shall be complete in every respect and bound in sets when submitted. No work for which drawings are required shall be commenced prior to the approval of the drawings by the General Contractor.

(H) If the shop drawings show variation from the contract requirements because of the standard shop practices, or other reasons, the Contractor shall make specific mention of such variation in his letter of transmittal, in order that (if acceptable) suitable action may be taken for proper adjustment of the contract, otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the contract, even though the drawings have been approved.

(I) Approval of shop drawings will be general and will not relieve the contractor from the responsibility for proper fitting and construction of the work, or from furnishing materials and work required by the contract which may not be

indicated in the shop drawings when approved. The approval of shop drawings shall not be construed as approving departures from the full size drawings, as furnished by the contracting officer.

5. Patents

The Contractor shall hold and save the General Contractor the Government, its officers, agents, servants, and employees, harmless from liability of any nature or kind, including cost and expenses, for or on account of any patented or unpatented invention, article, or appliance manufactured or used in the performance of this work and contract, including their use by the Government.

6. Materials

All necessary materials for the complete fabrication, assembly, and erection are to be supplied by the Contractor unless otherwise specified on the plans or in these specifications. All materials used in the execution of this work shall conform as far as possible, to the applicable Federal, Army, or Navy Specifications, including revisions and addenda in effect on the date of issue of this specification. Where there is no applicable Federal, Army, or Navy Specification, the materials shall be of the best quality of their respective kinds. Where two or more varieties of materials are specified, for any purpose, it shall be optional with the Contractor which is used, but the same material must be used throughout and must meet with the approval of the Contracting Officer. In all cases where an article or material is mentioned in the specifications in connection with the words "best quality", "approved quality", "equal to", or "equivalent to", the Contracting Officer shall decide which is the best quality and most suitable to use.

7. Inspection and Acceptance

(A) All materials and articles delivered shall be subject to the inspection of the Contracting Officer or other authorized agent of the Government, with the full right to accept or reject all or any part thereof. The Contractor shall, at his own expense, within a reasonable time, remedy any defective or unsatisfactory materials, articles or work. In the event of his failure to do so, after due notice, the General Contractor shall have the full right to have the same replaced or work done and to deduct the cost thereof from any money due the contractor. All condemned materials must be immediately removed from the premises. Inspection of all materials and articles used will be made at the site unless otherwise specifically stated herein, or as directed hereafter.

8. Workmanship

(A) All workmanship throughout this entire project shall be of the highest grade trade practice for the various types of trades and work required and must meet the strict approval of the Contracting Officer. The accuracy of dimensions shall be consistent with that found on any high-grade work of similar nature.

9. Guarantee

(A) The Contractor shall guarantee all work, articles, materials, equipment, and appliances furnished, installed, or supplied by him to be free from defects for a period of one year, or as otherwise herein stated, from date of final acceptance of the work, and shall replace any and all parts found to be defective in material or workmanship by the contracting officer within the period of the guarantee without cost to the Government.

10. Price Breakdown

The Contractor shall furnish a breakdown of his bid price, arranged in any manner he prefers, but sufficiently detailed and clear to indicate the prices of the various items involved in the contract.