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SPECIFICATION EG-1381-C

THERMAL INSULATION FOR HOT LINES AND VESSELS

1.0 SCOPE

This specification covers the requirements for the insulation for the facilities as described in the attached list sheets and drawings.

In cases of conflict between this specification and the list sheets, the list sheets shall govern. This specification shall control if there is variance between it and EF Forms 429 and 492 and Drawings GA-N-99783 and GA-N-99785.

2.0 HOT PIPING INSULATION

- 2.01 Piping shall be insulated as per COMPANY Form EF-492 and Drawing GA-N-99783. Thickness of insulation called for does not include weather coating.
- 2.02 Emulsion-type weather coating shall not be applied when atmospheric conditions are such that the finished surface may be wetted within 24 hours from the time of application.
- 2.03 Traced lines shall be insulated by one of the below outlined methods. 28-gage sheet metal tracer shields shall be installed by the CONTRACTOR as shown on Detail D, Drawing GA-N-99783 in all cases. Bidder shall indicate his proposed method of insulating in his bid.
 - 2.031 Oversized rigid pipe covering, calcium silicate of an approved make. Covering sections shall all be of the same ID with the legs trimmed to bring the maximum clearance between the tracer-pipe combination and insulation to within less than 1/4 in. Deviations from this technique must be approved in writing by COMPANY'S Representative. Materials and insulating techniques used shall be as shown on Drawing GA-N-99783.
 - 2.032 The use of performed "Defendex" or asbestos sponge felt or equal is acceptable.
- 2.04 Insulation shall be tied with galvanized wire as specified on Drawing GA-N-99783.
- 2.05 Weather coating shall be installed and secured with copper wire or stainless steel bands as specified in Weather Coating Schedule A on Drawing GA-N-99783.

3.0 VESSELS, COLUMNS, HEAT EXCHANGERS

- 3.01 Block insulation shall be applied in accordance with COMPANY Forms EF-429 and Drawing GA-N-99785 attached. Thickness of insulation called for does not include weatherproofing.

- 3.02 Vertical vessels 3-ft and larger in diameter and operating between 220F and 350F may be insulated with glass or mineral wool fiber blankets. Details shall be as set forth in paragraph 4.0 below.
- 3.03 Alternate weather coats applicable only upon specific approval in the contract and its attachments:
- 3.031 Corrugated aluminum weathercoating, 0.019-in. or 0.024-in. thick with vapor barrier, Childers or approved equal, may be used upon specific approval in the inquiry or purchase order. It shall be secured to the tank by aluminum or stainless steel bands on 2-ft maximum vertical centers. Horizontal joints shall be lapped 3 in. and fastened on 6-in. centers with gasketed self-tapping aluminum sheet metal screws. Vertical joints shall be either lapped two corrugations or butted and battened using a 16-gage or heavier batten 4-in. wide secured by studs or self-tapping screws.
- 3.032 Asbestos cement sheet, 1/16-in. precurved Johns-Manville or approved equal, applied as per Paragraph 4.0 below.
- 3.033 Asphalt emulsion coatings such as American Bitumuls Company's Layhold, Johns-Manville Company's Insulkote or approved equal. Applied as per Drawing GA-N-99785. These may not be used where insulation surface temperatures will exceed 175F and then only on block or rigid insulation. They shall not be applied when atmospheric conditions are such that the finished surface may be wetted within 24 hours from the time of application.
- 3.04 Nameplates and weep-hole nipples on reinforcing pads shall not be covered.
- 3.05 Insulation for exchanger channels shall not include insulation of channel covers. Flanges will not be insulated.
- 3.06 Each section of a double pipe exchanger shall be insulated as a single unit. Continuous insulation around a multi-sectional unit is permissible upon specific approval by COMPANY.

4.0 TANKS

- 4.01 Tank shells shall be insulated with Johns-Manville Spintex J.X., Fiberglas PF or equal mineral or glass wool blankets with a density of 3 lb per cu ft minimum. Blankets shall be placed with the long dimension vertical and with horizontal joints staggered, and shall be secured to the tank with sufficient stud welded, galvanized steel insulation pins and speed clips to hold it in place until weatherproofing is applied. Pins shall be short enough to fit under the weatherproofing without interference.

Weatherproofing on tank shells shall be 3/16-in. thick Johns-Manville Asbestocite asbestos cement sheets or approved equal. The 4' x 8' sheets shall be oriented with the long

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dimension horizontal, and shall be secured to the tank with Nelson studs. Studs shall be spaced on 2-ft vertical centers between the sheets of asbestos cement board - i.e., on 8-ft horizontal centers, and in addition there shall be one stud in the center of each asbestos cement board, these center studs to be on 8-ft horizontal centers and 45-in. vertical centers. Studs shall be secured with a stud welding gun and tested with a light hammer blow to be sure the weld is sound. Studs shall be Type 304 austenitic stainless steel or composite studs with carbon steel through the insulation and a Type 304 stainless steel tip projecting through the weather-coating sheets. Asbestos cement sheets shall be drilled to fit studs snugly and mastic compound shall be used to seal the outer washer and prevent ingress of water at stud holes.

Weatherproofing sheets shall be lapped 3-in. on the horizontal joints, with the upper sheet on the outside; and the upper sheet shall be supported from the lower by stainless steel "S" or "Z" clips or by providing a supporting ledge in the batten over the vertical joint. The sheets shall be butted together tightly and covered with 1/16-in. minimum thick by 4-in. wide austenitic stainless steel strip bolted to the Nelson studs on 2-ft vertical centers. The sheets shall be further secured by austenitic stainless steel bands, 3/4-in. wide by 0.020 in. thick placed above the studs at each 3-in. horizontal lap and the center of each sheet (i.e., on approximate 2-ft vertical centers). Bands for tanks 18-ft and larger in diameter shall be secured to heavy stainless steel spring clips to provide for expansion of the tank.

Shell insulation shall be suitably flashed with lead or aluminum flashing to prevent moisture entering the insulation at openings, structural connections, or at the eaves.

- 4.02 Roof insulation shall be Fiberglas roof deck, 12-lb per cu ft density, or approved equal, and shall be secured by impaling the blocks on prepositioned studs. Studs of the type required for tank shells above shall be spaced to provide four studs per block of insulation. Length of studs shall equal the thickness of the insulation. CONTRACTOR may finish the roof with 1/4-in. thick Asbestocite or approved equal asbestos cement sheets or may mop down a 1/2-in. thick layer of fiberboard with joints butted and finished with a built-up roof consisting of four layers of 15-lb asphalt saturated asbestos roofing felt guaranteed for 20-year life. Details of roof design proposed together with flashing detail around roof connections and at the eaves shall be furnished by CONTRACTOR for approval by COMPANY. Wind damage to the roof will be evidence of faulty workmanship or materials under the terms of the guarantee.
- 4.03 All external metal on the surface of the finished asbestos cement weatherproofing, except flashing, but including studs, battens, and bands, shall be austenitic stainless steel, except flashing may be aluminum (16-ga. min.) or lead.

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- 4.04 Aluminum weathercoating, 0.019-in. or 0.024-in. thick with vapor barrier may be used on specific approval in the inquiry or purchase order. CONTRACTOR is to furnish details of proposed method of installing and securing aluminum weathercoat for approval by COMPANY.
- 4.05 Insulation shall be fitted around nozzles, manways and other appurtenances so as to allow room for bolt removal around all flanges. These appurtenances shall not be insulated. Insulation around manways, nozzles and other appurtenances shall be completely sealed with weatherproof material to prevent leakage into the insulation. Insulation around structural members supporting stairs, etc. shall be suitably weatherproofed and flashed.
- 4.06 CONTRACTOR shall submit details of his proposed construction with his quotation showing size and spacing of bands, type of insulation and weatherproofing to be used, spacing of Nelson studs, details of expansion joints, details of weatherproofing around tank connections, details of roof flashing, and roof insulation and weatherproofing details.
- 4.07 Where weather coating is to be painted, asbestos cement sheets, if used, shall be steam cured to remove free alkali and shall be primed on back and edges with a vinyl sealer of Amercoat 33 prior to application over the insulation.

5.0 MISCELLANEOUS EQUIPMENT

Pumps, turbines, and other miscellaneous equipment shall be insulated with block insulation or a combination of block and plastic insulation. Block insulation material selection and application for miscellaneous equipment shall be in accordance with Drawing GA-N-99785. Block insulation shall be used on all large flat or curved surfaces and any other surface which does not necessitate complicated fitting of blocks. Care shall be taken to leave access to pump and turbine glands and other points requiring periodic maintenance.

- 5.01 Johns-Manville #450 or equal plastic insulation shall be used on any surface which is not suited to block insulation but its use shall be kept to a minimum. Insulation shall be applied on clean surface to recommended coat thicknesses. If a second layer is required, plastic insulation shall be allowed to set and 1" x 20-ga. galvanized hexagonal mesh applied over the entire plastic insulation surface with butted joints laced together with #18 gage galvanized iron wire and secured to the insulation with 1-1/2-in. copper vine staples, placed to hold mesh snugly against the insulation. The insulation, when dry, shall be covered with weathercoating similar to that used over vessels and exchangers having the same type of insulation.

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6.0 MATERIALS AND FACILITIES FURNISHED BY COMPANY

- 6.01 COMPANY will furnish near the job site all of the following materials required for the specified work:

Item N-109: Laykold Weather Coat

CONTRACTOR shall advise COMPANY of the quantities of these materials required. This advice shall be given sufficiently in advance to permit orderly procurement.

- 6.02 COMPANY will furnish at job site fresh water, air, and electricity as stated in the contract or purchase order.
- 6.03 COMPANY will furnish expansion joint ribs, stiffening rings, and skirt angle clips on vessels and columns.
- 6.04 COMPANY will install steam tracers but will not install sheet metal or aluminum foil shields around tracers.
- 6.05 COMPANY will provide CONTRACTOR with necessary working space at job site and a storage area within a reasonable distance from job site for materials, supplies, tools and equipment, but will not furnish means for protecting these from the elements. COMPANY will provide right of way making these areas accessible to CONTRACTOR and his equipment.
- 6.06 COMPANY will furnish staging for insulation of piping. CONTRACTOR may use such staging at CONTRACTOR'S risk. Should suitable staging not be available to CONTRACTOR when required, written agreement shall be reached in the field on the extra due CONTRACTOR for furnishing his own staging. Work shall not proceed until this extra work has been properly authorized.

7.0 MATERIALS AND WORK FURNISHED BY CONTRACTOR

- 7.01 CONTRACTOR shall provide all labor, tools, special equipment and materials for a complete insulation job in every detail, except those listed in Section 6.0 as being furnished by COMPANY.
- 7.02 All flashing, anchorages, clips, supports, angles or reinforcements required for complete application of insulation shall be furnished and installed by CONTRACTOR, except as noted in 6.0 above.
- 7.03 CONTRACTOR will furnish all staging required for tanks, and vessels. Staging must meet local requirements for safety. Staging for each piece of equipment shall be quoted separately and shall be deductible from the contract price when CONTRACTOR is able to use COMPANY'S staging.
- 7.04 CONTRACTOR shall remove all insulation, debris, tools, equipment and excess material immediately on completion of the job.

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8.0 EXECUTION OF THE JOB

- 8.01 Work shall be performed in accordance with COMPANY'S time schedule, as stated in the contract or purchase order. It must be understood by CONTRACTOR that this contract is a part of the construction of a complex process plant and work must be done as available and in the presence of other working crafts.
- 8.02 No substitution of materials specified herein will be permitted unless requested by CONTRACTOR in his quotation and specifically approved in writing by COMPANY. Substitutions proposed by CONTRACTOR must, in his view, provide overall quality for the job equal to or better than that provided by specified materials.

9.0 INSPECTION AND GUARANTEE

- 9.01 All work shall be subject to inspection by the COMPANY.
- 9.02 CONTRACTOR shall guarantee the work for a period of at least three (3) years after final date of completion and acceptance by COMPANY. CONTRACTOR shall repair at his own expense all defects due to faulty materials or workmanship as determined within time limits of the guarantee.

10.0 SAFETY AND REFINERY REGULATIONS

- 10.01 Prior to commencement of work, CONTRACTOR shall obtain information from PURCHASER'S Construction Superintendent regarding refinery regulations concerning use of vehicles, gate passes, smoking, identification of employees, safety measures, and similar practices to be followed within refinery limits. CONTRACTOR shall be responsible for compliance with these regulations.

11.0 SCHEDULE OF PAYMENTS

- 11.01 Payment for insulation of vessels, tanks, exchangers, and miscellaneous equipment will be based on the lump-sum bid for each item submitted by CONTRACTOR and accepted by COMPANY.
- 11.02 CONTRACTOR shall quote a unit price per foot for each item of piping listed on the attached sheets. Remuneration for insulation of valves and fittings will be based on the price of one linear foot of pipe insulation of the same size times the multiplication factors for the various fittings as agreed upon in the contract.
- 11.021 Compensation will be made on basis of actual length and size of pipe and number of fittings insulated by CONTRACTOR in accordance with CONTRACTOR'S proposal accepted by COMPANY. Lengths of all piping shall be based upon actual field measurements taken by representatives of COMPANY and CONTRACTOR together. COMPANY may waive the right to have a representative present, in which case COMPANY will accept CONTRACTOR'S measurement.

- 11.0211 Insulated straight piping shall be measured as such, from end to end of insulation.
- 11.0212 Where uninsulated fittings such as valves, flanges, etc., occur in the straight run of piping, they shall be excluded from measurement.
- 11.0213 Where a miter occurs in the piping, the straight run of piping shall be measured on the center of the miter along the axis of the pipe.
- 11.0214 Where a bend or welding elbow occurs in the piping, the run of piping shall be measured through the bend on the centerline of the pipe, including the actual length of the bend along the centerline as part of the run.
- 11.0215 Where an insulated stub-in, tee, or Y-connection occurs in the straight piping, the branch line shall be measured to the first point of contact of bare metal on the straight run of piping. The straight run of piping shall be measured through the tee or Y, including the length of the tee as part of the run. Stub-in tees or butt welding tees shall not be counted as a separate fitting when computing compensation due CONTRACTOR.
- 11.0216 Measurements of insulated lines containing insulated valves, flanges, reducers, strainers, unions, and caps shall be made through these fittings, including the length of the fitting as part of the run.
- 11.0217 The number of fittings including bends shall be determined by actual field count.
- 11.0218 No allowance will be made for interference at clamps, brackets, anchors, hangers, shoes, etc.
- 11.03 Miscellaneous repairing and patching of existing lines and equipment may be requested by COMPANY'S representatives. Prior to performances of such work, authorization must be made by COMPANY'S representative and a basis for payment made by mutual agreement.
- 11.04 In special cases where no factor for payment has been specified, or where the above rules do not apply, CONTRACTOR shall obtain COMPANY'S written approval as to payment before starting work or suffer the loss of any rights to claim payment.