

**PLAINTIFF'S
EXHIBIT**

MON-75

**SECTION GS - VIII
GENERAL SPECIFICATIONS
FOR
INSULATION**

**FOR
MONSANTO CHEMICAL COMPANY
PLASTICS DIVISION**

**DESIGN ENGINEERING DEPARTMENT
TEXAS CITY, TEXAS**

(Rev. 3 - September 15, 1955)

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GS-VIII

GENERAL SPECIFICATIONS FOR

INSULATION

Monsanto Chemical Company
Texas City, Texas

I. SCOPE

All insulation installations for the Texas City Plant of the Monsanto Chemical Company are to be made in accordance with this specification, except in those cases where the drawings specifically direct a deviation from these specifications or a separate specification is issued to cover specific pieces of equipment and/or sections of piping.

II. WORK BY CONTRACTOR

If the work is performed by a contractor, he shall furnish, deliver and apply all material and provide all labor, transportation, tools, apparatus, scaffolding and anything else required for the proper execution of the work of insulating, in accordance with this specification, equipment and/or piping at the Monsanto Chemical Company Plant at Texas City, Texas, as directed by the Superintendent of Construction or his representative. The necessary expansion joints and nozzle flashings shall be furnished and installed as a part of the contract. This specification shall be considered as an integral part of any contract for the installation of insulation.

III. BID REQUIREMENTS

Thicknesses of material given in this specification are those required for the material and service indicated. Contractors may quote on alternate materials such as 85% Magnesia, "Unibestos," or "Armabestos" except that 85% Magnesia shall not be used where the temperature is over 575°F or where it is in contact with stainless steel or aluminum. The quotation shall be on such a thickness of the alternate material that the maximum heat transfer through the proposed material will not exceed that through the specified thickness of the indicated material.

All bidders shall state and guarantee the maximum rate of heat transfer through the completely installed and finished insulation he proposes to furnish. For piping or cylindrical vessels up to 30" outside diameter, this guarantee shall be BTU per hour, per lineal foot of pipe at the temperature stated. For cylindrical vessels greater than 30" outside diameter, curved and flat surfaces, the heat transfer shall be stated in BTU per hour per square foot of the exposed metal surface to which the insulation is to be applied.

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The bidder shall give the thickness, "K" Valve, and maximum and minimum recommended temperatures of the alternate material and a description of it. Samples of the proposed material shall be submitted when requested.

The contractor shall also state in his proposal any changes in supporting angles or clips, tie wire, tension or anchor rings, method of installation, etc., shown on the drawings, existing on the equipment or given in these specifications, that he considers necessary or desirable to give more satisfactory service from the insulation or lower installed cost, and give his reasons therefor. Unless such changes are stated, the bidders proposal shall constitute his approval that these items are satisfactory for the particular service intended and his responsibility shall be determined accordingly.

IV. REQUIREMENTS AND LIMITATIONS

Vessels, equipment and piping designated shall be insulated with the materials and to the thicknesses designated in the tables for the service designated. These services are:

- a. Conservation of heat
- b. Stabilization of operation
- c. Operator protection

Jacketed, traced or wrapped vessels, equipment or piping shall be insulated over such jacketing, tracing or wrapping with the materials and to the thicknesses designated in the tables. The type and thickness of the insulation shall be governed by the higher temperature material, whether it is in the jacket, tracing or wrap, or in the vessel.

Where hot vessels, equipment or piping are designated to have "Operator Protection" insulation for the prevention of burns, the insulation shall be installed on only that portion of the vessels, equipment or piping with which the operator might come in contact in the usual performance of his duties. This would normally include only those portions of such installations that are lower than 8' above either the finished grade or a working floor or platform and are within three foot horizontally of a working platform. Such burn protection insulation shall be carried past these limits when it is desirable to close small gaps of two or three feet in the insulation on a pipe run; where it is necessary to obtain satisfactory operator protection or where it is desirable for installation reasons, such as to obtain first class weather proof sealing of the insulation. Where cold or chilled water lines or chilled air ductwork are designated to have "drip-proof" insulation to prevent condensation on their outside surfaces, this insulation shall consist of a 1" thickness of cork with the materials and application in accordance with this specification or a sprayed or trowled coating of Lion Oil Company "K.Kote" of sufficient thickness to stop

condensation at 95°F dry bulb with 80% relative humidity. The thickness of "K Kote" shall not exceed 1/2" and if greater thickness than this is required, the 1" of cork shall be used. The "K Kote" shall be applied in layers not exceeding 1/4" thick with a drying period of at least 48 hours between coats. This "drip-proofing" is for use only on normal drinking water or cooling water lines or on chilled air ducts where the formation of condensate on the outside would be objectional, and is not to be used on lines conveying brine or other chilled or refrigerated liquids or materials, which lines are to be insulated in accordance with these specifications for the temperature specified.

V. SPECIAL REQUIREMENTS

Insulation shall not be applied to vessels, equipment, or piping until all hydrostatic tests required have been successfully completed.

Code inspection plates or stampings, name plates, etc., on vessels, equipment, or piping shall be left permanently visible by cutting back the insulation where necessary to accomplish this. On low temperature service this opening shall be closed by a removable plug of the same material as the insulation used. On high temperature installations this opening shall be closed by a removable plastic insulation plug when so designated. These openings shall be permanently weatherproofed.

All insulation materials shall be non-corrosive, whether wet or dry. Plastic insulation shall, of itself, be non-corrosive whether wet or dry and shall contain a rust inhibitor which will, when the plastic insulation is made into plastic cement by the addition of Portland cement or other binders, prevent corrosion when moist or wet.

Flanges of valves, fittings, and pipe line flanges shall be insulated. The entire surface of screwed and flanged fittings and the entire surface of screwed and flanged valves up to the bonnet are to be insulated.

Equipment nozzles and flanges and vessel manholes shall not be insulated unless specifically called for. Exchanger covers, manhole covers, etc., which have bolt circles larger than 16" diameter shall have the center portion insulated. This insulation shall be held in place by #16 gauge galvanized wires fastened to nuts welded edgewise to the surface involved or by an equivalent method. This insulation shall have the same weatherproofing as that on the vessel.

Pumps and/or turbines when designated shall be covered with insulation securely wired in place and pointed up with suitable asbestos cement. The insulation shall be covered with two coats of plastic asbestos cement troweled smooth and with sufficient Portland cement added to form a hard surface. A coat of "Seal Perm" 1/8" thick when dry shall then be applied to give a weather-proof finish.

Heat exchangers when designated shall be completely insulated except flange joints. The insulation of covers, channels, bonnets and shells shall be integral with their respective parts and shall extend to the point of clearance of flange bolts or studs.

All attachments such as angle iron, studs, blank nuts, etc., made to the piece being insulated shall be of the same material as the piece being insulated unless a different material is specifically approved by the engineering department.

VI. CLASSIFICATION OF INSULATION

For purposes of reference, the insulation has been divided into seven groups as follows:

Group A - Towers, tanks	32°F to 250°F
Group B - Towers, tanks, exchangers	100°F to 1200°F
Group C - Towers, tanks, exchangers	Above 1200°F
Group D - Towers, tanks, exchangers	60°F and lower
Group E - Piping	100°F to 1200°F
Group F - Piping	Above 1200°F
Group G - Piping	60°F and lower

VII. MATERIALS

The following materials are to be used for the insulating work covered by this specification. The use of alternate materials will be permitted only with the specific approval of the Construction Superintendent or his representative of bids submitted on alternate materials in line with the section of this specification entitled "Bid Requirements."

Group A Materials

All block insulation shall be foamed glass sawed block with edges beveled for a neat fit to the contour of the vessel. Bands shall be Monel Metal with a thickness of not less than 0.020". Stainless steel or aluminum bands may be used in certain locations when approved by Monsanto's representative.

Weatherproofing shall be Lion Oil Company "Seal Kote" vaporseal, medium grade for spraying; heavy grade for trowling. Sealing and pointing material shall be Lion Oil Company "Low Temp."

Group B Materials

All block insulation shall be calcium silicate block such as "Kaylo" as manufactured by the American Structural Products Co. or Thermobestc

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as manufactured by the Johns Manville Company. Bands shall be monel metal with a thickness of not less than 0.020". Stainless steel or aluminum bands may be used in certain locations when approved by Monsanto's representative.

Tie wires shall be double dipped galvanized. Black annealed will not be acceptable. Reinforcing membrane shall be either 1" hexagonal poultry netting, galvanized before weaving and not lighter than 19 gauge or glass cloth such as "Glasfab."

Weatherproofing shall be Lion Oil Company "Seal Perm."

Group C Materials

All materials for Group C are the same as those specified for Group B except that the high temperature inside insulation blocks required for Group C shall be a blend of calcined diatomaceous silica and asbestos fiber with high temperature bonding agents, suitable for use at temperatures up to 1900°F. Suitable high temperature insulation blocks are Johns-Manville's "Superfex," Philip Carey's "Hi-Temp," Ehret's "Enduro" or Ruberoid's "Hi-Temp."

Group D Materials

All block insulation shall be 100% pure vegetable corkboard, steam baked, using as a binder nothing except its own natural resin. It shall have a thermal conductivity (at 60°F) guaranteed not to exceed 0.29 BTU per hour per square foot per degree fahrenheit temperature difference. It shall have a weight not in excess of 71 lbs. per cubic foot. All edges shall be machine cut and squared. Suitable corkboard is manufactured by Mundet Cork Corporation or Armstrong Cork Company.

Bands shall be monel or stainless steel not less than 0.020" thick.

Tie wire shall be copper clad.

Reinforcing membrane shall be asphalt impregnated glass cloth such as "Glasfab." Weathercoating and sealing material shall be Lion Oil Company "Seal Kote."

Group E Materials

All pipe insulation shall be calcium silicate pipe insulation such as "Kaylo" as manufactured by the American Structural Products Co. or "Thermobestos" as manufactured by the Johns-Manville Company in moulded pipe sections and segments. This material shall be suitable for use at temperatures up to 1200°F without cracking, crumbling or otherwise failing mechanically.

Weatherproof jacket shall be an asphalt impregnated rag or asbestos felt weighing approximately 45 lbs. per 100 square feet carrying the Underwriters' Class C label. A suitable material meeting this requirement is Johns-Manville's Medium Pilot Roofing.

Metal jackets for pipes, where specified as an alternate, shall be corrugated aluminum not less than .016" thick.

Wire shall be galvanized iron, the gauge of which will be as set forth in the "Wire Schedule" Table III.

Bands shall be Monel not less than .020" thick. Stainless steel or aluminum bands may be used in certain locations when approved by Monsanto's representative.

Group F Materials

All materials for Group F are the same as those specified for Group E except that the high temperature inside insulation required for Group E shall be a blend of calcined diatomaceous silica and asbestos fiber with high temperature binding agent, suitable for use at temperatures up to 1900°F. Suitable high temperature pipe insulation is Johns-Manville's "Superex," Philip Carey's "Hi-Temp," Ehret's "Enduro" or Ruberoid's "Hi-Temp."

Group G Materials

Pipe covering shall be 100% pure vegetable cork meeting the same requirements as Group C insulation. Pipe covering shall have a factory ironed mastic coating.

Tie wire shall be copper clad. Weather coating shall be as specified for Group E materials. Asphaltic nozzle sealing materials shall be as specified for Group D materials. Seam filler shall be manufactured by Armstrong Cork Company, Mundet Cork Corporation or Cork Import Corporation.

Lap adhesive shall be Lion Oil Company "Brush Cement."

VIII. APPLICATION

The materials listed in Section 7 of this specification are to be applied in accordance with the following requirements except as modified or further defined by Section 6 "Special Requirements" presented above.

Group A Application

Before proceeding with the application of insulation to the surface of towers and tanks in this group, the entire surface of the vessel shall have been thoroughly cleaned and painted with a suitable Gilsonite base paint, such painting being done under separate contract not covered by this specification.

Foam glass block shall then be buttered with "Low Temp" applied in accordance with the manufacturer's recommendation on all edges and applied with full broken joint or staggered joint construction. The foam glass blocks shall be secured in place by machine stretched and fastened bands on not more than 9" centers. If 3/4" bands are

used, 9" centers will be permissible. If 1/2" bands are used, the centers will be 6". Each block shall be secured by at least two bands.

A tack coat of "Seal Kote" shall then be applied over the outer surface. While this coat of "Seal Kote" is still wet, a layer of glass fabric shall be embedded into it with all joints lapped at least 2" and sealed with "Seal Kote". A second sprayed or troweled coat of "Seal Kote" at least 1/8" thick when dry shall be applied over the glass fabric. This finish shall be used either inside or outside.

For details of expansion joints and nozzle flashing on Group A vessels, see the attached drawings. Insulation thickness shall be as specified in Table II. When the insulation is 3" or more thick, it shall be installed in two or more layers with no layer being over 2" thick. When the insulation is in two or more layers, the inside layers may be secured with 1/2" monel or stainless steel bands .020" thick spaced on not over 12" centers with each block secured by at least one band and the outside layer banded as given in the first part of this section. The layers shall be applied with full staggered joints both longitudinally and circumferentially. All faces of blocks in any layer which are in contact with blocks in another layer shall be buttered with "Low Temp."

Group B Application

Before proceeding with the application of insulation to the surface of towers, tanks, and exchangers in this group, the entire surface of the vessel shall have been thoroughly cleaned. These vessels may or may not be painted before the insulation is applied. This is to be checked by the contractor with the Monsanto representative in each case. If painting is required, this shall be done under separate contract before any insulation is applied. If painting is not required, the insulation contractor shall thoroughly clean the surface before any insulation is applied.

Calcium silicate blocks shall then be applied with full broken joint or staggered joint construction. The blocks shall be secured in place by machine stretched and fastened bands on not more than 9" centers. If 3/4" bands are used, 9" centers will be permissible. If 1/2" bands are used, the centers shall be 6".

If the equipment is outside it shall be finished as follows: A very thin skim coat of approximately 1/32" thickness, of asbestos and Portland cement mixed in the ratio of three parts to one part by weight shall then be applied and allowed to thoroughly air slack. The purpose of this coat of asbestos and Portland cement is to fill cracks between the blocks and to provide a bond between the blocks and the weather coat. When the cement coat is perfectly dry, there shall then be applied a thin coat of "Seal Perm" 1/16" thick when dry, and then 1" mesh hexagonal poultry netting shall be stretched tightly around the entire outer surface of the insulation and secured either by lacing with 18 gauge galvanized iron wire, or by needle twisting the two selvage edges together to form the seam. Directly over the poultry netting shall be applied a

heavy sprayed or troweled coat of "Seal Perm" not less than 1/8" thick when dry. "Glasfab" may be substituted for the poultry netting.

If inside it shall be finished as follows:

Poultry netting shall be neatly fitted and tightly secured to the insulation. A layer of asbestos cement approximately 1/4" thick shall then be troweled over the netting. The surface of this layer shall be roughened to provide a good bond to the second layer. A second layer of a mixture of three parts asbestos cement to one part portland cement by weight approximately 1/4" thick shall then be applied. The surface of this second layer shall be troweled to a smooth neat finish.

For details of expansion joints and nozzle flashing on Group B vessels see the attached drawings. For thickness of insulation use Table II.

Group C Application

The same method of application is to be used for Group C vessels as has already been specified for Group B vessels, except these vessels may or may not be painted before the insulation is applied. This is to be checked by the contractor with the Monsanto Construction Superintendent in each case. If painting is required, this shall be done under separate contract before any insulation is applied. If painting is not required, the insulation contractor shall thoroughly clean the surface to be insulated before any insulation is applied. Because of the higher temperature range of Group C vessels, a layer of high temperature insulation blocks must be applied first. From that point the calcium silicate blocks shall be applied directly over the high temperature insulating blocks. The thickness of insulation shall be as shown on Table II and details of expansion joints and nozzle flashing shall conform to the attached drawings.

Group D Application

Before proceeding with the application of insulation the entire surface of the vessel shall have been thoroughly cleaned and painted with a suitable Gilsonite base paint, this painting being done under separate contract not covered by this specification.

The vessel shall then be insulated with scored corkboard or with cork lags in accordance with the vessel diameter and insulation thickness table as given in Table I and Table II. The cork boards shall be applied directly to the surface of the vessel under a spring to a diameter substantially greater than that of the vessel. These cork boards shall be perfectly dry and free from asphalt or other types of coatings. When the course is complete, cork boards shall then be compressed down to the surface of the vessel by use of cable or rope and load binders, and securely banded in place with 3/4" wide metal bands machine stretched and fastened on 6" centers. Each succeeding layer of cork board shall be applied in exactly the same fashion circumferentially. After the last layer

of cork board has been applied, a tack coat not more than 1/16" thick when dry of "Seal Kote" shall be applied directly over the outer cork surface.

While this coat of "Seal Kote" is still wet, a layer of asphalt saturated glass fabric shall be embedded into it, with all joints lapped at least 2" and sealed with "Seal Kote". A second sprayed or troweled coat of "Seal Kote" at least 1/8" thick when dry shall be applied over the glass fabric. This finish shall be used either inside or outside.

Vessels That Require Lags Shall be Insulated as Follows:

Lags beveled to the proper angles to exactly fit the bare iron surface of the vessel shall be applied dry and securely banded on 9" centers and with 3/4" wide machine stretched and fastened bands. Lags shall be slightly oversize so that when tightened by bands, vertical joints will be air tight. Each succeeding layer of lags shall be applied over the preceding layer in exactly the same manner until the proper thickness of insulation has been obtained, after which the weather proof finish shall be applied in exactly the same manner as prescribed for vessels insulated with cork board.

Vessels with Convex Heads Shall be Insulated as Follows:

The vessel heads shall be insulated with cork board scored two ways and cut to proper angles in order to make perfect fitting board covers. The cork boards applied to side areas of such vessels shall be allowed to extend beyond the tangent point at which the head and vessel shell are jointed a sufficient distance to contain the thickness of the vessel head insulation. This specification shall be followed on vessels with welded heads only.

Vessels with Flanged Heads Shall be Insulated as Follows:

The cork board applied to vessel sides shall be abutted firmly against the head flange. When the proper thickness has been reached for vessel side insulation, cork boards shall then be applied over the flange proper and around the outer surface of the side shell insulation from the back side of the flange to a point 6" toward the center of the vessel, and extending from this point toward the end of the vessel to a perpendicular line striking a tangent on the outer extremity of the convex head plus as many inches as the thickness of the insulation to be applied. Not less than two bands shall be securely fastened around the outer surface of this flange cover at its inner extremity or at the end near the center of the vessel. A cork disc of specified thickness shall then be inserted in the circle formed by the outer extremity of these lags forming the cork cover. This disc shall be secured in place by driving wood skewers through the cork lags, and into the edge of the disc. It shall further be secured in place by application of waterproof cement or other suitable and similar material between its edge and the cork lags or boards. The entire surface of such vessels shall then be finished in the same manner as prescribed above.

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In every case on Group D equipment, at the junction of a nozzle at the vessel surface, the insulation shall be applied in accordance with the attached drawing. No metal flashing will be used on this type of vessel, but a seal between insulation surfaces or insulation and metal surfaces will be provided by the use of bitumastic or similar material as indicated on the attached drawing.

Group E Application

The pipe to be insulated may or may not require painting before the insulation is applied. This is to be checked by the contractor with the Monsanto Construction Superintendent in each case. If painting is required, this shall be done under separate contract before any insulation is applied. If painting is not required the insulation contractor shall thoroughly clean the surface to be insulated before any insulation is applied.

Pipe Requiring Single Layer Insulation:

The calcium silicate pipe covering shall be applied to the pipe from 1/2" to and including 10" diameter in two full half round sections. Larger pipes may be insulated with either half round or with segmental pipe covering. These sections shall be wired in place by means of galvanized wire tightly twisted about the outer surface of the insulation proper, the gauge of the wire to be as indicated on "Wire Schedule", Table II. All longitudinal and circumferential seams shall be neatly and thoroughly pointed with asbestos cement.

The weather coat for outside pipes shall be 45 lb. roofing felt applied directly around the outer insulation surface in the following manner:

The roofing felt shall be lapped 3" circumferentially and 2" longitudinally.

On horizontal lines, the 3" lap shall be placed in such a manner that the outer lapping edge of the roofing paper shall fall at a point approximately 15 degrees below the horizontal center line of the pipe to insure against water getting under the roofing paper.

On lines 4" in diameter and smaller, having insulation thickness 2" and less, the roofing felt shall be securely wired in place by means of copper clad wire located on 6" centers and twisted until tight.

On lines larger than 4" in diameter or 4" diameter lines having insulation thickness in excess of 2" the roofing felt shall be securely banded in place by means of 1/2" x .020 machine stretched and sealed monel bands on 9" centers. In places where they are permissible, the aluminum bands shall be installed in the same manner as given for monel bands.

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In place of 45 lb. roofing felt used as a weather coating, a permissible and acceptable alternate shall be corrugated Aluminum sheeting. The aluminum sheets after they have been wrapped around the pipe insulation shall be fastened together with aluminum sheet metal screws. The sheets shall overlap 2" on the longitudinal seams and 2" on the circumferential seams.

Inside pipes shall have all irregularities in the insulation smoothed out with finishing cement. Six ounce canvas shall then be glued over the entire surface or sewn in place with at least 3 stitches per inch. If glued the laps shall be at least 3" and face down.

Inside valves and fitting insulation shall have irregularities smoothed out with finishing cement and then have 6 ounce canvas glued to the surface.

When the pipes are inside a cell, they shall be finished with a laminated asbestos jacket such as Philip Cary 38# Fire Guard Jacket instead of the canvas specified above. This jacket shall be lapped at least 2" circumferentially and 2" longitudinally and banded with 1/2" bands on 9" centers.

Pipes Requiring Double Layer Insulation:

The first layer of pipe covering shall be applied on lines 10" and smaller in two full half round sections. These sections shall be secured about the surface of the pipe by means of galvanized wire on 9" centers. All longitudinal and circumferential seams shall be neatly pointed with asbestos cement and then in turn a second layer of pipe covering shall be applied with longitudinal seams staggered to the greatest possible extent and the circumferential seams staggered not less than 6". This outer layer of pipe covering shall be secured in place by means of galvanized wire on 9" centers and pointed and weather proofed in exactly the same manner as specified for single layer insulation.

Pipes Requiring Segmental Pipe Covering:

The pipe should be insulated with calcium silicate blocks curved and beveled to fit the exact circumference of the pipe or inner layer of insulation. These segments shall be wired on 9" centers. All longitudinal and circumferential joints are to be staggered and all seams are to be pointed with asbestos cement. The weatherproof finish to be applied shall then be the same as specified for single layer insulation.

Valves and Fittings:

Welded and screwed valves and fittings 4" and smaller may be insulated with mineral wool cement. The cement shall be allowed to dry thoroughly, then a skim palm coat of finishing cement, meeting the same specifications as that applied over block insulation shall be applied over the outer surface of the mineral wool cement. When this has dried thoroughly, "Seal Perm" shall be palmed or throweled

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on the fitting to a thickness of not less than $1/8$ " when dry. Special care shall be taken that the "Seal Perm" is spread at least 6" back of the terminal point of the adjacent pipe covering roofing paper jacket so that no edges of the roofing paper are visible at the point of junction between fitting insulation and piping insulation finish.

Welded fittings larger than 4" shall be insulated with calcium silicate pipe coverings or blocks cut and pre-formed to fit the fittings. Joints on these segments shall be tightly sealed with sodium silicate and asbestos fibre or other suitable material so that the fitting when finished will consist of two half fitting covers. These two halves shall then be applied to the fitting and wired in place with galvanized wire crossed from bottom to top of fitting and twisted tightly. A thin skim coat of asbestos cement shall then be applied and when thoroughly dry, over this coat, "Seal Perm" shall be applied to a thickness of $1/8$ " when dry. The "Seal Perm" shall be spread at least 6" back of the terminal point of the roofing paper as described above. This method of insulating may be used on fittings smaller than 4" if desired.

Flanged valves and fittings and flanges smaller than 8" are to be insulated with either block or pipe covering of same thickness as specified for the adjacent piping, secured and wired in place with galvanized wire and finished in the same manner as for welded fittings.

Flanged valves, fittings and flanges 8" and over are to have an extra layer of "Seal Perm" $1/8$ " thick when dry, with a layer of 1" mesh galvanized poultry netting or glass fabric applied between the two layers of "Seal Perm", as specified on Type A vessels.

Group F Application

Methods of application for Group F will be the same as for Group E except that an inner layer of high temperature insulation will be used. The thickness of pipe covering is designated on Table II.

Group G Application

Before proceeding with the application of insulation, the entire surface of the pipe shall have been thoroughly cleaned and painted with a suitable Gilsonite base paint, this painting being done under separate contract not covered by this specification.

Pipes Requiring Single Layer Insulation:

Cork pipe covering shall be applied with longitudinal and circumferential seams tightly sealed with seam filler. Cork pipe covering shall be held in place by means of copper clad wire on $4\frac{1}{2}$ " centers twisted tightly about the outer surface thereof. Then in turn, 45 lb. roofing felt shall be applied, and fastened in exactly the same manner as prescribed under Group E pipe covering, except it shall be lapped 180 degrees circumferentially and the lap shall be sealed with "Brush Cement." This finish shall be used either inside or outside.

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Pipes Requiring Multiple Thickness Insulation:

The first layer of pipe covering shall be applied in the same manner as prescribed above. All seams shall be tightly sealed with seam filler and the covering shall be secured in place by means of copper clad wire on $4\frac{1}{2}$ " centers, then in turn a second layer of pipe covering shall be applied with all longitudinal and circumferential seams staggered with respect to those of the first layer to the greatest possible extent and securely sealed with seam filler. This layer shall be wired in place in the same manner specified for single layer application and shall be finished with roofing felt, sealed and secured as specified under single layer insulation.

Vapor Seals:

On long runs of piping insulation and at the point of junction of all piping insulation with fitting insulation, the following type vapor seals shall be made:

Abutting ends of fittings and/or cork covering shall be thoroughly coated with "Brush Cement" extending over the outer surface of the pipe covering, across the pipe covering and along the bar iron surface of the pipe for a distance of not less than 6". Such seals shall be made on long runs at intervals of not more than 40' to insure against loss of a greater portion of the line insulation in the event a vapor seal is lost at any point along the line while in operation.

Pipe Hangers;

All pipe hangers shall fit over metal shields placed on the outside of the cork insulation. If it is determined that the weight of the pipe and the spacing of the pipe hangers or saddles is such that the weight imposed upon the cork pipe covering is excessive, a small wooden half moon, 2" wide shall be placed around the bottom one half of the bare iron pipe and extending from the outer surfaces of the bare iron pipe to the inner surface of the saddle. Cork pipe covering ends shall then be sealed against this wooden block in the same manner as prescribed for seals and junctions of cork pipe covering on fitting insulation.

Metal Jackets:

Cork covering in locations likely to be walked on shall be finished exactly as specified elsewhere herein and shall then receive corrugated aluminum jackets formed to fit around the surface of the cork insulation finish, which jacket shall be secured in place by aluminum bands. - These jackets shall be not less than .019" thick. After receiving a finish such as specified elsewhere herein that portion of vessels immediately adjacent to platforms or places where operators will normally be at frequent intervals, shall receive a corrugated aluminum jacket not less than .019" thick over the already applied vapor tight finish to whatever extent necessary to protect the vapor tight finish from being gouged or broken accidentally by these workmen.

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IX. WORKMANSHIP

The intent of this specification is to secure a first class job in all respects. The workmanship shall be of the highest quality throughout, and the contractor shall furnish a competent superintendent experienced in this class of work.

The pipe covering shall be applied as soon as the work on the piping and equipment will permit, and work shall be started immediately upon notification by the Superintendent of Construction to do so.

After the work covered by this specification has been completed, all rubbish and debris resulting from such work shall be removed, and the premises left in a condition satisfactory to the Monsanto Chemical Company.

During the progress of the work, the premises shall be maintained in a neat condition satisfactory to the Monsanto Chemical Company.

X. INSPECTION

The Superintendent of Construction or his authorized representative shall have the right to inspect all work and material at the factory or the site and any work or material found to be defective or which does not meet the requirements of the inspection shall be replaced by the Contractor at his own expense. Such inspection, however, shall not relieve the Contractor from full responsibility for the quality or correctness of his materials or work.

XI. PROTECTION AND COORDINATION

The Contractor shall at all times assume full responsibility for the complete protection of his work and those of adjacent trades at all times. He shall extend full cooperation to and coordinate his work with other crafts concerned at all times so the complete project will proceed in an expeditious manner.

XII. GUARANTEE

Before final acceptance by Monsanto Chemical Company the Contractor shall guarantee, in writing, for a period of one year all of the materials and workmanship furnished by him. The period of one year is to start from the date of final acceptance by the owner and the Contractor shall, at his own expense, repair or replace any material or work found defective during the guarantee period.

XIII. ATTACHMENTS

The following tables and drawings are attached hereto and form a part of this specification. They apply to the work with the same force as though they were a part of the written matter of this specification:

- Table I - Types of Vegetable Cork
Insulation of Different Thicknesses for
various sizes of Vessels.
- Table II - Thicknesses and types of insulation.
- Table III - Wire Schedule
- Table IV - Nominal Cork Thickness
- Dwg. No. A - SD-624 - Typical Vessel or Tank Nozzle
Flashing and Insulation
- Dwg. No. A - SD-625 - Typical Pipe Flange Flashing
and Insulation
- Dwg. No. A - SD-626 - Column Insulation Details
- Dwg. No. A - SD-627 - Typical Manhole and Nameplate
Insulation Details for Tanks
- Dwg. No. A - SD-632 - Typical Tank Insulation Expansion
Joint
- Dwg. No. A - SD-633 - Application of Insulation to
Metal Projection Attached to Low Temperature
Surface
- Dwg. No. A - SD-634 - Typical Reinforcement of Weather
Vapor Barrier at Corners
- Dwg. No. A - SD-635 - Rigid Insulation of High Tempera-
ture Vessel Nozzle
- Dwg. No. A - SD-636 - Insulation Details for High
Temperature Vessels

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TABLE I

TYPES OF VEGETABLE CORK INSULATION OF
DIFFERENT THICKNESSES FOR VARIOUS SIZES
OF VESSELS

BEVELED CORK LAGS

Thickness of Insulation

	1½"	2"	3"	4"	6"	8"	10"	12"
20" to 60" dia. Beveled Cork Lags	1 lyr.	1 lyr.	1 lyr.	1 lyr.	1 lyr.	2 lyr.	2 lyr.	2 lyr.
60" to 8'-0" dia. Beveled Cork Lags			1 lyr.	1 lyr.	1 lyr.	2 lyr.	2 lyr.	2 lyr.
60" to 8'-0" dia. Scored Cork- board	1 lyr.	1 lyr.	2 lyr.	2 lyr.				
8'0" to 10'0" dia. Scored Corkboard	1 lyr.	1 lyr.	1 lyr.	2 lyr.	2 lyr.	3 lyr.	4 lyr.	4 lyr.
Above 10'0" dia. Flat Corkboard	1 lyr.	1 lyr.	1 lyr.	2 lyr.	2 lyr.	3 lyr.	4 lyr.	4 lyr.

EXPLANATION OF SYMBOLS

C - Cork Insulation
HDC - Heavy Duty Cork Insulation
SC - Standard Cork Insulation
LDC - Light Duty Cork Insulation
FG - Foam Glass Insulation
CS - Calcium Silicate Insulation
HT - High Temperature Insulation

TABLE II
THICKNESS & TYPE OF INSULATION

Temperature Range Degree F	Towers, Tanks, Exchangers Pipes over 30" Diameter and other Flat Surfaces		Under 2"		Pipe 2" to 4"		Over 4" to 10"		Over 10" to 30"	
	COH	SO or OP	COH	SO or OP	COH	SO or OP	COH	SO or OP	COH	SO or OP
-40 to -30	8" C		4" C		5" C		6" C		7" C	
-30 to -20	7" C		HDC		4" C		5" C		6" C	
-20 to -10	6" C		HDC		HDC		HDC		5" C	
-10 to 0	5" C		HDC		HDC		HDC		HDC	
0 to 10	4" C		HDC		HDC		HDC		HDC	
10 to 20	4" C		SDC		HDC		HDC		HDC	
20 to 30	3" C		SDC		SDC		SDC		SDC	
30 to 40	3" C		SDC		SDC		SDC		SDC	
40 to 50	2" C		SDC		SDC		SDC		SDC	
50 to 60	1 1/2" C		LDC		LDC		LDC		LDC	
60 to 100	As noted		As noted		As noted		As noted		As noted	
100 to 250	1" CS or 1 1/2" FG	1" CS or 1 1/2" FG	1" CS	1" CS	1" CS	1" CS	1 1/2" CS	1 1/2" CS	1 1/2" CS	1 1/2" CS
250 to 300	1 1/2" CS	1 1/2" CS	1" CS	1" CS	1" CS	1" CS	1 1/2" CS	1 1/2" CS	1 1/2" CS	1 1/2" CS
300 to 350	1 1/2" CS	1" CS	1" CS	1" CS	1" CS	1" CS	1 1/2" CS	1 1/2" CS	1 1/2" CS	1 1/2" CS
350 to 400	2" CS	1 1/2" CS	1 1/2" CS	1" CS	1 1/2" CS	1" CS	1 1/2" CS	1 1/2" CS	2" CS	1 1/2" CS
400 to 450	2 1/2" CS	1 1/2" CS	1 1/2" CS	1" CS	1 1/2" CS	1" CS	2" CS	1 1/2" CS	2 1/2" CS	1 1/2" CS
450 to 500	2 1/2" CS	2" CS	1 1/2" CS	1 1/2" CS	2" CS	1 1/2" CS	2" CS	1 1/2" CS	2 1/2" CS	2" CS
500 to 550	3" CS	2 1/2" CS	2" CS	1 1/2" CS	2 1/2" CS	1 1/2" CS	2 1/2" CS	1 1/2" CS	3" CS	2 1/2" CS
550 to 600	3 1/2" CS	3" CS	2 1/2" CS	2" CS	3" CS	2" CS	3 1/2" CS	2" CS	3 1/2" CS	2 1/2" CS
600 to 700	4" CS	3 1/2" CS	3" CS	2" CS	3 1/2" CS	2" CS	4" CS	2 1/2" CS	4" CS	3" CS
700 to 800	4 1/2" CS	4" CS	3 1/2" CS	2 1/2" CS	4" CS	2 1/2" CS	4 1/2" CS	3" CS	4 1/2" CS	3 1/2" CS
800 to 900	5" CS	4 1/2" CS	4" CS	2" CS	4 1/2" CS	2 1/2" CS	5" CS	3 1/2" CS	5" CS	3 1/2" CS
900 to 1000	6" CS	5" CS	4 1/2" CS	2 1/2" CS	5" CS	2 1/2" CS	6" CS	4" CS	6" CS	4 1/2" CS
1000 to 1100	6" CS	5" CS	4 1/2" CS	2 1/2" CS	5" CS	2 1/2" CS	6" CS	4" CS	6" CS	4 1/2" CS
1100 to 1200	2" HT &	2" HT &	2" HT &	2" HT &	2" HT &	2" HT &	2" HT &	2" HT &	2" HT &	2" HT &
1200 to 1400	5" CS	4" CS	3" CS	2" CS	3" CS	2" CS	4" CS	3" CS	5" CS	4" CS
1400 to 1500	6" CS	5" CS	4" CS	2" CS	4" CS	2" CS	5" CS	4" CS	6" CS	5" CS

TABLE III

WIRE SCHEDULE

Pipe Size	Standard Thick Hot Pipe Covering
1/2" to 6"	16 ga. galv. on 9" centers (Average)
8" to 16"	12 ga. galv. on 9" centers (Average)
Over 16"	12 ga. galv. on 9" centers (Average)
	<u>1 1/2" Thick Hot Pipe Covering</u>
1/2" to 5"	16 ga. galv. on 9" centers (Average)
6" to 16"	14 ga. galv. on 9" centers (Average)
Over 16"	12 ga. galv. on 9" centers (Average)
	<u>2" Thick Hot Pipe Covering</u>
1/2" to 4"	16 ga. galv. on 9" centers (Average)
5" to 15"	14 ga. galv. on 9" centers (Average)
Over 15"	12 ga. galv. on 9" centers (Average)
	<u>Double Standard Hot Pipe Covering</u>
1/2" to 4"	16 ga. galv. on 9" centers (Average)
5"	16 ga. on inner layer 14 ga. on outer layer on 9" centers
6" to 12"	14 ga. galv. on 9" centers (Average)
14"	14 ga. on inner layer 12 ga. on outer layer on 9" centers
Over 14"	12 ga. galv. on 9" centers (Average)

For Combination Hot Pipe Coverings use the Following Formulas

2 1/2" to 9" o.d. covering	16 ga. galv. on 9" centers (Average)
10" to 19" o.d. covering	14 ga. galv. on 9" centers (Average)
Over 19" o.d. covering	12 ga. galv. on 9" centers (Average)

	<u>Roofing Jackets</u>
2 1/2" to 12" o.d. covering	16 ga. galv. on 6" centers (Average)
Over 12" o.d. covering	14 ga. galv. on 6" centers (Average)

	<u>Light Duty Thickness Vegetable Cork Pipe Covering</u>
1/4" to 3"	14 ga. copper clad steel on 4 1/2" centers
3 1/2" to 10"	12 ga. copper clad steel on 4 1/2" centers
12" to 20"	10 ga. copper clad steel on 4 1/2" centers

	<u>Standard Thickness Cork Pipe Covering</u>
1/4" to 1 1/2"	14 ga. copper clad steel on 4 1/2" centers
2" to 8"	12 ga. copper clad steel on 4 1/2" centers
9" to 20"	10 ga. copper clad steel on 4 1/2" centers

C 003896

TABLE III (Continued)

	<u>Heavy Duty Thickness Cork Pipe</u>
	<u>Covering</u>
1/4 to 3/4"	14 ga. copper clad steel on 4 1/2" centers
1" to 6"	12 ga. copper clad steel on 4 1/2" centers
7" to 20"	10 ga. copper clad steel on 4 1/2" centers

C 003897

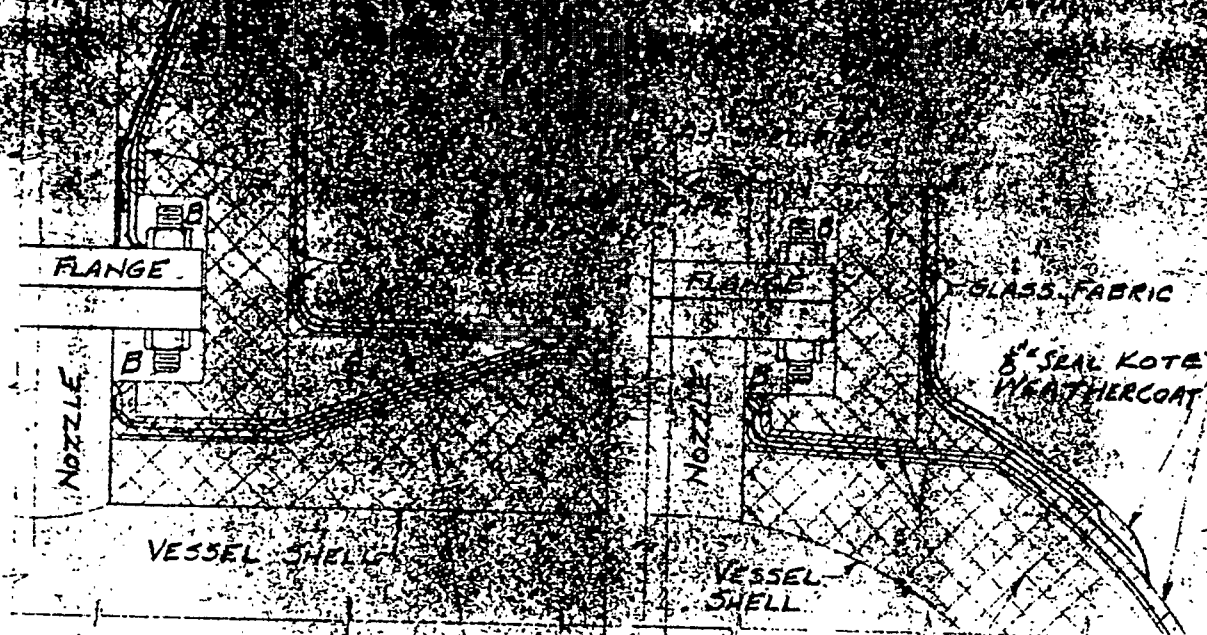
NO.	DATE
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TABLE IV
Nominal Cork Thickness
 All dimensions are in inches

Pipe Size	O.D. Pipe	Light Duty		Standard		Heavy Duty	
		Cork Thickness	O.D. Covering	Cork Thickness	O.D. Covering	Cork Thickness	O.D. Covering
1/4	.540	1.35	3.25	1.85	4.25	2.88	6.31
3/8	.675	1.28	3.25	1.78	4.25	2.82	6.31
1/2	.840	1.20	3.25	1.70	4.25	2.73	6.31
3/4	1.050	1.35	3.75	1.85	4.75	2.63	6.31
1	1.315	1.47	4.25	2.00	5.31	2.97	7.25
1 1/4	1.660	1.48	4.62	2.32	6.31	3.10	7.87
1 1/2	1.900	1.42	4.75	2.50	6.90	2.99	7.87
2	2.375	1.47	5.31	2.44	7.25	3.25	8.87
2 1/2	2.875	1.37	5.62	2.50	7.87	3.00	8.87
3	3.500	1.56	6.62	2.68	8.87	3.06	9.62
3 1/2	4.000	1.62	7.25	2.81	9.62	3.56	11.12
4	4.500	1.68	7.87	2.56	9.62	3.31	11.12
5	5.563	1.65	8.87	2.78	11.12	3.78	13.12
6	6.625	1.81	10.25	2.78	12.18	4.00	14.62
8	8.625	1.78	12.18	3.00	14.62	4.00	16.62
10	10.750	1.93	14.62	3.00	16.75	4.00	18.75
12	12.750	1.50	15.75	3.00	18.75	4.00	20.75
14	14.000	1.50	17.00	3.00	20.00	4.00	22.00
16	16.000	1.50	19.00	3.00	22.00	4.00	24.00
18	18.000	1.50	21.00	3.00	24.00	4.00	26.00
20	20.000	1.50	23.00	3.00	26.00	4.00	28.00

These dimensions are for a guide as to clearance required. Actual dimensions will vary between manufacturers.

C 003898



TANK OR VESSEL INSULATION
AS SPECIFIED - BEVEL AS REQ'D.

LONGITUDINAL SECTION

CIRCUMFERENTIAL SECTION

GENERAL NOTES

1. FILL SPACE "A" WITH INSULATION BLOCK OR "SEAL KOTE" WEATHERCOAT DEPENDING ON SIZE & CARRY THE "LOW TEMP" BUTTERING TO THE EDGE OF THE INSULATION BLOCK.
2. FILL SPACE "B" WITH BLOCK OR GROUND INSULATION OF THE SAME TYPE AS USED TO INSULATE FLANGE.
3. INSTALL THE FLANGE INSULATION AFTER THE WEATHERCOAT ON THE PIPE INSULATION HAS HARDENED.
4. FLASH & INSULATE VALVES OR FLANGED FITTINGS SIMILAR TO FLANGE'S SHOWN.
5. INSULATION DETAILS SHOWN ARE FOR CORK OR "FOAMGLAS" INSULATION.

MONSANTO CHEMICAL COMPANY
PROJECT TEX. CITY, TEX.

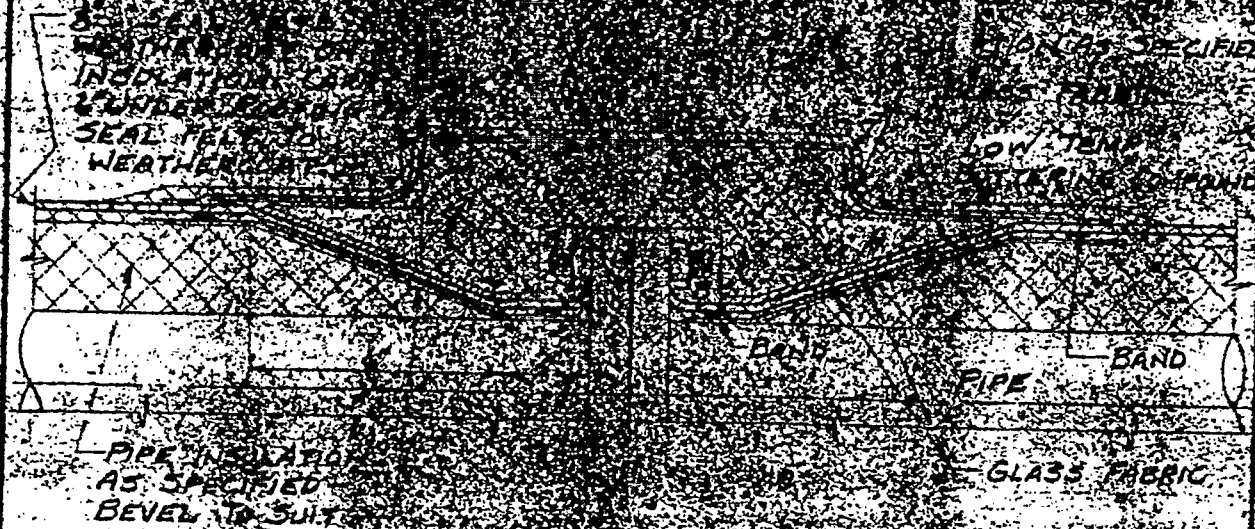
TYPICAL VESSEL OR TANK
NOZZLE FLANGING & INSULATION

DATE	BY
REVISION	BY
NOTES	BY

FILE NO. A-50-624

NO.	DATE
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C 003899



GENERAL NOTES

1. FILL SPACE "A" WITH INSULATION BLOCK OR "SEAL KOTE" WEATHERCOAT DEPENDING ON SIZE & CARRY THE "LOW TEMP" BUTTERING TO THE EDGE OF THE INSULATION BLOCK.
2. FILL SPACE "B" WITH BLOCK OR "ROD" INSULATION OF THE SAME TYPE AS USED TO INSULATE FLANGE.
3. INSTALL THE FLANGE INSULATION AFTER THE WEATHERCOAT ON THE PIPE INSULATION HAS HARDENED.
4. FLASH & INSULATE VALVES OR FLANGED FITTINGS SIMILAR TO PIPE FLANGE SHOWING.
5. INSULATION DETAILS SHOWN ARE FOR COR. OF "FOAMGLAS" INSULATION.

MONSANTO CHEMICAL COMPANY

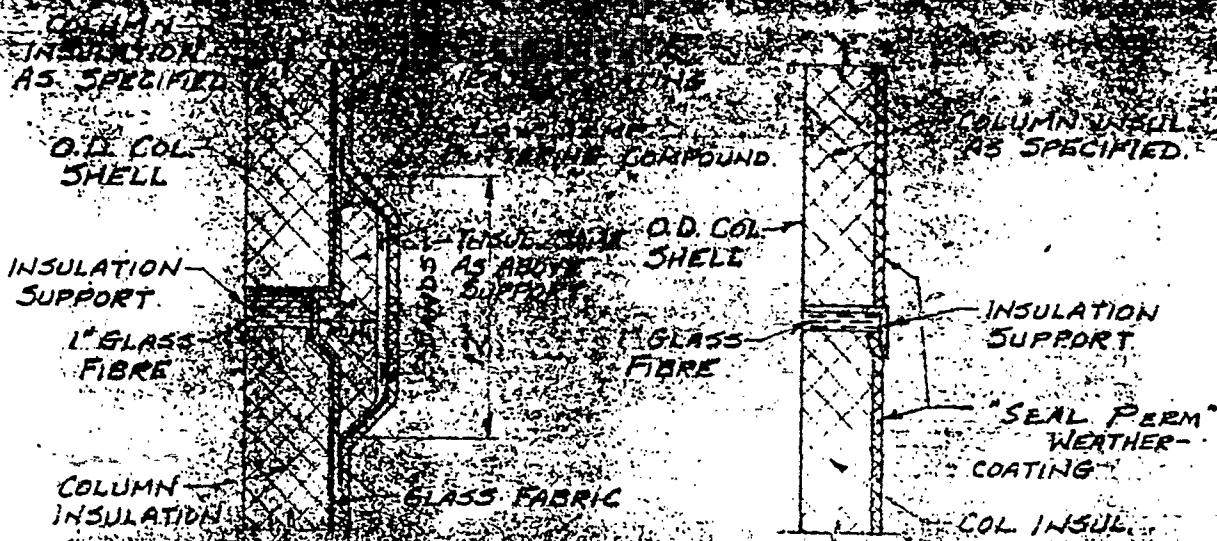
PIPE & PIPE FLANGE
INSULATION

REVISIONS

NO.	DATE
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NO. NO. 50

C 003900



NO. 1
FOR CORK OR FOAMGLAS
INSULATION

NO. 2
FOR CALCIUM SILICATE
INSULATION

EXPANSION JOINT DETAILS

GENERAL NOTES:

1. INSTALL EXPANSION JOINTS AT EACH INSULATION SUPPORT.
2. INSULATION ON COL. TOPS TO BE HELD IN PLACE WITH CEMENT & BANDS ONLY. USE NO DIRECT METAL ATTACHMENTS SUCH AS NELSON STUDS.
3. INSTALL ONE LAYER OF GLASS FABRIC EMBEDDED IN $\frac{1}{8}$ " SEAL KOTE OVER ALL CORK OR FOAMGLAS FOR A VAPOR SEAL.

C 003901

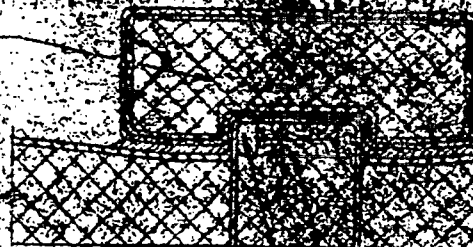
MONSANTO CHEMICAL COMPANY
PROJECT TEX CITY, TEX.

COLUMN INSULATION DETAILS

DRAWN BY	A.H.D. 8-55	APPROVED BY	J.C.H. 8-55
CHECKED BY	A.H.D. 8-55		
SCALE	NONE		

NO.	DATE	REVISION	DWG. NO.	A-5D-626
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INSULATION
AS SPECIFIED
FOR TANK



GLASS FABRIC
SEAL KOTE WEATHERCOAT
LOW TEMP BUTTERING

TANK INSULATION -
DEVELOPED & FLASHED
TO SUPPORT

TANK SHELL

NAMEPLATE SUPPORT

FILL THIS SPACE WITH LIKE CREOSOTED BOARDS Laid ON TOP
K KOTE TANK INSULATION & PROTRUDING
CAP FOR HAND

DETAIL OF NAMEPLATE REMOVABLE CAP

MAKE UP CAP AS SHOWN AFTER WEATHERCOAT
13 DETAIL BOTH CAP & TANK SET IN PLACE &
BED IN TANK TANK CAP SET IN PLACE WITH BAND
ACROSS TOP OF CAP & TANK SET TO COVER BOARD

MONSIEUR CHEMICAL COMPANY

1001 TEXAS ST. TEX.

TYPE MAIL ORDER

1001 TEXAS ST. TEX.

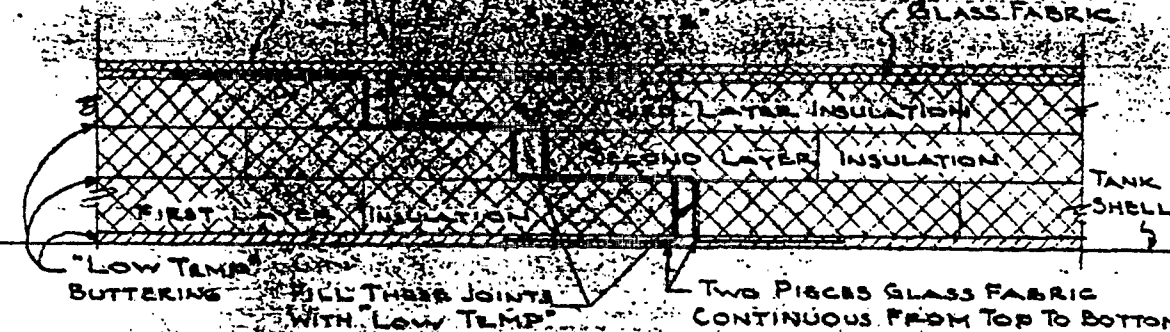
1001 TEXAS ST. TEX.

1001 TEXAS ST. TEX.

1001 TEXAS ST. TEX.

1001 TEXAS ST. TEX.

"SEAL KOTE"
WEATHERCOAT



MULTILAYER

GENERAL NOTES:
1. INSULATION DETAILS SHOWN ARE FOR
CORK OR "FOAMGLAS" INSULATION.

C 003903

MONSANTO CHEMICAL COMPANY

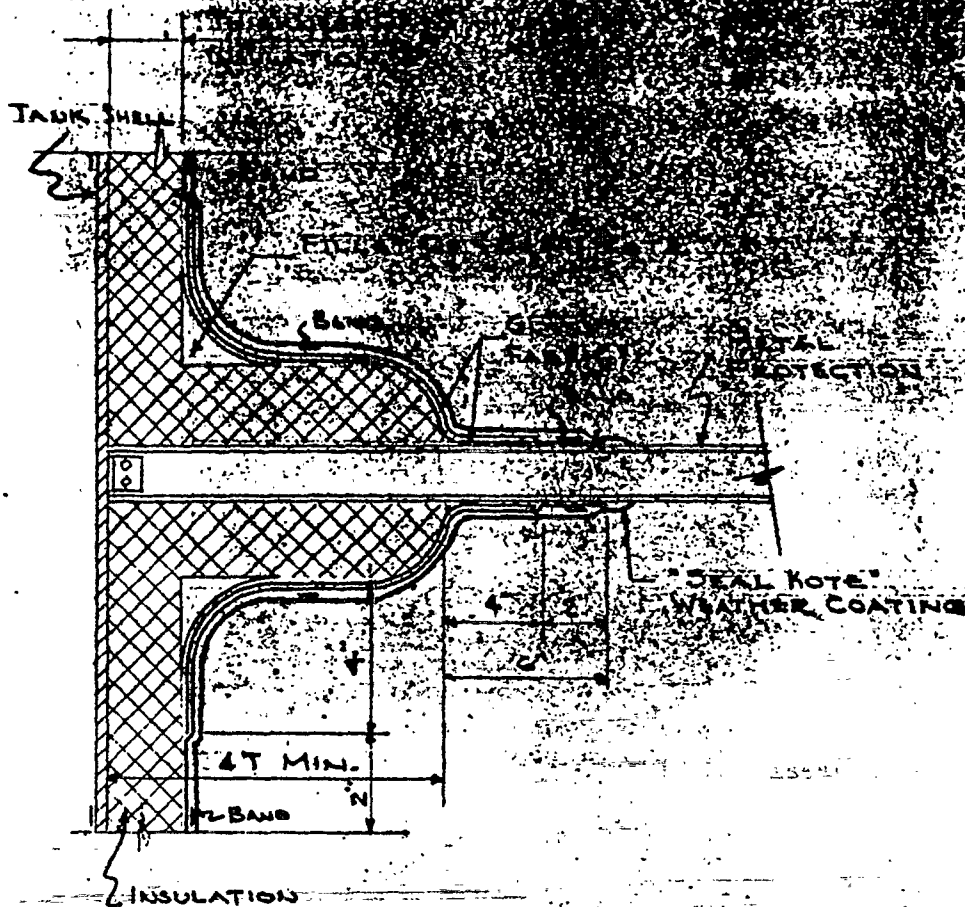
PROJECT

TYPICAL TANK INSULATION
EXPANSION JOINT

DATE: 11/15/54
BY: JCH

DWG NO. A 3D-632

NO. DATE

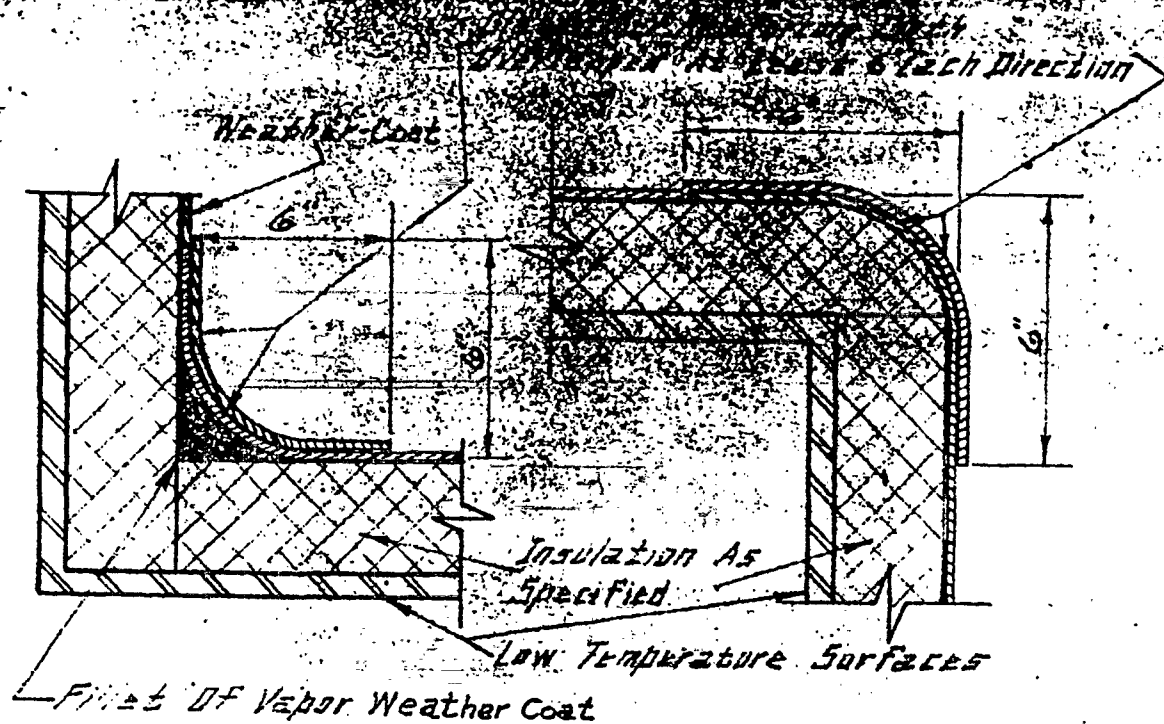


GENERAL NOTES:
 1. INSULATION DETAILS SHOWN ARE FOR
 CORK OR "FOAMGLAS" INSULATION

C 003904

MONTANTO CHEMICAL COMPANY	
PROJECT	
APPLICATION OF INSULATION TO METAL PROJECTION ATTACHED TO LOWEST TEMPERATURE SURFACE	
NO. OF 150 LBS. BARS	APPROX. BY
AND 100 LBS. BARS	4
100 LBS. BARS	8
100 LBS. BARS	12
DWG. NO. A-101	

NO.	DATE
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General Notes:

1. Insulation Details Shown Are For Cork Or "Foamglas" Insulation.

C 003905

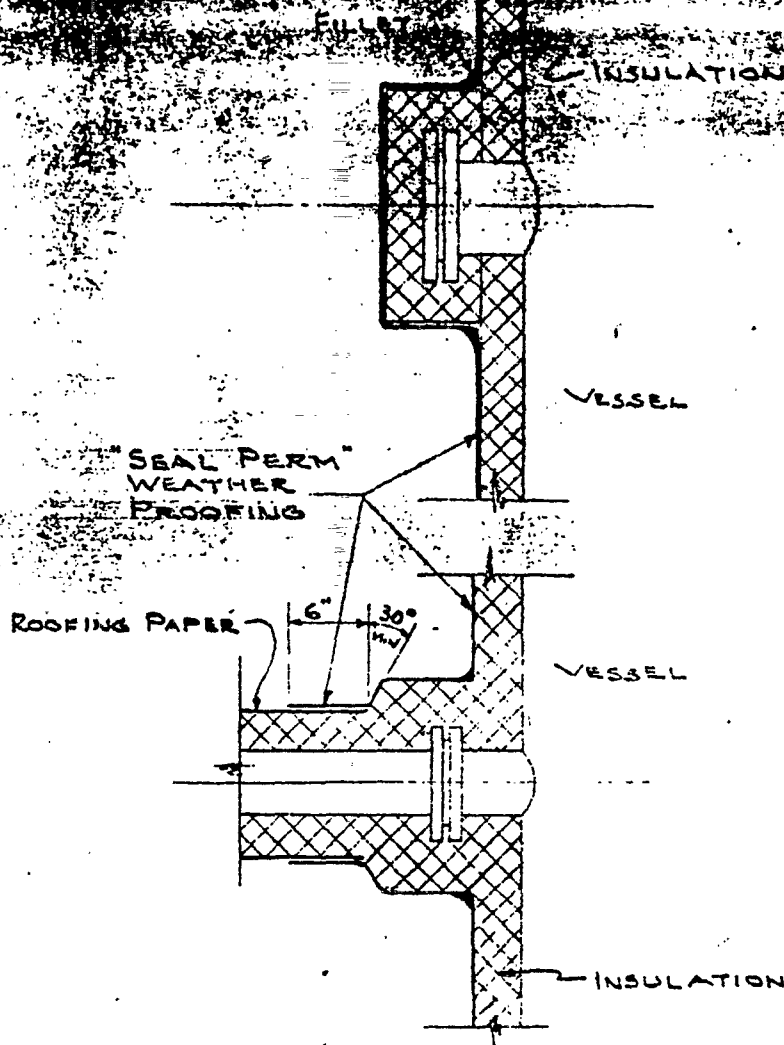
MONSANTO CHEMICAL COMPANY
PROJECT, TEX. CITY, TEX.

Typical Reinforcement Of
Weather-Resistive Barrier
Assemblies

DATE: 11/1/55
CHECKED BY: J. S. S.
DRAWN BY: J. S. S.

NO.	DATE	REVISION	BY

DWG. NO. A-511-634



C 003906

MONSANTO CHEMICAL COMPANY
PROJECT

RIGID INSULATION OF HIGH
TEMPERATURE VESSEL NOZZLE

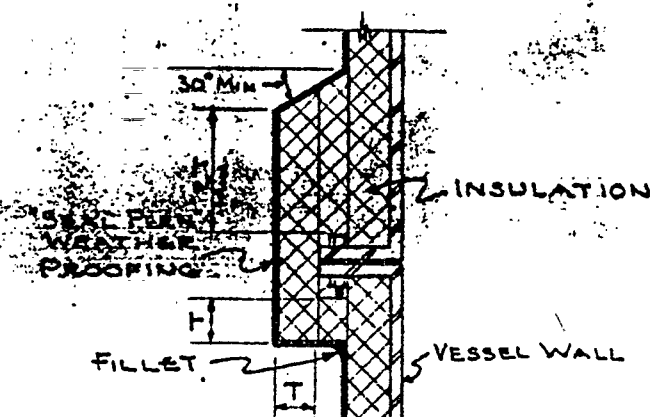
DESIGNED BY J. E. B. Smith 7/30/68	CHKD BY
DESIGNED BY J. E. B. Smith 7/30/68	CHKD BY
DESIGNED BY J. E. B. Smith 7/30/68	CHKD BY

NO.	DATE	REVISION
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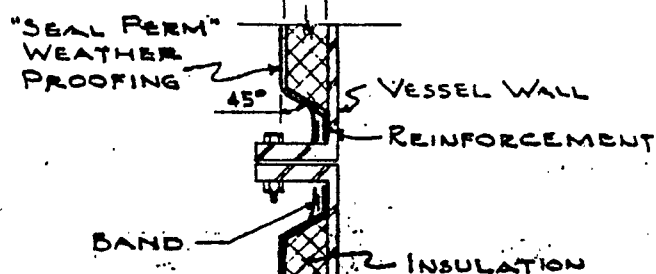
DWG. No. A 5D-635



APPLICATION OF INSULATION TO VALVE OR LINE FLANGE



RIGID INSULATION OF VESSEL FLANGE



SEALING OF VESSEL INSULATION AROUND UNINSULATED FLANGE

C 003907

MONSANTO CHEMICAL COMPANY

PROJECT

INSULATION DETAILS FOR HIGH TEMPERATURE VESSELS

DESIGNED BY	W. J. B.	DATE	1/2/55
CHECKED BY	W. J. B.	DATE	1/2/55
APPROVED BY	W. J. B.	DATE	1/2/55

NO.

DATE

REVISION

DWG No. A 5D - 636