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EXHIBIT
DUP-2328

ENGINEERING DEPARTMENT

SEPTEMBER 25, 1967

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CONSTRUCTION DIVISION - INSULATION PRACTICES

The insulation materials and installation methods used vary widely between sites, and, in some cases, vary within different areas on the same project. The use of certain materials and methods results in lower "in-place" cost of insulation. The attached listing is intended to re-emphasize some current cost saving material and installation information. It is expected that each site will review this list and immediately implement applicable items. One reminder, in most cases insulation is intended to last--maintenance free for the life of the item being insulated, and the quality of workmanship must be consistent with this philosophy.

Your assistance and comments are solicited to help keep the Division ahead of the insulation industry.

CONSTRUCTION DIVISION

DE. Sours

D. E. Sours, Div. Thermal Insulation Specialist

DES:slg
Attachment

*For Information Only

BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

DUP 1008948

DU 052030

September 25, 1967

CONSTRUCTION DIVISION - INSULATION PRACTICES

I. SPECIFICATIONS

A. Standard Engineering Specifications

1. Have field supervision review Standard Specification SN100.80A, "High Temperature Pipe Insulation." This specification replaces several others and represents the Standards Committee's recent thinking on the subject. Several requirements add to the costs and should be questioned on an individual basis (these are under review by the Standards Committee); other sections point out necessary items which should be, but are not always followed. See Sections 3.1.5, 3.1.7, 3.1.8, 4.1.1, 4.4.5, 5.1, 8.1, and Figures 7, 10 and 13. Also see new specification SN213P.
2. The above comments also apply to SN100.85A, "High Temperature Equipment and Duct Insulation."
3. Tentative Specifications SN100.90A and 100.95A for cold insulation will soon be available in pink sheet form and should be obtained and reviewed by site supervision.

B. Design Project Specifications

These should be reviewed with Design and the Plant and updated to reflect current practices and include cost reduction, teletype and other approved changes; be sure that special plant requirements are included in these specifications. Route an updated copy of these specifications to all site engineers for their review and re-education. Special plant requirements which add extra costs should be reviewed for necessity with the Works Engineer; a factual cost comparison should be presented.

II. INSULATION MATERIALS

The least expensive purchased price materials often cost more to apply than premium materials, and since labor costs are increasing more rapidly than material prices, total installed costs of systems must be evaluated, rather than material prices of system components.

DUP 1008949

3.1.7 ?
4.1.1 MOEN 102.1
4.4.5. NO
ITEM 2 ON FIG 13
NOT NEEDED.

Some material items which should be reviewed:

A. Pipe Insulation

1. Expanded (beaded) polystyrene ("Vapo-lock" 2# density) is least expensive in the -100° to 150°F. range.
2. For hot work codes, 102 and 102.1, usually cost less than code 106 material. Where double layer 102.1 is required, single layer 106 is less expensive installed. Most code 102 material works easier than 102.1 and thus can cost less installed on carbon steel pipe and equipment. Site control must insure 102 is not installed on stainless steel items.
3. Carbon steel wire rather than stainless steel wire will suffice in most instances to hold hot pipe insulation. (Can be used with Design and/or plant approval.) Glass fiber tape also works well and eliminates the problem of either embedding the wire or having it show through the finish. Inexpensive masking tape should be used to hold cold pipe insulation.
4. The use of premolded fittings saves money and results in a better job. When used, make a large scale takeoff and buy these bulk quantities-- don't wait and make takeoff on small individual drawing or sketch basis.
5. When available, purchase material in 4 ft rather than 3 ft sections.
6. Store material--before and after installed--in a dry area. Water can leach the inhibiting agents out of insulation, cause a loss in effectiveness, and cause the material to break or come apart with subsequent handling.
7. The use of glass fiber insulation codes 112 can save costs in the 80°F. to 350°F. range and the dust problem is eliminated. *NOT SO.*

B. Equipment Insulation

1. In some areas mineral wool block, code 114, costs about 20 per cent less than code 102.1 material. Installation costs are about the same, and the dust problem is eliminated. *NOT SO*

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- OK
2. Sprayed materials for hot insulation, such as Monospray and Armaspray, have wide potential use where large areas must be covered. (Not approved at this time for use on stainless steel.) Sprayed (foamed in place) urethane has been used at a cost savings in the insulation of cold service equipment.
- OK
3. Preassembled stud weld pins, with cupped heads, which are spot welded through the insulation, eliminate sharp points and are a one-step rather than multi-step operation; a more uniform compression of the insulation is also obtained. AGM Industries, P. O. Box 146, Canton, Mass., telephone A.C. 617, 828-4749, and others can provide more information.
- OK
4. Insulation blankets and bats SN200M can be utilized on many pieces of equipment where the current practice is to use block or cut lags.
- OK
5. On curved or cylindrical equipment and duct, use molded pipe insulation. Where molded insulation is not available in the thickness specified, it is usually less expensive to substitute thicker material than to cut lag strips of the thinner material. The next cost cutting alternate is to score board insulation and bend it around the equipment contours. Where the use of lag strips is the only possible method, they should be cut in the maximum width to give approximately the same finished contour as the piece being insulated.

OK.

In some instances, where H&V duct is insulated externally, the insulation can be eliminated from the flanges, standing seams, etc. with a minimum heat transfer loss, thus eliminating the need to box around these projections. In other instances, the substitution of thicker than specified material will cover these projections and yield a net savings in installed cost.

C. Insulation Finishes

- OK
1. For pipe insulation, factory applied finishes, roofing felts, and aluminum jackets prove less expensive than laminates, site applied canvas, "A" cloth, or reinforced mastics.

DUP 1008951

- OK.
2. Spray applied mastic finishes on pipe fittings and equipment are most satisfactory. Brush application of mastics are satisfactory where spray is impractical, but trowelled finishes are too expensive to be tolerated.
- OK.
3. Preformed fitting covers of aluminum and PVC save money when installed by the insulation craft. Metal thickness should be selected to permit installation by the insulation craft. Two piece Aluminels by Premetco are available on special orders in nominal .016" thickness; 3 to 4 week delivery, no minimum quantity and at same price as standard .025" ells.
- OK.
4. Dymetrol (nylon) strapping is less expensive than stainless steel bands; aluminum bands are also a less expensive substitute. For hot pipe, bands are not necessary to secure aluminum jackets; mechanically applied screws or rivets are satisfactory. For cold work, screws, rivets, staples, etc. should not be used to secure the finish because they puncture the vapor barrier and penetrate the insulation.
- OK. EXCEPT
5. Glass cloth, code 708, is usually applied more rapidly than the less expensive cotton cloth, code 733, in reinforced mastic finishes. Each site should evaluate their installed cost of these alternate reinforcing methods. Glass and cotton cloth cannot be used as a finish for insulation ~~containing sodium silicate~~, codes 102.1 and 106, without first coating the insulation with an asphalt primer, code 707. See SN100.80A, Section 4.1.1.
- OK
6. The use of pipe hangers outside of the insulation is generally less expensive than the cost of fitting and flashing around a hanger fastened directly to the pipe.
- OK
7. When available, purchase finish materials in 4 ft width rather than 3 ft width rolls.
- OK
8. Cold water paste dry shrinks canvas to a good tight finish and is less expensive than code 725 PVA.

III. INSULATION SHOP PRACTICES

- OK
- A. Pre-insulation saves dollars when all crafts cooperate and the program is supported by site management.

DUP 1008952

OK.

- B. Where site-fabricated fittings are used, they should be shop-fabricated using power saw, layout gibs, and roll adhesive applicator. The work should be scheduled to assure largest volume of like items are fabricated at one time, and not on a piece-meal basis. Prefinish field installed fittings in the shop. Fabricated fittings should not receive a cement coat, our specifications require that only major voids or chips be filled to insure effectiveness of the insulation. Precut large quantities of like size fabric pieces and other finish materials.

C. Aluminum Jacket

OK

1. Sites with large volume can justify the purchase of a mechanized shear for shop precutting.

OK

2. Pregang punch the leading lap of jacket for hot pipe insulation to eliminate the layout of individual holes for rivets. There is no need to layout and punch individual holes for screws. Mechanical screwdriver and approximate spacing eliminate these operations. Precut the bands to length for cold pipe insulation and equipment.

WILL TRY
ALUM-TAPE

3. Hold jacket in place on pipe and equipment with reusable expansion bands, or small pieces of aluminum-colored, pressure sensitive tape to be left in place, prior to fastening with bands or mechanically-applied screws or rivets.

OK

4. Eliminate the extra fold on leading edge of the longitudinal seam lap. This is done to eliminate a sharp edge at the insistence of some plants.

OK

- D. Use spray applied finishes on fittings, equipment and duct where mastics are required by the specifications.

OK

- E. When large quantities of complicated assemblies such as special valves or pumps, spinning machines, etc. are required, fabricate one complete assembly, work out the problems and establish a production plan, then fabricate the assemblies on a production line basis.

OK

- F. Do not coat insulation with cement--fill only voids which would impair the effectiveness of the insulation.

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- OK G. Duct lined with insulation must receive special care, since in-service liner failures are very expensive to repair or replace. Keep the insulation dry at all times and follow the instructions in Standard Specification SN200.69A.

IV. INSULATION - FIELD PRACTICES

- OK A. Gang insulate nests of valves, pipes, etc., rather than individually insulating each item.
- OK B. Where finish mastics are required, apply with brush; *OR-SPRI* if the mastic must be of trowel consistency, apply by palm or glove. In any event, make all efforts to eliminate trowel work. Eliminate "over finishing" and spot check to insure applied thickness is as specified.
- OK C. Be sure openings in insulation and finish are flashed against moisture penetration, see SN100.80A, Section 8.
- OK D. An increasing portion of insulation costs result from the handling of materials. Ideally, materials should be received and unloaded at the point of application. Where long term site storage is required, it should be arranged to permit one step easy unloading, to eliminate the need to hunt for and move materials and to permit one step movement to point of installation. Tight scheduling and use of helpers or improvers will reduce costs by having the material at the right place at the right time so that mechanics are not waiting for material or going for it on an individual basis.
- OK E. By making large scale material takeoff rather than piece-meal individual sketch takeoff, the unit cost of this operation is reduced. On most jobs, the pipe material takeoff should be used to order the quantity of insulation required.

V. INSULATION PRACTICES - COST REDUCTION ITEMS

These recent cost reduction items have potential use on future insulation work.

- ✓ A. Eliminate step joints in insulation material.
- B. Reduce thickness of insulation materials.
- ✓ C. Substitute less expensive insulation and finish materials.

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- ✓ D. Change double layer to single layer insulation.
- ✓ E. Eliminate insulation, eliminate finish on insulation, eliminate insulation on pipe and duct flanges.
- ✓ F. Gang insulation of nested items.
- G. Eliminate or minimize removable insulation.
- ✓ H. Use automatic aluminum jacket cutter.
- I. Raise permissible surface temperature from 140°F. to 180°F. This can reduce the thickness and eliminate some safety insulation.
- J. Eliminate reinforcing from mastic finishes on fittings and equipment not subject to unusual mechanical abuse.
- ✓ K. Use sodium silicate for fitting fabrication adhesive in lieu of fibrous adhesive 803.
- L. Eliminate complicated metal finish covers on equipment heads, substitute cloth and spray mastic finish painted with a hard durable finish material.
- ✓ M. Seal joints on above freezing cold insulation and eliminate separate vapor barrier.

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