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SUPREME COURT
OF THE STATE OF WASHINGTON

VERNON BRAATEN,

Respondent,

v.

BUFFALO PUMPS, INC., et al.,

Petitioners.

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SUPREME COURT
STATE OF WASHINGTON
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I. STATEMENT OF THE QUESTION PRESENTED

Whether the Court of Appeals correctly held that there was sufficient evidence that the equipment manufacturers owed a duty to warn of the hazards of asbestos involved in the ordinary and foreseeable use of their products to mandate reversal of the trial court's summary judgment in favor of the equipment manufacturers.

II. STATEMENT OF INTEREST

O-I is, and has always been, primarily a manufacturer of glass bottles and jars. Over fifty years ago, O-I manufactured a high temperature thermal insulation product named "Kaylo", which contained approximately 15% asbestos. O-I manufactured and sold Kaylo in commercial quantities from 1948 until 1958. O-I has been named as a co-defendant in asbestos personal injury cases together with equipment manufacturers in a number of jurisdictions, including Washington.

In some of those cases, plaintiffs allege exposure to Kaylo purportedly manufactured by O-I at shipyards and on Navy vessels. Some of those cases are brought by shipworkers such as Mr. Braaten. In many of those cases, O-I's co-defendants are equipment manufacturers such as the Petitioners and their amici in this case. Accordingly, O-I has an interest in the consistent

application of common law principles of negligence and products liability to all parties involved in the manufacture, distribution and sale of products and equipment, the use of which allegedly contributed to the injuries claimed by similarly situated plaintiffs.

O-I believes that its experience and perspective as a defendant in these asbestos-related equipment cases will assist the Court in resolving the issues presented.

III. STATEMENT OF FACTS

This *amicus* adopts the facts as stated by the Court of Appeals in *Braaten* and *Simonetta*, and as stated by the Respondents.

IV. SUMMARY OF THE ARGUMENT

Whether manufacturers of equipment that was insulated with asbestos or contained asbestos materials such as gaskets and packing are liable to workers exposed to dust from such asbestos is an issue that should not be decided as a matter of law under a "one rule fits all" approach. Washington law does not support either a wholesale grant of immunity to such manufacturers, nor an across-the-board finding of liability as a matter of law. Rather, and consistent with the law of this state, the liability of such equipment manufacturers must be determined based on the specific facts of

each case. As demonstrated by the facts of this case and those of other reported decisions, there are differences in each case between equipment, asbestos-containing components, user, circumstance of use, and other facts. Those differences affect the analysis of foreseeability and duty that are central to a finding of liability. For these reasons, a uniform rule of either liability or immunity has no applicability here.

In the underlying case and in the *Simonetta* case, there is evidence in the record that the defendant equipment manufacturers made and supplied equipment containing asbestos component parts including asbestos gaskets and packing. Further, the evidence shows that some defendant equipment manufacturers specified that asbestos insulation be used and applied by the end-user in order that the equipment function properly as designed. Other defendant equipment manufacturers sold asbestos-containing products for use with the equipment they made and supplied. The record also demonstrates that the defendant equipment manufacturers knew that the equipment they made and supplied required asbestos-containing insulation to function as designed and intended, and that it was foreseeable that men such as Mr. Braaten would disturb the asbestos on and in the equipment

during the ordinary course of their activities. Thus, the record in these cases was sufficient to support establishing a duty to warn on the part of the equipment manufacturers.

V. ARGUMENT

A. Duty To Warn Requires A Case-By-Case Analysis.

From the briefs already filed, one can get the impression that either equipment manufacturers **never** have a duty to warn or equipment manufacturers virtually **always** have a duty to warn. These positions focus on abstractions of policy rather than on the specific record in this case. Under the applicable law, however, the question of duty to warn requires an analysis that depends on the facts and circumstances applicable to each particular case.

Duty is an “obligation, recognized by the law, requiring the actor to conform to a certain standard of conduct for the protection of others against unreasonable risks.” *Daly v. Lynch*, 24 Wn. App. 69, 76, 600 P.2d 592 (1979) (quoting William L. Prosser, THE LAW OF TORTS § 30, at 143 (4th ed. 1971)). While the question of duty is a question of law for the Court, that question is never decided in a vacuum. The determination of whether a defendant owes a tort duty turns on whether the injury was foreseeable. See *Keller v. City of Spokane*, 146 Wn.2d 237, 243, 44 P.3d 845 (2002)

(holding that duty “generally includes a determination of whether the incident that occurred was foreseeable.”); **King v. City of Seattle**, 84 Wn.2d 239, 248, 525 P.2d 228 (1974) (holding that “foreseeability of the risk of harm to the plaintiff is an element of the duty question.”).¹

Where, as here, plaintiff alleges separate theories of liability, the Court applies a different focus in resolving the existence of a duty to warn. In a negligence case, the focus is on the conduct and knowledge of the manufacturer. **Young for Young v. Key Pharmaceuticals, Inc.**, 130 Wn.2d 160, 178, 922 P.2d 59 (1996). See **Braaten v. Saberhagen Holdings**, 137 Wn. App. 32, 48, 151 P.3d 1010, ¶23 (2007); **Simonetta v. Viad Corp.**, 137 Wn. App. 15, 21, 151 P.3d 1019, ¶7 (2007). As the Court of Appeals in **Braaten** noted, all parties and amici agreed that “this general duty is bounded by the foreseeability of the harm.” **Braaten**, 137 Wn. App. at 48, ¶25.

¹ See also **Yong Tao v. Heng Bin Li**, 140 Wn. App. 825, 833, 166 P.3d 1263, ¶21 (2007) (the conclusion that a defendant owes a duty “turns on whether injury or damage is foreseeable.”); **Parrilla v. King County**, 138 Wn. App. 427, 436, 157 P.3d 879, ¶19 (2007) (“If the risk is foreseeable, an individual generally has a duty exercise reasonable care to prevent it.”); **Knott v. Liberty Jewelry & Loan, Inc.**, 50 Wn. App. 267, 271, 748 P.2d 661, rev. denied, 110 Wn.2d 1024 (1988) (“Foreseeability determines the extent and scope of duty.”)

On the other hand, in a strict liability case based upon *Restatement (Second) Torts* § 402A, the focus is on the product and the consumer's expectations. *Young*, 130 Wn.2d at 178. The focus also is on "when a manufacturer becomes aware, or should have become aware, of the dangers of the product." *Simonetta*, 137 Wn. App. at 24, ¶13.²

As is evident from the cases before the Court and from the cases cited by the parties and their *amici*, the question of duty to warn in the context of asbestos cases against equipment manufacturers is awash with questions of fact. *Simonetta*, 137 Wn. App. at 22-25, ¶¶9-17 (extensive analysis of facts). See *Chicano v. General Elec. Co.*, 2004 WL 2250990, at *6-9 (E.D. Pa. 2004) (discussion of fact issues);³ *Berkowitz v. A.C. and S.*,

² The Court of Appeals in *Simonetta* noted that the courts have moved away from a "reasonable consumer test" to a focus on the manufacturer's knowledge of the dangers of the products. *Simonetta*, 137 Wn. App. at 24, ¶13.

³ Fact issues discussed in *Chicano* included: (1) whether GE turbines were generic or designed for a particular product; (2) whether GE could reasonably foresee that its turbines would be combined with asbestos to constitute a defective product, absent adequate warnings; and (3) whether GE could be expected to foresee that asbestos-containing material would be used to insulate its turbines. *Chicano*, 2004 WL 2250990, at *3, *6, *9.

Inc., 288 A.D.2d 148, 733 N.Y.S.2d 410 (2001) (same).⁴ Thus, whether a duty to warn exists in a case like this cannot be determined by reference to a blanket rule; it depends on the relevant facts presented in each individual case.

B. Each Case Presents A Separate Set Of Facts.

Each asbestos personal injury case involving equipment manufacturers presents a unique set of facts that, in turn, triggers a different analysis of the duty issue. There are differing degrees of knowledge, different products involved, variations in the way in which the products were used and variations in the types of foreseeable users. The different analyses of the duty issue preclude a uniform finding of a duty to warn or no duty to warn on the part of equipment manufacturers in these cases.

Understanding how equipment located in shipyards, or placed on board Navy ships, operates provides relevant

⁴ Fact issues discussed in *Berkowitz* included: (1) whether the product had asbestos gaskets and packing; (2) whether the manuals referred to asbestos in pumps; (3) whether government specifications required asbestos use; (4) whether there was an absence of evidence of deviation from government specifications; (5) the testimony of plaintiffs that they observed the making of asbestos gaskets; and (6) whether the pumps could operate safely without insulation. *Berkowitz*, 733 N.Y.S.2d at 411-12.

background information for examining the factual differences in these cases.

Most equipment is driven by one of two power sources—electricity (motors) or steam (drive turbines). Although some of the equipment driven by motors sometimes is insulated (and many motor-driven pieces of equipment contain asbestos gaskets and packing), the great majority of equipment coupled with and driven by drive turbines is insulated, at least on the turbine end and sometimes on the pump end too. Thus, when an equipment manufacturer claims that its “pump” was not insulated, it sometimes is attempting to divorce that which is inextricably married—the turbines and pumps are one piece of machinery, delivered by the equipment manufacturer to the end-user as a single piece of equipment. To say that the pump end is not insulated (while ignoring that the turbine part of the equipment is insulated), is misleading and not salient to the foreseeability analysis in these cases.⁵

⁵ In some cases, the equipment manufacturer made both the pumps and the turbines. In other cases, the manufacturer manufactured the pumps and purchased the drive turbines from another equipment manufacturer to be incorporated into its equipment, which it then sold as a single piece of equipment to end-users such as the US Navy.

1. There Is A Wide Range Of Equipment Involved.

One of the reasons that the Court cannot create a blanket rule regarding duty for all equipment manufacturers is that the cases involve a wide range of equipment, each with different asbestos components, functions, locations, intended users, potential exposure to asbestos, and manufacturer knowledge.

For example, **Simonetta** involved a large evaporator (called a distiller) that was used aboard ship to convert sea water to fresh water. **Simonetta**, 137 Wn. App. at 19, ¶¶1-3. **Braaten** involved equipment located in a shipyard, including ship valves (manufactured by Crane Co. and Yarway Corp.), pumps (manufactured by IMO Industries, Inc. and Buffalo Pumps) and large steam turbines (manufactured by General Electric). **Braaten**, 137 Wn. App. at 37, ¶3. The similarly situated **Chicano** case, out of the Eastern District of Pennsylvania, discussed the inner workings of the ship's boiler rooms, which housed "giant turbines, generators and pumps" in a "dusty and dirty environment" with "visible dust and white flakes from the insulation material." **Chicano**, 2004 WL 2250990, at *1. The **Berkowitz** case involved pumps with asbestos gaskets on them. **Berkowitz**, 733 N.Y.S. 2d at 411.

Certainly, because each piece of equipment differs in material respects, the duty to warn can be decided only on a case-by-case basis.

2. There Are Variations In How Asbestos Was Incorporated Into The Equipment.

In addition to the wide divergence of equipment, there are significant differences in how the equipment was used and maintained, differences that likewise affect the duty to warn analysis.

There is evidence that some of the equipment required insulation in order to operate as designed and intended—such as pumps, valves and steam turbines that operated at high temperatures on Navy ships. See *Simonetta*, 137 Wn. App. at 22, ¶9 (“[T]he danger of asbestos exposure is ‘inherent’ in the use of its product, because the evaporators were built with the knowledge that insulation would be needed for the units to operate properly and that workers would need to invade the insulation to service the units.”); *Braaten*, 137 Wn. App. at 38, ¶5 (“Yarway acknowledged that asbestos was the ‘only insulation product available to withstand temperature’ on Navy ships.”); see also *Chicano*, 2004 WL 2250990, at *2 (“the turbines required thermal insulation to operate

properly and safely.”); *Berkowitz*, 733 N.Y.S.2d at 412 (holding that there was a fact issue “whether pumps transporting steam and hot liquids on board a ship could be operated safely without insulation, which Worthington [the equipment manufacturer] knew would be made out of asbestos.”).

With some of the equipment, the manufacturer knew that it was “highly likely” that the valve, pump or turbine would be used in conjunction with asbestos. See *Braaten*, 137 Wn. App. at 38, ¶15. Some manufacturers actually applied exterior insulation (also called “lagging”) to their equipment before selling and delivering it to the Navy or other end-users.⁶ Some manufacturers specified that their equipment needed to be insulated in order to be used as designed and intended, anticipating that other asbestos-containing products would also be incorporated into and onto the equipment.⁷ Other manufacturers readily admit in testimony that they knew certain equipment would be insulated prior to ordinary and foreseeable use

⁶ See attached Exhibit 1, a Warren Pumps plan showing that it actually applied exterior insulation to its fire and bilge pumps and emergency feed pumps before selling and delivering them to the Navy for installation aboard Navy vessels.

⁷ See attached Exhibits 2-4, which are plans for General Electric, Buffalo Pump and Ingersoll-Rand equipment, all of which specify the use of lagging and a number of other asbestos-containing products such as cements, cloth and blankets. The Ingersoll-Rand plan even suggests how to insulate its equipment.

by the end user. See **Braaten**, 137 Wn. App. at 38, ¶5 (“Yarway acknowledged that asbestos was the ‘only insulation product available to withstand temperature’ on Navy ships.”)

Some of the equipment was designed in a manner in which it would be necessary to disturb the asbestos in order to service the equipment. See **Simonetta**, 137 Wn. App. at 19, 22, ¶¶3, 9; **Braaten**, 137 Wn. App. at 38, ¶6.

For example, the asbestos gaskets and packing contained in the equipment, or insulation used on the equipment, would necessarily be disturbed, removed, and sometimes replaced with new asbestos products during the ordinary and expected maintenance, repair or overhaul of the equipment. See **Braaten**, 137 Wn. App. at 37, ¶3 (regular maintenance required “replacement of interior asbestos, gaskets and packing, which usually had to be ground, scraped, or chipped off.”) The normal operation and maintenance of the equipment by the service workers would result in release of asbestos dust in the air. See **Simonetta**, 137 Wn. App. at 23, ¶11; **Braaten**, 137 Wn. App. at 45-46, ¶19 (“the hazardous substance was released into the air as part of the regular operation and maintenance of pumps and valves, rather than by accident . . .”).

The differences in how asbestos was used with and incorporated into the equipment is a further example of the need for a case-by-case analysis to resolve the duty to warn issue and its foreseeability corollary.

The examples set forth above also demonstrate the fallacy of the claim that the duty to warn analysis should be limited to the equipment itself without regard to the asbestos materials deliberately incorporated in and onto the equipment and without which the equipment could not function as intended.

Notwithstanding the Petitioners' arguments that the asbestos components—insulation, gaskets, packing, cloth, etc.—should be regarded as separate from the equipment itself for purposes of a duty to warn analysis, the Court of Appeals recognized correctly that, in the appropriate circumstance, the asbestos components cannot be separated from the equipment any more than the gasoline from the motorcycle in *Stapleton v. Kawasaki Heavy Industries, Ltd.*, 608 F.2d 571 (5th Cir. 1979). See *Simonetta*, 137 Wn. App. at 31-32, ¶¶25-26; *Braaten*, 137 Wn. App. at 47, ¶21, n. 47 (“...[T]he manufacturers would no doubt argue that the asbestos, not their products, posed the danger. However, as discussed below, the pumps and valves are the correct products for

this analysis.”).⁸ Indeed, whether the asbestos materials should be considered a part of the equipment for purposes of the duty to warn analysis is another issue that must be resolved on a case-by-case basis.⁹

These are some of the differences among product applications; there are others. The wide divergence of products and product applications in the context of equipment and asbestos precludes a general rule regarding the existence or absence of a duty to warn.

3. There Are Variations In The Type Of Foreseeable Users.

The duty to warn extends to “foreseeable users” of the manufactured product. See *Braaten*, 137 Wn. App. at 41, ¶13; *Restatement (Second) Torts* § 388. Workers who were responsible

⁸ The argument by Petitioners’ amici that the equipment was merely a “component part” is unpersuasive. The asbestos gaskets, packing and insulation were necessary for the operation of the equipment. It is illogical to distinguish any portion of a completed evaporator as a “component part” and subject only the purported “component part” to the duty to warn analysis. As the *Simonetta* court held below, the evaporator itself was the “end product.” *Simonetta*, 137 Wn. App. at 29, ¶21.

⁹ If the equipment already is insulated with asbestos and/or contains asbestos gaskets and packing and requires servicing that would result in disturbing the asbestos, the equipment manufacturer may have the duty to warn because it is the only product supplier in the position to provide an adequate warning (either on the equipment itself or in the service manuals) to intended users of the equipment.

for servicing the equipment, such as Mr. Braaten, were foreseeable users of the equipment itself—the product at issue in the duty to warn analysis. 137 Wn. App. at 41, ¶13.

Not everyone who comes into contact with the equipment, however, is a foreseeable user. Is the captain of the ship a foreseeable user? Is the person who cooked meals on the ship a foreseeable user? Those questions are not posed in the present cases, but may be posed in future cases. The facts and circumstances of the uses by the plaintiff and whether those were foreseeable will vary from case to case; yet intended use and users are essential to the foreseeability and duty analyses.

Given the myriad conceivable factual situations, there can be no uniform duty to warn that could be applied to all cases in a manner consistent with Washington negligence and product liability law. There is no reason for the Court to adopt a global solution here. The trial courts should continue to resolve these cases on the facts presented by the particular record.

C. The Court Of Appeals Correctly Reversed Summary Judgment.

The record in both cases demonstrates sufficient evidence to affirm the Court of Appeals' holding that the trial court erroneously

granted summary judgment on the issue of duty to the equipment manufacturers in *Braaten* and *Simonetta*. These equipment manufacturers designed their equipment to require the use of asbestos gaskets, packing and, in some cases, insulation component parts to function as designed and intended. Petitioners' equipment could not be used in an ordinary and foreseeable fashion without the asbestos-containing components. Petitioners knew, or reasonably should have known, that foreseeable end-users such as Braaten and Simonetta would work on, or in close proximity to, their equipment, and in doing so, disturb the asbestos used in or on the equipment. These facts, along with the others cited by Respondents in their briefs, provide sufficient evidence to affirm the Court of Appeals' reversal of the trial court.

The question of whether an affirmative duty to act exists depends on many factors, including "mixed considerations of logic, common sense, justice, policy and precedent." *Snyder v. Med. Serv. Corp. of Eastern Washington*, 145 Wn.2d 233, 243, 35 P.3d 1158 (2001) (quotation omitted). It would defy not only Washington products liability law, but also logic, common sense, justice and sound policy, for this Court to accept the equipment manufacturers' invitation to grant them immunity from liability to

injured Washington residents who inhaled asbestos in **any** current or future case and irrespective of the fact pattern. The facts of these cases are simply too varied to justify providing immunity from liability to all equipment manufacturers. The cases should be decided, as they were decided by the Court of Appeals below, on a case-by-case basis, based on the facts there presented.

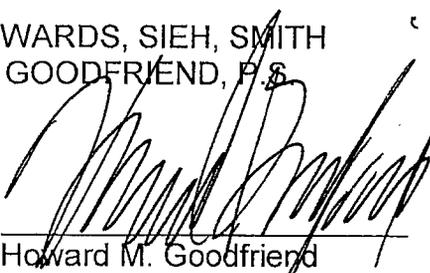
VI. CONCLUSION

For the above reasons, *amicus curiae* asks this Court to affirm the judgments of the Courts of Appeal below.

Respectfully submitted this 15th day of February, 2008.

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DECLARATION OF SERVICE

The undersigned declares under penalty of perjury, under the laws of the State of Washington, that the following is true and correct:

That on February 15, 2008, I arranged for service of Amicus Brief of O-I, Inc to the court and to the parties to this action as follows:

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<p>Jeanne F. Loftis Allen E. Eraut Bullivant Houser Bailey PC 300 Pioneer Tower 888 SW Fifth Avenue Portland, OR 97204-2089</p>	<p><input type="checkbox"/> Facsimile <input type="checkbox"/> Messenger <input type="checkbox"/> U.S. Mail <input type="checkbox"/> Overnight Mail <input checked="" type="checkbox"/> Email</p>
<p>David W. Holman The Holman Law Firms, P.C. 24 Greenway Plaza, Suite 2000 Houston TX 77046</p>	<p><input type="checkbox"/> Facsimile <input type="checkbox"/> Messenger <input type="checkbox"/> U.S. Mail <input type="checkbox"/> Overnight Mail <input checked="" type="checkbox"/> Email</p>
<p>Diana M. Kirchheim Pacific Legal Foundation 10940 NE 33rd Place, Suite 210 Bellevue, WA 98004</p>	<p><input type="checkbox"/> Facsimile <input type="checkbox"/> Messenger <input type="checkbox"/> U.S. Mail <input type="checkbox"/> Overnight Mail <input checked="" type="checkbox"/> Email</p>

Aaron Rocke Rocke Law Group, PLLC 1700 7 th Ave, Suite 2100 Seattle, WA 98101	<input type="checkbox"/> Facsimile <input type="checkbox"/> Messenger <input type="checkbox"/> U.S. Mail <input type="checkbox"/> Overnight Mail <input checked="" type="checkbox"/> Email
Stewart A. Estes Keating, Bucklin & McCormack, Inc., P.S. 800 5 th Ave, Suite 4141 Seattle, WA 98104	<input type="checkbox"/> Facsimile <input type="checkbox"/> Messenger <input type="checkbox"/> U.S. Mail <input type="checkbox"/> Overnight Mail <input checked="" type="checkbox"/> Email
Jon Peter Ferguson Office of Attorney General 800 5 th Ave, Suite 2000 Seattle, WA 98104-3188	<input type="checkbox"/> Facsimile <input type="checkbox"/> Messenger <input type="checkbox"/> U.S. Mail <input type="checkbox"/> Overnight Mail <input checked="" type="checkbox"/> Email
Bryan Harnetiaux Attorney at Law 517 E. 17 th Ave Spokane, WA 99203-2210	<input type="checkbox"/> Facsimile <input type="checkbox"/> Messenger <input checked="" type="checkbox"/> U.S. Mail <input type="checkbox"/> Overnight Mail <input type="checkbox"/> Email

DATED at Seattle, Washington this 15th day of February,
 2008.



Daniel F. King

**FILED AS ATTACHMENT
 TO E-MAIL**

BOILERS, MACHINERY AND MISC EQUIPMENT

UNIT	INSULATION		LAGGING		REMARKS
	MATERIAL	THICKNESS	MATERIAL	THICKNESS	
MAIN STEAM DRUMS	AMOR ASBESTOS FELT	1"	SHEET STEEL GALV	.031"	SEE DWG NO 448-3902-10
WATER DRUMS AND HEADERS	AMOR ASBESTOS FELT	1"	SHEET STEEL GALV	.031"	SEE DWG NO 448-3902-11
DEAERATING FEED TANKS	AMOR ASBESTOS FELT	1"	ASBESTOS CLOTH	1/8"	SEE DWG NO 448-3902-12
FUEL OIL HEATERS			SHEET STEEL GALV	.015"	SEE DWG NO 448-3902-13
AIR EJECTORS (MAIN AUX DIST)			ASBESTOS CLOTH	1/8"	
CONDENSATE COOLER (DIST. PLANT)	HAIR FELT	1"	CANVAS	985 OZ	
FORCED DRAFT BLOWERS	AMOR ASBESTOS FELT	1"	ASBESTOS CLOTH	1/8"	SEE DWG NO 448-3902-17
H RAIN COMPRESSORS					SEE DWG NO 448-3902-18
L P TURBINES AND CROSS-OVER PIPES					SEE DWG NO 448-3902-11
H R TURBINES					SEE DWG NO 448-3902-10
CRUISING TURBINES					SEE DWG NO 448-3902-9
TURBO GENERATORS					SEE DWG NO 448-3902-12
DISTILLING EVAPORATORS					SEE DWG NO 448-3902-13
DISTILLING AIR EJECTOR CONDENSERS					SEE DWG NO 448-3902-14
H R DRAIN TRAPS			CANVAS	985 OZ	
DRAINAGES (STEAM DRAIN IN TANKS HEATER COIL)					
DRAINERS (DISTILLING PLANT)					
WHISTLE STEAM SEPARATOR			ASBESTOS CLOTH	1/8"	
WATER SEAL (FUEL OIL HEATERS)			CANVAS	985 OZ	
EXHAUST SILENCER (DIESEL GEN EXHAUST)			ASBESTOS CLOTH	1/8"	
FLASH CHAMBER (DISTILLING PLANT)			CANVAS	985 OZ	
FIRE & BILGE PUMPS					SEE NOTE #9
EMERGENCY FEED PUMPS					SEE NOTE #9
MAIN FEED PUMPS	AMOR ASBESTOS FELT	1"	ASBESTOS CLOTH	1/8"	SEE DWG NO 448-3902-4
L O SERVICE PUMPS					SEE DWG NO 448-3902-10
F O SERVICE PUMPS					SEE DWG NO 448-3902-11
F O BOOSTER PUMPS					SEE DWG NO 448-3902-12
MAIN CONDENSATE PUMPS					SEE DWG NO 448-3902-13
MAIN FEED BOOSTER PUMPS					SEE DWG NO 448-3902-14
AUXILIARY FEED BOOSTER PUMPS					SEE DWG NO 448-3902-15
MAIN CONDENSER CIRCULATING PUMPS					SEE DWG NO 448-3902-16
TANK TRAP (DIESEL GEN EXHAUST)					SEE DWG NO 448-3902-17

PIECE NO	NAME
340	1/2" DIA. COPPER
341	1/2" DIA. COPPER
342	1/2" DIA. COPPER
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400	1/2" DIA. COPPER

GENERAL NOTES

INSULATION AND LAGGING SHALL BE READY REMOVABLE AND REPLACEABLE FOR SERVICE MAINTENANCE AND REPAIR OF ALL INSULATED EQUIPMENT WITHOUT DESTRUCTION OF SUCH COVERING.

ALL STEAM, EXHAUST, HOT WATER AND FUEL OIL PIPING SHALL BE INSULATED WITH HEAT INSULATING MATERIAL AS SPECIFIED ON THIS PLAN FOR THEIR RESPECTIVE SERVICES.

COVERED IN ACCORDANCE WITH NOTE #13.

WHERE SPECIFIED, ALL COLD WATER PIPES ABOVE FLOOR LEVELS ONLY SHALL BE COVERED IN ACCORDANCE WITH NOTE #13.

REFRIGERATION PIPES SHALL BE INSULATED IN ACCORDANCE WITH INSTRUCTIONS 5A.

PRIOR TO INSULATING ALL EXTERNAL SURFACES OF UNGALVANIZED FERROUS METAL PIPING, FITTINGS AND VALVES SHALL, AFTER CLEANING, BE GIVEN TWO (2) COATS OF HEAT RESISTING ALUMINUM PAINT NO. SPECS 8-18-11 IN ACCORDANCE WITH GEN SPECS 8-18-11.

BLACK SHEET STEEL LAGG NO. 014 THICK SHALL BE FITTED OVER CLOTH LAGGING ONLY WHERE REQUIRED FOR THE PROTECTION OF INSULATION FROM DAMAGE SUCH AS BLAND LEAKAGES OR ABRASIONS. ALL STEAM LINES AND STEAM MANIFOLDS LOCATED DIRECTLY UNDER LUB. OIL AND FUEL OIL SERVICE LINES SHALL HAVE SHEET STEEL LAGGING, PAINTED ON BOTH SIDES WITH 2 COATS OF RED LEAD AND ONE COAT OF APPROVED COLOR PAINT ON THE OUTSIDE ONLY.

THE DIESEL ENGINE EXHAUST AND ESCAPE PIPING, VALVES AND FITTINGS LOCATED IN POSITIONS WHERE EXPOSED TO THE WEATHER OR SALT WATER SPRAY, SHALL NOT BE INSULATED OR LAGGED BUT SHALL BE COATED WITH AN APPROVED HEAT AND CORROSION RESISTING PAINT. SUITABLE GUARDS SHALL BE INSTALLED WHERE NECESSARY TO PROTECT PERSONNEL.

WHERE STEAM HEATING PIPES PASS THRU BULKHEADS, THE COVERS SHALL HAVE SUFFICIENT CLEARANCE FOR EXPANSION OF PIPES. SEE DETAILS ON DRAWING NO. 448-3902-6.

THE "SEE NOTE #9" FOUND IN "REMARKS" COLUMN IN THE ABOVE LIST OF BOILERS, MACHINERY AND MISCELLANEOUS EQUIPMENT REFERS TO THE STEAM END OF VARIOUS MACHINERY EQUIPMENT WHICH ARE SHIPPED COMPLETELY INSULATED AND LAGGED BY THE MANUFACTURER.

MATERIAL FOR NON-REMOVABLE FLANGE COVERS ONLY IS ORDERED ON DWG NO 448-3902-6.

ALL INSULATION AND LAGGING MUST MEET THE REQUIREMENTS OF N.D. GEN. SPECS SUB SECT 839-1 OF JUNE 1, 1940 AND GEN. SPECS 85-1 OF MAY 1, 1938.

THE 4" OD DOWN COMER BOILER TUBES WHICH ARE INDICATED ON PORTER VERTICAL CORR. PLAN NO. NY-400-800-6 BUREAU OF ENG FILE NO 00448-800-100 TO BE COVERED WITH A SINGLE LAYER 1" THICK OF 870 AMOSITE SECTIONAL PIPE COVERING APPLIED DIRECTLY TO THE TUBE AND SECURED IN PLACE BY AT LEAST FOUR (4) LOOPS PER SECTION WITH A 0.4" DIA. ANNEALED HOT DIPPED GALV. IRON WIRE. ALL SEAMS TO BE POINTED UP WITH PLASTIC CEMENT NO. SPECS 32014 TYPE "A" THE INSULATION TO BE LAGGED WITH ASBESTOS CLOTH N.D. SPEC 32014 TYPE "A" MODIFIED, FITTED SMOOTH AND SEWED ON USING BRASS INSERTED ASBESTOS YARN NOT LESS THAN THREE (3) STITCHES PER INCH.

FOR 2" & 3" INCL. USE FIBROUS GLASS TAPE (N.D. SPEC 32018) IN LIEU OF ASBESTOS CLOTH FOR PIPE LAGGING, IN LINEAR QUANTITIES AS FOLLOWS: 4" WIDTH - 25,000 FT.; 3" WIDTH - 35,000 FT.; 2" WIDTH - 50,000 FT. & 1 1/2" WIDTH - 75,000 FT.

WHISTLE & BUREN PIPING ABOVE MAIN DECK TO BE LAGGED WITH CANVAS & WATERPROOFED WITH ONE COAT OF "INSULKOTE" CEMENT OR EQUAL, FOR BOSTON BUILT SHIPS ONLY.

AN IMBINATION OF WATER REPELLENT AMOSITE ASBESTOS FELT 1/2" THICK OR EQUAL WRAPPED WITH A WATERPROOF AND FIREPROOF PAPER AND LAGGED WITH GLASS TAPE, SHALL BE SUBSTITUTED FOR HAIR FELT AND ASPHALT PAPER ON ALL COLD WATER PIPING AND MISCELLANEOUS EQUIPMENT AS CALLED FOR ON THIS PLAN, IN ACCORDANCE WITH BU SHIP LETTER 339-W/EN 28/22-11 (3-45) OF OCT. 15, 1942.

LIST OF MATERIAL QUANTITIES ARE FOR ONE PUMP

NO.	NAME OF PIECE	QTY.	MATERIAL	FINISH	REMARKS	PRICE	TOTAL
270	WALNUT KEYWAY	1	WALNUT	32 H 2			
271	KEYS BARS, CIL.	2	BRASS	COMM'L			
272	KEYS BARS, CARST	2	"	"			
273	BRASS SCREW SCREWS		STEEL				
274	"		"				
275	STEEL PLATE	2	STEEL				
276	"	4	"				
277	"	4	"				
278	STEEL SCREWS		"				
279	"	2	"				
280	"	4	"				
281	"	4	"				
282	BRASS WALKER CLAMP	2	BRASS	32 H 2			
283	INSULATING MATERIAL		85% WOLFRAM	32 H 2			
284	HEAD CASE	1	GALVANIZED SHEET IRON	47.5 H 2			
285	"		STEEL	COMM.			
286	WALNUT SCREWS	4	BRASS				
287	BRASS FOR STRAP	1	BRASS				
288	WALNUT	12	BRASS				
289	WALNUT SCREWS	2	"	42.5 H 2			
290	WALNUT PLATE	1	BRASS	32 H 2			
291	BRACE C	4	STEEL	COMM'L	65-115E		264.42-1400-24
292	BRACE D	4	"	"	"		"

NOTE A - GALVANIZED STRAP IRON SUBSTITUTED FOR ORIGINAL INSTALLATION ON PUMPS FOR LATER VESSELS BY AUTHORITY OF SUPERVISORS OF SHIPBUILDING LETTER TO FED (G.C) 80495 CLASS/547 (49345-P) OF JULY 23, 1947

FINISH SYMBOLS

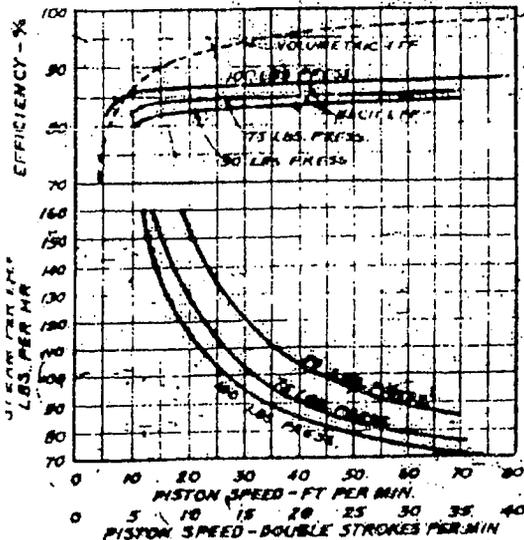
- | | | |
|--------------------|------------|--------------|
| (1) WITH TOOL FIN. | (2) POLISH | (3) FILE |
| (4) FINE TOOL FIN. | (5) DRILL | (6) SCRAPE |
| (7) GRIND | (8) REAM | (9) SPOTFACE |

GENERAL NOTES

1. ALL MATERIAL TO BE IN ACCORDANCE WITH SPECIFICATIONS FOR INSPECTION BY MATERIAL ENGINEER BY SHIP'S DEPT. PLAN
 2. ALL THREADED TO BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS
 3. ALL BOLT HEADS ROUNDED, NOT CHAMFERED
 4. SPACINGS BETWEEN ALL PARTS AND BOLT HEADS
 5. SET END OF ALL STAPLES 5 THIRDS FT - SPECIAL TWO 1/4 INCH END FT - ALL OTHERS 1/2 INCH END TAPPED FT
 6. SET DEPTH OF STAPLE TO BE EQUAL TO DIAMETER OF STAPLE PLUS 1/2
 7. HYDRAULIC TEST PRESSURE 150 LBS/IN² (WATER ONLY)
 8. ALL PARTS SUBJECT TO FINAL INSPECTION BY SUPERVISOR TESTED TO 150 LBS/IN² PRESSURE
 9. WINDING STRAP IRON INSPECTION BY SUPERVISOR
 10. ALL SPACINGS FOR END OF PUMPS TO BE IN ACCORDANCE WITH PLAN
 11. PUMPS TO BE SHIP ON ALL OTHER PUMPS
- (8) PUMPS ASSEMBLY TO COMPLY WITH DESIGN ON A-1000

PERFORMANCE CURVES

SUCTION - 2 FT. SUBMERGENCE 90° F. TEMP.



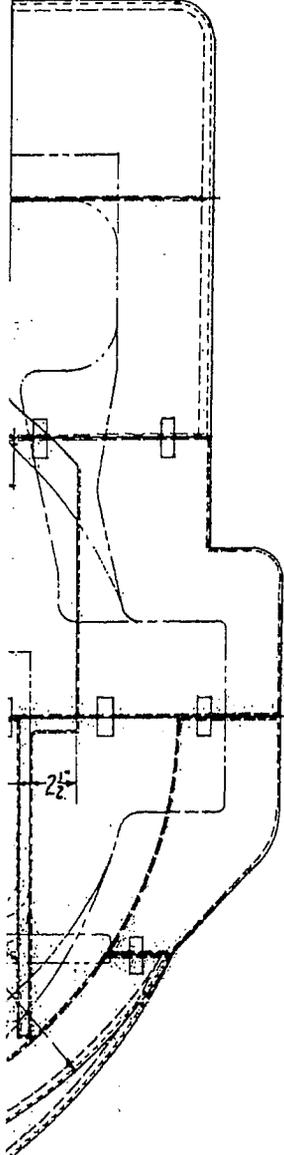
SCHEDULE OF INSULATION-ENGINEERING & HULL

INSULATION & LAGGING FOR AUXILIARIES - SHOWN ON PLANS

ITEM NO.	UNIT	INSULATION		LAGGING		SUB-COMT (PLANS)
		MATERIAL	THICK.	MATERIAL	THICK.	
500	MAIN DISC PUMP-TUBES - 4 PER SHIP	2" LAYER OF PLASTIC CEMENT ON CASING, PUMP & 1" THK CORR SP. THE REM. CEMENT MIXED WITH 1-PART LIAMITE CEMENT IN 4 PORTION OF THE CASING PLASTIC INSULATION AROUND VALVE COUPLERS & THE BOLTS	1 1/2"	AMP. CLOTH TYPE A 100	1/2"	B.F. STURTEVANT DWG DIS-793
501	MAIN CONDENSATE PUMP-TUBES 4 PER SHIP	MATERIAL & APPLICATION THE SAME AS LISTED ABOVE UNLESS PLANS FOR REDUCTION WHERE AVAILABLE.	2 1/2"			
502	MAIN FEED BOOSTER PUMP-TUBES 4 PER SHIP		1 1/2"			TERTY STEAM NO. PLANS
502A	MAIN FEED BOOSTER PUMP-TUBES 4 PER SHIP		1 1/2"			
503	MAIN FEED PUMP-TUBES 8 PER SHIP		1 1/2"			
504	MAIN FEED PUMP 8 PLS SHIP		1 1/2"			
505	PACKED HEAPT BLOWER TUBES 4 UNITS PER SHIP		1 1/2"			NO PLANS
506	FO. SERVICE PUMP-TUBES 8 UNITS PER SHIP		1 1/2"			WESTINGHOUSE NO PLANS
507	FO. BOOSTER & TEAN SPER. PUMP TUBES 2 UNITS PER SHIP		1 1/2"			B.F. STURTEVANT DWG DIS-783
508	PIER & FLUSHING PUMP TUBES 2 UNITS PER SHIP		1 1/2"			B.F. STURTEVANT DWG-DIS-793
509	INSPECTION FITT. 4 UNITS PER SHIP	2-1" THK LAYERS POLYETHYLENE PLUS 1" THK CORR OF EAGLE 12 PLASTIC FINED WITH 1 PART LIAMITE CEMENT TO 4 PARTS OF PLASTIC.	2 1/2"			B.F. STURTEVANT DWG DIS-783 1971-37-D-27
517	1300 KW TURBO-GEN 4 UNITS PER SHIP	MATERIAL TO BE ORDERED IN ACCORDANCE WITH LIST OF MATERIAL ON THE EE. CO. MASTER LAGGING PLAN WW-666319				
518	HEAT EXCHANGERS FOR AIR COND'T BYS. (2) UNITS PER SHIP 40" LONG 10 1/4" DIA.	COMP'D CORK LAGS 1" THK. 2 1/2" WIDE AT OUTSIDE. RADIAL BEVELLED TO SUIT. 1/4" DIA. ENDS COMP'D CORK BOARD PIECES 1" THK. 10 1/4" DIA. ALL SURFACES TO BE THOROUGHLY & EVENLY COATED WITH VAPOR SEAL. INSULATION SECURED WITH WIRE FUMING WITH VAPOR SEAL.		GLASS-BESTON CLOTH TYPICAL PLAIN WEAVE SECURED TO VAPOR SEAL WITH 1/2" STILL SOFT (NO SEWING)	1/2"	FRICK CO. DRAWING
NOTE:						
INSULATION & LAGGING FOR THE		ABOVE LISTED ITEMS				
IS ORDERED IN 1/4 OF THIS SCHED		EXCEPT FOR 1300KW.				
TURBO-GENERATORS						

BILL OF MATERIAL — QUANTITIES FOR ONE UNIT — 1 UNIT PER SHIP

PIECE NO.	NAME OF PIECE	NO. WANTED	MATERIAL	NAVY DEPT. SPECIFICATION	REMARKS	DRAWING NUMBERS	PATTERN NUMBER	G.E. MAX SPEC	WT-LBS PER PC.
1	ASSEMBLY	X							
2	CLIP	30	STEEL	46 S2	SEE NOTE 4				1 1/2
3	LACING RING	30	STEEL	46 S13	CADMIUM PLATE-SEE NOTE 6				2
4	WASHER	30	STEEL GALV.	47 S10TYPE II	SEE NOTE 6				3
5	LACING WIRE .080 DIA.	200FT	COPPER	22 W9	SEE NOTE 5-6				1 1/2
6	INSULATION	3000FT	ASBESTOS FELT	32 F3	SEE NOTE 4-7-8				135
7	INSULATION	2500FT	ASBESTOS FELT	32 F3	SEE NOTE 4-7-9				28
8	INSULATION	1500FT	ASBESTOS FELT	32 F3	SEE NOTE 4-7-10				45
9	INSULATION	1450FT	ASBESTOS FELT	32 F3					52
10	INSULATION	1250FT	ASBESTOS FELT	32 F3					44
11	INSULATION	2500FT	ASBESTOS FELT	32 F3					32
12	COVER FOR BLANKET (INSIDE)	2400FT	ASBESTOS CLOTH	32CII-TYPE C	SEE NOTE 11				24
13	COVER FOR BLANKET (OUTSIDE)	1650FT	ASBESTOS CLOTH	32CII-TYPE B	SEE NOTE 11				36
14	INSULATION FOR BLANKET	3000FT	ASBESTOS FELT	32 F3	SEE NOTE 5-11				110
15	TWINE FOR BLANKET	5LBS	ASBESTOS	32CII-TYPE D	SEE NOTE 11				5
16	PLASTIC INSULATION	4000FT	ASBESTOS	32CII-TYPE B	SEE NOTE 12				650
17	LAGGING	200LBS	ASBESTOS CEMENT	32C14	SEE NOTE 14-17				200
18	LAGGING	70LBS	PORTLAND CEMENT	33-C-191	SEE NOTE 17				70
19	LAGGING	150LBS	CEMENT	52 C 5	SEE NOTE 18-19				120
20	LAGGING	6000FT	ASBESTOS CLOTH	32CII-TYPE A	SEE NOTE 19				60
21	PARTING	1500FT	ASBESTOS CLOTH	32CII-TYPE B	SEE NOTE 15				15
22	SNAP FASTENERS	X							



- NOTE 1 INSULATION OR LAGGING TO BE IN ACCORDANCE WITH GENERAL NOTE 16 SPECIFICATIONS FOR MACHINERY 539-1.
- NOTE 2 THICKNESS OF INSULATION TO BE IN ACCORDANCE WITH SPECIFICATION 539-1-F-6 EXCEPT WHERE PHYSICAL CONDITIONS MAKE THIS IMPRACTICAL.
- NOTE 3 THICKNESS OF INSULATION AT POINTS MARKED "X" SHOW EXCEPTIONS TO GENERAL SPECIFICATIONS.
- NOTE 4 CLIPS TO BE TACK WELDED TO CASING. WELDING TO BE IN ACCORDANCE WITH GENERAL SPECIFICATIONS FOR MACHINERY 51-2 CLASS B4.
- NOTE 5 INSULATION TO BE SECURED BY WIRE LACED THROUGH CLIPS.
- NOTE 6 LACING RINGS TO BE SECURED TO ASBESTOS CLOTH THROUGH WASHERS PLACED ON BOTH SIDES OF CLOTH.
- NOTE 7 INSULATION MATERIAL TO BE ASBESTOS WOVEN FELT, IN ACCORDANCE WITH 539-1-F-6. WEIGHT MUST NOT EXCEED 12 LBS. PER CU. FT.
- NOTE 8 4 1/2" OF INSULATION TO CONSIST OF THREE LAYERS OF 1" FELT AND TWO LAYERS OF 3/4" FELT.
- NOTE 9 3 1/2" OF INSULATION TO CONSIST OF TWO LAYERS OF 1" FELT AND TWO LAYERS OF 3/4" FELT.
- NOTE 10 3" OF INSULATION TO CONSIST OF THREE LAYERS OF 1" FELT.
- NOTE 11 BLANKETS TO BE BUILT UP WITH LAYERS OF FELT TO THE REQUIRED THICKNESS AND ENCLOSED IN ASBESTOS CLOTH ON THE INSIDE AND OUTSIDE, STITCHED AND SEWN WITH ASBESTOS TWINE TO PREVENT SHIFTING.
- NOTE 12 ALL CREVICES AND INFREQUENTLY REMOVED FLANGES TO BE FILLED AND COVERED WITH ASBESTOS PLASTIC INSULATING CEMENT.
- NOTE 13 SURFACES OF PERMANENT INSULATION TO BE SMOOTHED WITH PLASTIC INSULATING CEMENT.
- NOTE 14 SURFACES OF PLASTICS SHOULD BE SMOOTHED OVER WITH ASBESTOS FINISHING CEMENT.
- NOTE 15 PARTING SURFACES BETWEEN PERMANENT INSULATION AND BLANKETS OR PLASTICS SHALL BE COVERED WITH ASBESTOS CLOTH STUCK TO THE PERMANENT INSULATION WITH INSULATION CEMENT.
- NOTE 17 THE EXTERIOR SURFACE OF THE PERMANENT INSULATION SHALL BE COVERED WITH A PROTECTING LACING OF HARD FINISH ASBESTOS INSULATING CEMENT AND ASBESTOS CLOTH.
- NOTE 18 1/2" COAT OF ASBESTOS INSULATING CEMENT TEMPERED WITH PORTLAND CEMENT (FOUR PARTS ASBESTOS CEMENT TO ONE PART PORTLAND CEMENT) TROWEL RUBBED TO A SMOOTH FINISH OVER THE INSULATION. THIS SHALL BE ALLOWED TO DRY FOR 24 HOURS BEFORE APPLYING INSULATION CEMENT.
- NOTE 19 A COATING OF INSULATION CEMENT SHALL BE APPLIED TO THE HARD FINISH CEMENT AND ALLOWED TO DRY FOR ONE HOUR AFTER WHICH A SECOND COAT OF THE SAME CEMENT SHALL BE APPLIED AND ALLOWED TO DRY BEFORE APPLYING THE ASBESTOS CLOTH.
- NOTE 20 ASBESTOS CLOTH COATED ON THE UNDER SIDE WITH INSULATION CEMENT SHALL BE APPLIED TO THE HARD FINISH CEMENT AND ALLOWED TO DRY FOR 72 HOURS. THE SURFACE OF THE ASBESTOS CLOTH SHALL BE PAINTED.

LEGEND OF FINISH SYMBOLS

GRADE OF FINISH

- 1 - FINE, GRIND & LAPPED
- 2 - VERY FINE GRIND
- 3 - FINE GRIND
- 4 - FINE TOOL MACHINING
- 5 - MEDIUM TOOL MACHINING
- 6 - MACHINE RUN TOOL FINISH
- 7 - BETTER THAN ROUGH TOOL MACH
- 8 - ROUGH TOOL MACHINING

SUFFIX TO DENOTE TYPE OF FINISH

- S - STEAM JOINT
- O - OIL JOINT
- P - POLISH
- G - GRIND
- F - FLAME CUT
- N - NO FINISH ALLOW ON PART

NO. PART	DESCRIPTION	APPROVED DATE	AUTHORITY

ALTERATIONS

AP 00 U.S.S. BANGUE
 AP 02 U.S.S. OZARD
 AP 03 U.S.S. MONTANA
 AP 04 U.S.S. MONTANA
 AP 07 U.S.S. OZARD
 AP 106 U.S.S. CATSKILL
 GME-5256-7000

3500HP. MAIN PROPULSION TURBINE GEAR UNIT

LAGGING

H.P. TURBINE - STARBOARD UNIT

SCALE 3 INCHES=1 FOOT

GENERAL ELECTRIC COMPANY
 LYNN, MASS.

DESIGN BY: [Signature] APPROVED: [Signature]
 FINISHED BY: [Signature] DATE: 27. COMD US N' REF

TRACED BY: [Signature] APPROVAL LETTER: [Signature]
 INSPECTED BY: [Signature] DATE: 4 Feb 1941

APPROVED: [Signature] DATE: 4 Feb 1941

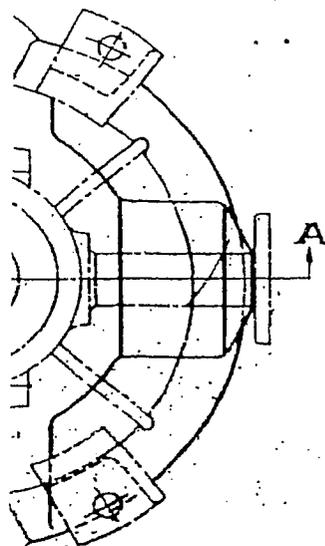
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WW-6664207 INDEX GROUP FILE NUMBER

2 SHEETS SHEET 1 GMS 641 673 ALT
 641 641 646 646

AP 109 INSULATING MFG. CORP.	EN-35
AP 108 INSULATING MFG. CORP.	EN-35
AP 161 INSULATING MFG. CORP.	EN-35
AP 100 INSULATING MFG. CORP.	EN-35
AP 07 WELLS AND RICE MFG. CORP.	C-05-12
AP 106 WELLS AND RICE MFG. CORP.	C-05-12
GEN. ELEC. CO.	C-05-12

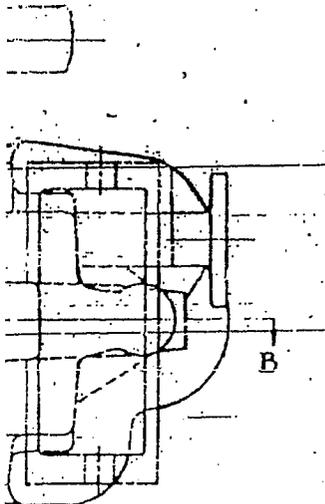
BUREAU OF SHIPS CONTRACT NO. 73386



LIST OF MATERIAL						
QUANTITIES ARE FOR ONE PUMP						
PIECE NO.	NAME OF PIECE	NO. PLYS.	MATERIAL	MATERIAL SPECIFICATION	REMARKS	PIECE QTY.
1	INSULATION (NON-FIBROUS)	1	CEMENT	52-C-11		1
2	INSULATION	1	CEMENT	52-C-8		
3	CLOTH	1	ASBESTOS	52-C-11 TYPE A		
4	INSULATION 1" THICK	1	CEMENT	52-C-3		
5	PORTLAND CEMENT	1	CEMENT	55-C-181		

INSULATION SHALL BE APPLIED AS FOLLOWS:
 A LAYER OF 1" THICK WOVEN ASBESTOS FELT (NO. SPEC. 52-F-3) GLUED TO THE PUMP CASING WITH INSULATING CEMENT (NO. SPEC. 52-C-8). THE FELT SHOULD THEN BE LAGGED WITH 1/2" LAYER OF INSULATING CEMENT (NO. SPEC. 52-C-11 TYPE B) TEMPERED WITH PORTLAND CEMENT (NO. SPEC. 55-C-181) 4 PARTS INSULATING CEMENT TO 1 PART PORTLAND CEMENT (NO. SPEC. 55-C-181) TROWEL RUB TO A SMOOTH FINISH.
 AFTER DRYING FOR 24 HOURS AN INSULATION CEMENT (NO. SPEC. 52-C-8) SHALL BE APPLIED TO THE HARD FINISH CEMENT AND ALLOWED TO DRY FOR ONE HOUR AFTER WHICH A SECOND COAT OF THE SAME CEMENT SHALL BE APPLIED AND ALLOWED TO DRY. THE INSULATION SHALL THEN BE COVERED WITH ASBESTOS CLOTH (NO. SPEC. 52-C-11 TYPE A) WHICH SHALL BE COATED ON THE UNDERSIDE WITH THE INSULATION CEMENT AND ALLOWED TO DRY FOR 72 HOURS. THE EDGES OF THE ASBESTOS CLOTH SHALL BE BEVELLED WITH ASBESTOS AND PORTLAND CEMENT AS A PROTECTION AGAINST BEING TORN AWAY AT THE EDGE.

NOTE: INSULATION AND LAGGING FURNISHED AND APPLIED BY THE NAVY YARD.



FOR OUTLINE DRAWING REFER TO BUFFALO PUMPS, INC.
 DRAWING NO. CA-6312 QUANTITY BB 61-347-018
 UNITS PER SHIP

NO.	DATE	DESCRIPTION	APPROVED	INITIALS
ALTERATIONS				
		USS IOWA	BB 61	
		USS NEW JERSEY	BB 62	
		USS MISSOURI	BB 63	
		USS WISCONSIN	BB 64	
		USS ILLINOIS	BB 65	
		USS KENTUCKY	BB 66	
VERTICAL AUXILIARY FEED BOOSTER PUMP LAGGING DETAILS				
SCALE 8 INCHES = 1 FOOT				
BUFFALO PUMPS, INC. BUFFALO, N.Y.				
CONT'D 7244		DATE: AUG. 18, 1949		
DRAWN BY		APPROVED:		
CHECKED BY <i>[Signature]</i>		<i>[Signature]</i>		
CHECKED BY				
APPROVED				
BUFFALO PUMPS, INC. CHG.		BUREAU OF ENG. FILE NO.		
CA-6312		INDEX	GROUP	FILE NUMBER
		BB 61	547	0800

**CORRECTED
PLAN**

EXHIBIT 3

LIST OF MATERIAL

QUANTITIES ARE FOR ONE PUMP

PIECE NO.	NAME OF PIECE	NO. REQD.	MATERIAL	MATERIAL SPECIFICATION	REMARKS	PIECE PAT. NO.
1	INSULATION FROM THE PUMP CASE	1	CEMENT	32-C-10		
2	INSULATION	1	CEMENT	32-C-8		
3	CLOTH	1	ASBESTOS	32-C-11		
4	INSULATION 1" THICK	1	CEMENT	32-F-3		
5	PORTLAND CEMENT	1	CEMENT	33-C-101		

INSULATION SHALL BE APPLIED AS FOLLOWS:

A LAYER OF 1" THICK WOVEN ASBESTOS FELT (N.D. SPEC. 32-F-3) GLUED TO THE PUMP CASING WITH INSULATING CEMENT (N.D. SPEC. 32-C-8). THE FELT SHOULD THEN BE LAGGED WITH 1" LAYER OF INSULATING CEMENT (N.D. SPEC. 32-C-10 TYPE 'B') TEMPERED WITH PORTLAND CEMENT (N.D. SPEC. 33-C-101) 4 PARTS INSULATING CEMENT TO 1 PART PORTLAND CEMENT (N.D. SPEC. 33-C-101) TROWEL RUB TO A SMOOTH FINISH.

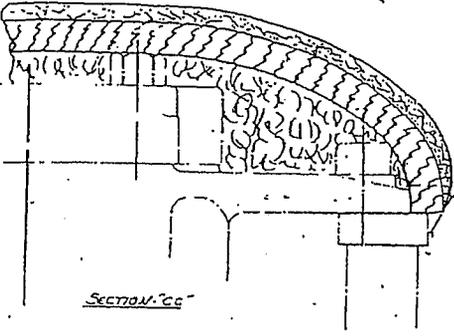
AFTER DRYING FOR 24 HOURS AN INSULATION CEMENT (N.D. SPEC. 32-C-8) SHALL BE APPLIED TO THE HARD FINISH CEMENT AND ALLOWED TO DRY FOR ONE HOUR AFTER WHICH A SECOND COAT OF THE SAME CEMENT SHALL BE APPLIED AND ALLOWED TO DRY. THE INSULATION SHALL THEN BE COVERED WITH ASBESTOS CLOTH (N.D. SPEC. 32-C-11 TYPE 'A') WHICH SHALL BE COATED ON THE UNDERSIDE WITH THE INSULATING CEMENT AND ALLOWED TO DRY FOR 72 HOURS. THE EDGES OF THE ASBESTOS CLOTH SHALL BE BEVELLED WITH ASBESTOS AND PORTLAND CEMENT AS A PROTECTION AGAINST BEING TORN AWAY AT THE EDGE.

NOTE: INSULATION AND LAGGING FURNISHED AND
APPLIED BY THE NAVY YARD.

LIST OF MATERIAL

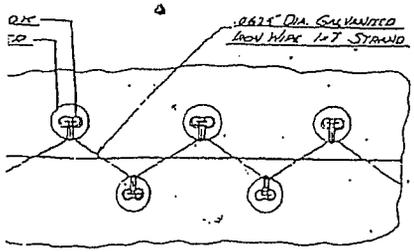
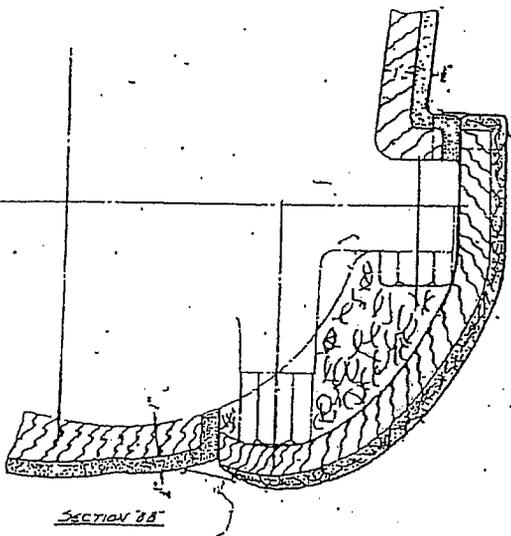
SUBMERSIBLE 12" DIAMETER PUMP 12" DIAMETER PUMP

NO.	DESCRIPTION	QUANTITY	UNIT	REMARKS
1	WELDED STEEL SHEET	100	SQ. FT.	1/2" THICK
2	WELDED STEEL SHEET	100	SQ. FT.	3/8" THICK
3	WELDED STEEL SHEET	100	SQ. FT.	1/4" THICK
4	WELDED STEEL SHEET	100	SQ. FT.	1/8" THICK
5	WELDED STEEL SHEET	100	SQ. FT.	1/16" THICK
6	WELDED STEEL SHEET	100	SQ. FT.	1/32" THICK
7	WELDED STEEL SHEET	100	SQ. FT.	1/64" THICK
8	WELDED STEEL SHEET	100	SQ. FT.	1/128" THICK
9	WELDED STEEL SHEET	100	SQ. FT.	1/256" THICK
10	WELDED STEEL SHEET	100	SQ. FT.	1/512" THICK
11	WELDED STEEL SHEET	100	SQ. FT.	1/1024" THICK
12	WELDED STEEL SHEET	100	SQ. FT.	1/2048" THICK
13	WELDED STEEL SHEET	100	SQ. FT.	1/4096" THICK
14	WELDED STEEL SHEET	100	SQ. FT.	1/8192" THICK
15	WELDED STEEL SHEET	100	SQ. FT.	1/16384" THICK
16	WELDED STEEL SHEET	100	SQ. FT.	1/32768" THICK
17	WELDED STEEL SHEET	100	SQ. FT.	1/65536" THICK
18	WELDED STEEL SHEET	100	SQ. FT.	1/131072" THICK
19	WELDED STEEL SHEET	100	SQ. FT.	1/262144" THICK
20	WELDED STEEL SHEET	100	SQ. FT.	1/524288" THICK
21	WELDED STEEL SHEET	100	SQ. FT.	1/1048576" THICK
22	WELDED STEEL SHEET	100	SQ. FT.	1/2097152" THICK
23	WELDED STEEL SHEET	100	SQ. FT.	1/4194304" THICK
24	WELDED STEEL SHEET	100	SQ. FT.	1/8388608" THICK
25	WELDED STEEL SHEET	100	SQ. FT.	1/16777216" THICK
26	WELDED STEEL SHEET	100	SQ. FT.	1/33554432" THICK
27	WELDED STEEL SHEET	100	SQ. FT.	1/67108864" THICK
28	WELDED STEEL SHEET	100	SQ. FT.	1/134217728" THICK
29	WELDED STEEL SHEET	100	SQ. FT.	1/268435456" THICK
30	WELDED STEEL SHEET	100	SQ. FT.	1/536870912" THICK
31	WELDED STEEL SHEET	100	SQ. FT.	1/1073741824" THICK
32	WELDED STEEL SHEET	100	SQ. FT.	1/2147483648" THICK
33	WELDED STEEL SHEET	100	SQ. FT.	1/4294967296" THICK
34	WELDED STEEL SHEET	100	SQ. FT.	1/8589934592" THICK
35	WELDED STEEL SHEET	100	SQ. FT.	1/17179869184" THICK
36	WELDED STEEL SHEET	100	SQ. FT.	1/34359738368" THICK
37	WELDED STEEL SHEET	100	SQ. FT.	1/68719476736" THICK
38	WELDED STEEL SHEET	100	SQ. FT.	1/137438953472" THICK
39	WELDED STEEL SHEET	100	SQ. FT.	1/274877906944" THICK
40	WELDED STEEL SHEET	100	SQ. FT.	1/549755813888" THICK
41	WELDED STEEL SHEET	100	SQ. FT.	1/1099511627776" THICK
42	WELDED STEEL SHEET	100	SQ. FT.	1/2199023255552" THICK
43	WELDED STEEL SHEET	100	SQ. FT.	1/4398046511104" THICK
44	WELDED STEEL SHEET	100	SQ. FT.	1/8796093022208" THICK
45	WELDED STEEL SHEET	100	SQ. FT.	1/17592186044416" THICK
46	WELDED STEEL SHEET	100	SQ. FT.	1/35184372088832" THICK
47	WELDED STEEL SHEET	100	SQ. FT.	1/70368744177664" THICK
48	WELDED STEEL SHEET	100	SQ. FT.	1/140737488355328" THICK
49	WELDED STEEL SHEET	100	SQ. FT.	1/281474976710656" THICK
50	WELDED STEEL SHEET	100	SQ. FT.	1/562949953421312" THICK
51	WELDED STEEL SHEET	100	SQ. FT.	1/1125899906842624" THICK
52	WELDED STEEL SHEET	100	SQ. FT.	1/2251799813685248" THICK
53	WELDED STEEL SHEET	100	SQ. FT.	1/4503599627370496" THICK
54	WELDED STEEL SHEET	100	SQ. FT.	1/9007199254740992" THICK
55	WELDED STEEL SHEET	100	SQ. FT.	1/18014398509481984" THICK
56	WELDED STEEL SHEET	100	SQ. FT.	1/36028797018963968" THICK
57	WELDED STEEL SHEET	100	SQ. FT.	1/72057594037927936" THICK
58	WELDED STEEL SHEET	100	SQ. FT.	1/144115188075855872" THICK
59	WELDED STEEL SHEET	100	SQ. FT.	1/288230376151711744" THICK
60	WELDED STEEL SHEET	100	SQ. FT.	1/576460752303423488" THICK
61	WELDED STEEL SHEET	100	SQ. FT.	1/1152921504606846976" THICK
62	WELDED STEEL SHEET	100	SQ. FT.	1/2305843009213693952" THICK
63	WELDED STEEL SHEET	100	SQ. FT.	1/4611686018427387904" THICK
64	WELDED STEEL SHEET	100	SQ. FT.	1/9223372036854775808" THICK
65	WELDED STEEL SHEET	100	SQ. FT.	1/18446744073709551616" THICK
66	WELDED STEEL SHEET	100	SQ. FT.	1/36893488147419103232" THICK
67	WELDED STEEL SHEET	100	SQ. FT.	1/73786976294838206464" THICK
68	WELDED STEEL SHEET	100	SQ. FT.	1/147573952589676412928" THICK
69	WELDED STEEL SHEET	100	SQ. FT.	1/295147905179352825856" THICK
70	WELDED STEEL SHEET	100	SQ. FT.	1/590295810358705651712" THICK
71	WELDED STEEL SHEET	100	SQ. FT.	1/1180591620717411303424" THICK
72	WELDED STEEL SHEET	100	SQ. FT.	1/2361183241434822606848" THICK
73	WELDED STEEL SHEET	100	SQ. FT.	1/4722366482869645213696" THICK
74	WELDED STEEL SHEET	100	SQ. FT.	1/9444732965739290427392" THICK
75	WELDED STEEL SHEET	100	SQ. FT.	1/18889465911478580854784" THICK
76	WELDED STEEL SHEET	100	SQ. FT.	1/37778931822957161709568" THICK
77	WELDED STEEL SHEET	100	SQ. FT.	1/75557863645914323419136" THICK
78	WELDED STEEL SHEET	100	SQ. FT.	1/151115727291828646838272" THICK
79	WELDED STEEL SHEET	100	SQ. FT.	1/302231454583657293676544" THICK
80	WELDED STEEL SHEET	100	SQ. FT.	1/604462909167314587353088" THICK
81	WELDED STEEL SHEET	100	SQ. FT.	1/1208925818334629174706176" THICK
82	WELDED STEEL SHEET	100	SQ. FT.	1/2417851636669258349412352" THICK
83	WELDED STEEL SHEET	100	SQ. FT.	1/4835703273338516698824704" THICK
84	WELDED STEEL SHEET	100	SQ. FT.	1/9671406546677033397649408" THICK
85	WELDED STEEL SHEET	100	SQ. FT.	1/1934281309335406679289816" THICK
86	WELDED STEEL SHEET	100	SQ. FT.	1/3868562618670813358579632" THICK
87	WELDED STEEL SHEET	100	SQ. FT.	1/7737125237341626717159264" THICK
88	WELDED STEEL SHEET	100	SQ. FT.	1/15474250474683253434318528" THICK
89	WELDED STEEL SHEET	100	SQ. FT.	1/30948500949366506868637056" THICK
90	WELDED STEEL SHEET	100	SQ. FT.	1/61897001898733013737274112" THICK
91	WELDED STEEL SHEET	100	SQ. FT.	1/123794003797466027474542224" THICK
92	WELDED STEEL SHEET	100	SQ. FT.	1/247588007594932054949084448" THICK
93	WELDED STEEL SHEET	100	SQ. FT.	1/495176015189864109898168896" THICK
94	WELDED STEEL SHEET	100	SQ. FT.	1/990352030379728219796337792" THICK
95	WELDED STEEL SHEET	100	SQ. FT.	1/1980704060759456439592675584" THICK
96	WELDED STEEL SHEET	100	SQ. FT.	1/3961408121518912879185351168" THICK
97	WELDED STEEL SHEET	100	SQ. FT.	1/7922816243037825758370702336" THICK
98	WELDED STEEL SHEET	100	SQ. FT.	1/15845632486075651516741404672" THICK
99	WELDED STEEL SHEET	100	SQ. FT.	1/31691264972151303033482809344" THICK
100	WELDED STEEL SHEET	100	SQ. FT.	1/63382529944302606066965618688" THICK



NOTE "A" - HOLES AND WELDS SHALL BE COVERED
BY COPPER (U.S. 92-P-1)

NOTE "B" - INSULATION & LIGGING SHALL BE REALIZED
AND APPROVED BY COMMANDANT



DETAIL "E"
METHOD OF FASTENING: ASBESTOS
INSULATION SET PLASTER

CORRECTED
PLAN

NO.	DESCRIPTION	APPROVED DATE AUTHORITY
ALTERATIONS		
1	U.S.S. IOWA	BB-61
2	U.S.S. NEW JERSEY	BB-62
3	U.S.S. MISSOURI	BB-63
4	U.S.S. WISCONSIN	BB-64
5	U.S.S. ILLINOIS	BB-65
6	U.S.S. KENTUCKY	BB-66
MAIN-FEED PUMP SUGGESTED METHOD OF INSULATION		
SCALE _____		DATE _____
INGERSOLL-RAND CO. SUBMERSIBLE PUMP DIVISION PHILIPSBURG, N. J.		
CONTRACT NO. 7242Z		APPROVED _____
DRAWN BY: J. S. J.		INSPECTED BY: J. S. J.
CHIEF DRY DOCK		HEAD OF DIVISION
INGERSOLL-RAND CO. TAG NO.		BUREAU OF ENGINEERING FILE NO.
215193		INDEX GROUP FILE NUMBER BB61/S47.018

