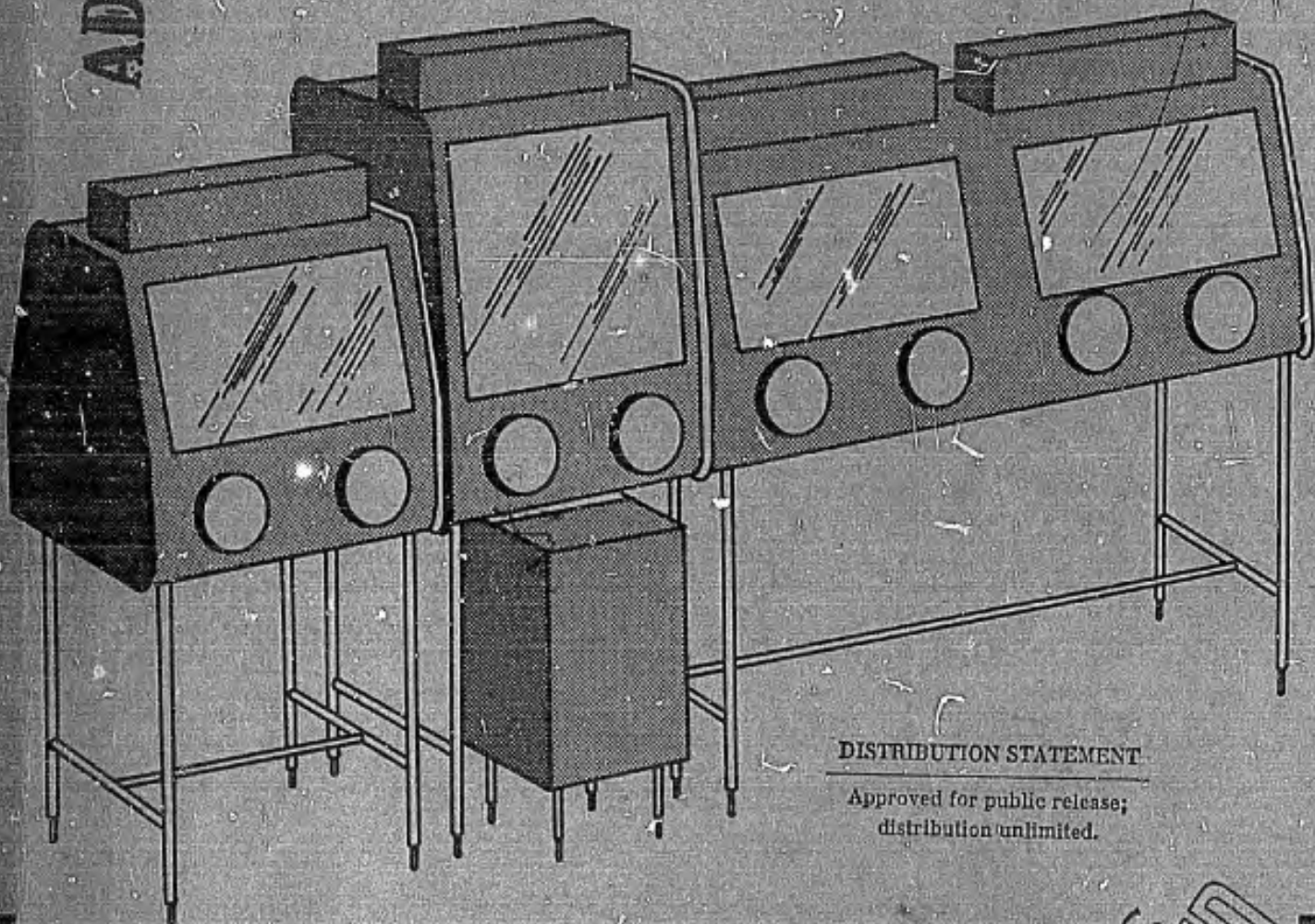


AD 735520

BIOLOGICAL SAFETY CABINETS

VOLUME II



DISTRIBUTION STATEMENT

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PURCHASE DESCRIPTION And ASSEMBLY PROCEDURE

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PROCESS ENGINEERING DIVISION

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FORT DETRICK, FREDERICK, MARYLAND 21701

MAY 1965

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ABSTRACT

This volume consists of two parts. Part I presents a general purchase description for nine types of Class III biological safety cabinets. Part II presents the assembly procedures for Class III cabinets, with special emphasis on seals, sealants, and sealant application. Ten illustrations are included.

PART I. PURCHASE DESCRIPTION

SAFETY CABINETS, BIOLOGICAL

I. SCOPE

I.1 Scope. This purchase description covers various types and sizes of biological safety cabinets and optional accessories used for protection of personnel working with highly infectious microorganisms.

I.2 Classification. Biological safety cabinets shall be of the following types and sizes, as specified (see 6.1):

Type I - 24 by 30 inches (in.) - sloping single side
Size S - 34 in. wide
Size D - 68 in. wide (nominal (nom.))

Type II - 30 by 40 in. - sloping single side
Size S - 34 in. wide
Size D - 68 in. wide (nom.)

Type III - 30 by 30 in. - sloping double side
Size S - 34 in. wide
Size D - 68 in. wide (nom.)

Type IV - 30 by 30 in. - L - shaped
Size S - 34 in. wide

Type V - 30 by 30 in. - T - shaped
Size S - 34 in. wide

Type VI - 24 by 30 in. - rectangular single side
Size S - 34 in. wide
Size D - 68 in. wide (nom.)

Type VII - 32 by 30 in. - rectangular single side
Size S - 34 in. wide
Size D - 68 in. wide (nom.)

Type VIII - 42 by 30 in. - sloping double side
Size S - 34 in. wide
Size D - 68 in. wide (nom.)

Type IX - 30 by 30 in. - sloping single side
Size S - 34 in. wide
Size D - 68 in. wide (nom.)

2. APPLICABLE DOCUMENTS

2.1 Government documents. The following documents of the issue in effect on date of invitation for bids, or request for proposal, form a part of this purchase description to the extent specified herein:

SPECIFICATIONS

FEDERAL

QQ-S-00766 Steel plates, sheets and strip, corrosion resisting

QQ-S-633 Steel bars, carbon, cold finished or hot rolled
(General Purpose)

MILITARY

MIL-G-3787 Glass, laminated, flat (except aircraft)

DRAWINGS

BWP-30-S-0 Cover sheet and drawing list

MANUAL

See Part II cabinet system assembly procedure

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this purchase description to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN WELDING SOCIETY

AWS STANDARDS

CI.1 - Recommended Practices for Resistance Welding.
Spot Welding Stainless Steel.

Welding Handbook - Weld Quality.

(Application for copies should be addressed to American Welding Society, 33 W. 39th Street, New York 18, New York)

UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification - Ratings, Rules, and Regulations.

(Application for copies should be addressed to the Uniform Classification Committee, 202 Union Station, Chicago, Illinois, 60606.)

3. REQUIREMENTS

3.1 Materials and Components.

3.1.1 Materials. All materials cited on applicable drawings of the various types and sizes of safety cabinets shall conform to the specifications listed thereon, or to the specific characteristics set forth on the drawings.

3.1.2 Components.

3.1.2.1 Fabricated components. The fabricated components shall conform to all the specifications, commercial standards, and drawings for the safety cabinets.

3.1.2.2 Commercial components. Substitution of other commercial components for those listed on applicable drawings shall be allowed, provided the substituted parts are equal to or better than the listed parts in material and performance. Documentary evidence of the adequacy of substituted parts shall be submitted to and approved by the Contracting Officer.

3.2 Assembly. Each safety cabinet of the type and size required shall be assembled in accordance with the specific requirements such as: Equipment Number, Type, Assembly Drawings Number, Opening Frames, Opening Panels, Glove Rings, Cup Sink, Vents, Utilities, Stands, Leg Sockets, Shelving, Utility Bracket, Valve Plate, U.V. Fixture and Remarks and Notes as defined on Drawing BWP-30-S-46 and subsidiary drawings.

3.3 Window Panels. The window panels shall be laminated glass, plastic, or tempered glass.

3.3.1 Laminated glass. Laminated glass shall be of specified thickness and shall conform to Class I, Type A of MIL-G-3787.

3.3.2 Plastic. The plastic shall be transparent shall of Cast, Thermosetting, ALLYLDIGYLCOCARBONATE with a minimum of 10% TRIALLYLCYANURATE copolymer. All sheets shall be of specified thickness and protective masked on both sides. (See 6.3).

3.3.3 Tempered glass. Tempered glass shall be glass, plate, tempered and polished and of specified thickness. (See 6.4).

3.4 Construction.

3.4.1 Welding techniques. Unless otherwise specified, the cabinet shall be of full welded construction. All welding shall be done by the heliarc process, and shall be preceded by a suitable solvent degreasing treatment of the areas to be welded. Welding methods used shall be such as to minimize changes in the metallurgical properties of the metal. Resistance welding (spot and stud welding) shall be done immediately following a suitable acid or alkali cleaning process. Studs shall be aligned as to assure a consistent flow of molten metal over the entire contact area during stud welding. All finished welds shall be free of flux, slag and spatter which shall be removed by wire brushing. Overwelding shall be avoided; however, weld sizes shall be adequate to provide necessary mechanical strength and tightness.

3.4.1.1 Seams. All seam welds shall be of full penetration, free from undercut, cracks and pits. The edges of plates to be welded shall be straight and free of burrs, grease and dirt before welding. The fits for joints being welded shall have a maximum opening of 1/16 inch. Concentration of welds shall be avoided.

3.4.1.2 Spot welds. All spot welds shall be made in accordance with AWS Standard - Spot Welding Stainless Steel.

3.4.1.3 Stud welding. All studs shall be secured by a suitable stud welding process as described in the AWS Handbook. The studs shall be located prior to welding by a template method. All studs shall be perpendicular to the surface on which they are attached within 2 degrees. Any tilt, within this limit, shall not take any part of the stud out of the location tolerances shown on the applicable drawings. The stud weld fillet shall not extend beyond the radius of the stud by more than 1/32 inch. Any extension beyond these limits shall be corrected by grinding the fillet back to within specified tolerances and refinishing ground surfaces in accordance with surface finish requirements specified herein. Areas adjacent to the stud shall be cleaned of all scale, flux and spatter. Length of stud shall be in compliance with the dimensions specified on the applicable drawings.

3.4.1.4 Weld finishing. All interior welds shall be finished flush with adjacent surfaces and shall be no rougher than adjacent surfaces. Exterior weld area shall be ground smooth and flush with adjacent surfaces only where necessary to provide gasket seating surfaces. Finishes made for this or other reasons shall be no rougher than the finish on adjacent surfaces. All other weld areas shall be buffed to remove all scale, flux and spatter.

3.4.2 Sheet metal work. The sheet metal work shall be performed by forming, wherever possible, to keep the amount of welding required to a minimum.

3.4.2.1 Waviness. Waviness of sheet metal in the cabinets shall be held to a minimum consistent with good shop practices.

3.4.2.2 Interior finish. All interior surfaces of the cabinets shall be finished as specified on the applicable drawings. All areas shall be free from pits, cracks and blemishes. The surface of all metal edges, welds and fabricating marks shall be ground and buffed to a finish having a surface roughness no greater than the adjoining specified finish.

3.4.2.3 Exterior finish. All exterior surfaces of the equipment shall be finished as specified on the applicable drawings, except as otherwise noted herein. The surface of all metal edges, welds and fabricating marks shall be ground and buffed to remove burrs and sharp edges.

3.4.3 Tolerances.

3.4.3.1 General sheet metal tolerances. The general sheet metal tolerance for dimensions 0 inches to 36 inches shall be plus or minus $1/32$ inch and for dimensions from 36 inches to 72 inches the tolerance shall be plus or minus $1/16$ inch except where otherwise specified on the applicable drawings.

3.4.3.2 Openings. The mean bottom or front edge of all the openings in the cabinet shell, other than end openings, shall be within plus or minus $1/16$ inch of parallel to the mean outside line of the bottom or front surfaces of the shell at or within 1 inch of a bend radius tangent point.

3.4.3.3 Perpendicular surfaces. Perpendicular surfaces shall be held perpendicular to within plus or minus 0°-15' (nom. 3/64" per lin. ft. deflection.)

3.4.3.4 Hole and stud locations. The hole and stud locations in the finished work shall be within plus or minus .016 inch of dimension specified on the applicable drawings, unless otherwise noted. The same template shall be used to drill, punch, or align holes and studs on all mating parts.

3.4.3.5 Window sealing surfaces. The sealing surfaces for all window panels shall be in plane within plus or minus .031 inch per linear foot (continuous around corners) with no abrupt irregularities.

3.4.4 Cabinet system assembly. Component assembly for individual cabinets and cabinet systems shall be performed in strict accordance with the procedures specified in "Cabinet System Assembly Procedure".

3.5 Leakage. Each cabinet and cabinet system shall not leak when tested as specified in "Cabinet Systems Assembly Procedure".

3.6 Mating parts. All mating parts of the cabinets shall assemble without force fits.

3.7 Finished surfaces. All finished surfaces of the cabinets shall be free of pits, cracks, and blemishes, and shall have a surface roughness equal to the adjacent sheet metal finish when tested in accordance with 4.4.2.

3.8 Welds.

3.8.1 Seam. Seam welds shall show no pits or cracks when tested as specified in 4.4.1.

3.8.2 Studs.

3.8.2.1 Nondestructive. Stud welds shall show no cracking, fragmentation, or failure when tested as specified in 4.4.3.1.

3.8.2.2 Destructive. Stud welds shall fail only in the stud or base plate outside the weld zone when tested as specified in 4.4.3.2.

3.8.3 Spot. Spot welds shall be considered acceptable if the weld is torn out in its entirety when tested as specified in 4.4.4.

3.9 Contractor's responsibilities. The contractor shall be responsible for providing the necessary tooling, jigs, dies, gauges, forms, templates, measuring devices, temporary closure panels and testing equipment, together with anything else not otherwise covered in this purchase description that may be required to assure conformance of the cabinets with the requirements of this purchase description. All such jigs or templates made especially for this work shall become the property of the Government.

3.10 Workmanship. The workmanship on the cabinet shall conform to the best standards of metal working and other shop practices. The cabinets shall be free of defects which detract from their appearance or which may in any manner impair their serviceability; the exterior and interior surfaces of the metal work shall conform to the requirements for surface finish specified herein. There shall be a complete absence of readily observable waviness or distortion in all sheet metal parts, caused by faulty welding techniques or forming practices. Wherever

dimensions and tolerances are not specified they shall be determined consistent with best shop practices. Where dimensions and tolerances affect the interchangeability, operation or performance of the cabinets, they shall be held or limited accordingly. After final assembly all cabinets shall be thoroughly cleaned of all stains and other foreign matter.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Special provisions.

4.2.1 Alternative inspection. The supplier may utilize any alternative inspection procedure which will provide equal or better assurance of quality by submitting a written proposal, with justification, and obtaining written approval from the Government prior to instituting the procedure. In case of dispute, the procedures of this specification will govern.

4.2.2 Objective evidence. The supplier shall provide objective evidence acceptable to the Contracting Officer that the requirements of 3.1 and section 5 for which specific inspection has not been provided in this specification have been satisfied.

4.3 Sampling.

4.3.1 Stud welds (for nondestructive test). Samples shall be furnished by the contractor during production at the request and in the presence of the Government representative for testing as specified in 4.4.3.1.

4.3.2 Stud and spot welds (for destructive test). Samples shall be furnished during production by the contractor at the request of and in the presence of the Government representative for testing as specified in 4.4.3.2 and 4.4.4 respectively.

4.4 Tests.

4.4.1 Leakage. The test or tests for leakage shall be conducted according to conditions, procedures and testing equipment specified in "Cabinet Systems Assembly Procedure."

4.4.2 Finishes. Finishes shall be measured by fingernail scratch, comparison with adjacent surfaces and by visual comparison.

4.4.3 Stud welds.

4.4.3.1 Nondestructive. Stud welds shall be tested by bending the stud 10° to 15° from the vertical and straightening it. (The tool

used for this bending may be a 1 inch diameter rod, 10 to 12 inches long, and drilled or tapped on one end to fit the stud.) The weld shall be visually observed for compliance with 3.8.2.1.

4.4.3.2 Destructive. Stud welds shall be tested to destruction with a hammer. Observation shall be made for compliance with 3.8.2.2.

4.4.4 Spot welds. Spot welds shall be tested in accordance with AWS Standard C1.1 (Peel test). Observation shall be made for compliance with 3.8.2.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging.

5.1.1 Level C. Biological safety cabinets shall be packaged in accordance with the manufacturer's commercial practice to provide adequate protection for the cabinets packed as specified in 5.2.1.

5.2 Packing.

5.2.1 Level C. Biological safety cabinets packaged as specified in 5.1.1, shall be packed to afford protection against damage during direct shipment from the supply source to the first receiving activity for immediate use. Containers shall comply with the Uniform Freight Classification Rules, or other common carrier regulations applicable to the mode of transportation.

5.3 Marking. In addition to any special marking required by the contract or order, unit and intermediate packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Ordering data. Procurement documents should specify the following:

(a) Title, number and date of this Purchase Description.

(b) Type, size and all other requirements as shown on BWP-30-S-46.

(c) Type of compound for sealing and jointing (See Para IV of Cabinet System Assembly Procedure).

6.2 Corrosion resistant steel. Corrosion resisting steels as named in QQ-S-00766 is named stainless steel and abbreviated SST on the drawings per commercial practice.

6.3 Plastic. A plastic which conforms to 3.3.2 requirements is XHT-CR-39, a product of Homolite Corporation, Wilmington, Delaware.

6.4 Glass. A glass meeting requirements of 3.3.3 is "Tuf-flex", manufacturer Libby-Owens-Ford.

6.5 Interchangeability. The cabinets covered by this purchase description are of the modular type, and so designed that interchangeability within a similar system is available.

6.6 Military standards. In addition to the military standards referenced in 2.1, the following are listed as an aid in interpreting

and understanding the drawings forming a part of this purchase description:

- (a) MIL-STD-12 - Abbreviations for Use on Drawings
- (b) MIL-STD-15 - Electrical and Electronic Symbols
- (c) MIL-STD-18 - Mechanical Symbols
- (d) JAN-STD-19 - Welding Symbols
- (e) MIL-STD-20 - Welding Terms and Definitions
- (f) MIL-STD-103- Abbreviations (for Electrical and Electronic Use)

6.7 Qualification. In the procurement of products requiring qualification, the right is reserved to reject bids on products that have not been subjected to the required tests and found satisfactory for inclusion on the Qualified Products List. The attention of suppliers is called to this requirement, and manufacturers are urged to arrange to have the products they propose to offer to the Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the cabinets covered by this purchase description.

PART II
CABINET SYSTEM ASSEMBLY PROCEDURE
FOR
CLASS III BIOLOGICAL SAFETY CABINETS

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1 March 1965

I. GENERAL

The following instructions are for guidance and presentation of extent of work involved in the assembly of biological safety cabinets, component parts and accessory equipment through use of sealing compounds. Since safety is the ultimate factor, it is important the Class III cabinets be assembled and sealed with the utmost care, with the consideration of continuous use over a period of several years. Probably the most critical part of the entire procedure for using synthetic rubber compounds for sealing biological safety cabinets is the application procedure. Any number of factors, if not fully understood or avoided, can contribute to joint failures.

Cabinet shells, with all necessary weldments, shall be supplied by the fabricator and approved by a Government representative. Components to be attached with sealant such as windows, glove rings, plates, etc., shall be supplied separately by the fabricator. All component and line assemblies shall be performed by the installing contractor with sole responsibility for accomplishing a sealed system as outlined herein.

II. SITE PREPARATION

Prior to any assembly the installation areas shall be thoroughly washed down and be cleaned free of debris so that setting and jointing

work will be performed in a dust and dirt-free condition. No work involving attachments to the cabinet in the immediate area shall proceed until seven days (curing period) after sealant is applied on cabinet assemblies.

III. WELD LEAK TEST PRIOR TO LINE ASSEMBLY

Cabinet welds shall be inspected by the Government at the fabricator's plant. However, during shipment or subsequent handling, damages may cause an open joint. Therefore, at the installation site, a test set-up shall be provided by the installing contractor. All openings on each cabinet shall be tightly closed (See Fig. 10) and a halogen leak test performed as later described herein. This test shall be performed on each cabinet immediately prior to line assembly and shall be witnessed and approved by a Government representative. Any detected weld leaks shall be rewelded by the installing contractor and retested for leakage.

IV. JOINT SEALANT

Assemblies shall be made by use of the sealant bonding method. Procurement documents shall prescribe the use of either of the following compounds:

- I. Two-part accelerated synthetic rubber (polysulfide type) sealing compound, high quality, aircraft specification

grade, MIL-S-8802C.* (See Sections V and VI)

2. One-part silicone-base sealant compound. An acceptable product is RTV-106 adhesive-sealant as manufactured by General Electric Silicone Products Dept., Waterford, N.Y.

Sealant shall be furnished by installing contractor.

V. MIXING AND STORAGE PROCEDURES FOR TWO-PART COMPOUND

The installing contractor shall furnish all the equipment necessary for the proper mixing, storing and application of the two-part sealing compound. The sealing compound shall be obtained from the manufacturer in 3/4-gallon kits. Both materials shall be packaged separately, suitably labeled to distinguish base compound from accelerator, in sealed, air-tight containers, that favor maximum shelf life.

Kit labels shall show the manufacturer's name, date and place of manufacture, lot number, type and name of sealant, net weight, and color. At the time of receipt at the assembly site, the kits shall be dated to

* Up to August 1962 three major sealant manufacturers have submitted materials that they recommended. After testing and evaluation, only one of the three has been found to be acceptable under all cabinet sealant test conditions. The complete trade designation as extracted from Technical Data Sheet PR-1422 Class B, dated November 1961.

NamePR-1422 Class B-2.
Minimum Application LifeTwo hours.
Standard Container3/4-Gallon kit - 96 fluid ounces in a 1-gallon can.
AcceleratorProvided in proportion to base material in separate container on lid of gallon can.
ManufacturerProducts Research Company, 410-416 Jersey Avenue, Gloucester City, New Jersey.

insure that no sealant is used after more than six months' in-house storage. To insure maximum shelf life, sealants shall be stored in unopened containers at 80°F or below.

The 3/4-gallon kit shall be received in a form that permits the accelerator portion to be added to the base compound in the gallon can without weighing either ingredient. Care shall be taken to insure that the accelerator is stirred* before addition to the base compound and that as much of the accelerator as possible be transferred to the gallon can of base compound. Either the Pyles (Pyles Industries, Inc., Detroit, Mich.) or Semco (Semco Sales & Services, Inc., Inglewood, Calif.) 1300 series dasher-type mixers or other mixers of equal characteristics are acceptable for mixing the sealant. Before blending the two with the dasher-type mixer, mix them by hand with a spatula to avoid edge-loading the can with accelerator. Most of the acceptable dasher-type mixers require either that the rolled portion of the cover rim on the gallon can be removed or that the materials be transferred to a mixing pot on the mixer itself. When mixed in a separate pot, the pot should be "battered" with previously mixed sealant. For best rheological properties and minimum void content, material should be mixed for five minutes at

***WARNING:** Catalyst in the sealant accelerator can be toxic. Avoid prolonged contact. Wash traces off skin immediately with chlorinated hydrocarbon followed by soap and water.

a rate of seven strokes per minute. The pot pressure should be maintained at 60 to 80 psig and cooling water should be circulated around the mixing pot to avoid excessive temperature rise.

In all cases, mixing procedures should conform very closely, with only minor modifications, to those specified by the manufacturer.

In order to test for proper mixing procedures on a suspected bad lot, a sample (approximately 25 grams) from each gallon of fresh, mixed, unfrozen material should be spread on a cleaned stainless steel test panel and allowed to cure for seven days. This requires that the batch of sealant be held frozen for at least seven days before use. Insufficient bond or cure hardness calls for disposal of the cartridges from the gallon. A poorly bonded sample is easily torn from the stainless panel.

The specification calls for a sufficient color difference between base compound and accelerator to permit visual observation of the extent of mixing. Streaks or off-color variations in freshly mixed sealants indicate insufficient blending.

The application time of the sealant is the time that the mixed compound remains suitable for application with injection or extrusion guns. Application life is always based on ambient conditions at 75°F and 50 percent relative humidity; consequently, in mixing, temperature, time, and relative humidity are important. Once the accelerator comes in contact with the base compound, the two-hour application time has

begun. Mixing and packaging in cartridges should not consume more than five to seven minutes. Also, for every 10°F rise in temperature above 75°F, application time is reduced by half and for every 10°F drop, it is doubled. High humidity at the time of mixing also shortens application life. A water-jacketed mixing pot, if available, can minimize heat problems during mixing.

Immediately following mixing and packaging the sealant should be frozen as quickly as possible. One successful method of freezing is to immerse the filled cartridges in a slurry of dry ice and alcohol for 10 minutes. The temperature of the sealant will drop to approximately -70°F and the cartridges may then be transferred to a storage box maintained at -40°F or below. This permits storage of mixed sealant for as long as 30 days. It should be noted that the time required for mixing, freezing, storing, and thawing operations reduces the total application life by approximately 45 minutes.

In some cases it is necessary to caulk or patch small joints, requiring possibly one tube of sealant. One example might be a minor leak found during test of a complete system. If proved, frozen, sealant is not available, a gallon of sealant from a lot of material that has already shown consistently acceptable results may be mixed and used; however, this procedure should be used only as an emergency step.

Sealant that exhibits poor flow properties by not flowing uniformly and evenly from the gun tip indicates a degree of cure already present in the material before application; consequently the material should be discarded. An experienced worker can recognize this easily.

VI. SEALANT AND GUN PREPARATION FOR TWO-PART COMPOUND

After the compound has been mixed thoroughly and blended in the proper proportions without air entrapment, and the cartridges have been frozen according to the specified procedure, the compound is ready for application. As mentioned in the previous section, the cartridges should be thawed in minimum time without subjecting the compound to abnormally high temperatures. One acceptable method is to thaw the cartridges in a 120°F water bath for four minutes \pm 15 seconds, then airsoak the cartridges at room temperature for an additional 20 minutes to bring the sealant to the equilibrium temperature. This procedure applies to sealants that have been stored frozen at -40°F or below for a maximum of 30 days. After thawing, the sealant is ready to be applied to a joint.

The Semco Series 250 or Pyles Series 950 (Pyles East Coast Company, Wilmington, Delaware) air-powered sealant application guns, or other units having equal characteristics, may be used successfully to apply sealant.

The Semco series guns are provided with trigger-actuated flow control and may be found to be more desirable for use where the quantity applied varies throughout a joint. Although somewhat lower pressures are acceptable, the guns should be operated on pressure-regulated air at 60 to 90 psig.

The shape of the gun-tip being used to form the sealant should be compatible with the type of joint being filled. In all cases, the tip of the gun should extend to the deepest extremity of the joint so that sealant is extruded from the inside of the joint outward. Forcing the material into a joint that is smaller than the gun-tip causes voids or air fissures that result in an unacceptable seal. The nature of the sealant prevents visual location of voids; therefore, joint extrusion practices must be sound. Four acceptable gun-tip configurations are: (a) round, in 1/8-inch to 1/4-inch orifice sizes; (b) flared, with 1/8-inch orifice; (c) duckbill, with 1/8-inch by 3/4-inch opening; and (d) vent duct, with 1/16-inch orifice. The length and outside diameter of the tip can be of any suitable size for ease of application. Polyethylene tips are recommended because of the ease of cleaning and inability of the sealant to adhere to the plastic surfaces. In areas posing access problems, a bent tip may be used.

VII. ONE-PART COMPOUND

This compound requires no mixing or special storage facilities and may be applied by hand directly from containers (tubes with caulking tips) per manufacturer's instructions. However, the high cost of this product may limit its use to joints where high temperatures exist, e.g. sterilizer attachments, or where extreme chemical conditions occur.

VIII. SAFETY CABINET AND COMPONENT PREPARATION

Determine from occupancy drawing the fixed location of first cabinet in the line. This cabinet must be accurately aligned with wall, adjusted to correct height and leveled. Succeeding cabinets shall follow likewise. A marked outline of the entire system on room floor is suggested as a check and guide.

As each successive unit is matched for assembly, holes shall be provided at flange corners for 1/4"-20UNC-2 bolts with hex nuts and 1/4" long spacers. Where otherwise required, weld studs and matching holes shall be provided, also with nuts and spacers.

Any foreign matter between the sealant and a bonding surface will cause poor adhesion; therefore, it is imperative that all joint surfaces be scrupulously cleaned. In general, a chlorinated hydrocarbon such as trichloroethylene may be used successfully to clean surfaces before sealant application. It also can be used to remove cured sealant from previously applied joints in repair and patching

procedures. However, trichloroethylene is very reactive to both cured and uncured polysulfide sealants; therefore, in patching or repairing a joint, care should be taken to apply solvent only to that part of the joint that is being repaired. Chlorinated hydrocarbons soften and dissolve polysulfide sealants and render them unsatisfactory for sealing after only mild exposure to liquid solvent. Vapors, unless condensed on a joint surface, generally produce no effect.

Chlorinated hydrocarbon solvents are extremely toxic; therefore, good ventilation should be provided. It is noteworthy that the high-temperature-stable (240°F) thermosetting plastic windows sometimes used in the safety cabinets should not be affected by trichloroethylene in the installation or repair cleaning procedures. Fogging or crazing of the plastic indicates that the window is of off-grade material and is not acceptable for use.

In washing a joint, solvent-wetted clean cloth towels shall be used to remove all foreign matter. The obvious goal is to provide a completely clean bonding surface that is free of oils, dirt, dust or other foreign matter. Each joint shall be wiped dry; that is, the solvent shall not be allowed to evaporate on the bonding surface. It shall be removed with a clean, oil-free cloth. This assures that residues will be removed.

It is especially important that windows be cleaned carefully at all joint locations. The lower peel strength of the sealant when applied to glass (the bond to stainless steel is somewhat higher) requires absolutely clean surfaces to insure a perfect bond. Furthermore, after the surfaces have been cleaned, the window shall not be handled with bare hands because this results in oily fingerprints that interfere with the sealant bond. Clean white cloth gloves are very satisfactory for handling these windows and shall be used as a general procedure. Using gloves in the application procedure also prevents skin contact with the highly reactive catalyst, which if permitted to contact the skin for prolonged periods can produce toxic effects.

The preceding paragraph shall be applicable also for metallic component assemblies.

After a joint has been washed and dried carefully, it is ready for sealant application. It is important that sealant be applied to an exposed joint immediately after cleaning; therefore, each step in a safety cabinet installation or in a joint repair operation should be carefully planned and coordinated. The sealing of a safety cabinet system shall constitute one complete and individual step. Whenever welding on or near a cabinet after sealant application, avoid heating the sealant joint through conduction, by placing water-soaked towels on the metal surface between the weld location and the sealant joint.

Prior to the filling of a flange joint between cabinet units with sealing compound, the cabinet shall be adjusted to correct height and leveled carefully, the corner locating bolts aligned, flange faces spaced a minimum of 1/4 inch apart with spacers, and the bolts pulled down snug on the flanges. The entire periphery of the joint should then be checked for spacing. If the joint narrows to less than 1/4 inch, a shim shall be used to bring the joint to size. The joint thickness can range up to 3/8 inch when shim adjustments for minimum thickness at one location require a greater spacing around the remaining joint.

IX. CAULKING PROCEDURES

Finished joint configurations shall be as shown on pictorials herein, Figures 2 thru 9, with locations defined by a typical cabinet arrangement, Figure 1. These are the most common joints only; for such items as bottom and rear mounted equipment, etc., jointing shall be similar.

Windows shall be the last items assembled because the openings for same are required for access into the system during installation. Flanged drain fittings in the bottom of the cabinet, and glove rings, shall be caulked in place before the installation, preferably seven days to allow for cure.

Since the majority of cabinets are located close to walls, common practice is to caulk from inside. This requires taping the entire outer periphery of flanges as backing to prevent escape of compound. Ordinary

masking tape is acceptable for this use. The operator may then proceed to fill the joints and progress along with unit assembly. After each joint has formed a set, and before hardening, remove the back-up tape.

After the cabinet line assembly is completed and internal equipment installed the placement of windows shall proceed.

The windows should be spaced one-fourth inch from the cabinet face with neoprene rubber or butyl rubber spacers measuring one-fourth inch on a side. The spacers should be spaced approximately in the center of the joint when the window is equispaced in the angled surrounding frame. The best technique is to extrude a bead into the joint prior to window placement, place the spacers, then press the window into the sealant. One man on the inside of the cabinet (access is gained through the access doors or other entrance port that has not been sealed) trims the excess and smooths the fillet on the inside while the other, on the outside, completes the joint and smooths the fillet there. Spacers along the bottom edge of the window on a slanted face should be used to prevent shift of the window during the cure period. These spacers should be of a suitable noncompressible material and should be staggered so as to avoid placement at the same location as a joint spacer. See window joint configuration, Figure 6, for details.

The nature of the sealing compound creates difficulty in avoiding smears without prior precaution. Therefore, along the edge limits of

all joints to be caulked, masking tape of necessary width shall be applied beforehand and later stripped off when compound has formed a set. The complete cabinet assembly, on the interior and exterior surfaces, shall be cleaned free of dirt, smears or blemishes.

It is important that during the sealant application and during the cure period (seven days) the cabinet must not be disturbed in any manner. Before or after installation, the cabinets shall never be climbed or walked upon. Ladders and/or scaffolding shall be used for remainder of installation.

Inspection of joints should be completed after the seven-day cure period. All joints should be smoothly filleted, clean and free of smears, and have a clean appearance. At several locations the joints should be checked for hardness of cure, using a hardness tester. The hardness should be not less than 35 nor more than 60 points when a Shore Type A2 hardness tester is used.

The sealant test specimen that was placed on a stainless steel panel directly after mixing, but before freezing, should also show a hardness rating of 35 to 60 when tested at several locations on the specimen surface.

Before proceeding with utility, ventilation, drain and electrical installations, it is recommended that the cabinet line be covered for protection against dust and grime until final work completion.

After the utility, ventilation, drain and electrical connections have been made and all openings have been closed with panels or accessory

equipment, two additional tests shall be performed. The first is a soap bubble test to find major defects. The second is a final halogen leak test to insure that the cabinet shells, bulkhead doors, accessory equipment, etc. form an enclosure that is freon tight. (See Testing Paragraph X).

X. TESTING

Soap Bubble Test: Introduce air into the cabinet enclosure until three (3) inches water gauge pressure is attained. This pressure shall be maintained throughout the testing period. Apply a soap and water solution (1 part liquid household detergent to 10 parts water) generously to all areas to be tested using a soft paint brush and at the same time watch for bubble formation which indicates a major air leak.

Halogen Leak Test: Introduce one ounce of Freon-12 gas for every 30 cubic feet of enclosure, then apply and maintain air pressure during test of three (3) inches water gauge pressure. The room used for testing must be free of halogen compounds. No smoking should be allowed in the testing area and air movement should be at a minimum. In testing for a leak, the nozzle of the probe should be held at the surface of unit being tested in a manner as not to jar the instrument and should be moved at a rate of approximately 1/2 inch per second. Ordinarily no indication of leakage should be accepted. However, in practical usage the inspector may, at his discretion, consider that a reading of 0.5 milliamperes is required to be significant. This is on the high sensitivity setting of

a General Electric (or equal) Halogen Leak Detector that will respond to a leak rate of 0.025 ounces per year when checked with a "standard leak" according to the manufacturer's instructions.

General Note on Testing: Where there is a requirement for freon tight isolating bulkhead doors between cabinet sections, special attention shall be given to the preinstallation halogen testing of these doors so that any major adjustment may be made prior to installation in the cabinet.

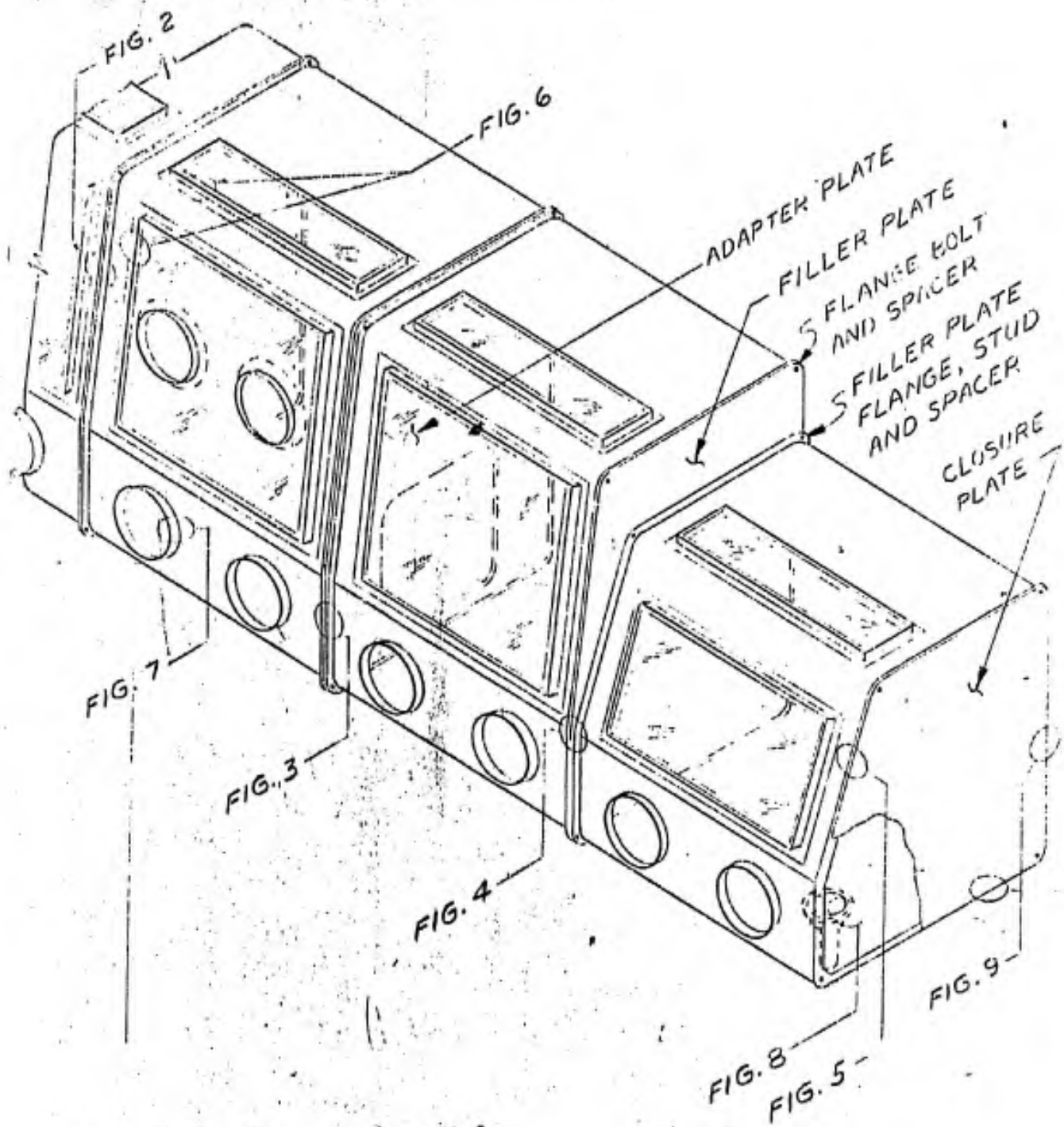


FIGURE 1
TYPICAL CABINET ARRANGEMENT

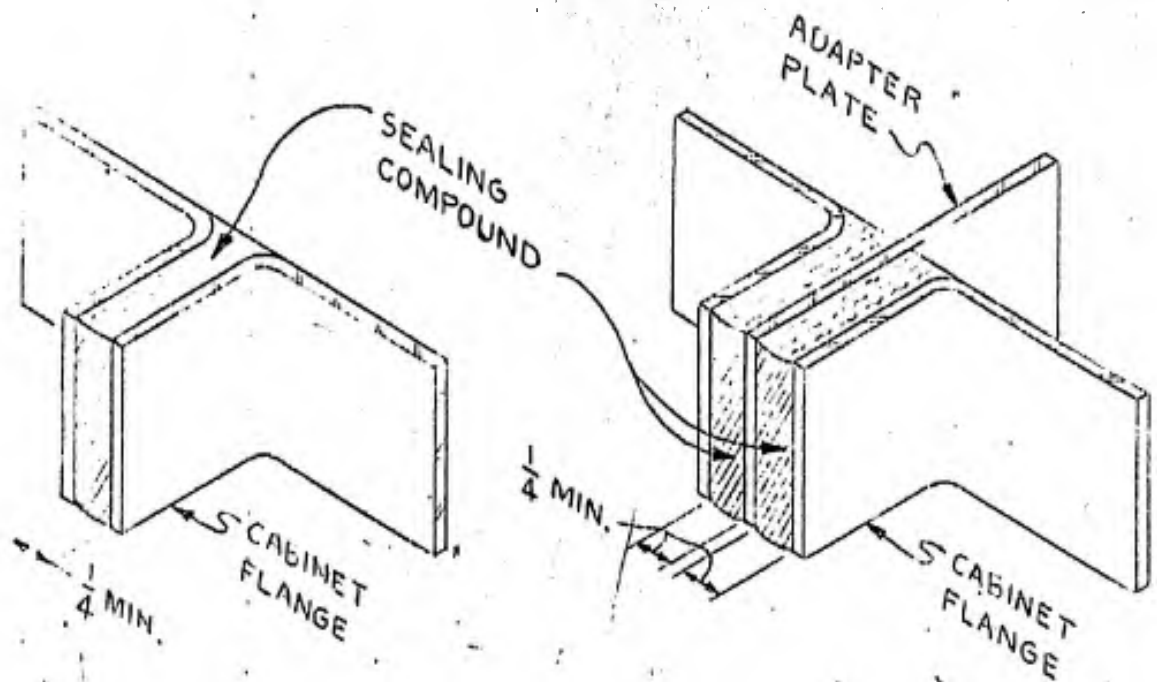


FIGURE 2
SIMILAR CABINETS

FIGURE 3
ADAPTER PLATE W/ACCESSORIES

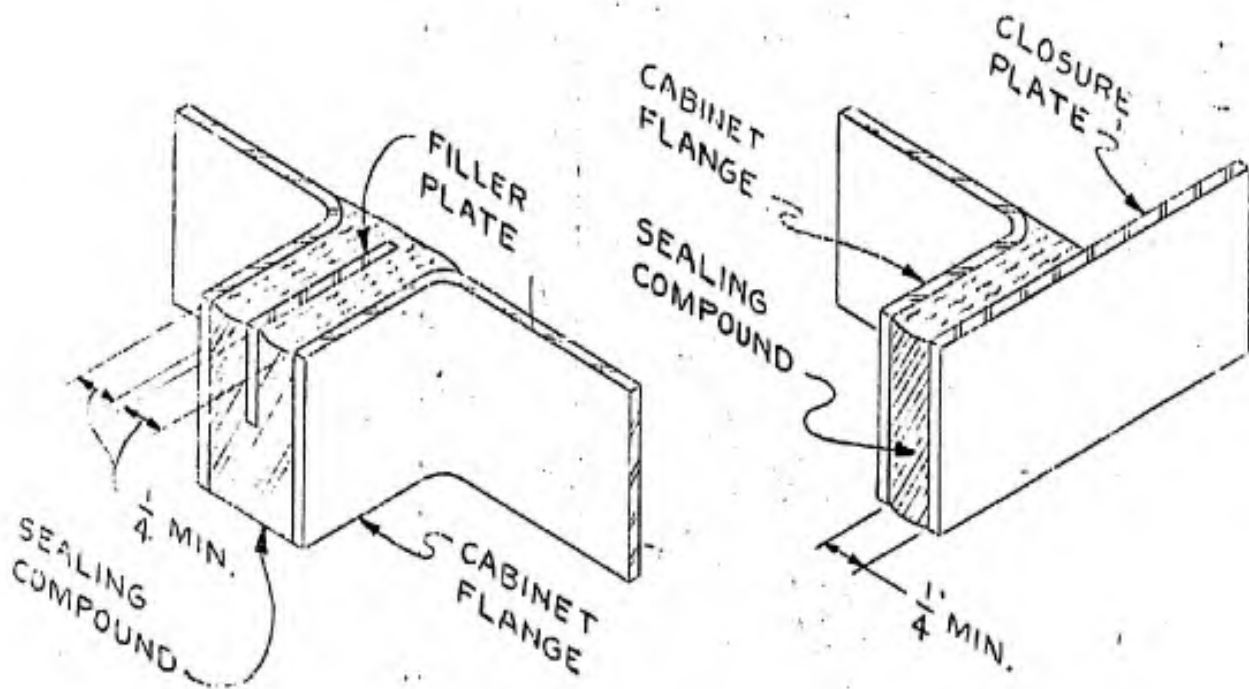


FIGURE 4
DISSIMILAR CABINETS

FIGURE 5
CLOSURE PLATE WITH OR
WITHOUT ACCESSORIES

TYPICAL CABINET SYSTEM JOINTS

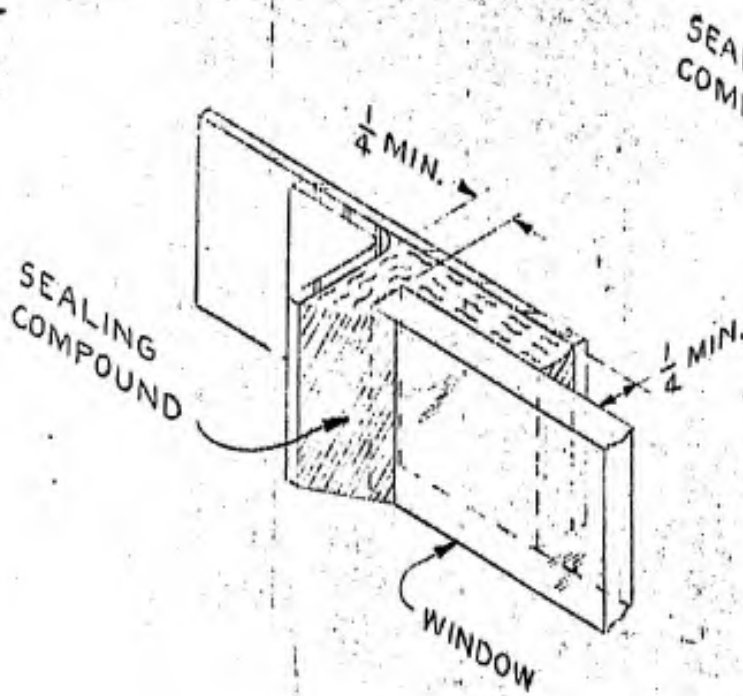


FIGURE 6
LIGHTING AND VIEWING WINDOWS

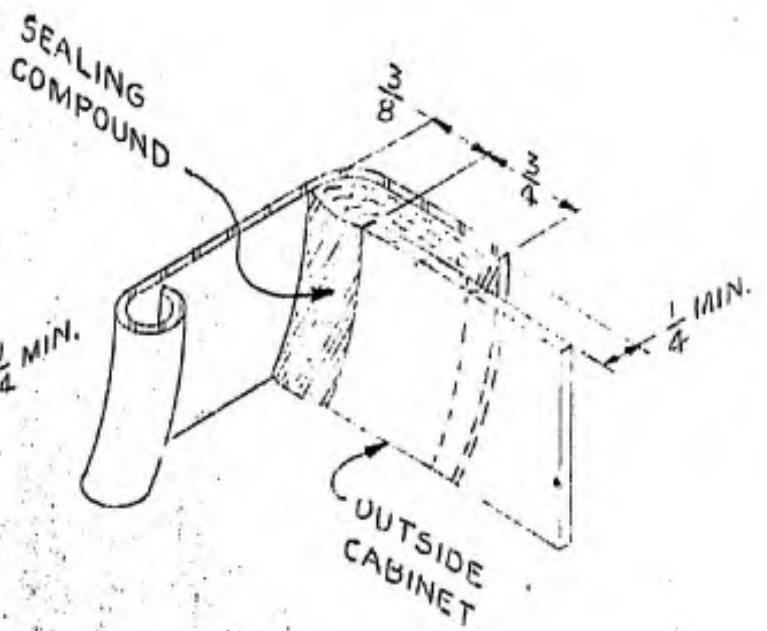


FIGURE 7
GLOVE RING

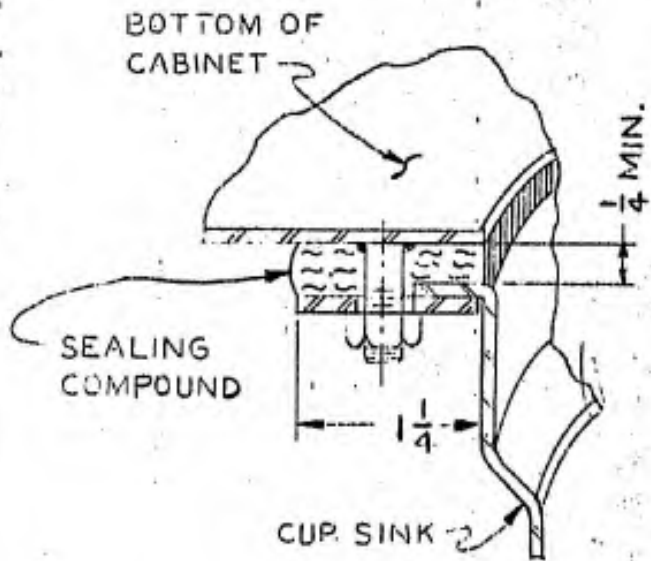


FIGURE 8
FLANGED CUP SINK DRAIN

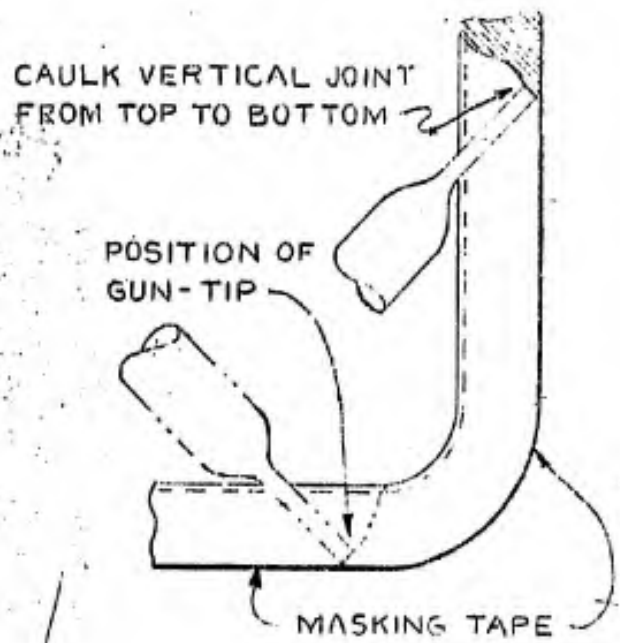
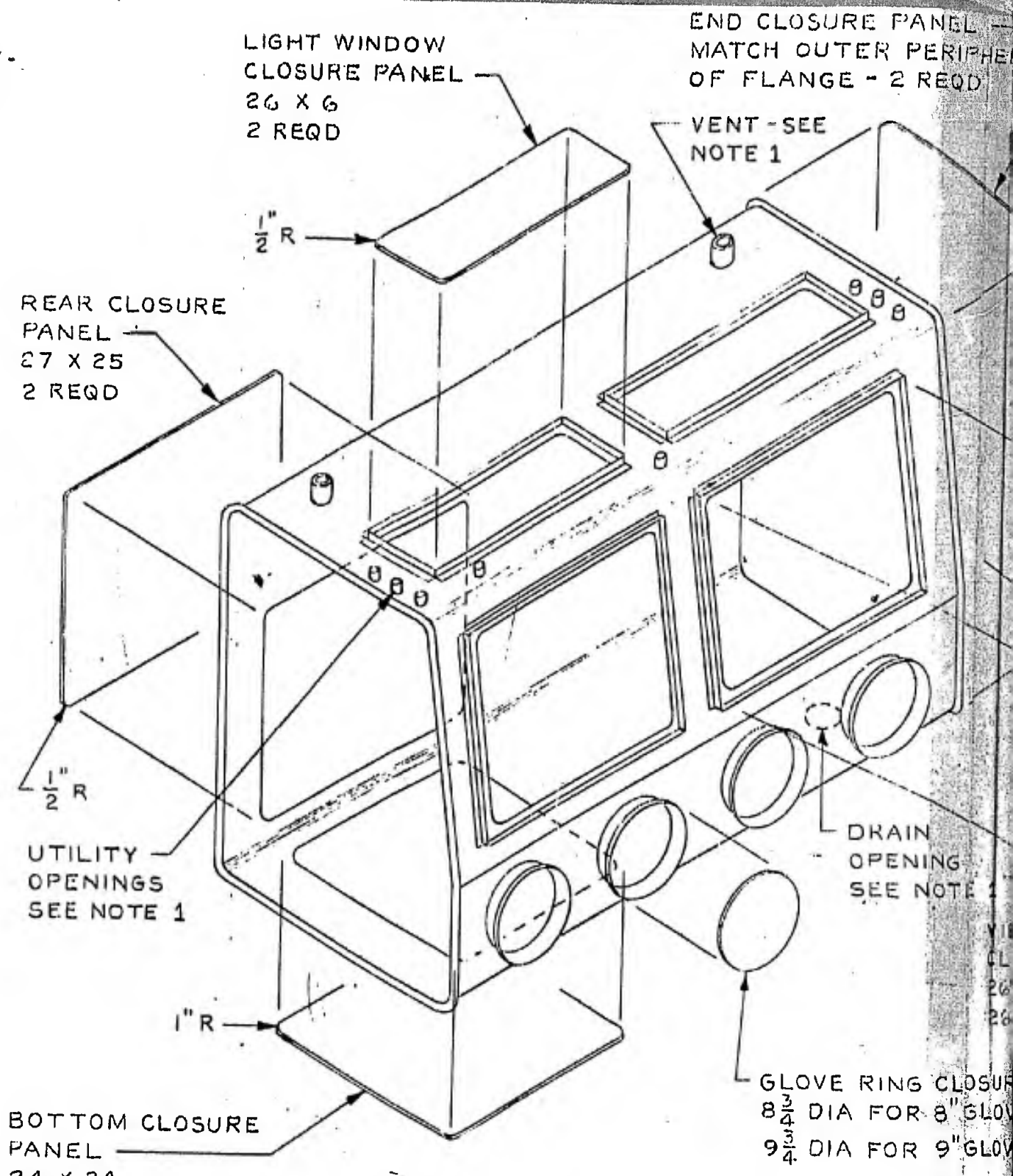


FIGURE 9
CAULKING METHOD

TYPICAL CABINET SYSTEM JOINTS

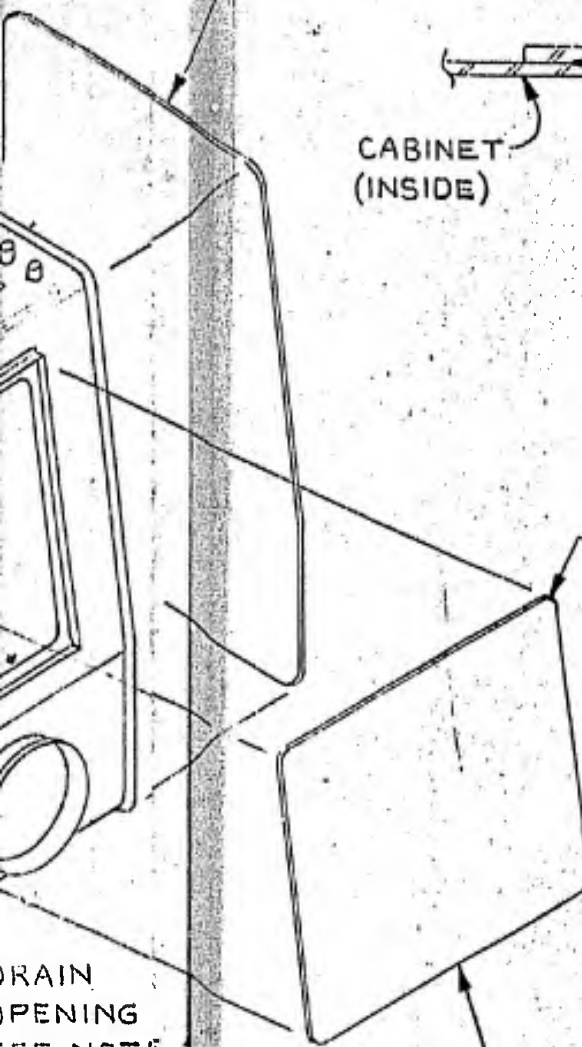
A.



- NOTES:
1. UTILITY, VENT AND DRAIN OPENING APPROPRIATE RUBBER STOPPERS.
 2. PROVIDE THREE COUPLINGS ON ONE FOR FREON, AIR AND MANOMETER CO
 3. MATERIAL FOR CLOSURE PANELS AN OR PLASTIC.
 4. THE CLOSURE PANELS FOR LIGHT A AND REAR AND BOTTOM OPENING CABINET. ALL SEALS MAY BE MADE
 5. PROVIDE WEIGHT SCALE WITH GAS C

PANEL
OR PERIPHERY
2 REQD

B



DRAIN
OPENING
SEE NOTE

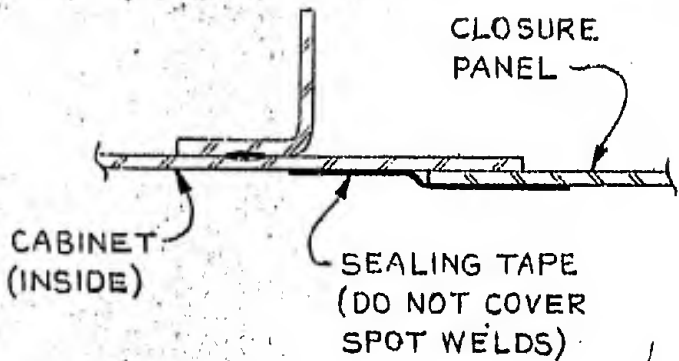
VIEW WINDOW
CLOSURE PANEL

24 X 24 FOR TYPE II - 2 REQD
20 X 13 FOR OTHER TYPES - 4 REQD

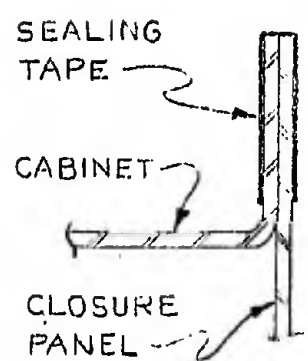
RING CLOSURE DISC
FOR 8" GLOVE RINGS - 8 REQD
FOR 9" GLOVE RINGS - 8 REQD

DRAIN OPENINGS MAY BE SEALED WITH
STOPPER
RINGS ON ONE LIGHT WINDOW CLOSURE PANEL
MANOMETER CONNECTIONS ON ALL TYPE CABINETS,
RE PANELS AND DISCS MAY BE THIN METAL

S FOR LIGHT AND VIEW WINDOW OPENINGS
BOTTOM OPENINGS SHALL BE TAPED INSIDE THE
MAY BE MADE WITH PLASTIC ELECTRICAL TAPE.
LE WITH 55 CONTAINER.

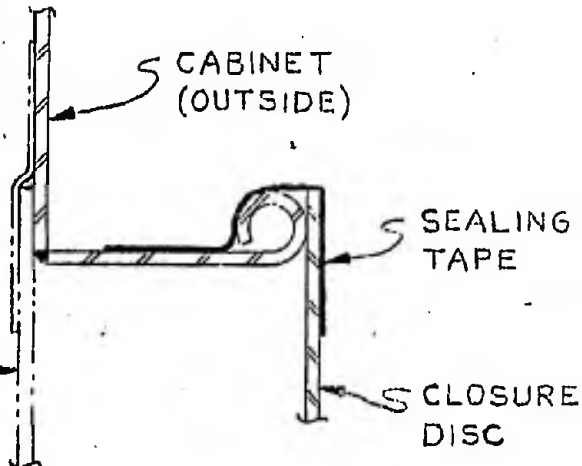


TYPICAL CLOSURE FOR
FRAMED OPENINGS



TYPICAL CLOSURE FOR
CABINET END OPENINGS

CLOSURE DISC
TAPED INSIDE
FOR SEALING
HOLES ONLY



TYPICAL CLOSURES FOR GLOVE
RINGS (WELDED OR CAULKED)
AND/OR GLOVE RING HOLES

FIGURE 10

WELD LEAK TEST SET-UP

(RECOMMENDED)