# NAVSEA S9086-C1-STM-000/CH-091

CHANGE 2

NAVAL SHIPS' TECHNICAL MANUAL

# NAVSEA S9086-C1-STM-000

# CHAPTER 091

# SUBMARINE HULL INSPECTION


FOR OFFICIAL USE ONLY

Published by direction of Commander, Naval Sea Systems Command

1 SEPTEMBER 1977
CHANGED 15 APRIL 1979

# LIST OF EFFECTIVE PAGES

| Page No. | Change No.* |
|---|---|
| Title | 2 |
| A | 2 |
| Flyleaf−1 | 0 |
| Flyleaf−2 blank | 0 |
| i | 0 |
| ii thru iv | 2 |
| 1 thru 4 | 2 |
| 5 | 0 |
| 6 and 7 | 2 |
| 8 | 0 |
| 9 thru 10A | 2 |
| 10B blank | 2 |
| 11 thru 90 | 0 |
| 91 thru 92F | 2 |
| 93 thru 96 | 0 |
| 97 | 2 |
| 98 thru 106 | 0 |
| 106A | 2 |
| 106B blank | 2 |
| 107 thru 116 | 2 |
| 117 thru 119 | 0 |
| 120 and 121 | 2 |
| 122 thru 125 | 0 |
| 126 thru 128 | 2 |
| 129 thru 131 | 0 |
| 132 | 2 |
| 133 thru 167 | 0 |
| 168 | 2 |
| 169 thru 198 | 0 |

*Zero in this column indicates an original page.

# RECORD OF CHANGES

ACN/Formal

CHAPTER 091

| *CHANGE ACN NO | DATE OF CHANGE | TITLE OR BRIEF DESCRIPTION ** | ENTERED BY |
|---|---|---|---|
| | | | |

* When a formal change supersedes an ACN, draw a line through the ACN number

** Only message or letter reference need be cited for ACNs

**Paragraph** **Page**

# CHAPTER 091

# SUBMARINE HULL INSPECTION

## SECTION 1. HULL INTEGRITY



## SECTION 2. HULL SURVEY

## LIST OF ILLUSTRATIONS



## LIST OF TABLES

# CHAPTER 091

# SUBMARINE HULL INSPECTION

## SECTION 1. HULL INTEGRITY

### 091−1.1 INTRODUCTION

**091−1.2 BACKGROUND**. Submarine structures are being built to increasingly higher standards and the demands made on these structures continues to increase. Improved, advanced inspection procedures provide a means for locating other structural discontinuities that were previously undetectable. Present inspection techniques, therefore, reveal numerous recordable discontinuities in the welded connections. Some discontinuities which were undetectable by previous inspection procedures are located in areas of low stress or are relatively inaccessible. A judgment based primarily on submarine safety considerations, coupled with technological advances concerning the effects of discontinuities must be made regarding the retention of some which are known and recordable. These discontinuities must be monitored periodically so that remedial action can be taken if the discontinuities propagate and the attendant deterioration of material condition becomes apparent.

**091−1.3** In the case of high tensile strength (HTS) steel hulls, acute discontinuities are undesirable and their repair is considered mandatory. Discontinuities interpreted as slag, porosity, and lack of penetration at the root of the joint, are considered to be relatively non−propagating. Repair of such discontinuities, therefore, is not mandatory, provided they are reinspected at intervals specified in paragraphs 091−1.69 and 091−1.70.

**091−1.4 DEFINITIONS**. Primary inspection routines are defined in the following paragraphs.

**091−1.5 Sampling Routine**. The sampling routine is a statistically−designed sampling plan established and conducted to provide an initial and reliable assessment of material condition of individual submarine hull welds. Based on results of the sampling routine, a submarine will be placed in one of three inspection classifications.

1. A normal periodic sampling routine
2. An expanded sampling routine
3. An expanded, more comprehensive, inspection.

**091−1.6** A periodic monitoring routine may be required as a result of any of these inspections.

**091−1.7 Full Hull Integrity Routine**. The full hull integrity routine is an inspection designed to cover, to the maximum extent feasible, all frame, floor, and bulkhead−to−hull attachment welds and all shell−to−transition ring butt welds.

**091−1.8 Miscellaneous Surveillance Routine**. The miscellaneous surveillance routine is an inspection which keeps under close scrutiny a reasonable number of miscellaneous details whose condition would not be known otherwise and whose soundness is paramount to watertight integrity of the submarine hull. These areas are kept under surveillance, generally because they are areas of high stress concentration in which critical weld cracks might first develop and tend to propagate.

**091−1.9 Monitoring Routine**. The monitoring routine is an inspection conducted to keep under surveillance all (or a reasonable sampling of) known discontinuities that are retained unrepaired in operational hull structures.

**091−1.10 GENERAL INFORMATION**. The ultrasonic (UT) inspection technique is used with the majority of structural items covered under hull integrity inspections. This procedure is described in NAVSEA 0900−LP−006−3020, supplement to **Ultrasonic Inspection Procedures and Acceptance Standards for Hull Structure Production and Repair Welds**, NAVSEA 0900−LP−006−3010.

**091−1.11** When magnetic particle (MT), eddy current (ET), or dye penetrant (PT) inspections are specified, preparation of the weld for inspection shall be limited to those means that insure surface defects will not be masked from detection as a result of preparation. Only that preparation is to be done which will eliminate the possibility of spurious inspection results.

**091−1.12** When inspections of any kind are conducted with the weld in view, a visual determination shall be made of adequacy of amount and geometry of the weld deposit.

**091−1.13** With prior Naval Sea Systems Command (NAVSEA) approval, occasional trepan−type samples may be removed from selected nonnuclear areas of the submarine hull during large scale inspections. This aids in interpretation of UT inspection results because these samples visually show actual defects associated with various types of ultrasonic responses. Welding procedures for repairing such trepanned areas must be approved by NAVSEA prior to trepan removal.

> **NOTE:** Trepan removal will not be authorized if this will result in a submarine availability extension or a major cost increase.

**091−1.14 HULL INTEGRITY INSPECTION OF WELDS**

**091−1.15** SAMPLING ROUTINE. The scope, method, and procedure for conducting the sampling routine are described in paragraphs 091−1.16 through 091−1.32. This sampling routine shall be conducted to satisfy the requirement imposed by maintenance requirement card (MRC 004) for unrestricted operation (URO), and limited in depth (LID), submarines.

**091−1.16 Scope**. Heavy hull HTS submarines shall receive their initial sampling routine inspection no later than 60 months after the end of the availability during which a full hull integrity routine inspection was conducted. Subsequent sampling routine inspections shall be conducted at intervals not to exceed 60 months, counting from the end of the availability during which the last sampling routine inspection was conducted.

**091−1.17** New HY−80 submarines should receive their initial sampling routine inspection no later than 60 months from delivery, but shall receive the inspection no later than 84 months from delivery. Subsequent sampling routine inspections shall be conducted at intervals not to exceed 60 months, counting from the end of the availability during which the last sampling routine inspection was conducted. Some submarines operating under a significant depth restriction may have sampling routine inspection conducted at intervals not to exceed 72 months.

> **NOTE:** When determining the due date for inspections, time in overhaul, or other periods when the submarine is tied up or in the yard for periods of 5 months or more, shall be excluded from time elapsed since last accomplished.

**091−1.18** Inspection schedules for the new HY−100 submarines and the new HY−130 submarines will be determined at a later date.

**091−1.19 Method**. The sampling inspection shall be done by the UT inspection technique described in NAVSEA 0900−LP−006−3020 for full penetration butt welds, T−welds, and other welds shown in Figure 091−1. The purpose of this inspection is to discover if any defect, discontinuity, or departure from design intent exists in inspection zones shown in the illustration.

**091−1.20** The shear wave inspection technique shall be used as the primary inspection method. Any discovered discontinuities leading to rejection in accordance with criteria established in NAVSEA 0900−LP−006−3020 also may be inspected by the compressional wave method so that existing discontinuities, regardless of their orientation, will be accurately defined and recorded.

**091−1.21 Procedure**. The sampling plan consists of inspection of 300 randomly−selected 1−foot sites. The basic apportionment of sites assumes existence of transition ring−to−shell−plating butt welds, and both internal and external transverse frame− or bulkhead−to−hull welds. The three types of welds described above are divided, for selection, into separate groups which are defined below:

1. Group I. External frame− and bulkhead−to−hull welds

2. Group II. Internal frame− and bulkhead−to−hull welds

3. Group III. Cone−cylinder transition ring−to−shell butt welds

**091−1.22** Not all submarines have welds in each of the three defined groups, nor are the proportions of the groups to each other the same for all submarines. Table 091−1 describes the apportionment of randomly−selected sites among the three groups.

**091−1.23** Table 091−2 describes detailed apportionment procedure of randomly−selected inspection sites for individual submarines or groups of submarines.

**091−1.24** To facilitate selection of random sites for inspection, and location of random sites to be inspected on the hull, divide the various frames, bulkheads and transition ring−to−shell−plating butt welds into 1−foot−long increments around the outside girth of the submarine hull, starting at the bottom centerline and proceeding both port and starboard to the top centerline. Fractional sites at

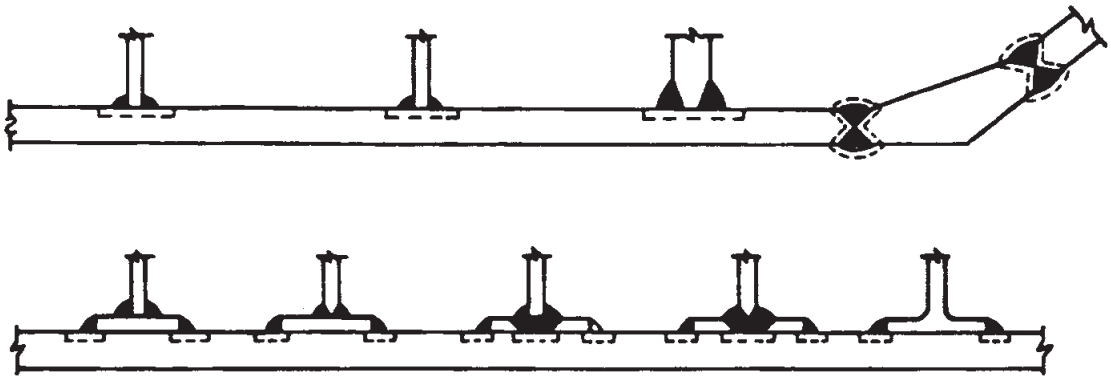


**Figure 091−1. Weld Inspection Zones**

the ends equal to or greater than 6 inches shall be considered separate sites. Fractional sites less than 6 inches in length shall be considered part of the preceeding site.

**091−1.25** When clear sites have been selected for inspection, but the clear site list locates the sites from points other than the bottom centerline, the inspecting activity shall reestablish their location from the bottom centerline in accordance with the following procedure:

1. Lay out the clear site's previously reported location, by actual measurement from the previously−reported reference point.

2. Lay out, from this location, the 12−inch site along the weld.

3. Measure the distance from the bottom centerline to the extremity of the site that lies closest to the bottom centerline. If this location does not coincide with a 12−inch interval (for example: if the distance is not a multiple of twelve), expand the area to give a minimum weld length that will include one complete 12−inch interval.

**091−1.26** The sample site selected shall be inspected and the results − length, depth, type of discontinuity, orientation, and location − shall be recorded on the appropriate hull integrity inspection report forms (see paragraph 091−1.89).

**091−1.27** All discontinuities located at the toe or in the underbead areas of the weld, that register a signal amplitude equal to or above the disregard level (DRL) shall be traced to their extremities and recorded, regardless of their depth or length or whether they extend beyond the boundaries of the originally selected inspection site. Discontinuities located at the root of the weld, that register a signal amplitude at or above the amplitude rejection level (ARL) shall be traced to the points at which the signal amplitude drops below the ARL and recorded, regardless of their depth or length or whether they extend beyond the boundaries of the originally selected inspection site.

**091−1.28** The depth of a discontinuity is a significant factor in determination of the criticality of the joint in question; therefore, a standard method of defining depth is required. This method is described in the following paragraphs.

**091−1.29** If the discontinuity originates at or extends to the surface, or a point in a weld that is above the surface of the pressure hull plate or other through member, only that portion of the discontinuity extending into the plate or through member is considered. Two decimal figures are required to define depth. In the case of a T−weld, the first and second figures relate to and are determined from the surface of the through member to which the web is attached, such as the interface surface. In the case of butt welds, the first and second figures relate to and are determined from the probed surface.

**091−1.30** Figure 091−2 illustrates the method by which depth shall be recorded for the range of normal discontinuities encountered in T−welds.

**091−1.31** Figure 091−3 illustrates the method by which depth shall be recorded for the range of normal discontinuities encountered in butt welds.

**091−1.32** Upon determining the depth of discontinuities, an immediate preliminary report shall be made to NAVSEA if either of the following conditions exist:

1. The depth (vertical height) of any T−weld discontinuity extending into the pressure hull plating

(T) is equal to or greater than 1/8 in way of external frames or 1/4 T in way of internal frames.

2. Any butt weld discontinuity is discovered whose amplitude exceeds the ARL given in NAVSEA 0900−LP−006−3010, and which has a vertical height equal to or greater than 1/4 T.

**NOTE:** At transitions, T is the thickness of the thinner plate.

3. Missing welds, incomplete structure, and severe deformation, that the inspecting activity considers critical to the safety of the submarine.

**091−1.33 Repair**. Repairs when specified shall be made in accordance with paragraphs 091−1.79 through 091−1.83.

**091−1.34 Reporting**. Reports shall be prepared in accordance with paragraphs 091−1.84 through 091−1.89.

**091−1.35 FULL HULL INTEGRITY ROUTINE**. The scope, method, and procedure for conducting the full hull integrity routine are described in paragraphs 091−1.36 through 091−1.41.

**091−1.36 Scope**. The full hull integrity routine inspection shall be conducted on all submarines as prescribed by NAVSEA.

**091−1.37 Method**. Inspection shall be conducted by the same method and for the same intent as that of the sampling routine. For details refer to paragraphs 091−1.19 and 091−1.20.

**Table 091−1. APPORTIONMENT OF RANDOMLY-SELECTED INSPECTION SITES**

| Submarine | Random Selection & Sites for Weld Inspections | | |
|---|---|---|---|
| | GROUP I External Frames | GROUP II Internal Frames | GROUP III Transition Rings |
| SS563 Class | 200 | 100 | 0 |
| AGSS569<br>LPSS574<br>SS576 | 180 | 100 | 20 |
| SSN571<br>SSN575 | 140 | 140 | 20 |
| SS580 Class | 300 | 0 | 0 |
| SSN578 Class<br>SSN585<br>SSN588 Class<br>SSN587<br>SSN597<br>SSBN598 Class<br>SSBN608 Class<br>SSBN616 Class<br>SSBN640 Class<br>SSN594 Class<br>SS637 Class<br>SSN671<br>SSN685 | 100 | 180 | 20 |
| SSN688 Class | 20 | 280 | 0 |
| SSBN726 Class | 20 | 280 | 0 |
| AGSS555 | 0 | 175 | 0 |
| NR-1 | 0 | 175 | 0 |

## Table 091−2. DETAILED APPORTIONMENT PROCEDURE

### RANDOMLY SELECTION (Sheet 1 of 2)

| | Group I | Group II | Group III |
|---|---|---|---|
| **SS563 Class** | | | |
| Initial Sample | 10 sites at each of 20 external frames and bulkheads for total of 200 sites | 100 sites from total population of sites on internal frames and bulkheads | 0 |
| Subsequent Samples | *Maximum of 50 clear sites plus additional sites** for total of 200 sites | *Maximum of 25 clear sites plus additional sites** for total of 100 sites | 0 |
| **AGSS569 LPSS574 SS576** | | | |
| Initial Sample | 10 sites on each of 18 external frames and bulkheads for total of 180 sites | 100 sites from total population of sites on internal frames and bulkheads | 20 sites from total population of sites on transition ring to shell plating butt-welds |
| Subsequent Samples | *A maximum of 45 clear sites plus additional sites** for total of 180 sites | *A maximum of 25 clear sites plus additional sites** for total of 100 sites | *A maximum of 5 clear sites plus additional sites** for total of 20 sites |
| **SSN571 SSN575** | | | |
| Initial Sample | 10 sites on each of 14 external frames and bulkheads | 140 sites from total population of sites on internal frames and bulkheads | 20 sites from total population of sites on transition ring to shell plating butt welds |
| Subsequent Samples | *A maximum of 35 clear sites plus additional sites** for total of 140 sites | *A maximum of 35 clear sites plus additional sites** for total of 140 sites | *A maximum of 5 clear sites plus additional sites** for total of 20 sites |
| **SS580 Class** | | | |
| Initial Sample | 10 sites on each of 30 external frames and bulkheads | | |
| Subsequent Samples | *A maximum of 75 clear sites plus additional sites** for total of 300 sites | | |

*if a clear site list has been published
**previously uninspected

## Table 091−2. DETAILED APPORTIONMENT PROCEDURE

### RANDOMLY SELECTION (Sheet 2 of 2)

| | Group I | Group II | Group III |
|---|---|---|---|
| | SSN578 Class<br>SSN585<br>SSN588 Class<br>SSN587 | SSN597<br>SSBN598 Class<br>SSBN608 Class<br>SSBN616 Class<br>SSBN640 Class | SSN594 Class<br>SSN637 Class<br>SSN671<br>SSN685 |
| Initial Sample | 10 sites on each of 10 external frames and bulkheads for total of 100 sites | 180 sites from total population of sites on internal frames and bulkheads | 20 sites from the total population of sites on transition ring to shell plating butt welds |
| Subsequent Samples | *A maximum of 25 clear sites plus additional sites** for total of 100 sites | *A maximum of 45 clear sites plus additional sites** for total of 180 sites | *A maximum of 5 clear sites plus additional sites** for total of 20 sites |
| **SSN688 Class SSBN726 Class** | | | |
| Initial Sample | 20 sites from total population on sites on external frames and bulkheads | 280 sites from total population of sites on internal frames and bulkheads | |
| Subsequent Samples | *A maximum of 5 clear sites plus additional sites** for total of 20 sites | *A maximum of 70 clear sites plus additional sites** for total of 280 sites | |
| **AGSS555** | | | |
| Initial Sample | | 175 sites from total population of sites on internal frames | |
| Subsequent Samples | | *A maximum of 45 clear sites plus additional sites** for total of 175 sites | |
| **NR-1** | | | |
| Initial Sample | | 175 sites from total population of sites on internal frames | |
| Subsequent Samples | | *A maximum of 45 clear sites plus additional sites** for total of 175 sites | |

*if a clear site list has been published
**previously uninspected

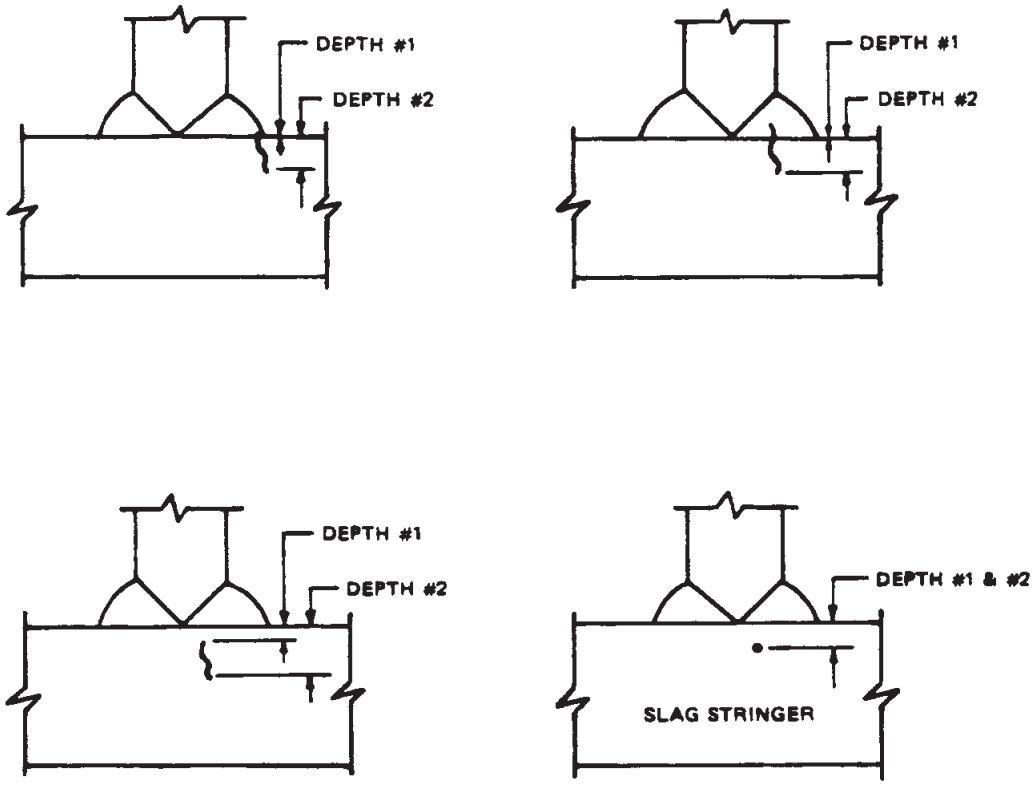



**Figure 091−2. Depth Recording of T−Weld Discontinuities**

**091−1.38** When the joint detail for external attachments is comprised of a frame, bulkhead, or floor attached to a faying bar, and the faying bar is, in turn, attached to the hull plate; the frame, bulkhead, or floor weld to the faying bar shall be inspected by the MT or the ET inspection techniques, in addition to the required UT inspection.

**091−1.39 Procedure**. Full hull integrity routine inspections, while being directed primarily toward the detection of defects in welded joints, should not overlook other possible harmful conditions such as laminar indications in plate edges, poor weld geometry, omission of welds, and damaged structure. Inspection shall cover all pressure hull structural attachment welds such as internal and external frames, internal and external bulkheads, flat end closure bulkheads, and floor−to−hull plating, and includes full penetration, partial penetration, and fillet welded joints.

**091−1.40** Inspection also shall cover transition ring−to−shell−plating butt welds. Removal of outer shell plating or void fillers shall not be done, however, unless accessible hull butt welds associated with the intersection indicate extensive defects. This determination will be made by NAVSEA.

**091−1.41** The goal of full hull integrity routine inspection is to inspect 100 percent of the designated welds. If major interferences exist to obstruct complete inspection, however, a minimum of 75 percent of each attachment or butt weld shall be inspected. Exception to this minimum is subject to approval by NAVSEA on a case basis.

**091−1.42 Repair**. Repairs when specified shall be made in accordance with paragraphs 091−1.79 through 091−1.83.

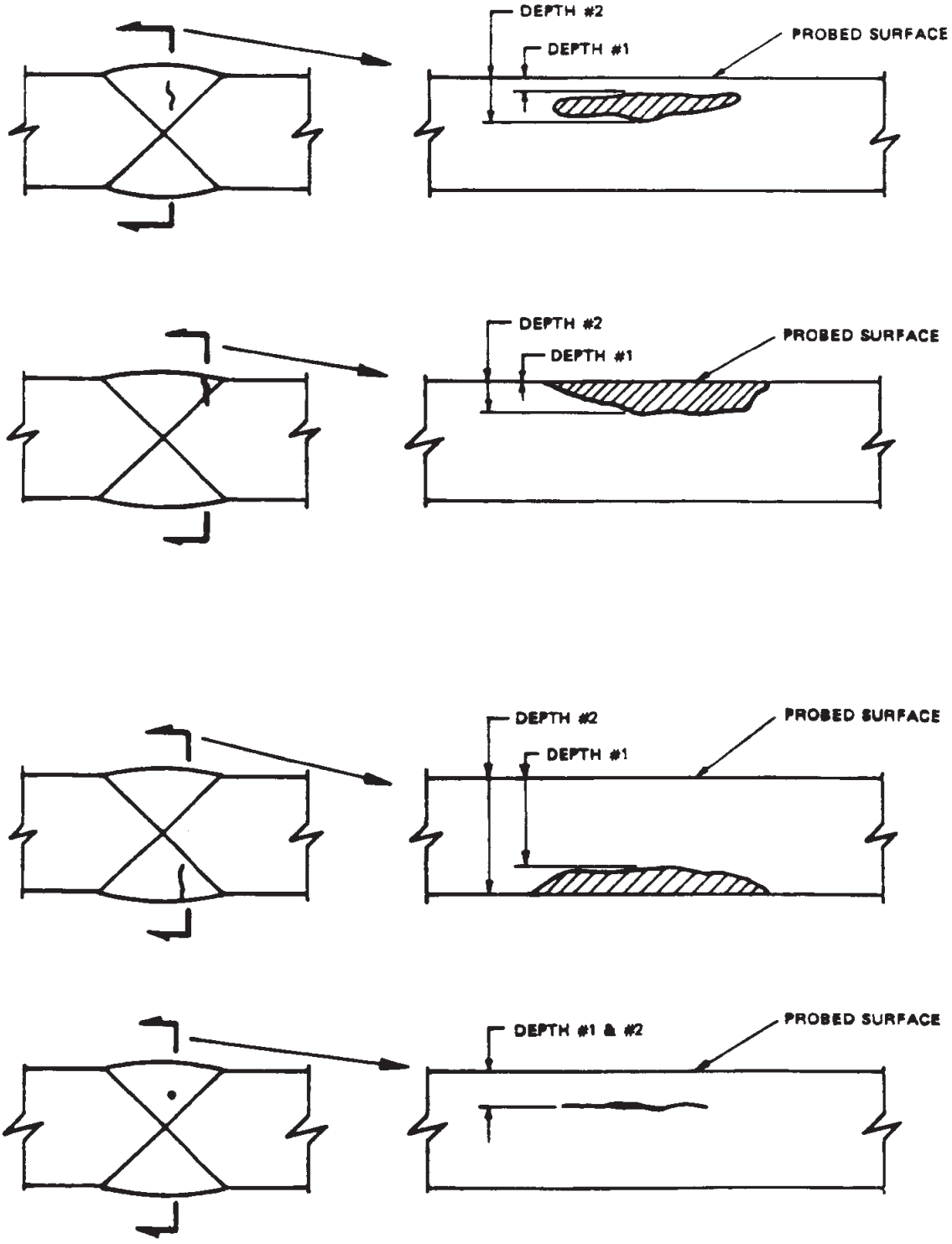



**Figure 091−3. Depth Recording of Butt Weld Discontinuities**

**091−1.43 Reporting**. Reports shall be prepared in accordance with paragraphs 091−1.84 through 091−1.89.

**091−1.44 MISCELLANEOUS SURVEILLANCE ROUTINE**. The scope, method, and procedure for conducting the miscellaneous surveillance routine is described in paragraphs 091−1.45 through 091−1.63. This miscellaneous surveillance routine shall be conducted to satisfy the requirement imposed by maintenance requirement card (MRC 001) for unrestricted operations (URO), and limited in depth (LID), submarines.

**091−1.45 Scope**. Heavy hull HTS submarines shall receive their initial miscellaneous surveillance routine inspection no later than 49 months after the end of the availability during which a full hull integrity routine was conducted. Subsequent miscellaneous surveillance routine inspections shall be conducted at intervals not to exceed 48 months, counting from the end of the availability during which the last miscellaneous surveillance routine inspection was conducted.

**091−1.46** New HY−80 submarines shall receive their initial miscellaneous surveillance routine inspection shortly after their first deep dive. Subsequent miscellaneous surveillance routine inspections shall be conducted at intervals not to exceed 49 months, counting from the end of the availability during which the last miscellaneous surveillance routine inspection was conducted.

> **NOTE:** When determining the due date for inspections, time in overhaul, or other periods when the submarine is tied up or in the yard for periods of 5 months or more, shall be excluded from time elapsed since last accomplished.

**091−1.47** The following class submarines may have miscellaneous surveillance routine inspections conducted at intervals not to exceed 72 months:

1. SSBN640 Class submarines
2. The SSSN627 Group of the SSBN616 Class submarines.
3. SSN637 Class submarines, with the exception of the following SSNS: 682, 683, 686, and 687

**091−1.48 Method**. The required miscellaneous surveillance routine inspections shall be conducted primarily by means of MT or ET inspection. Where MT or ET inspection is not possible nor practicable, the UT or dye penetrant (PT) techniques may be used, as appropriate. The intent of the miscellaneous surveillance routine inspection is to discover, if existing, any defect or departure from design intent within or adjacent to the designated weld joint.

**091−1.49 General**. Areas chosen to receive miscellaneous surveillance routine inspections are those most likely to contain incipient defects or to develop failures of welded connections. Generally speaking, items chosen are judged to have suspected high residual stresses, high nominal stresses, a crack sensitivity due to stress concentrations, and (with some materials) fatigue susceptibility due to constant cycling. In addition, failure of welds in most of the chosen inspection sites would precipitate uncontrolled flooding of the pressure hull.

**091−1.50 Procedure**. Table 091−3 through Table 091−26, which are presented following paragraph 091−1.66, describe the items to be inspected, the extent of inspection, and the expansion criteria to be used if necessary. The tables also include items pertaining to single classes of submarines or individual submarines within a class that require periodic inspections prior to replacement or modification. This would include temporary repairs or other suspected problem areas, such as unconventional repairs whose condition makes surveillance desirable and prudent. Considerations which must be kept in mind in utilizing the tables are discussed in paragraphs 091−1.51 through 091−1.63.

**091−1.51** If extent of the required inspection for a particular item is cited in increments, the increments must be selected so as to avoid inspecting areas which are obscured by major interferences. Increments selected may vary in size and location, so long as the total length inspected is equal to or greater than that required in the table for the item, and so long as inspected increments are reasonably distributed around the circumference of the joint.

**091−1.52** During the normal course of successive inspections, effort should be made to inspect the same areas previously inspected, unless it is specifically noted otherwise in the appropriate table.

**091−1.53** If extent of the inspection coverage to be performed is indicated as 100 percent, this is the goal, although a lesser percentage of inspection coverage is acceptable if costly removal of major interference is encountered. In no case, however, shall inspection coverage be less than 50 percent. If MT or ET are the primary inspection techniques used, they shall be used to cover the maximum accessible extent of the joints being inspected. If

maximum accessible extent is less than 50 percent of the joints, then UT−inspection shall be used as a supplement so a minimum of 50 percent coverage is achieved. The intent is that maximum reasonable extent of the joints in question be inspected. If 50 percent coverage cannot be achieved through use of these methods, further guidance should be requested from NAVSEA.

**NOTE:** Items considered to be major interferences include reactor compartment shielding, heavy equipment components, components of systems that require testing, and areas within sealed voids.

**NOTE:** In those cases where 100 percent is specified as the inspection coverage goal, and a lesser percentage is accessible for inspection, the following shall be accomplished. If a defect is discovered that continues into a normally inaccessible area, the interferences shall be removed to facilitate tracking the defect to its end. If the incidence of defects is in excess of 3 percent, the remainder of the interferences shall be removed to permit inspection of the total joint.

**091−1.54** Entrance into tanks or compartments, or temporary removal of interferences − such as insulation, sound−proofing, wireways, flanged piping, ducting, lightweight equipment components, lockers, sheet metal work, or protective coatings, − shall not deter the performance of specified inspections. As stated in paragraph 091−1.53, major interferences should not be removed. If results of inspections reveal an unusually high incidence of cracking, however, an expansion of inspection may be required. In this case, it may be necessary to remove additional interferences.

**091−1.55** The weld joints selected for inspection by MT, UT, or PT should be prepared for inspection in accordance with requirements given in **Ship Hulls Fabrication Welding and Inspection, NAVSEA 0900−LP−000−1000 and Inspection of HY−80 Fabrication Welding for Submarine Hulls, NAVSEA 0900−LP−006−9010**. No surface preparation as such is necessary to conduct ET inspection. This technique should be used to inspect and verify absence of surface cracks and establish the acceptability of areas inspected. The presence of cracks when indicated by positive readings on the ET meter, shall be verified by MT (AC Yoke or DC Prod) for ferrous material and PT for nonferrous materials prior to removal and repair.

**NOTE:** The use of ET for the inspection of ferrous or nonferrous material is permissible only if the inspecting activity has personnel properly trained and certified in accordance with NAVSEA ltr 6101D/JG SS/SSN/SSBN 9110 Ser 90 of 12 March 1976 − Implementation of Eddy Current Method of Hull Inspection.

**091−1.56** All variables in the inspection process must be standardized in order to obtain correlation of data between various inspection activities and various inspection teams within an activity. Strict compliance with MIL−STD−271 will insure uniformity to the degree required.

**091−1.57** All cracks discovered shall be traced to their extremities.

**091−1.58** Determine the incidence of cracking and expand inspection as required, in accordance with directions given in the inspection table for the specific submarine.

**NOTE:** Incidence of cracking is defined as the ratio of the total cumulative length of cracked weld discovered to the total cumulative length of weld inspected, expressed in percentage.

**091−1.59** The total cumulative lengths of cracked welds and the total cumulative lengths of welds inspected, used to calculate incidence, shall be determined by the procedure described in paragraphs 091−1.60 and 091−1.61.

**091−1.60** If two opposite surfaces of a welded joint exhibit different stress levels − such as the surfaces of butt welds in shell plating, or welds of transition rings−to−shell−plating, or internal and external welds of trunks to hull inserts − consider each surface as a separately inspected area. An exception to this rule would be the case of small penetrations in pressure structure. In this case total, length of weld surface inspected on all penetrations, including both internal and external surfaces, shall be combined.

**091−1.61** If two surfaces of a welded joint exhibit the same stress level − such as the weld of a T−frame to the pressure hull, or a bulkhead to the pressure hull − combine the inspected length of both weld surfaces of the joint when calculating the incidence of cracking.

**NOTE:** The total cumulative length of a cracked weld shall not consider adjacent of overlapping cracks as being additive. This precludes the possibility or the incidence of cracking being greater than 100 percent.

**091−1.62** For repair and reporting purposes, record the location, size (length and depth), and description of all cracks. The following definitions can be used:

1. **Longitudinal crack.** A crack that is oriented longitudinally or parallel to the weld deposit and is located in the body of the weld.

2. **Longitudinal toe crack.** A crack that is oriented longitudinally or parallel to the weld deposit and is located at the toe or edge of the weld.

3. **Transverse crack.** A crack that is oriented transversely or perpendicular to the weld deposit.

4. **Length of crack.** The greatest length encountered during the process of inspection and removal.

5. **Depth of crack.** The greatest depth encountered during the process of inspection and removal, measured from the original surface of the base plate.

**091−1.63** If defects are discovered by MT, ET, or PT inspection methods, remove all defects discovered until reinspection of the area shows no evidence of defects. Defects can be removed either by grinding or carbon arc air gouging. If defects are discovered by UT inspection when this method is used, the discontinuities which fail to meet the acceptance criteria of NAVSEA 0900−LP−116−3010 must be reported to NAVSEA as soon as possible for evaluation. Also report immediately to NAVSEA any other conditions such as missing welds, incomplete structure, and severe deformation that the inspecting activity considers critical to the safety of the submarine.

**091−1.64 Repair**. Repairs when specified shall be made in accordance with paragraphs 091−1.79 through 091−1.83.

**091−1.65 Reporting**. Reports shall be prepared in accordance with paragraphs 091−1.84 through 091−1.89.

**091−1.66 Tables of Submarine Hull Inspection Areas**. Table 091−3, through Table 091−26 define inspection criteria for classes of submarines or individual submarines. Each table title includes the submarine or class of submarine to which the data pertains.

**Table 091−3. SS563 CLASS SUBMARINE HULL INSPECTION CRITERIA**

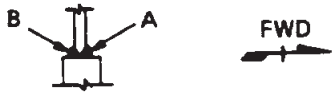
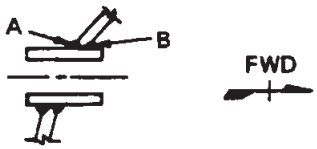
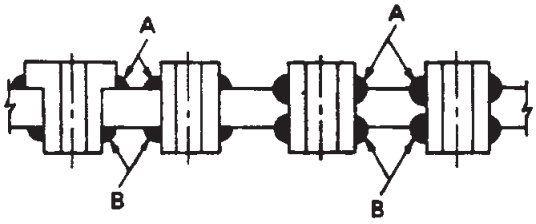
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | End closure bhd Frame 16   | Inspect 25 percent of welds A and B | Note: 1 |
| 2 | Torpedo tube inserts to bhd 16   | Inspect 100 percent of all torpedo tube insert to bhd welds | Note: 2a |
| 3 | Fwd access/escape trunk to hull insert   | Inspect 100 percent of welds A and B | Note: 2b |
| 4 | Steering ram penetration   | Inspect 100 percent of welds A and B | ----- |
| 5 | Negative tank | Inspect 100 percent of the internal surfaces of all T- and corner welds affecting the watertight integrity of the tank. | Note: 2c |
| 6 | Diving ram penetration   | Inspect 100 percent of welds A and B | ----- |

Table 091-3. SS563 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 7 | Shaft Tube Penetration   | Inspect 100 percent of welds A and B | ----- |
| 8 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (See Note 3) | Note: 2d |

CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION

Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.

Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include:

a. 100 percent of the aft torpedo tubes to ellipsoidal closure head welds.

b. 100 percent of the aft access/escape trunk to hull insert welds.

c. 100 percent of the corresponding welds of the safety tank.

d. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.

Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected).

**Table 091-4. AGSS569 SUBMARINES HULL INSPECTION CRITERIA**

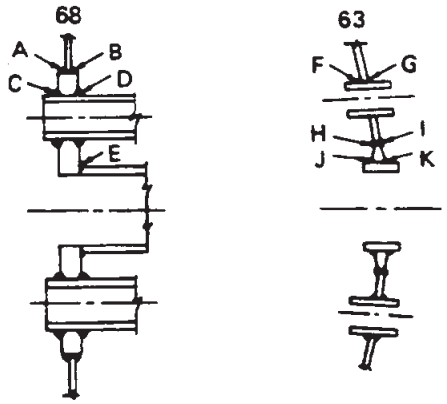
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder joint 12 inches aft of frame 14   | Inspect 25 percent of welds A and B | Note: 1<br>Note: 2a |
| 2 | Access/escape trunk, frame 12   | Inspect 100 percent of welds A and B | Note: 2b |
| 3 | Bulkhead 68 to shell   | Inspect 25 percent of welds A and B | Note: 1 |
| 4 | Shaft and ram penetrations of bhd 68 and ellipsoidal head frame 63   | Inspect 100 percent of welds A through K | ----- |

**Table 091−4. AGSS569 SUBMARINES HULL INSPECTION CRITERIA (Continued)**

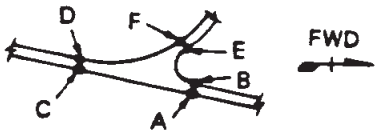
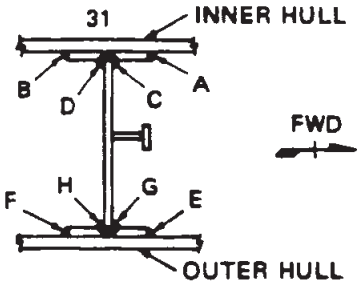
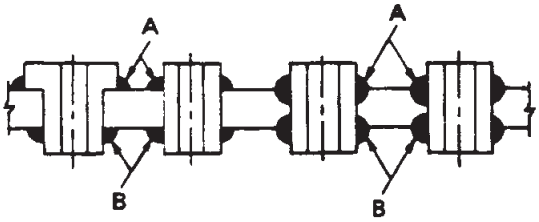
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 5 | HY-80. Forged insert to pressure hull and ellipsoidal head   | Inspect 25% of welds A through F | Note: 2c |
| 6 | Safety tank bhd frame 31   | Inspect 100 percent of welds A through H and 4 Flat Plate Panel Boundary welds. Panels to be chosen for accessibility | Note: 2d<br>Note: 3 |
| 7 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (See Note: 4) | Note: 2e |

Table 091-4. AGSS569 SUBMARINES HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION<br><br>Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.<br><br>Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include:<br>a. 25 percent of the cone-cylinder joint 9-3/8 inches fwd of frame 54.<br>b. 100 percent of the access & escape trunk, at frame 41-1/2, to hull joint.<br>c. The remainder of the other joints associated with the HY-80 forged insert.<br>d. 100 percent of the corresponding safety tank bhd 28 welds.<br>e. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.<br><br>Note: 3 In cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on.<br><br>Note: 4 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

**Table 091-5. LPSS574 SUBMARINE HULL INSPECTION CRITERIA**

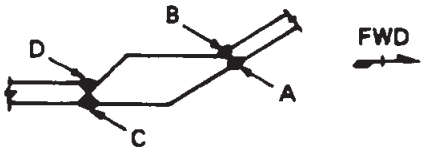
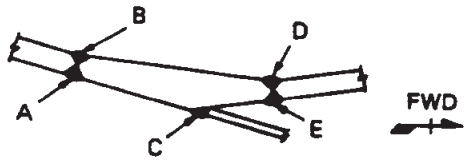
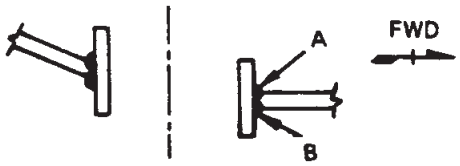
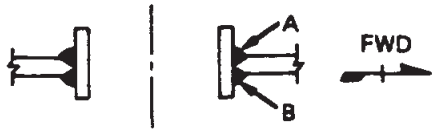
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder intersection frame BB   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 2 | Cone-cylinder intersection frame 92   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 3 | End closure bhd, frame 15   | Inspect 25 percent of welds A and B | Note: 1<br>Note: 2b |
| 4 | Aft access/escape trunk, frame 90   | Inspect 100 percent of welds A and B | Note: 2c |
| 5 | Crews access trunk, frame 64   | Inspect 100 percent of weld A and B | Note: 2d |

Table 091−5. LPSS574 SUBMARINE HULL INSPECTION CRITERIA (Continued)

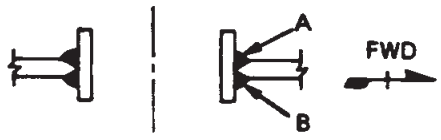
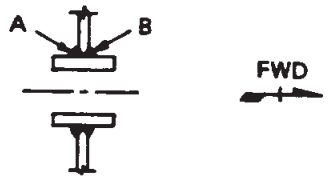
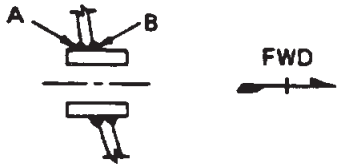
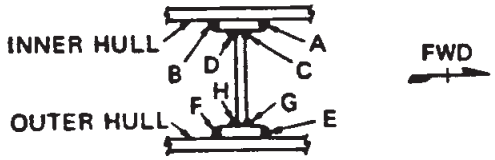
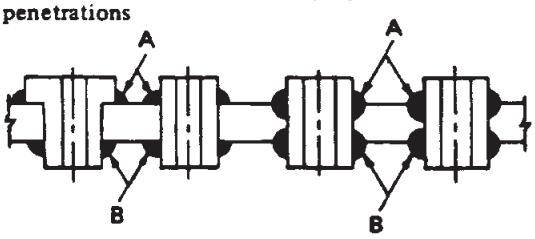
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Bridge access trunk, frame 46   | Inspect 100 percent of weld A and B | Note: 2e |
| 7 | Shaft tube penetration of bhd 90   | Inspect 100 percent of welds A and B | – – – – – |
| 8 | Steering ram penetration   | Inspect 100 percent of welds A and B | – – – – – |
| 9 | Diving ram penetration   | Inspect 100 percent of welds A and B | – – – – – |

Table 091-5. LPSS574 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 10 | Torpedo tube insert to bhd 16   | Inspect 100 percent of welds A and B | Note: 2f |
| 11 | Bhd 59   | Inspect 100 percent of welds A through H and 4 flat plate panel boundary welds. Panel to be chosen for accessibility | Note: 2g<br>Note: 3 |
| 12 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (See Note: 4) | Note: 2h |

CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION

Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.

Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include:

a. The remainder of the joint at the opposite end of the transition ring.

b. The remainder of the joint at bhd 15.

c. 100 percent of the forward escape trunk to hull insert weld.

d. 100 percent of the hangar access trunks to hull insert weld.

e. 100 percent of the torpedo loading hatch to hull insert wled.

f. The torpedo tube to ellipsoidal head welds at frame 110.

g. 100 percent of the similar welds on bulkhead 54.

h. Additional penetrations until such time as the ratio of length of defects to length inspected becomes less than 3 percent.

Table 091-5. LPSS574 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION (Continued) | | |
| | Note: 3 If in cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on. | | |
| | Note: 4 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks that are subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

**Table 091−6. SS576 SUBMARINE HULL INSPECTION CRITERIA**

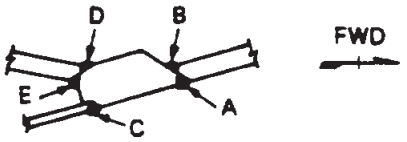
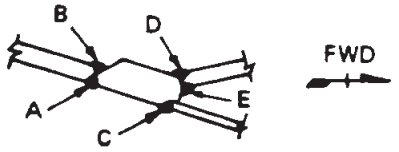
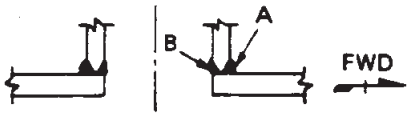
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder intersection, frame 25   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 2 | Cone-cylinder intersection, frame 82   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 3 | End closure bulkhead, frame 12   | Inspect 25 percent of welds A and B | Note: 1 |
| 4 | Fwd access/escape trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 2b |
| 5 | Aft access/escape trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 2c |

**Table 091−6. SS576 SUBMARINE HULL INSPECTION CRITERIA (Continued)**

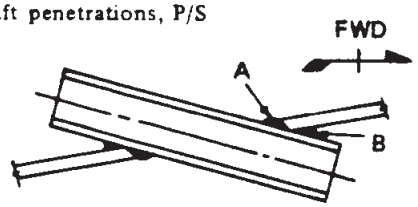
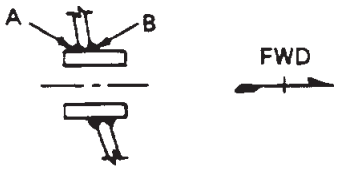
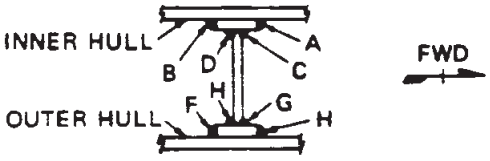
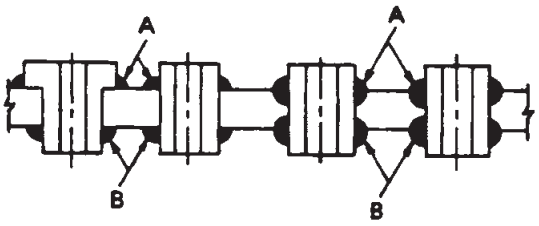
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Shaft penetrations, P/S   | Inspect 100 percent of welds A and B | – – – – – |
| 7 | Steering ram penetrations   | Inspect 100 percent of welds A and B | – – – – – |
| 8 | Diving ram penetrations   | Inspect 100 percent of weld A and B | – – – – – |
| 9 | Torpedo tube inserts to bhd 12   | Inspect 100 percent of welds A and B | Note: 2d |
| 10 | Auxiliary tank bhd, frame 46   | Inspect 100 percent of welds A through H and 4 flat plate panel boundary welds. Panels to be chosen for accessibility. | Note: 2e<br>Note: 3 |

Table 091-6. SS576 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 11 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (See Note: 4). | Note: 2f |

CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION

Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.

Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:

a. The remainder of the joint of the opposite end of the transition ring.

b. 100 percent of the bridge access trunk to hull connection.

c. 100 percent of the crews access trunk to hull connection, frame 51.

d. Torpedo tube to ellipsoidal head connection, frame 104.

e. 100 percent of the similar welds of bulkhead, frame 48.

f. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.

Note: 3 If in cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to be in excess of 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on.

Note: 4 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected).

## Table 091-7. SSN571 SUBMARINE HULL INSPECTION CRITERIA

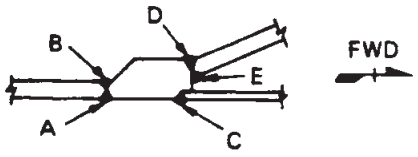
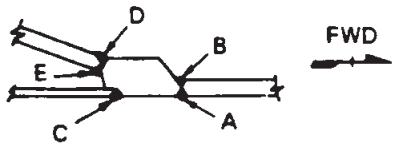
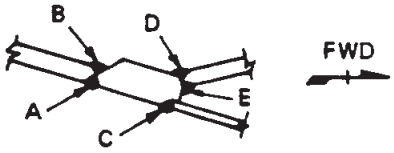
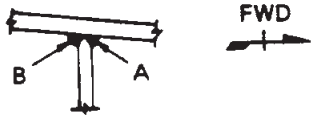
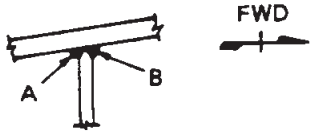
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder intersection, frame 30   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 2 | Cone-cylinder intersection, frame 55   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 3 | Cone-cylinder intersection, frame 78   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 4 | End closure bulkhead, frame 12   | Inspect 25 percent of welds A and B | Note: 1 |
| 5 | End closure bulkhead, frame 97   | Inspect 25 percent of welds A and B | Note: 1 |

Table 091-7. SSN571 SUBMARINE HULL INSPECTION CRITERIA (Continued)

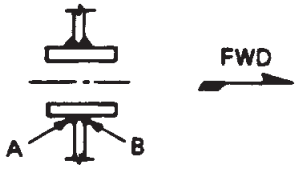
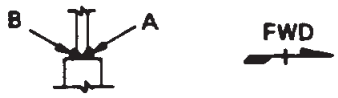
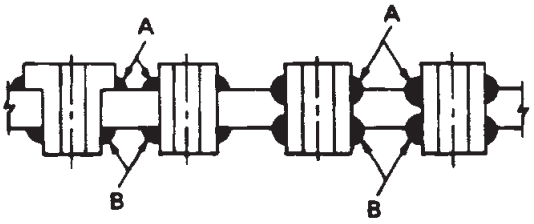
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Fwd access/escape trunk to hull insert   | Inspect 100 percent of welds A and B | Note: 2b |
| 7 | Aft access/escape trunk to hull insert   | Inspect 100 percent of welds A and B | Note: 2c |
| 8 | Shaft penetrations P/S   | Inspect 100 percent of welds A and B | ----- |
| 9 | Steering and diving ram penetrations   | Inspect 100 percent of welds A and B | Note: 2d |
| 10 | Torpedo tube insert to bulkhead 12 connection   | Inspect 100 percent of welds A and B | ----- |

Table 091-7. SSN571 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 11 | WRT tank bulkhead 14 | Inspect 100 percent of the welds in the periphery of the WRT tank bulkhead 14 | Note: 2e |
| 12 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by U.T. | ----- |
| 13 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (see Note: 3) | Note: 2f |

CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION

Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.

Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:

a. The remainder of the joint at the opposite end of the transition ring.

b. 100 percent of the access trunk to hull insert at frame 32.

c. 100 percent of the access trunk to hull insert at frame 64.

d. 100 percent of the bow diving ram penetration at frame 12 1/2.

e. 100 percent of the remainder of the boundary welds of the WRT tank.

f. Additional penetrations, until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.

Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected).

**Table 091−8. SSN575 SUBMARINE HULL INSPECTION CRITERIA**

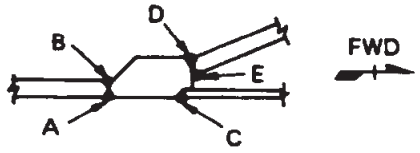
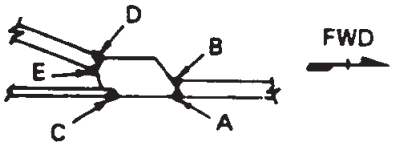
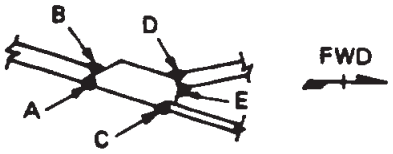
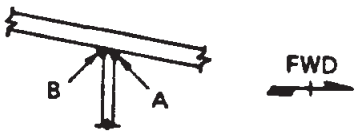
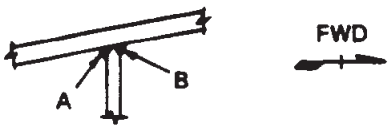
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder intersection, frame 30   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 2 | Cone-cylinder Intersection, frame 54   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 3 | Cone-cylinder intersection, frame 78   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 4 | End closure bulkhead, frame 12   | Inspect 25 percent of welds A and B | Note: 1 |
| 5 | End closure bulkhead, frame 97   | Inspect 25 percent of welds A and B | Note: 1 |

**Table 091-8. SSN575 SUBMARINE HULL INSPECTION CRITERIA (Continued)**

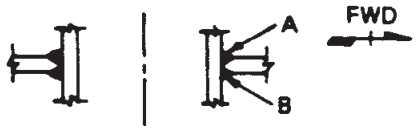
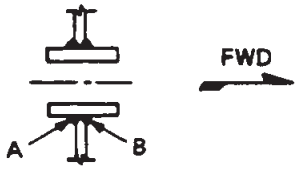
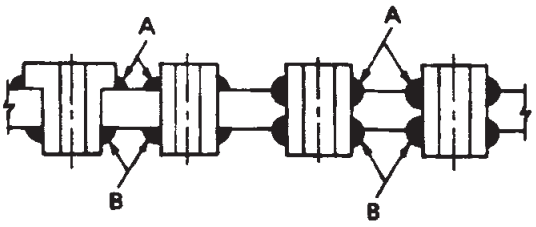
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Fwd access/escape trunk to hull insert   | Inspect 100 percent of welds A and B | Note: 2b |
| 7 | Aft access/escape trunk to hull insert   | Inspect 100 percent of welds A and B | Note: 2c |
| 8 | Shaft penetrations P/S   | Inspect 100 percent of welds A and B | ----- |
| 9 | Steering and diving ram penetrations   | Inspect 100 percent of welds A and B | ----- |
| 10 | Torpedo tube insert to bulkhead 12 connection   | Inspect 100 percent of welds A and B | ----- |

Table 091-8. SSN575 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 11 | WRT tank - bulkhead 14 | Inspect 100 percent of the welds in the periphery of the WRT tank bhd 14 | Note: 2d |
| 12 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT | - - - - - |
| 13 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (see Note: 3) | Note: 2e |

CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION

Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.

Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:

a. The remainder of the joint at the opposite end of the transition ring.

b. 100 percent of the access trunk to weld insert at frame 32.

c. 100 percent of the access trunk to hull insert at frame 66.

d. 100 percent of the remainder of the boundary welds of the WRT tank.

e. Additional penetrations, until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.

Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected).

**Table 091−9. SS580 CLASS SUBMARINE HULL INSPECTION CRITERIA**

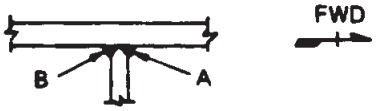
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | End closure bulkhead at frame 10   | Inspect 25 percent of welds A and B | Note: 1 |
| 2 | Fwd access/escape trunk   | Inspect 100 percent of welds A and B | Note: 2a |
| 3 | Aft access/escape trunk   | Inspect 100 percent of welds A and B | Note: 2b |
| 4 | Shaft tube penetration of ellipsoidal head, frame 77   | Inspect 100 percent of welds A and B | ----- |

Table 091−9. SS580 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

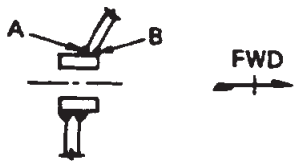
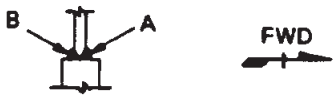
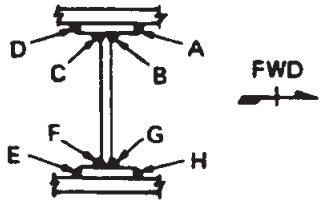
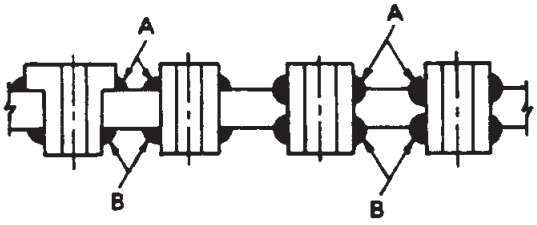
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 5 | Steering and diving ram penetrations   | Inspect 100 percent of welds A and B | – – – – – |
| 6 | Torpedo tube inserts to bhd 10 connection   | Inspect 100 percent of welds A and B | – – – – – |
| 7 | Auxiliary tank no. 1 bhd 40   | Inspect 100 percent of welds A through H and 4 flat plate panel boundary welds. Panels to be chosen for accessibility | Note: 2c<br>Note: 3 |
| 8 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (see Note: 4) | Note: 2d |

Table 091-9. SS580 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION<br><br>Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.<br><br>Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:<br>a. 100 percent of the bridge access trunk to hull insert.<br>b. 100 percent of the access loading hatch at frame 48.<br>c. 100 percent of the remaining boundary welds of auxiliary tank no. 1.<br>d. Additional penetrations, until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.<br><br>Note: 3 If in cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel the inspection shall be expanded to an adjacent panel and so on.<br><br>Note: 4 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

Table 091-10. SSN578 CLASS SUBMARINE HULL INSPECTION CRITERIA

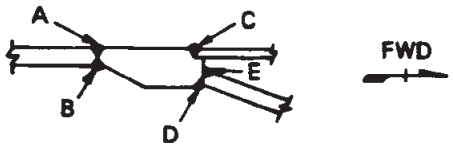
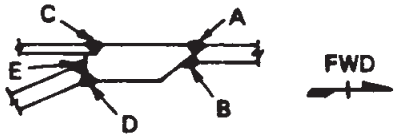
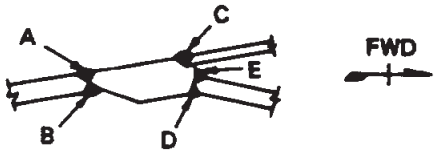
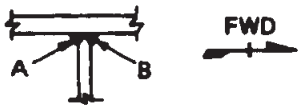
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder intersection, frame 30   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 2 | Cone-cylinder intersection, frame 54   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 3 | Cone-cylinder intersection, frame 78   | Inpsect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 4 | End closure bulkhead, frame 12   | Inspect 25 percent of welds A and B | Note: 1 |
| 5 | End closure bulkhead, frame 97   | Inspect 25 percent of welds A and B | Note: 1 |

**Table 091−10. SSN578 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)**

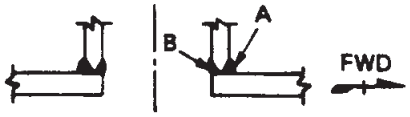
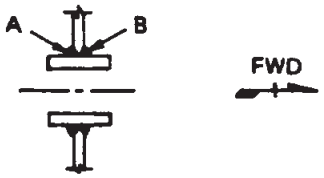
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Fwd access/escape trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 2b |
| 7 | Aft access/escape trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 2c |
| 8 | Shaft penetrations P/S   | Inspect 100 percent of welds A and B | ----- |
| 9 | Steering and diving ram penetrations   | Inspect 100 percent of welds A and B | ----- |

Table 091−10. SSN578 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

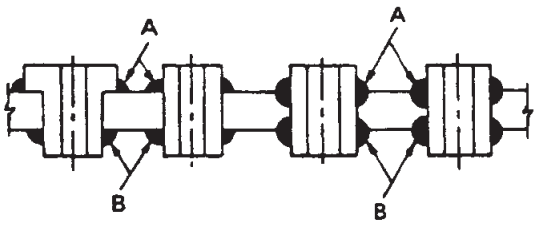
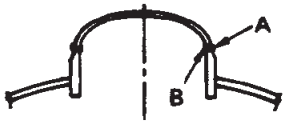
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 10 | Torpedo tube inserts to bhd 12 connection   | Inspect 100 percent of welds A and B | − − − − − |
| 11 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT | − − − − − |
| 12 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (see Note: 3) | Note: 2d |
| 13 | Ellipsoidal head to trunk of coolant pump closure hatch   | Inspect 100 percent of welds A and B | − − − − − |

Table 091-10. SSN578 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION<br><br>Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.<br><br>Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:<br>a. The remainder of the joint at the opposite end of the transition ring.<br>b. 100 percent of the access trunk to hull insert connection at frame 32.<br>c. 100 percent of the access trunk to hull insert connection at frame 66.<br>d. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.<br><br>Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

Table 091-11. SSN585 SUBMARINE HULL INSPECTION CRITERIA

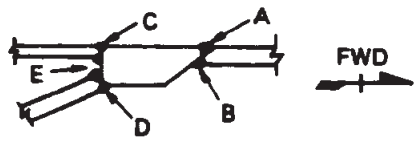
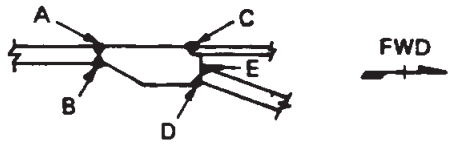
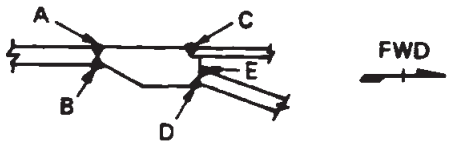
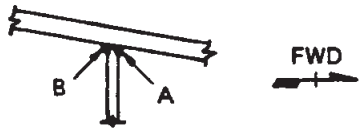
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder intersection frame 50   | Inspect 25 percent of weld A and 25 percent of weld C | Note: 1<br>Note: 2a<br>Note: 4 |
| 2 | Cone-cylinder intersection frame 67   | Inspect 25 percent of welds A, B, C, D | Note: 1<br>Note: 2a |
| 3 | Cone-cylinder intersection frame 28   | Inspect 25 percent of welds A, B, C, D | Note: 1<br>Note: 2a |
| 4 | Bhd 13   | Inspect 25 percent of weld A and 25 percent of weld B. Inspect three (3) flat plate panel boundaries. Panels to be chosen for accessibility. | Note: 1<br>Note: 2b<br>Note: 3 |
| 5 | Bhd 94   | Inspect 25 percent of weld A and 25 percent of weld B. Inspect three (3) flat plate panel boundaries. Panels to be chosen for accessibility. | Note: 1<br>Note: 2c<br>Note: 3 |

Table 091-11. SSN585 SUBMARINE HULL INSPECTION CRITERIA (Continued)

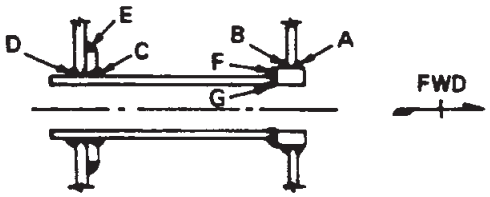
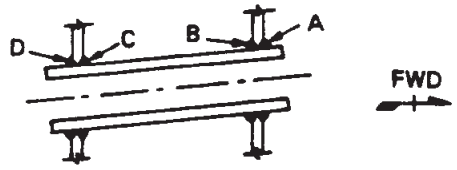
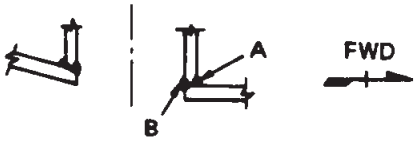
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Stern shaft tube to bhds 92 and 94   | Inspect 100 percent of welds A, B, C, D, E, F, and G. Inspect G only if and when the shaft is removed. | - - - - - |
| 7 | Steering and diving ram penetrations of bhds 92 and 94   | Inspect 100 percent of welds A, B, C, and D | - - - - - |
| 8 | Torpedo ejection pump seachest | Inspect 100 percent of all welds affecting the watertight integrity of the sea chest | - - - - - |
| 9 | Trash disposal unit | Inspect 100 percent of all welds affecting the watertight integrity of the sea chest | |
| 10 | Structural housing, main sea water cooling, suction and discharge seachests | Inspect 100 percent of the pressure side of all welds affecting the watertight integrity of the sea chest | - - - - - |
| 11 | Aft escape trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 2d |

Table 091-11. SSN585 SUBMARINE HULL INSPECTION CRITERIA (Continued)

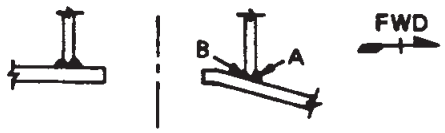
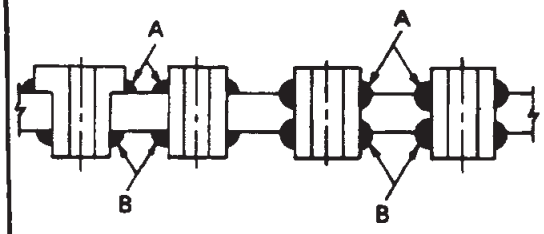
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 12 | Bridge access trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 2d |
| 13 | WRT tank | Inspect all tank bounding plate edge welds, both internal and external to WRT tank except where WRT and fwd trim tank have a common boundary. Where the common boundary exists inspect only that portion of the weld inside the WRT tank | ----- |
| 14 | Fwd trim tank | Inspect all tank bounding plate edge welds, both internal and external to fwd trim tank except where fwd trim and WRT have a common boundary. Where the common boundary exists inspect only that portion of the weld inside the fwd trim tank. Inspect 4 flat plate panel boundary welds. Panels to be chosen where accessible on frame 17. | ----- |
| 15 | Torpedo tube penetrations of bhd 13   | Inspect 100 percent of welds A and B on the upper port and upper starboard torpedo tubes | Note: 2e |
| 16 | Negative tank | Inspect 100 percent of all tank bounding plate edge welds internal to the negative tank. Inspect four (4) flat plate panel boundaries on the tank top. Panels to be chosen for accessibility. | Note: 2f<br>Note: 3 |

Table 091-11. SSN585 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 17 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT | - - - - - |
| 18 | Electrical, mechanical, and piping penetration   | Inspect 100 percent of either weld A and B of 50 percent of the total number of penetrations (see Note: 5) | Note: 2g |

CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION

Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.

Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:

a. The remainder of the joint at the opposite end of the transition ring.

b. The remainder of the joint at bhd 94.

c. The remainder of the joint at bhd 13.

d. 100 percent of the fwd escape trunk to hull insert connection.

e. The bhd 13 welds to the remaining torpedo tubes.

f. 100 percent of all tank bounding plate edge welds internal to the aft trim tank and auxiliary tanks 1 and 2.

g. Additional penetration until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.

Note: 3 If in cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on.

Note: 4 If in the course of inspection and repair, the removal of hull shielding is required, NAVSEA approval shall be obtained prior to the start of removal.

Note: 5 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected).

**Table 091−12. SSN588 CLASS SUBMARINE HULL INSPECTION CRITERIA**

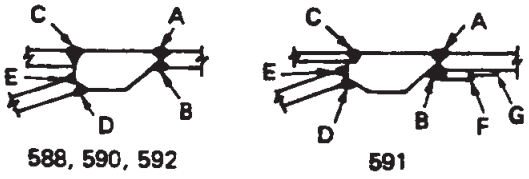
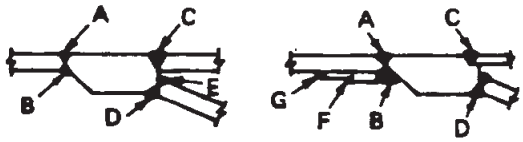
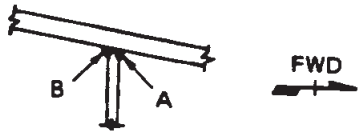
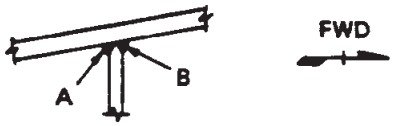
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder intersection frame 50<br>  <br><br>588, 590, 592 591 | Inspect 25 percent of weld A and 25 percent of weld C | Note: 1<br>Note: 2a<br>Note: 4 |
| 2 | Cone-cylinder intersection frame 67<br>  <br><br>588, 590, 592 591 | Inspect 25 percent of welds A, B, C, D, F and G | Note: 1<br>Note: 2a |
| 3 | Cone-cylinder intersection frame 28 (sim. to frame 67) | Inspect 25 percent of welds A, B, C, D, F and G | Note: 1<br>Note: 2a |
| 4 | Bhd 13<br>  <br> | Inspect 25 percent of weld A and 25 percent of weld B. Inspect three (3) flat plate panel boundaries. Panels to be chosen for accessibility. | Note: 1<br>Note: 2b<br>Note: 3 |
| 5 | Bhd 94<br>  <br> | Inspect 25 percent of weld A and 25 percent of weld B. Inspect three (3) flat plate panel boundaries. Panels to be chosen for accessibility. | Note: 1<br>Note: 2c<br>Note: 3 |

Table 091-12. SSN588 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

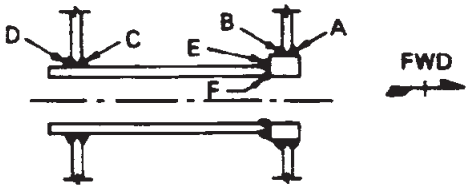
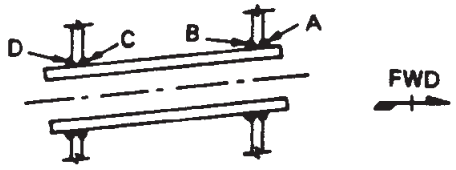
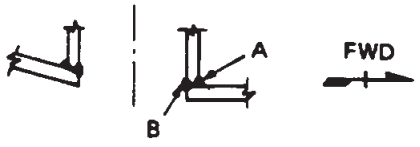
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Stern shaft tube to bhds 92 and 94   | Inspect 100 percent of welds A, B, C, D, E, and F. Inspect F only if and when the shaft is removed. | - - - - - |
| 7 | Steering and diving ram penetrations of bhds 92 and 94   | Inspect 100 percent of welds A, B, C, and D | - - - - - |
| 8 | Torpedo ejection pump sea chest | Inspect 100 percent of all welds affecting the watertight integrity of the sea chest | - - - - - |
| 9 | Trash disposal unit | Inspect 100 percent of all welds affecting the watertight integrity of the sea chest. | - - - - - |
| 10 | Structural housing, main sea water cooling, suction and discharge sea chests | Inspect 100 percent of the pressure side of all welds affecting the watertight integrity of the sea chest. | - - - - - |
| 11 | Aft escape trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 2d |

Table 091-12. SSN588 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

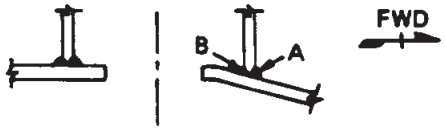
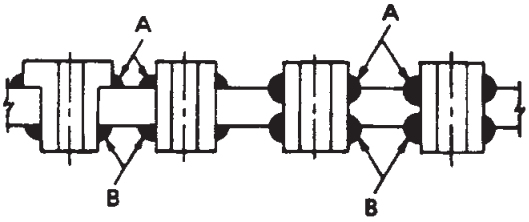
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 12 | Bridge access trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 2d |
| 13 | WRT tank | Inspect all tank bounding plate edge welds, both internal and external to WRT tank except where WRT and fwd trim tank have a common boundary. Where the common boundary exists inspect only that portion of the weld inside the WRT tank. | - - - - - |
| 14 | Fwd trim tank | Inspect all tank bounding plate edge welds, both internal and external to fwd trim tank except where fwd trim and WRT have a common boundary. Where the common boundary exists inspect only that portion of the weld inside the fwd trim tank. Inspect 4 flat plate panel boundary welds. Panels to be chosen where accessible on frame 17. | - - - - - |
| 15 | Torpedo tube penetrations of bhd 13   | Inspect 100 percent of welds A and B on the upper port and upper starboard torpedo tubes. | Note: 2e |

Table 091-12. SSN588 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 16 | Negative tank | Inspect 100 percent of all tank bounding plate edge welds internal to the negative tank. Inspect four (4) flat panel boundaries on the tank top. Panels to be chosen for accessibility. | Note: 2f<br>Note: 3 |
| 17 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT | ----- |
| 18 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (see Note: 5) | Note: 2g |

CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION

Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.

Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:

a. The remainder of the joint at the opposite end of the transition ring.

b. The remainder of the joint at bhd 94.

c. The remainder of the joint at bhd 13.

d. 100 percent of the fwd escape trunk to hull insert connection.

e. The bhd 13 welds to the remaining torpedo tubes.

f. 100 percent of all tank bounding plate edge welds internal to the aft trim tank and auxiliary tanks 1 and 2.

g. Additional penetration until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.

Table 091-12. SSN588 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | Note: 3 If in cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on.<br><br>Note: 4 If in the course of inspection and repair, the removal of hull shielding is required, NAVSEA approval shall be obtained prior to the start of removal.<br><br>Note: 5 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

**Table 091−13. SSN587 SUBMARINE HULL INSPECTION CRITERIA**

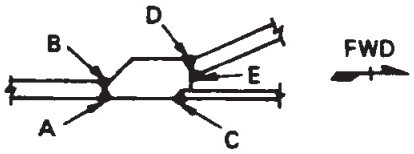
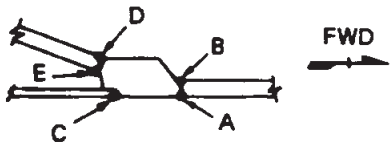
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder intersection frame 62   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 2 | Cone-cylinder intersection frame 116   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 3 | End closure bulkhead frame 1   | Inspect 25 percent of welds A and B | Note: 1<br>Note: 2b |
| 4 | Fwd access/escape trunk frame 17   | Inspect 100 percent of welds A and B | Note: 2c |
| 5 | Aft access/escape trunk frame 122   | Inspect 100 percent of welds A and B | Note: 2d |

Table 091−13. SSN587 SUBMARINE HULL INSPECTION CRITERIA (Continued)

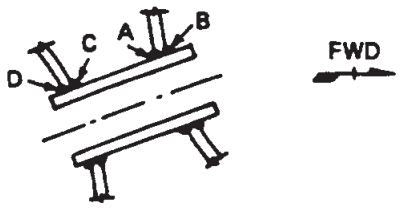
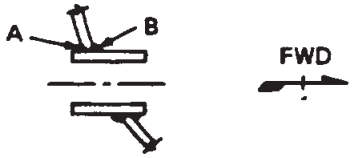
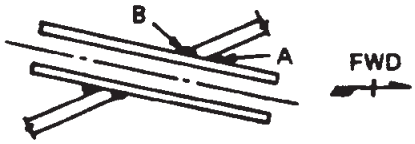
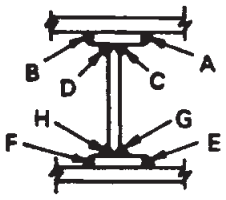
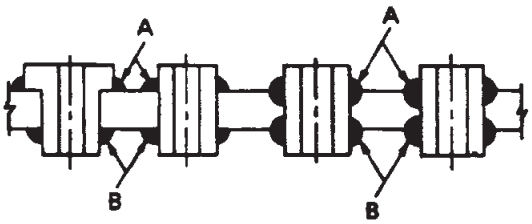
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Hangar to hull connection   | Inspect 100 percent of welds A, B, C, and D | − − − − − |
| 7 | Steering and diving ram penetrations   | Inspect 100 percent of welds A and B | − − − − − |
| 8 | Shaft tube penetration   | Inspect 100 percent of welds A and B | − − − − − |
| 9 | Torpedo tube insert to bhd 12 connections   | Inspect 100 percent of welds A and B | Note: 2e |

Table 091-13. SSN587 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 10 | Auxiliary tank no. 1 (bhd 57)   | Inspect 100 percent of welds A through H and 4 flat plate panel boundary welds. Panels to be chosen for accessibility. | Note: 2f<br>Note: 3 |
| 11 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT | ----- |
| 12 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations. (see Note: 4) | Note: 2g |

CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION

Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.

Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:

a. The remainder of the joint at the opposite end of the transition ring.

b. The remainder of the joint at bulkhead 11.

c. 100 percent of the access trunk to hull insert weld at frame 69.

d. 100 percent of the access trunk to hull insert weld at frame 101.

e. The torpedo tube to ellipsoidal head welds at frame 135.

f. 100 percent of the similar welds in auxiliary tank no. 2.

Table 091-13. SSN587 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | g. Additional penetrations until such time as the ratio of length of defects to length inspected becomes less than 3 percent.<br><br>Note: 3 If in cases where inspections of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel the inspection shall be expanded to an adjacent panel and so on.<br><br>Note: 4 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

Table 091-14. SSN597 SUBMARINE HULL INSPECTION CRITERIA

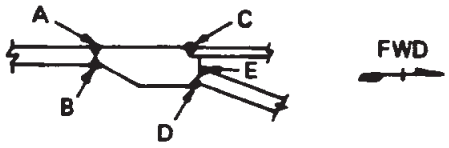
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder intersection frame 20   | Inspect 25 percent of welds A, B, C, and D | Note: 1<br>Note: 2a |
| 2 | Bulkhead "D"   | Inspect 25 percent of weld A and 25 percent of weld B. Inspect three (3) flat plate panel boundaries. Panels to be chosen for accessibility. | Note: 1<br>Note: 2b<br>Note: 3 |
| 3 | Bulkhead frame 88   | Inspect 25 percent of weld A and 25 percent of weld B. Inspect four (4) flat plate panel boundaries. Panels to be chosen for accessibility. | Note: 1<br>Note: 3 |
| 4 | Structural housing, main sea water cooling, suction and discharge sea chests | Inspect 100 percent of the pressure side of all welds affecting the watertight integrity of the sea chest. | ----- |
| 5 | Trash disposal unit | Inspect 100 percent of all welds affecting the watertight integrity of the sea chest. | ----- |
| 6 | Negative tank | Inspect all tank bounding plate edge welds, both internal and external to negative tank. Inspect four (4) flat plate panel boundary welds. Panels to be chosen where accessible on tank top or bhd 17. | Note: 3 |

Table 091-14. SSN597 SUBMARINE HULL INSPECTION CRITERIA (Continued)

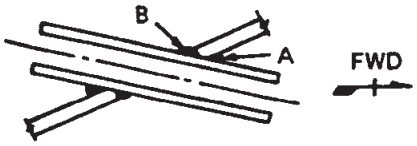
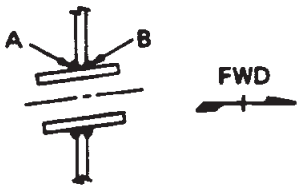
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 7 | Fwd escape trunk to hull insert   | Inspect 100 percent of welds A and B. | Note: 2c |
| 8 | Torpedo tube penetrations   | Inspect 100 percent of welds A and B on the upper starboard torpedo tube penetration. | Note: 2d |
| 9 | Stern shaft tube to bhd connection   | Inspect 100 percent of welds A and B | ----- |
| 10 | Steering and diving ram penetrations   | Inspect 100 percent of welds A and B | ----- |

Table 091-14. SSN597 SUBMARINE HULL INSPECTION CRITERIA (Continued)

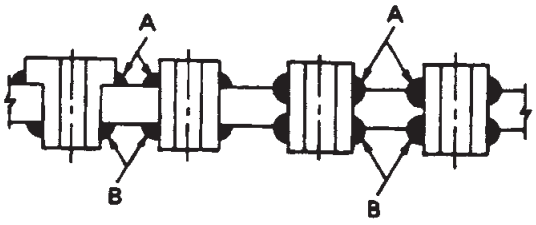
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 11 | Auxiliary tank no. 1 | Inspect 100 percent of all tank bounding plate edge welds internal to auxiliary tank no. 1. Inspect four (4) flat plate panel boundaries on the tank top. Panels to be chosen where accessible. | Note: 2e<br>Note: 3 |
| 12 | WRT tank no. 1 | Inspect 100 percent of all tank bounding plate edge welds internal to WRT no. 1. Inspect four (4) flat plate panel boundaries on the tank top. Panels to be choosen where accessible. | Note: 2f |
| 13 | Primary shield tank | Inspect 100 percent of the shield tank to hull plating interface by UT. | |
| 14 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (See note: 4) | Note: 2g |

Table 091-14. SSN597 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION | | |
| | Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface, is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint. | | |
| | Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface, is found to be defective, the inspection shall be expanded to include the following:<br>a. The remainder of the joint at the opposite end of the transition ring and 25 percent of the corresponding joints of cone-cylinder frame 0.<br>b. 25 percent of the internal bhd frame B to shell connection.<br>c. 100 percent of the trunk to shell connection of aft escape trunk frame 58.<br>d. 100 percent of the lower stbd torpedo tube to shell connection.<br>e. 100 percent of the tank bounding plate edge welds internal to auxiliary no. 2 and aft trim tank.<br>f. 100 percent of the tank bounding plate edge welds internal to WRT no. 2 and impulse tanks.<br>g. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent. | | |
| | Note: 3 If in cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel the inspection shall be expanded to an adajacent panel and so on. | | |
| | Note: 4 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

**Table 091-15. SSBN598 CLASS SUBMARINE HULL INSPECTION CRITERIA**

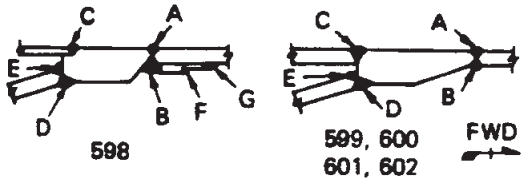
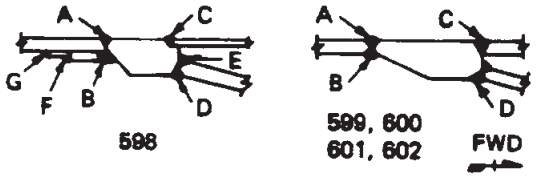
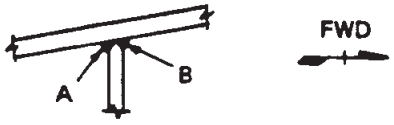
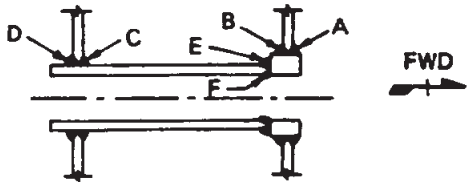
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder intersection frame 50<br>  | Inspect 25 percent of weld A and 25 percent of weld C. | Note: 1<br>Note: 2a<br>Note: 4 |
| 2 | Cone-cylinder intersection frame 67<br>  | Inspect 25 percent of welds A, B, C, D, F, and G. | Note: 1<br>Note: 2a |
| 3 | Bulkhead 13<br>  | Inspect 25 percent of weld A and 25 percent of weld B. Inspect three (3) flat plate panel boundaries. Panels to be chosen for accessibility. | Note: 1<br>Note: 2b<br>Note: 3 |
| 4 | Bulkhead 94<br>  | Inspect 25 percent of weld A and 25 percent of weld B. Inspect three (3) flat plate panel boundaries. Panels to be chosen for accessibility. | Note: 1<br>Note: 2c<br>Note: 3 |
| 5 | Stern shaft tube to bhds. 92 and 94<br>  | Inspect 100 percent of welds A, B, C, D, E, and F. Inspect F only if and when the shaft is removed. | |

Table 091-15. SSBN598 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

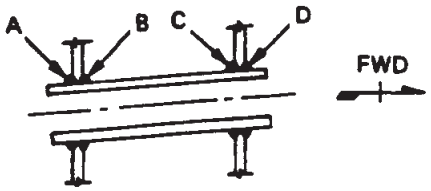
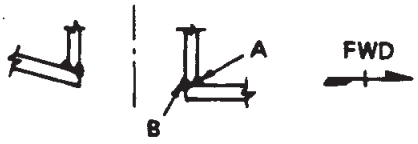
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Steering and diving ram penetrations of bhds 92 and 94   | Inspect 100 percent of welds A, B, C, and D | ------ |
| 7 | Torpedo ejection pump sea chest | Inspect 100 percent of all welds affecting the watertight integrity of the sea chest. | ------ |
| 8 | Trash disposal unit | Inspect 100 percent of all welds affecting the watertight integrity of the sea chest. | ------ |
| 9 | Structural housing, main sea water cooling, suction and discharge sea chests | Inspect 100 percent of the pressure side of all welds affecting the watertight integrity of the sea chest. | ------ |
| 10 | Aft escape trunk to hull insert connection   | Inspect 100 percent of wells A and B. | Note: 2d |
| 11 | Fwd trim tank | Inspect all tank bounding plate edge welds, both internal and external to the fwd. trim tank. Inspect four (4) flat plate panel boundary welds. Panels to be chosen where accessible on bhd 17. | Note: 2e<br>Note: 3 |

Table 091-15. SSBN598 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

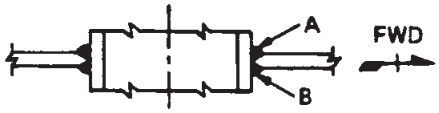
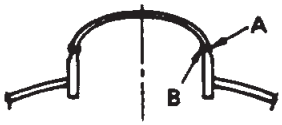
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 12 | MBT 4A and 4B | Inspect all tank bounding plate edge welds, internal to MBT 4A and 4B. Inspect four (4) flat plate panel boundary welds on the tank top of each tank. Panels to be choosen where accessible. | Note: 2f<br>Note: 3 |
| 13 | Torpedo tube penetrations of bhd 13<br>  | Inspect 100 percent of welds A and B on the upper port and upper stbd. torpedo tubes | Note: 2g |
| 14 | Missile tube penetrations<br>  | Inspect 100 percent of welds A and B of missile tubes 1 and 2. | Note: 2h |
| 15 | Primary Shield tank | Inspect 100 percent of the shield tank to hull plating interface by UT. | ------ |
| 16 | Elliptical closure head to trunk<br>  | Inspect 100 percent of welds A and B. | ------ |

Table 091-15. SSBN598 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

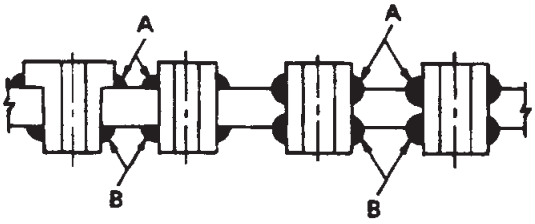
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 17 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (see note: 5) | Note: 2i |
| 18 | WRT tank | Inspect all tank bounding plate edge welds both internal and external to the WRT tank. Inspect two flat plate panel boundary welds. Choose panels where accessible. | Note: 3 |
| 19 | Sanitary tanks 1 and 3 | Inspect all tank bounding plate edge welds external to the sanitary tanks. | ------ |

Table 091-15. SSBN598 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION<br><br>Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface, is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.<br><br>Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint, or in a particular weld surface, is found to be defective, the inspection shall be expanded to include the following:<br><br>a. The remainder of the joint at the opposite end of the transisiton ring, and 25 percent of the corresponding joints of cone-cylinder 28.<br><br>b. The remainder of the joint at bulkhead 94.<br><br>c. The remainder of the joint at bulkhead 13.<br><br>d. 100 percent of the fwd escape trunk to hull insert connection.<br><br>e. 100 percent of all tank bounding plate edge welds, both internal and external to WRT tank.<br><br>f. 100 percent of all tank bounding plate edge welds, internal to MBT 3A and 3B.<br><br>g. The bhd 13 welds to the remaining torpedo tubes.<br><br>h. 100 percent of the missile tube to shell connections of tubes 3 and 4.<br><br>i. Additional penetrations until such times as the ratio of length of defects to total length inspected becomes less than 3 percent.<br><br>Note: 3 If in cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on.<br><br>Note: 4 If in the course of inspection and repair, the removal of hull shielding is required, NAVSEA approval must be obtained prior to the start of removal.<br><br>Note: 5 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

**Table 091−16. SSBN608 CLASS SUBMARINE HULL INSPECTION CRITERIA**

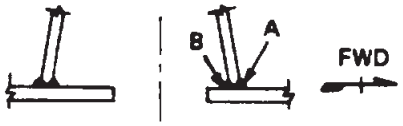
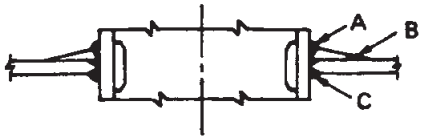
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Structural housing, main sea water cooling, suction and discharge sea chests   | Inspect 100 percent of welds A, B, C, and D | ------ |
| 2 | Depth control tanks | Inspect all tank bounding plate edge welds internal to the depth control tanks. Inspect four (4) flat plate panel boundary welds on the tank top of each tank. Panels to be chosen where accessible. | Note: 2 |
| 3 | Bridge access trunk to hull connection   | Inspect 100 percent of welds A and B | Note: 1a |
| 4 | Fwd escape trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 1a |
| 5 | Missile tube 1 and 2 to hull connection   | Inspect 100 percent of welds A, B, and C on missile tubes 1 and 2 | Note: 1b |

Table 091-16. SSBN608 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

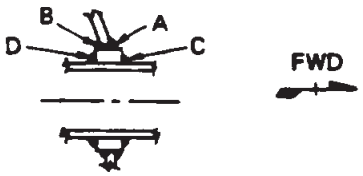
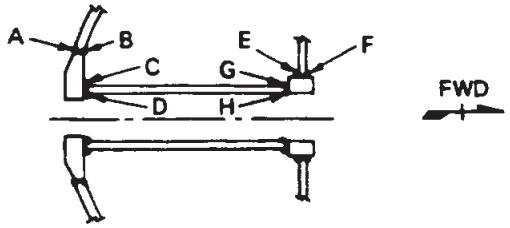
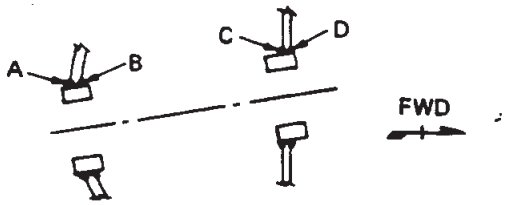
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Torpedo tube penetrations of fwd ellipsoidal head   | Inspect 100 percent of welds A, B, C, and D of the upper port and stbd tubes | Note: 1c |
| 7 | Shaft tube penetration of bhd 153 and aft ellipsoidal head   | Inspect 100 percent of welds A, B, C, E, F and G. Inspect D and H only if and when shaft is removed. | ------ |
| 8 | Steering and diving ram penetrations of bhd 153 and aft ellipsoidal head   | Inspect 100 percent of welds A, B, C, and D | ------ |
| 9 | Torpedo impulse tank | Inspect 100 percent of all interior and exterior tank bounding plate edge welds | ------ |

Table 091-16. SSBN608 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

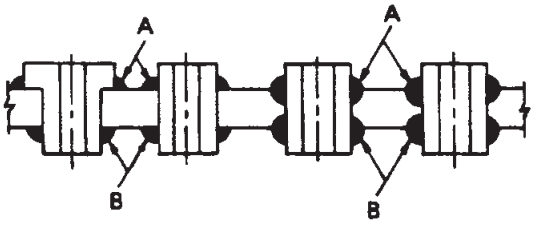
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 10 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT. Inspect PST top and sides to bulkhead by UT if HY-80 is involved. | ------ |
| 11 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations except for missile tube hatch operating cylinder penetrations which shall be inspected on the inner weld. (See note: 3) | Note: 1d |

Table 091-16. SSBN608 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION<br><br>Note: 1 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:<br><br>a. 100 percent of the aft escape trunk to hull insert welds and 100 percent of the access and capsule loading trunk to hull insert welds.<br>b. 100 percent of the missile tube to hull weld of missile tubes 3 and 4.<br>c. 100 percent of the lower port and stbd torpedo tubes to fwd head welds.<br>d. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.<br><br>Note: 2 If in cases where inspections of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel the inspection shall be expanded to an adjacent panel and so on.<br><br>Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). A weld contour inspection shall be performed on missile tube hatch operating cylinder penetrations prior to MT inpsection. If a notch exists, the notch shall be contour-ground and then MT'd. | | |

**Table 091−17. SSBN616 CLASS SUBMARINE HULL INSPECTION CRITERIA**

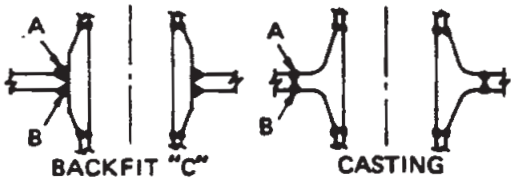
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Structural housing, main sea water cooling, suction and discharge sea chests   | Inspect 100 percent of welds A, B, C, and D | ------ |
| 2 | Depth control tanks | Inspect all tank bounding plate edge welds internal to the depth control tanks. Inspect four (4) flat plate panel boundary welds on the tank top of each tank. Panels to be chosen where accessible. | Note: 2 |
| 3 | Bridge access trunk to hull connection   | Inspect 100 percent of welds A and B | Note: 1a |
| 4 | Fwd escape trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 1a |
| 5 | Missile tube 1 and 2 to hull connection   | Inspect 100 percent of welds A and B on missile tubes 1 and 2 | Note: 1b |

**Table 091-17. SSBN616 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)**

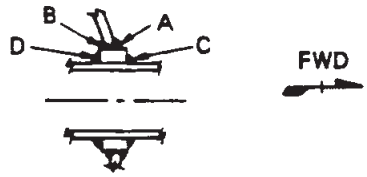
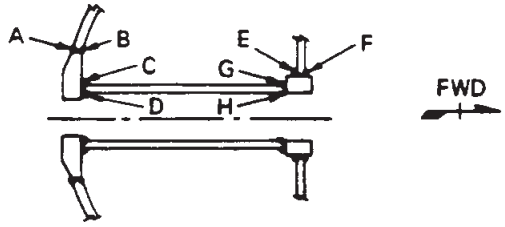
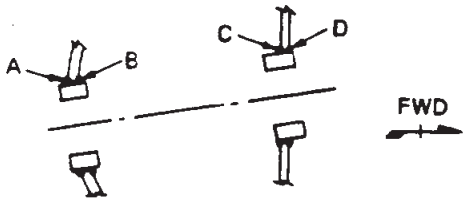
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Torpedo tube penetrations of fwd ellipsoidal head   | Inspect 100 percent of welds A, B, C, and D of the upper port and stbd tubes | Note: 1c |
| 7 | Shaft tube penetration of bhd 153 and aft ellipsoidal head   | Inspect 100 percent of welds A, B, C, E, F, and G. Inspect welds D and H only if and when shaft is removed. | ------ |
| 8 | Steering and diving ram penetrations of bhd 153 and aft ellipsoidal head   | Inspect 100 percent of welds A, B, C, and D | ------ |
| 9 | Torpedo impulse tank | Inspect 100 percent of all interior and exterior tank bounding plate edge welds. | ------ |

Table 091-17. SSBN616 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

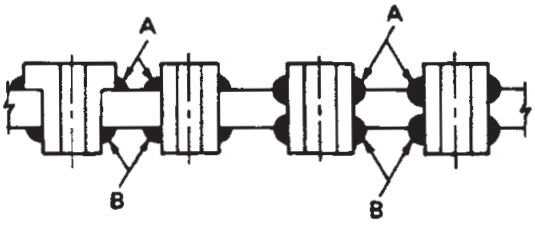
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 10 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT. Inspect PST top and sides to bulkhead by UT if HY-80 is involved. | ------ |
| 11 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations except for missile tube hatch operating cylinder penetrations which shall be inspected on the inner weld. (See note: 3) | Note: 1d |

Table 091-17. SSBN616 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AN EXTENT OF INSPECTION EXPANSION | | |
| | Note: 1 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:<br>a. 100 percent of the aft escape trunk to hull insert welds and 100 percent of the access and capsule loading trunk to hull insert welds.<br>b. 100 percent of the missile tube to hull weld of missile tubes 3 and 4.<br>c. 100 percent of the lower port and stbd torpedo tubes to fwd head welds.<br>d. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent. | | |
| | Note: 2 If in cases where inspections of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel the inspection shall be expanded to an adjacent panel and so on. | | |
| | Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). A weld contour inspection shall be performed on missile tube hatch operating cylinder penetrations prior to MT inspection. If a notch exists, the notch shall be contour-ground and then MT'd. | | |

**Table 091-18. SSBN640 CLASS SUBMARINE HULL INSPECTION CRITERIA**

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Structural housing, main sea water cooling, suction and discharge sea chests   | Inspect 100 percent of welds A, B, C, and D | ------ |
| 2 | Depth control tanks | Inspect all tank bounding plate edge welds internal to the depth control tanks. Inspect four (4) flat plate panel boundary welds on the tank top of each tank. Panels to be chosen where accessible. | Note: 2 |
| 3 | Bridge access trunk to hull connection   | Inspect 100 percent of welds A and B | Note: 1a |
| 4 | Fwd escape trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 1a |

**Table 091-18. SSBN640 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)**

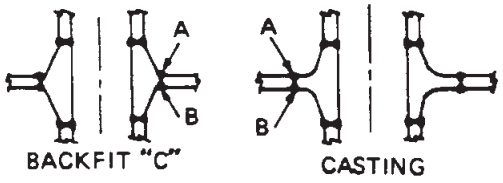
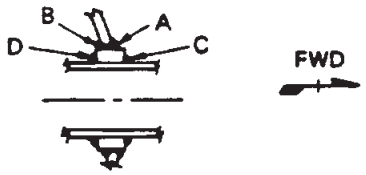
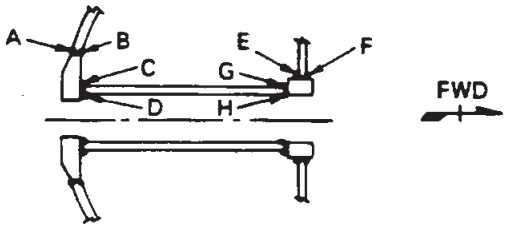
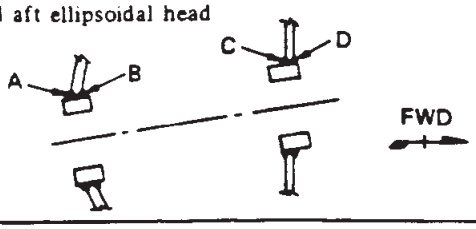
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 5 | Missile tube 1 and 2 to hull connection   | Inspect 100 percent of welds A and B on missile tubes 1 and 2 | Note: 1b |
| 6 | Torpedo tube penetrations of fwd ellipsoidal head   | Inspect 100 percent of welds A, B, C, and D of the upper port and stbd tubes. | Note: 1c |
| 7 | Shaft tube penetration of bhd 153 and aft ellipsoidal head   | Inspect 100 percent of welds A, B, C, E, F, and G. Inspect welds D and H only if and when shaft is removed. | ------ |
| 8 | Steering and diving ram penetrations of bhd 153 and aft ellipsoidal head   | Inspect 100 percent of welds A, B, C, and D | ------ |

Table 091-18. SSBN640 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

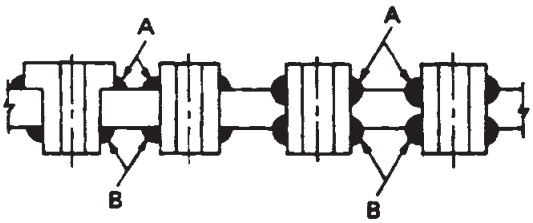
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 9 | Torpedo impulse tank | Inspect 100 percent of all interior and exterior tank bounding plate edge welds. | ------ |
| 10 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT. Inspect PST top and sides to bulkhead by UT if HY-80 is involved. | ------ |
| 11 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations except for missile tube hatch operating cylinder penetrations which shall be inspected on the inner weld. (See note: 3) | Note: 1d |

Table 091-18. SSBN640 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION | | |
| | Note: 1 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include:<br>a. 100 percent of the aft escape trunk to hull insert welds and 100 percent of the access and capsule loading trunk to hull insert welds.<br>b. 100 percent of the missile tube to hull weld of missile tubes 3 and 4.<br>c. 100 percent of the lower port and starboard torpedo tubes to forward ellipsoidal head welds.<br>d. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.<br><br>Note: 2 If in cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to be in excess of 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on.<br><br>Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). A weld contour inspection shall be performed on missile tube hatch-operating cylinder penetrations prior to MT inspection. If a notch exists, the notch shall be contour-ground and then MT'd. | | |

Table 091−19. SSN594 CLASS SUBMARINE HULL INSPECTION CRITERIA

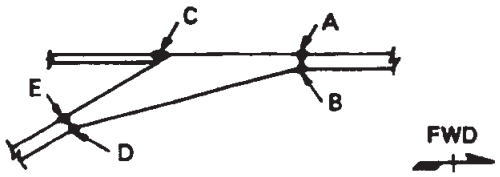
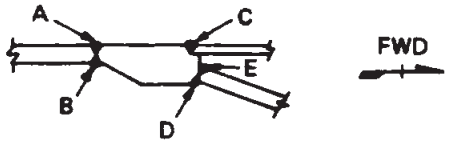
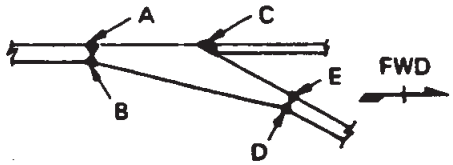
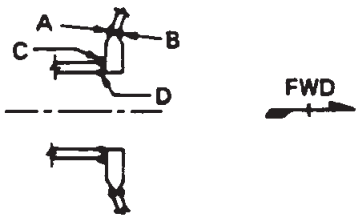
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Cone-cylinder intersection frame 58   | Inspect 25 percent of weld A and 25 percent of weld C | Note: 1<br>Note: 5 |
| 2 | Cone-cylinder intersection frame 34   | Inspect 25 percent of welds A, B, C, and D | Note: 1 |
| 3 | Cone-cylinder intersection frame 78   | Inspect 25 percent of welds A, B, C, and D | Note: 1 |
| 4 | Stern shaft tube and bhd insert   | Inspect 100 percent of welds A, B, and C. Weld D to be inspected only if and when shaft is removed. | ------ |

**Table 091−19. SSN594 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)**

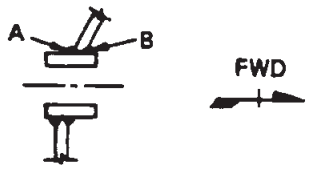
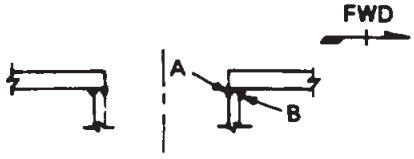
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 5 | Steering and driving ram penetrations of aft ellipsoidal head   | Inspect 100 percent of welds A and B | ------ |
| 6 | Structural housing, main seawater cooling, suction and discharge sea chests | Inspect 100 percent of the pressure side of all welds affecting the watertight integrity of the sea chest. | ------ |
| 7 | Torpedo impulse tanks | Inspect 100 percent of all welds affecting the watertight integrity of the impulse tanks. | ------ |
| 8 | Trash ejector | Inspect 100 percent of all welds affecting the watertight integrity of the sea chest. | ------ |
| 9 | Fwd. escape trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 2a |
| 10 | Torpedo loading trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 2a |

Table 091−19. SSN594 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

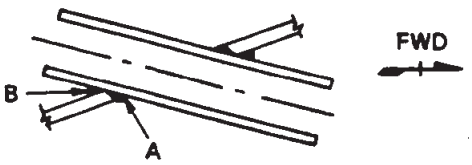
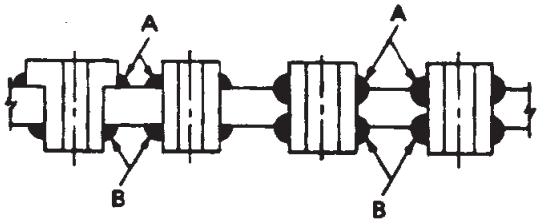
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 11 | Torpedo tube penetrations   | Inspect 100 percent of welds A and B on the upper starboard torpedo tube penetration | Note: 2b |
| 12 | Fwd. trim tank | Inspect all tank bounding plate edge welds both internal and external to the fwd trim tank. Inspect 4 flat plate panel boundary welds. Panels to be chosen where accessible on frame 11. | Note: 3 |
| 13 | Negative tank | Inspect all tank bounding plate edge welds both internal and external to the negative tank. | ------ |
| 14 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT. Inspect PST top and sides to bulkhead by UT if HY-80 is involved. | ------ |
| 15 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (See note: 3) | Note: 2c |

Table 091-19. SSN594 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION<br><br>Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.<br><br>Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include:<br><br>a. 100 percent of the aft escape trunk to hull insert connection.<br>b. The hull welds to the remaining torpedo tubes.<br>c. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.<br><br>Note: 3 In cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on.<br><br>Note: 4 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected).<br><br>Note: 5 If, in the course of inspection and repair, the removal of hull shielding is required, NAVSEA approval shall be obtained prior to the start of removal. | | |

Table 091−20. SSN637 CLASS SUBMARINE HULL INSPECTION CRITERIA

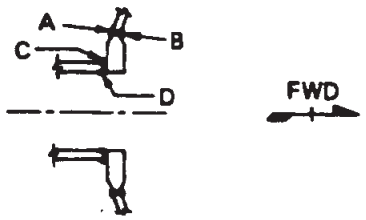
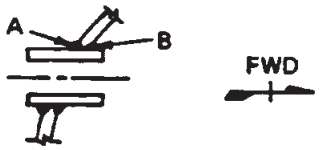
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Stern shaft tube and bhd insert   | Inspect 100 percent of welds A, B, and C. Inspect weld D only if and when shaft is removed. | ------ |
| 2 | Steering and driving ram penetrations of aft ellipsoidal head   | Inspect 100 percent of welds A and B | ------ |
| 3 | Structural housing, main seawater cooling, suction, and discharge sea chests | Inspect 100 percent of the pressure side of all welds affecting the watertight integrity of the sea chest. | ------ |
| 4 | Torpedo impulse tanks | Inspect 100 percent of all welds affecting the watertight integrity of the impulse tanks. | ------ |
| 5 | Fwd escape trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 1a |

Table 091-20. SSN637 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

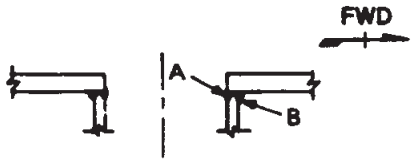
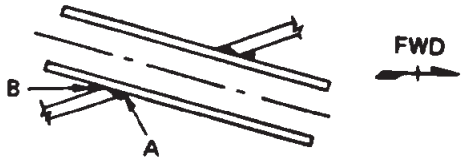
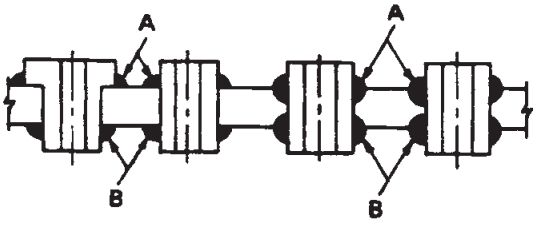
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Torpedo loading trunk to hull insert connection   | Inspect 100 percent of welds A and B | Note: 1a |
| 7 | Torpedo tube penetrations   | Inspect 100 percent of welds A and B on the upper stbd torpedo tube penetration | Note: 1b |
| 8 | Fwd trim tank | Inspect all tank bounding plate edge welds both internal and external to the fwd trim tank. Inspect four (4) flat plate panel boundary welds. Panels to be chosen where accessible on frame 11. | Note: 2 |
| 9 | Depth control tanks | Inspect 100 percent of the bounding plate edge welds internal to the tanks. Inspect four (4) flat plate panel boundary welds in each tank. Panels to be chosen where accessible. | Note: 2 |
| 10 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT. Inspect PST top and sides to bulkhead by UT if HY-80 is involved. | ------ |

Table 091-20. SSN637 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 11 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (see note: 3) | Note: 1c |

CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION

Note: 1 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:

a. 100 percent of the aft escape trunk to hull insert connection.

b. The hull welds to the remaining torpedo tubes.

c. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.

Note: 2 In cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to be in excess of 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on.

Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if penetration has at least one side wetted and is constantly cycled, it must be inspected).

**Table 091−21. SSN671 SUBMARINE HULL INSPECTION CRITERIA**

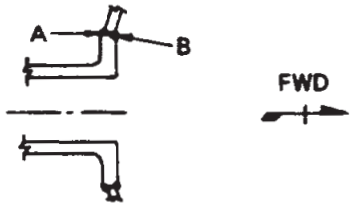
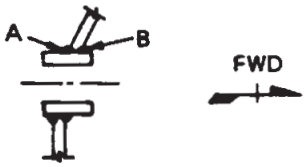
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Stern shaft insert to ellipsoidal head   | Inspect 100 percent of welds A and B | ------ |
| 2 | Steering and diving ram penetrations of aft ellipsoidal bhd   | Inspect 100 percent of welds A and B | ------ |
| 3 | Main seawater suction and discharge sea chest inserts to shell plate connection | Inspect 100 percent of the full penetration welds connecting the sea chest inserts to the pressure hull plating. | ------ |
| 4 | Torpedo impulse tank | Inspect 100 percent of all welds affecting the watertight integrity of the impulse tanks. | ------ |
| 5 | Trash ejector insert to shell plate connection | Inspect 100 percent of the full penetration welds connecting the trash ejector insert to the pressure hull plating. | ------ |
| 6 | Fwd escape trunk to hull   | Inspect 100 percent of welds A and B | Note: 1a |

Table 091-21. SSN671 SUBMARINE HULL INSPECTION CRITERIA (Continued)

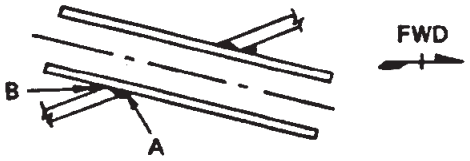
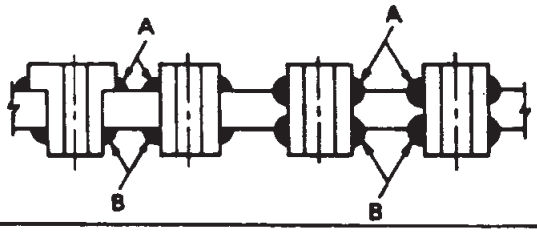
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 7 | Torpedo loading hatch   | Inspect 100 percent of welds A and B | Note: 1a |
| 8 | Torpedo tube penetration   | Inspect 100 percent of welds A and B on the upper stbd tube. | Note: 1b |
| 9 | Fwd trim tank | Inspect all bounding plate edge welds both internal and external to the fwd trim tank. Inspect four flat plate panel boundaries. Panels to be choosen for accessibility. | Note: 2 |
| 10 | Depth control tank no. 1 | Inspect 100 percent of all tank bounding plate edge welds internal to the depth control tank. Inspect four flat plate panel boundaries on the tank bhd. Panels to be chosen for accessibility. | Note: 1c<br>Note: 2 |
| 11 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT. | ------ |

Table 091-21. SSN671 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 12 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (See note: 3) | Note: 1d |

CRITERA FOR AND EXTENT OF INSPECTION EXPANSION

Note: 1 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective the inspection shall be expanded to include the following:

a. 100 percent of the corresponding welds of the aft escape trunk.

b. 100 percent of the corresponding welds of the lower stbd torpedo tube.

c. 100 percent of all internal tank bounding plates of Depth Control Tank No. 2.

d. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.

Note: 2 In cases where inspections of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel the inspection shall be extended to an adjacent panel and so on.

Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected).

Table 091-22. SSN685 SUBMARINE HULL INSPECTION CRITERIA

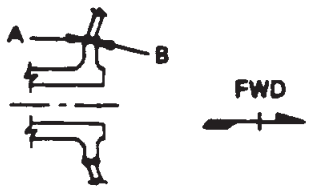
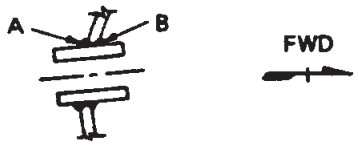
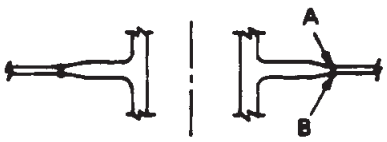
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Stern shaft tube insert to hull connection   | Inspect 100 percent of welds A and B | ------ |
| 2 | Steering and diving ram penetration inserts to hemispherical head   | Inspect 100 percent of welds A and B | ------ |
| 3 | MSW suction and discharge sea chest inserts to hull connection | Inspect 100 percent of the full penetration welds connecting the sea chest inserts to the pressure hull plating | ------ |
| 4 | Torpedo impulse tanks | Inspect 100 percent of all welds affecting the watertight integrity of the impulse tanks | ------ |
| 5 | Trash ejector insert to shell plate connection | Inspect 100 percent of the full penetration welds connecting the trash ejector insert to the pressure hull plating and framing | ------ |
| 6 | Forward escape trunk to hull welds   | Inspect 100 percent of welds A and B | Note: 1a |

Table 091−22. SSN685 SUBMARINE HULL INSPECTION CRITERIA (Continued)

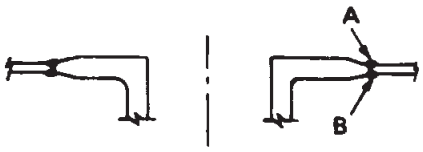
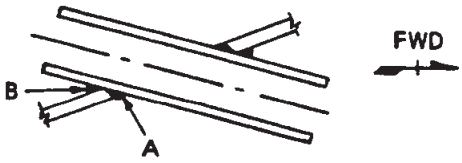
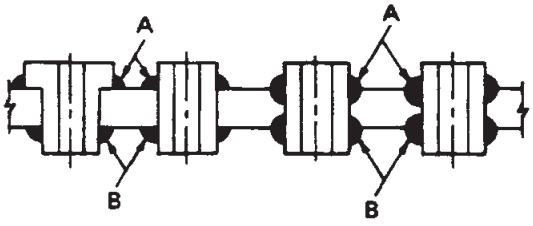
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 7 | Weapons shipping hatch   | Inspect 100 percent of welds A and B | Note: 1a |
| 8 | Torpedo tube penetrations   | Inspect 100 percent of welds A and B on the upper stbd tube | Note: 1b |
| 9 | Auxiliary tank no. 3 | Inspect 100 percent of all full penetration, bounding plate edge welds internal to the tank. Inspect (4) flat plate panel boundaries. Panels to be chosen for accessibility. | Note: 1c<br>Note: 2 |
| 10 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT. | |
| 11 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (see note: 3) | Note: 1d |

Table 091-22. SSN685 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERA FOR AND EXTENT OF INSPECTION EXPANSION | | |
| | Note: 1 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include the following:<br>a. 100 percent of the aft escape trunk to hull insert connection.<br>b. 100 percent of the corresponding welds of the remaining torpedo tubes.<br>c. 100 percent of the full penetration bounding plate edge welds internal to auxiliary tank no. 4.<br>d. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent. | | |
| | Note: 2 In cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to be in excess of 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on. | | |
| | Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

Table 091-23. SSN688 CLASS SUBMARINE HULL INSPECTION CRITERIA

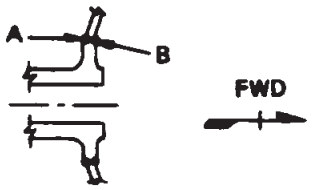
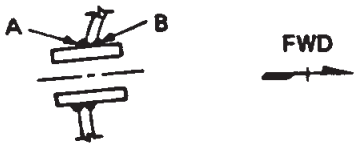
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Stern shaft tube insert to ellipsoidal head   | Inspect 100 percent of welds A and B | ------ |
| 2 | Steering and diving ram penetrations   | Inspect 100 percent of welds A and B | ------- |
| 3 | Structureal housing, main seawater cooling, suction and discharge sea chests | Inspect 100 percent of the full penetration welds connecting the sea chest inserts to the pressure hull plating | ------ |
| 4 | Torpedo impulse tanks | Inspect 100 percent of all welds affecting the watertight integrity of the impulse tanks. | ------ |
| 5 | Trash ejector | Inspect 100 percent of all welds affecting the watertight integrity of the installation. | ------ |
| 6 | Fwd access/escape trunk to shell connection   | Inspect 100 percent of welds A and B | Note: 1a |

Table 091-23. SSN688 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

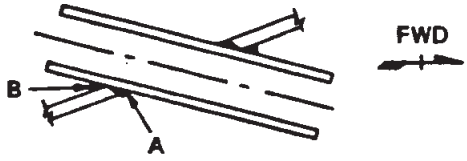
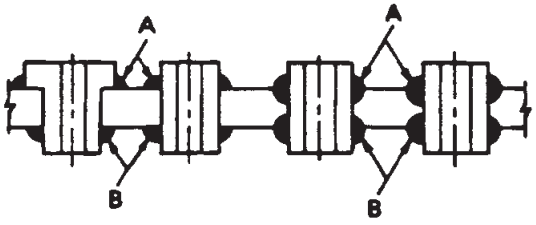
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 7 | Weapons shipping hatch to shell connection   | Inspect 100 percent of welds A and B | Note: 1a |
| 8 | Torpedo tube penetration   | Inspect 100 percent of welds A and B on the upper stbd torpedo tube penetration. | Note: 1b |
| 9 | Auxiliary tank no. 3 | Inspect 100 percent of all tank bounding plate edge welds internal to auxiliary tank no. 3. Inspect 4 flat plate panel boundary welds. Panels to be chosen for accessibility. | Note: 1c<br>Note: 2 |
| 10 | Primary shield tank to hull plating connection | Inspect 100 percent of the shield tank to hull plating interface by UT. | ------ |
| 11 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (see note: 3) | Note: 1d |

Table 091-23. SSN688 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION | | |
| | Note: 1 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include:<br>a. 100 percent of the aft/escape trunk to hull insert connection.<br>b. 100 percent of the corresponding welds of the remaining torpedo tubes.<br>c. The similar welds in auxiliary tank no. 4.<br>d. Additional penetrations until such time as the ratio of length of defects to length inspected becomes less than 3 percent. | | |
| | Note: 2 If in cases where inspection of panel boundary welds are specified and the incidence of cracking is discovered to exceed 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on. | | |
| | Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks that are subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

Table 091-24. AGSS555 SUBMARINE HULL INSPECTION CRITERIA

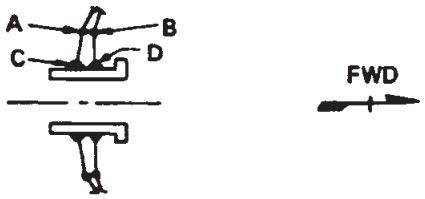
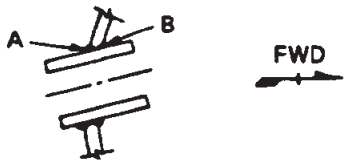
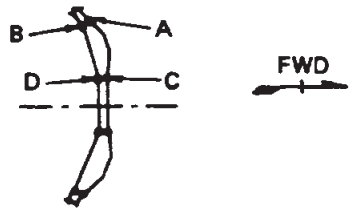
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Stern shaft tube penetration   | Inspect 100 percent of welds A, B, C, and D | ------ |
| 2 | Steering and diving ram penetrations   | Inspect 100 percent of welds A and B | ------ |
| 3 | Fwd hemi-head centerline plating   | Inspect 100 percent of welds A, B, C, and D | ------- |
| 4 | Access hatch insert to shell plating   | Inspect 100 percent of welds A and B | ------ |
| 5 | Hemi-head to cylindrical hull fwd and aft   | Inspect 25 percent of welds A and B. Inspect in several random increments. | Note: 1 |

Table 091-24. AGSS555 SUBMARINE HULL INSPECTION CRITERIA (Continued)

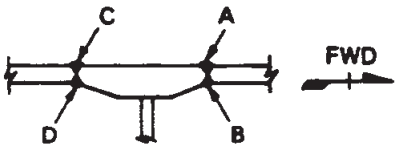
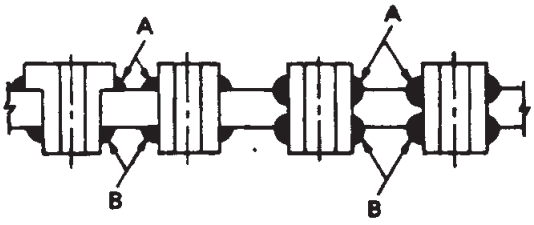
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 6 | Deep frame to hull insert   | Inspect 25 percent of welds A and B. Inspect in several random increments. Choose the most accessible deep frame. | Note: 1<br>Note: 2a |
| 7 | Typical frame to pressure hull   | Inspect 25 percent of welds A and B. Inspect in several random increments. Choose 3 of the most accessible frames. | Note: 1<br>Note: 2b |
| 8 | Deep frame insert to pressure hull   | Inspect 25 percent of welds A, B, C, and D. Inspect in several random increments. Choose the most accessible insert. | Note: 1<br>Note: 2c |
| 9 | Auxiliary tank no. 1 | Inspect all full penetration welds affecting the water-tight integrity of the auxiliary tank. | Note: 2d |
| 10 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (see note: 3) | Note: 2e |

Table 091-24. AGSS555 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERA FOR AND EXTENT OF INSPECTION EXPANSION<br><br>Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include the remainder of the weld in the subject joint.<br><br>Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include:<br><br>a. An additional deep frame to hull insert joint to the extent of the original inspection of the first deep frame to hull insert joint.<br>b. An additional typical frame to pressure hull joint to the extent of the original inspection of the first typical frame to hull joint.<br>c. The remainder of the joint at the opposite end of the deep frame insert.<br>d. All full penetration welds affecting the watertight integrity of auxiliary tank number 2.<br><br>Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

Table 091-25. NR-1 SUBMARINE HULL INSPECTION CRITERIA

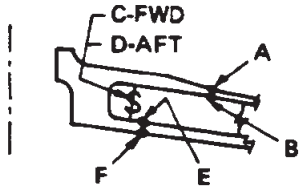
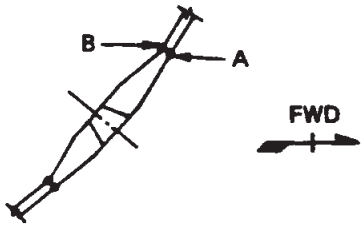
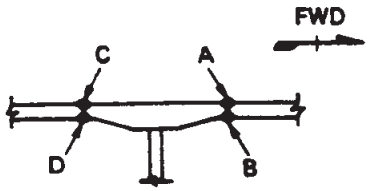
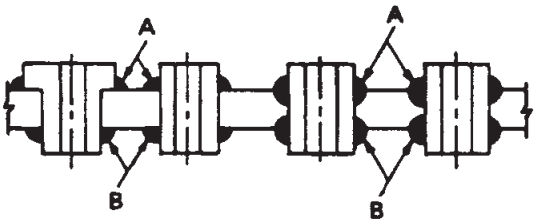
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Main seawater cooling, suction, and discharge penetrations   | Inspect 100 percent of welds A and B | ------ |
| 2 | Access hatch insert to shell and frames   | Inspect 100 percent of welds A and B. Inspect 100 percent of welds C, D, E, and F at frame 9, port and stbd. | Note: 1a |
| 3 | Viewport; centerline   | Inspect 100 percent of welds A and B | Note: 1b |
| 4 | Variable ballast tanks | Inspect 100 percent of the exterior surface of the penetrations to tanks 1 and 2. UT inspect 100 percent of frame 10 in tank no. 1, and 100 percent of frame 6 in tank no. 2. | Note: 2a |

Table 091-25. NR-1 SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 5 | Deep frame insert   | Inspect 25 percent of welds A, B, C, and D | Note: 1c<br>Note: 2b |
| 6 | Electrical, mechanical, and piping penetrations   | Inspect 100 percent of either weld A or B of 50 percent of the total number of penetrations (see note: 3) | Note: 2c |

CRITERA FOR AND EXTENT OF INSPECTION EXPANSION

Note: 1 If over 1 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include:

a. Welds C, D, E, and F at frame 10, port and stbd.

b. Welds A and B of the other viewports.

c. The remainder of the joint.

Note: 2 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include:

a. An additional frame to tank joint to the extent of the original inspection of the first frame to tank joint .

b. The remainder of the joint at the opposite end of the deep frame insert.

c. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.

Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e., if a penetration has at least one side wetted and is constantly cycled, it must be inspected).

TABLE 091-26. SSBN 726 CLASS SUBMARINE HULL INSPECTION CRITERIA

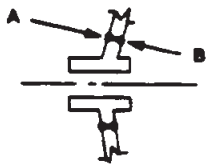
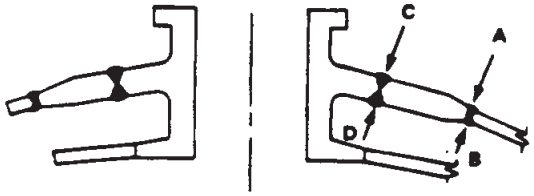
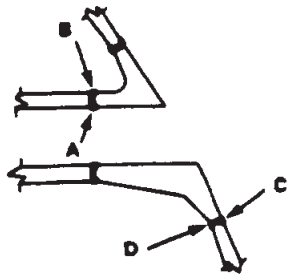
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 1 | Stern shaft tube bhd insert   | Inspect 100% of welds A and B. | |
| 2 | Steering & diving (ram penetrations)   | Inspect 100% of welds A and B. | |
| 3 | Logistics/escape trunk insert - fwd   | Inspect 100% of welds A, B, C, and D. | Note 1.a |
| 4 | Trash disposal unit muzzle-hull insert   | Inspect 100% of welds A, B, C, and D. | - |

TABLE 091-26. SSBN 726 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

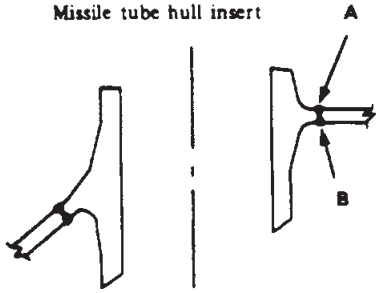
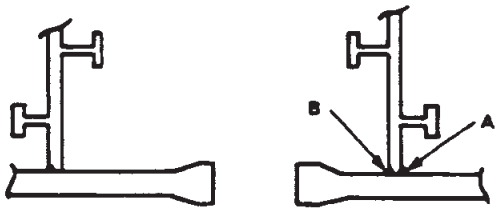
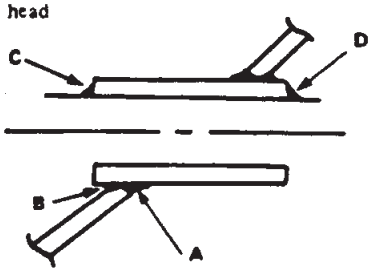
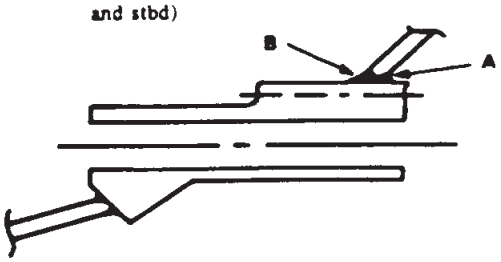
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 5 | Missile tube hull insert   | Inspect 100% of welds A and B on on missile tubes No. 1 and 12. | Note 1.b |
| 6 | Bridge access trunk to hull connection   | Inspect 100% of welds A and B. | |
| 7 | Torpedo tube penetration of forward spherical head   | Inspect 100% of welds A, B, C, and D on upper port and stbd tubes. | Note 1.c |
| 8 | Torpedo ejection pump hull penetrations (port and stbd)   | Inspect 100% of welds A and B | - |

**TABLE 091-26. SSBN 726 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)**

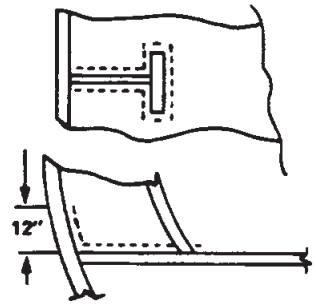
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 9 | Torpedo impulse tank (port) | Inspect 100% of all interior and exterior tank plate boundary welds, including welds around penetrations into the tank. | Note 1.d |
| 10a | Depth control tank No. 1 | Inspect 100% of all bounding edge welds internal to DCT No. 1. | Note 1.e |
| 10b | DCT No. 1 – transverse frame to tank top   | Inspect 100% of the frame to tank top connection at Fr 87 and 90. | Note 1.f |
| 10c | DCT No. 1 | Inspect 4 flat plate panel boundary welds. Panels shall be chosen where accessible. | Note 2 |

TABLE 091-26. SSBN 726 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

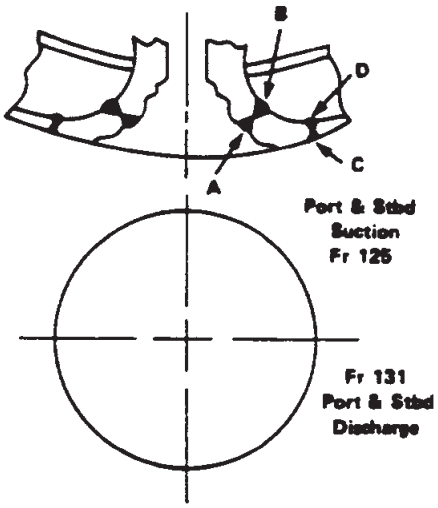
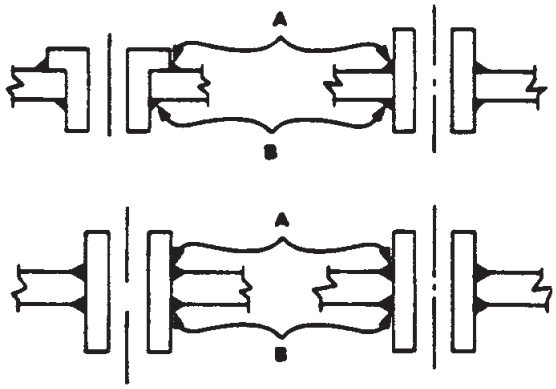
| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| 11 | Structural housing main sea water cooling suction and discharge sea chests   | Inspect 100% of welds A. B, C, and D. | Note 1.g |
| 12 | Primary shield tank boundaries to hull plating connection | Inspect 100% of the shield tank to hull plating interface by UT. | - |
| 13 | Electrical, mechanical, and piping penetrations   | Inspect 100% of either weld A or B of 33-1/3% of total number of penetrations. | Note 1.h |

Table 091-26. SSBN726 CLASS SUBMARINE HULL INSPECTION CRITERIA (Continued)

| Item No. | Structural Item | Specific Area to be Inspected | Criteria for and Extent of Insp. Expansion |
|---|---|---|---|
| | CRITERIA FOR AND EXTENT OF INSPECTION EXPANSION<br><br>Note: 1 If over 3 percent of the total footage of inspected weld in the subject joint or in a particular weld surface is found to be defective, the inspection shall be expanded to include:<br>a. 100 percent of the remaining two logistics/escape trunks<br>b. 100 percent of the missile tube to hull weld of two missile tubes (one opposite and one adjacent to the one in which the defect was detected)<br>c. 100 percent of the lower port and starboard torpedo tubes to forward spherical head welds.<br>d. 100 percent of all interior and exterior tank plate boundary welds, including welds around penetrations into the starboard tank<br>e. 100 percent of all bounding edges welds internal to DCT No. 2.<br>f. 100 percent of all the frame to tank top connection at Fr 87 and 90 on DCT No. 2<br>g. 100 percent of welds A&B on auxiliary suction and discharge valves.<br>h. Additional penetrations until such time as the ratio of length of defects to total length inspected becomes less than 3 percent.<br><br>Note: 2 Where the incidence of cracking is discovered to be in excess of 3 percent for any one panel, the inspection shall be expanded to an adjacent panel and so on.<br><br>Note: 3 Inspect only those penetrations attached by full or partial penetration T-welds or fillet welds to a pressure structure that is subject to constant cycling such as pressure hull plating, end closure bulkheads, that portion of trunks outside the pressure hull and trunk intersection, and plating of hard tanks subject to constant cycling (i.e.. if a penetration has at least one side wetted and is constantly cycled, it must be inspected). | | |

**091−1.67 MONITORING ROUTINE**. The scope, method, and procedure for conducting the monitoring routine are described in paragraphs 091−1.68 through 091−1.76. This monitoring routine shall be conducted to satisfy the requirement imposed by maintenance requirement card (MRC 005) for unrestricted operation (URO), and limited in depth (LID), submarines.

**091−1.68 Scope**. Monitoring routine inspections shall be conducted on all submarine structures containing known rejectable discontinuities. The interval between discovery of the discontinuity, the first monitoring inspection, and subsequent monitoring inspections depends on location of the particular discontinuity within the structure.

**091−1.69** Discontinuities located in welded joints of external pressure hull frames or bulkhead−to−hull welds, in pressure hull plating to transition ring butt welds, or in other weld joints as specified by NAVSEA on a case basis, shall be inspected at intervals not to exceed 24 months, counting from the end of the availability during which they were first discovered or from the end of the availability during which they were last inspected. As an exception to the above requirement, all SSN637 Class submarines (except SSN649) may be inspected at intervals not to exceed 48 months. SSN649 inspections shall not exceed 24 months.

**091−1.70** Discontinuities located in welded joints of internal pressure hull frames or bulkhead−to−hull welds, or in other weld joints as specified by NAVSEA on a case basis, shall be inspected at intervals not to exceed 60 months, counting from the end of the availability during which they were first discovered or from the end of the availability during which they were last inspected. As an exception to the above requirement, the SSBN627 Group of the SSBN616 Class submarines may have monitoring inspections conducted at intervals not to exceed 72 months.

> **NOTE:** Certain submarines on a case basis, have special inspection requirements. These requirements are contained in the official letter identifying hull weld discontinuities. Additional information relative to these requirements can be obtained by contacting NAVSEA, Code 3232.

**091−1.71 Method**. Monitoring inspections shall be done with the UT inspection technique. In order to insure the maximum amount of repeatability, efforts shall be made to duplicate the variables contained in the original or previous inspections.

**091−1.72 Procedure**. The following steps shall be taken to conduct monitoring inspections.

1. Determine sites or discontinuities to be inspected from the official letter identifying hull weld discontinuities requiring UT monitoring inspections.

2. Locate the areas to be inspected and prepare the surface for inspection in accordance with NAVSEA 0900−LP−006−3010 and NAVSEA 0900−LP−006−3020.

**091−1.73** For discontinuities where the previous location is based on measurement from the bottom centerline, the inspecting activity shall reestablish their locations in the same manner. Measurements shall be from the bottom centerline to their starting points. The starting point of a discontinuity is that point which lies closest to the bottom centerline. If a discontinuity is not found at its previously reported location, expand inspection until either the discontinuity has been found, or a minimum of 18 inches in both directions along the weld has been searched.

> **NOTE:** Inspection coverage of any known discontinuity not at the root of the welded joint shall only be in the direction as needed to cover the half−zone which contains the discontinuity.

**091−1.74** If other recordable discontinuities are found during the expanded search, they shall be reported. If no discontinuities are found, the area shall be considered clear. Report all data resulting from this inspection, as required in paragraphs 091−1.84 through 091−1.89.

**091−1.75** For discontinuities where the previous location is not based on measurement from the bottom centerline, inspecting activity shall reestablish their locations from the bottom centerline as follows:

1. Lay out the location previously reported for the discontinuity by measurement from the previously−reported reference point.
2. Measure this location from the bottom centerline and record it.
3. Perform monitoring inspection as outlined by paragraphs 091−1.73 and 091−1.74 and report results in accordance with paragraphs 091−1.84 through 091−1.89.
4. Conduct the inspection using the shear wave method in accordance with the requirements of NAVSEA 0900−LP−006−3010 and NAVSEA 0900−LP−006−3020, using qualified equipment, procedures, and inspectors.

**091−1.76** Upon determining the depth of discontinuities, an immediate preliminary report shall be made to NAVSEA if either of the following conditions exist:

1. The depth (vertical height) on any T−weld discontinuity extending into the pressure hull plating (T) is equal to or greater than 1/8 T in way of external frames or 1/4 T in way of internal frames.
2. Any butt weld discontinuity is discovered whose amplitude exceeds the ARL given in NAVSEA 0900−LP−006−3010, and which has a vertical height equal to or greater than 1/4 T.

**NOTE:** At transitions, T is the thickness of the thinner plate.

3. Missing welds, incomplete structure, and severe deformation that the inspecting activity considers critical to the safety of the submarine.

**091−1.77 Repair**. Repairs when specified shall be made in accordance with paragraphs 091−1.79 through 091−1.83.

**091−1.78 Reporting**. Reports shall be prepared in accordance with paragraphs 091−1.84 through 091−1.89. Figure 091−4, Figure 091−5, Figure 091−6 and Figure 091−7 and appendixes A and B illustrate forms to be used to report discontinuities discovered by the various inspection techniques and give detailed instructions for use of the forms.

**091−1.79 REPAIR OF WELDS**

**091−1.80** All repairs shall be made using the repair and acceptance techniques specified in NAVSEA 0900−LP−000−1000, NAVSEA 0900−LP−006−9010, and chapter 074(9920), **Welding and Allied Processes**, as well as techniques detailed in paragraphs 091−2.69 through 091−2.86. Removal of discontinuities can be effected either by machining or grinding, or by carbon arc air gouging. If the carbon arc air gouging method is used, prescribed amount of preheat shall be used.

**091−1.81** If any discontinuity is marked for repair, it shall be repaired in its entirety, along with any other discontinuity which is within 6 inches of it.

**091−1.82** All discontinuities located visually, or by MT, ET, or PT shall be repaired as shall all cracklike discontinuities discovered by UT in HTS structures. It is desirable, but not mandatory, to repair other UT−discovered discontinuities that exceed 1/4 T in depth, where T is defined as the thickness of the pressure hull plating.

**NOTE:** Repair of discontinuities discovered as a result of sampling routine inspections or monitoring routine inspections does not automatically provide for deferment of restrictions that might be imposed and that would have been imposed were the discontinuities retained. Repair of discontinuities being monitored, or discovered as a result of sampling routine inspections, however, does eliminate need for periodic monitoring of these particular discontinuities.

**091−1.83** If any discontinuities located in reactor compartment structures are marked for repair, cognizant nuclear power division personnel shall be informed of intent to repair. This notification must be made prior to commencement of removal and repair.

**091−1.84 REPORTING**

**091−1.85** A report (or reports) using the specified forms shall be prepared upon completion of any or all of the following types of hull integrity inspection routines:

1. Sampling routine
2. Full hull integrity routine
3. Miscellaneous surveillance routine
4. Monitoring routine

**091−1.85.1** Results of inspections require rigorous analysis for the purpose of modifying the specified scope and frequency of inspection requirements. Recording and reporting the results are important parts of the procedure. Because of the many possible reporting activities, it is necessary to maintain extreme accuracy and a high degree of standardization so that results may be meaningfully compared. This will promote rapid analysis and provide for prompt statements of hull condition including recommendations for additional inspection, repair work, or future operational recommendations.

**091−1.86** Upon completion of reports for inspection routines copies shall be distributed to the following activities:

1. Naval Sea Systems Command (SEA 921) − 1 copy
2. Naval Sea Systems Command (SEA 3232) − 2 copies
3. PERA (SS) − 1 copy

**091−1.87** Letters forwarding reports to the respective activities shall refer to inspections by the particular names designated in this chapter. Copies

of forwarding letters also shall be sent to the following, as auditable record of accomplishment.

1. Force Commander
2. Squadron Commander
3. Commanding Officer of submarine inspected.

**091−1.88** All results of UT inspections shall be forwarded to NAVSEA for evaluation.

**091−1.88.1** When ultrasonic inspections are performed during overhaul availabilities, reports shall be forwarded to NAVSEA as soon as possible in order to facilitate evaluation and possible repairs resulting from review of the inspection data, and so as not to jeopardize the scheduled completion date of the overhaul.

**091−1.88.2** When ultrasonic inspections are performed during restricted availabilities, reports shall be forwarded within 30 days from the conclusion of the docking period.

**091.1.88.3** Verification of total inspection completion shall be forwarded prior to fast cruise.

**091−1.88.4** The accomplishing activity shall retain one copy of each report for 7 years.

**091−1.89** Figure 091−4 through Figure 091−8 are examples of standardized forms. Figure 091−4 is the Ultrasonic Weld Inspection Record. Figure 091−5 is the form used to tabulate the results of sampling routine, full hull integrity routine, or monitoring routine inspections. Figure 091−6 is the Miscellaneous Surveillance Routine Inspection Record. Figure 091−7 is the form used to tabulate the results of the miscellaneous surveillance routine instruction. Figure 091−8 is the form used to tabulate a cumulative record in those cases when reporting activities submit partial inspection reports. Each of the illustrations presents the applicable form on sheet 1. Subsequent sheets contain instructions and notes, keyed to circled numbers on sheet 1, required to complete the forms.

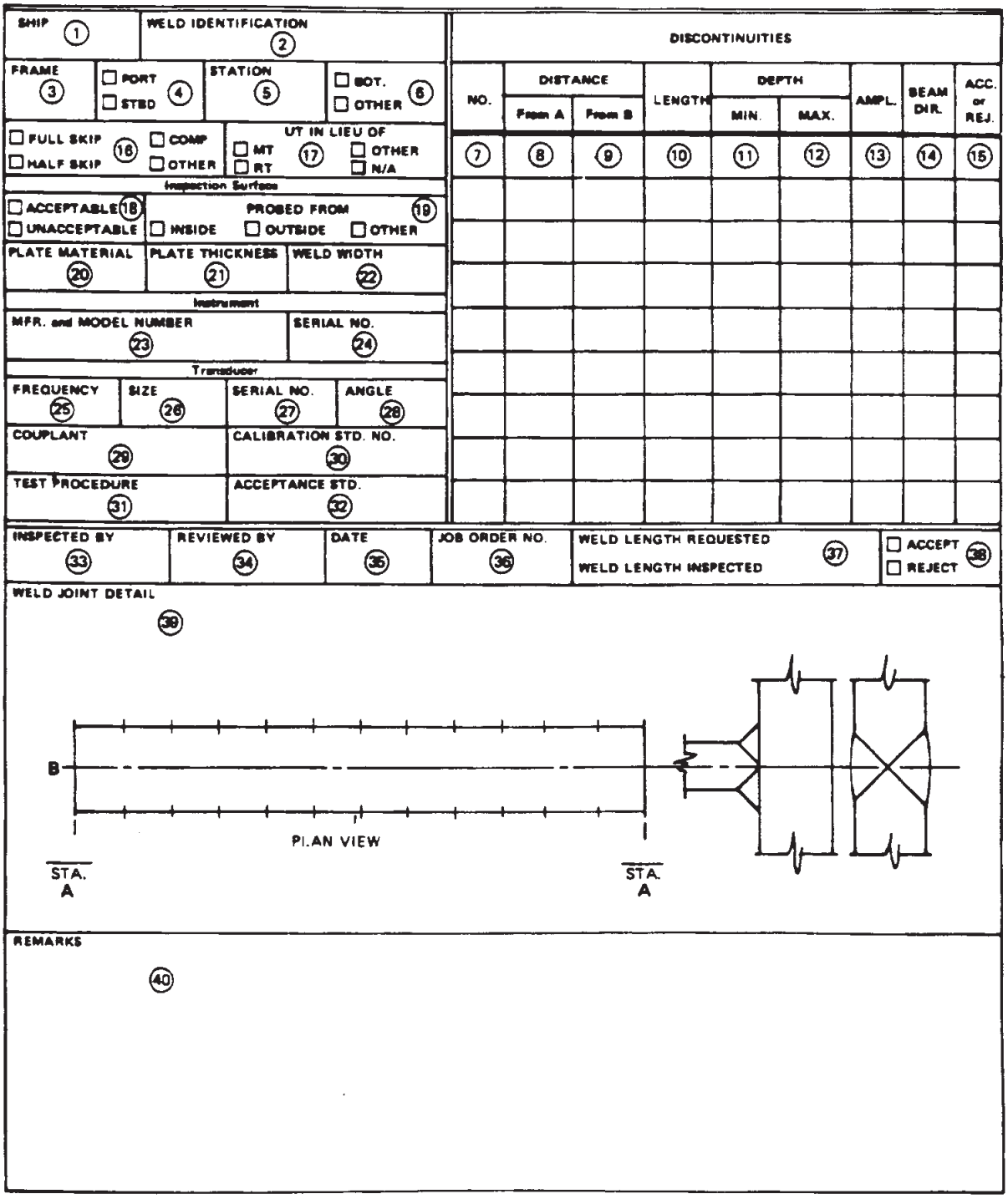



**Figure 091−4. Ultrasonic Weld Inspection Record**
**(Sheet 1 of 4)**

Instructions for Completing the Ultrasonic Weld Inspection Record

1. Figure 091-4, the Ultrasonic Weld Inspection Record, shall be filled out and submitted for each site inspected.

2. The following numbered statements are keyed to the circled numerals on sheet 1:

(1) Insert the NAVY hull number of the submarine.

(2) Using identifiable abbreviations as necessary, insert an identification of the weld connection such as External Frame to Hull, Internal Frame to Hull, Transition Ring Foreward Butt, or Transition Ring Aft Butt.

(3) Insert the frame number for external or internal frames. For transition ring to shell butts, insert the frame number nearest to the butt.

(4) Place an X in the appropriate box.

(5) Enter the distance in inches from the reference point designated in block 6 to the lead edge of the station. The station is defined as either a new 12-inch site or the location of a previously inspected and reported clear site. See $\overline{\underset{A}{\text{sta}}}$ at each end of the plan view in (39) The lead edge always shall be the edge closest to the reference point designated in block 6.

(6) Place an X in the appropriate box. If the reference point is other than the bottom centerline of the submarine, enter details in the remarks block. UT sampling inspections of frames or transition ring butts, however, always should use the bottom centerline as a reference point.

(7) Enter the discontinuity identification number, an integer. All discontinuities found within a station or site shall be listed by a sequential numbering system, inclusive of that station or site only.

(8) Enter the distance from the station number to the lead edge of the discontinuity. If the lead edge of the discontinuity is before the station denote the distance by a negative number.

(9) Enter distance and direction (foreward and aft) from the centerline of the weld attachment to the discontinuity, if the discontinuity is located other than at the centerline.

(10) Enter length of discontinuity. The length is defined to be the length where the amplitude is either at or above the DRL.

(11) Enter minimum depth of discontinuity from the surface of the weld connection interface for T- and fillet welds or from the scanning surface for butt welds. Depth shall be recorded in increments to the nearest 0.050 inches.

(12) Enter maximum depth of discontinuity from the surface of the weld connection interface for T- and fillet weld or from the scanning surface for butt welds. Depths shall be recorded in increments to the nearest 0.050 inches.

**Figure 091-4. Ultrasonic Weld Inspection Record**
**(Sheet 2 of 4)**

(13) Enter the amplitude of the signal by using integers 2 through 10 with 2 being at the DRL and 8 being at the ARL. Signal amplitude shall be recorded to the nearest integer.

(14) Enter an F if a foreward beam direction is used and/or an A if an aft beam direction is used.

(15) Enter an ACC if a discontinuity is acceptable or an REJ if a discontinuity is rejectable, as per requirements given in NAVSEA 0900-LP-006-3010.

(16) Designate the UT inspection method by placing an X in the appropriate box. If additional information is needed to describe the method used, enter such information in the remarks block.

(17) Place an X in the appropriate box to designate whether or not the UT inspection is substituted for another inspection. If the box labeled other is marked, enter details in the remarks block.

(18) Place an X in the appropriate box. If surface is unacceptable provide rationale in the remarks block.

(19) Place an X in the appropriate box. When the box labeled as other is marked, enter in the remarks block an adequate description of the weld joint.

(20) Enter type of material to be inspected.

(21) Enter plate thickness of through member. Thickness shall be determined by thickness reading in accordance with MIL-STD-271. Readings shall be taken at or near the station extremities or at areas that will best represent the thickness of the material of the weld joint.

(22) Enter the average width of weld joint being inspected.

(23) Enter manufacture and model number of the instrument used during inspection.

(24) Enter serial number of instrument.

(25) Enter frequency of transducer.

(26) Enter size of transducer.

(27) Enter serial number of transducer.

(28) Enter the beam angle of transducer.

(29) Enter the couplant used.

(30) Enter the calibration standard number.

(31) Enter local procedure document.

**Figure 091−4. Ultrasonic Weld Inspection Record (Sheet 3 of 4)**

(32) Enter applicable document and class of weld for acceptance criteria.

(33) Enter signature of inspector.

(34) Enter signature of reviewer.

(35) Enter date of inspection.

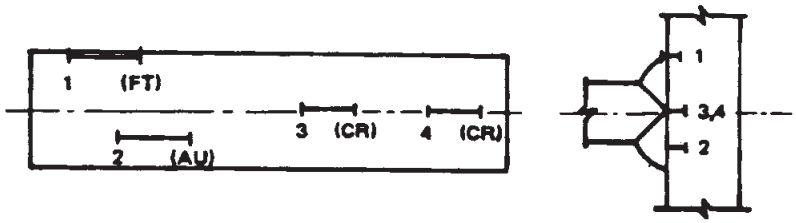
(36) Enter job order number (to be used primarily for local activity records).

(37) Enter both the weld lengths requested/required and weld lengths inspected.

(38) Place an X in the appropriate box if the total weld area is acceptable or rejectable as per requirements given in NAVSEA 0900-LP-006-3010.

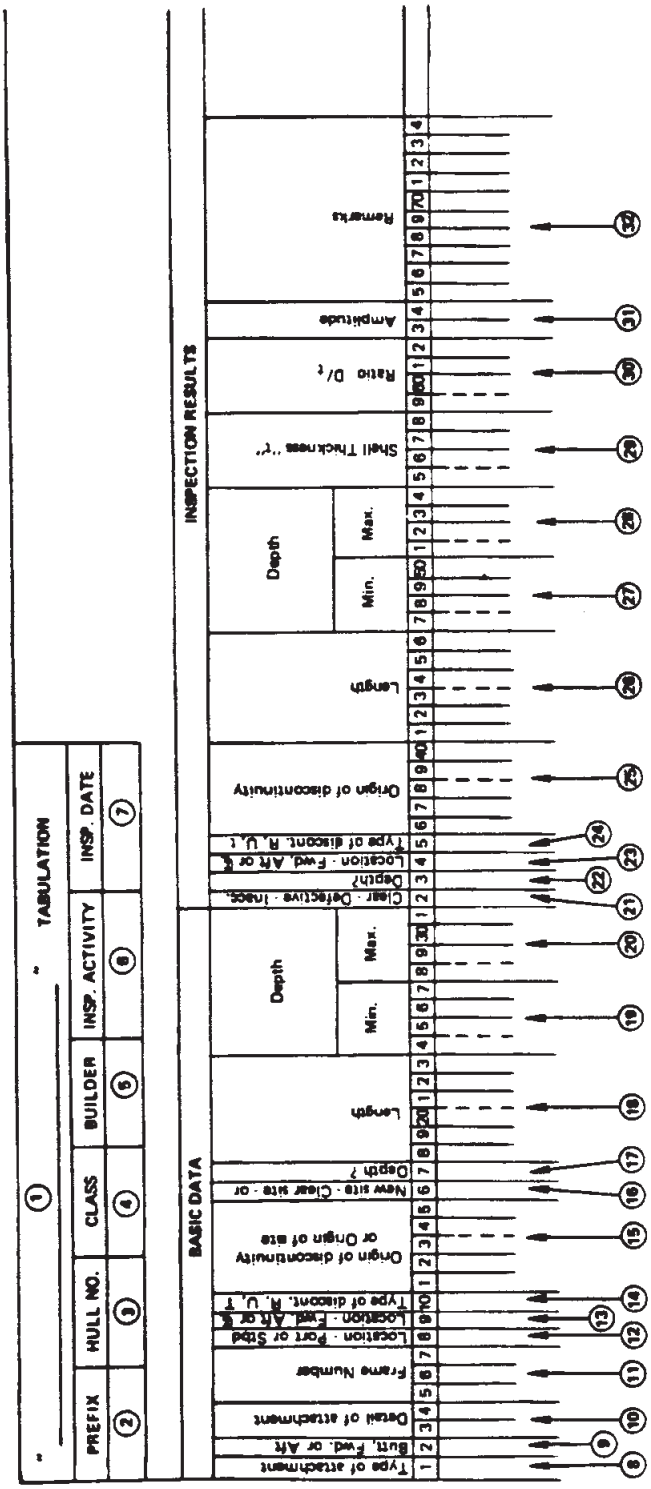
(39) Sketch in any discontinuities on both the plan view and the appropriate section view. Each discontinuity should be numbered in accordance with the discontinuity identification numbers in the table. This number should be under the lead edge of the discontinuity. Also, designate by use of FT, FU, FR, CR, AR, AU or AT the location of a discontinuity relative to the weld centerline.

EXAMPLE:




(40) Enter any remarks or sketches needed to properly identify the weld joint condition. Indicate in the remarks block whether the site being inspected is a new random selection or a previously inspected clear site.

**Figure 091-4. Ultrasonic Weld Inspection Record**
**(Sheet 4 of 4)**




**NOTE: The dotted vertical lines indicate the location of the decimal points for the numbers being inserted on the tabulation form.**

**Figure 091−5. Sampling, Full Hull Integrity, or Monitoring Routine Inspection Tabulation Form (Sheet 1 of 4)**

**Instructions for Tabulating Sampling Routine, Full Hull Integrity Routine, and Monitoring Routine Inspections**

1 Figure 091-5 shows the form which shall be compiled and submitted as a tabulation for each sampling routine, full hull integrity routine, and monitoring routine inspection conducted.

2 The following numbered statements are keyed to the circled numerals on sheet 1:

(1) Enter name of routine.

(2) Enter hull prefix, SS, SSN, SSBN, etc.

(3) Enter Navy hull number.

(4) Enter class number.

(5) Insert abbreviation of name of original builder.

(6) Insert abbreviation of inspecting activity.

(7) Enter the date of the completion of the inspection.

(8) In column 1, insert a letter (either E, I, or T) to denote the type of attachment, either external frame, internal frame, or transition ring-to-shell butt weld.

(9) In column 2, insert a letter (either F or A) to indicate either the foreward or aft butt weld of the transition ring-to-shell joint. Only this inspection is to be tabulated in column 2; otherwise leave blank.

(10) In columns 3 and 4, insert a number that coincides with one of the sketches shown below that reflects the detail of the attachment inspected.

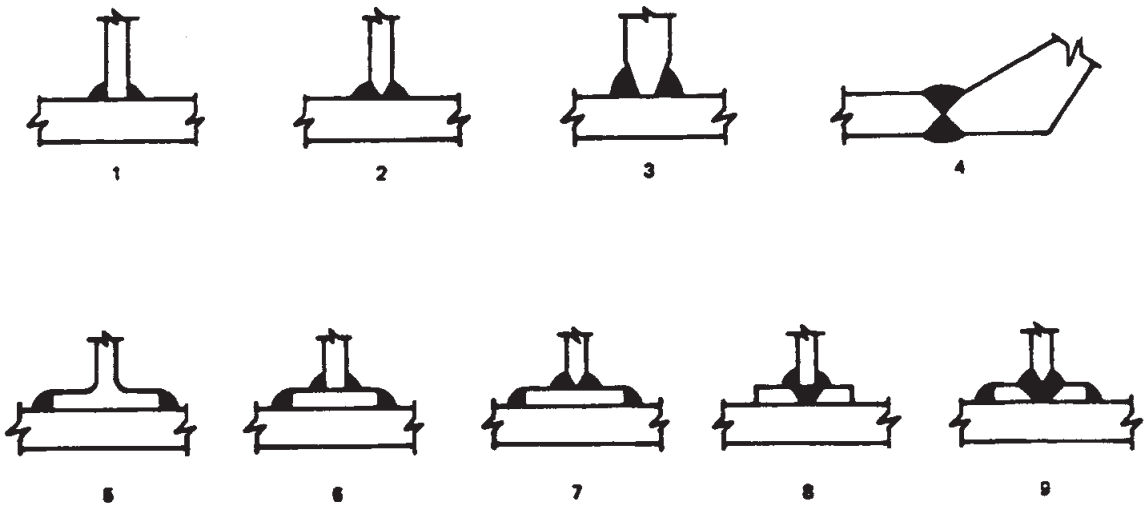


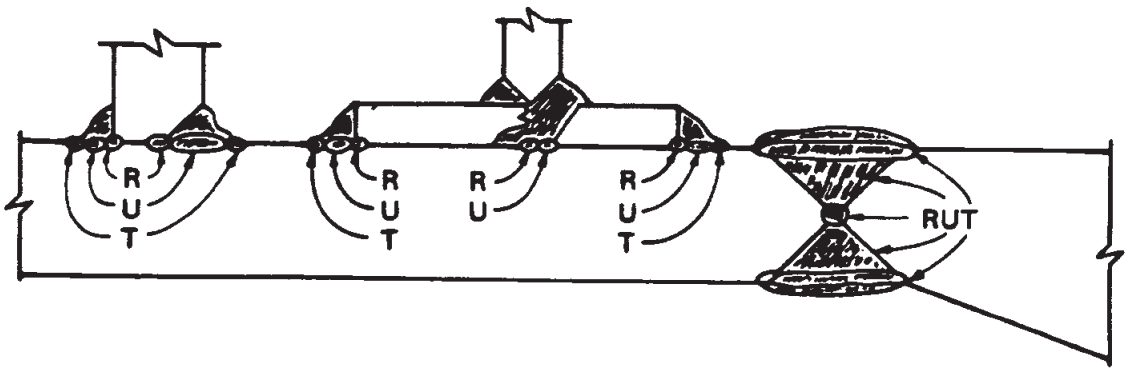

**Figure 091−5. Sampling, Full Hull Integrity, or Monitoring Routine Inspection Tabulation Form (Sheet 2 of 4)**

(11) In columns 5 through 7, insert the particular frame number on which the inspected site is located.

(12) In column 8, insert the appropriate letter (P or S) to denote the port or starboard location of the site or discontinuity being inspected.

(13) In column 9, insert the appropriate letter (F, A, or C) to denote the foreward, aft, or centerline location of the discontinuity within the welded joint. If no existing discontinuity is being reinspected, column 9 should be left blank.

(14) In column 10, insert the appropriate letter (R, U, or T) that describes the type of discontinuity, such as root type (R), underbead type (U), or toe type (T). The composite sketch below illustrates the parts of the various types of joints inspected. If no existing discontinuity is being reinspected, column 10 should be left blank.




(15) In columns 11 through 15, enter a numeral signifying the distance from the bottom centerline to the edge of the site, or the start of the known discontinuity. This should be given in inches, accurate to 2 decimal points.

(16) In column 16, insert the appropriate letter (N, C, D, R, or A) to signify whether the site being inspected is a new previously uninspected site (N), a previously inspected site known to be clear of recordable discontinuities (C), an existing discontinuity being reinspected and not known to be either acceptable or rejectable (D), an existing discontinuity being reinspected and known to be rejectable (R), or an existing discontinuity being reinspected and known to be acceptable (A).

(17) In column 17, insert the letter N to signify that the discontinuity has no measurable depth. If the discontinuity has depth, leave column 17 blank.

(18) In columns 18 through 23, enter the length of the discontinuity being reinspected. This should be tabulated in inches to 3 decimal points. If no discontinuity is being reinspected, columns 18 through 23 should remain blank.

(19) In columns 24 through 27, enter the first dimension relating to the depth of the discontinuity being reinspected. (The depth determination shall be made in accordance with paragraph 091-1.32.) If no existing discontinuity is being reinspected, columns 23 through 27 should remain blank.

**Figure 091−5. Sampling, Full Hull Integrity, or Monitoring Routine Inspection Tabulation Form (Sheet 3 of 4)**

(20) In columns 28 through 31, enter the second dimension relating to the depth of the discontinuity being reinspected. If no existing discontinuity is being reinspected, columns 28 through 31 should remain blank.

(21) In column 32, insert the appropriate letter (C, D, A, R, or I) to signify whether the site currently being inspected is free of recordable discontinuitites (C), contains a discontinuity and it is not known if it is rejectable or acceptable (D), contains an acceptable discontinuity (A), contains a rejectable discontinuity (R), or is determined to be inaccessible (I).

(22) In column 33, insert the letter N to signify that the discontinuity has no measurable depth. If the discontinuity has depth, leave column 33 blank.

(23) In column 34, insert the appropriate letter (F, A, or C) to describe whether the discontinuity is in the foreward portion (F), in the after portion (A), or on the centerline (C), of the welded joint.

(24) In column 35, insert the appropriate letter (R, U, or T) to describe the type of discontinuity such as root type (R), underbead type (U), or toe type (T). The composite sketch following item 14 above, illustrates the parts of the various types of joints being inspected.

(25) In columns 36 through 40, enter a numeral locating the origin of the discontinuity from the bottom centerline. This should be reported in inches, accurate to 2 decimal points.

(26) In columns 41 through 46, enter the length of the discontinuity itself. This should be reported in inches, accurate to 3 decimal points.

(27) In columns 47 through 50, enter the first dimension relating to the depth of the discontinuity. (The depth determination shall be made in accordance with paragraph 091-1.32.)

(28) In columns 51 through 54, enter the second dimension relating to the depth of the discontinuity.

(29) In columns 55 through 58, enter the thickness of the shell plating or through member in inches, accurate to 3 decimal points.

(30) In columns 59 through 62, enter the figure determined, by dividing the vertical height of the discontinuity, by the shell or through member thickness. The figure should be accurate to 3 decimal points.

(31) In columns 63 and 64, enter the amplitude of the UT signal, a value from 2 to 10, right justified. The number 2 coincides with the DRL and 8 coincides with the ARL.

(32) In columns 65 through 74, insert any remarks that might help to clarify the data line.

**Figure 091−5. Sampling, Full Hull Integrity, or Monitoring Routine Inspection Tabulation Form (Sheet 4 of 4)**

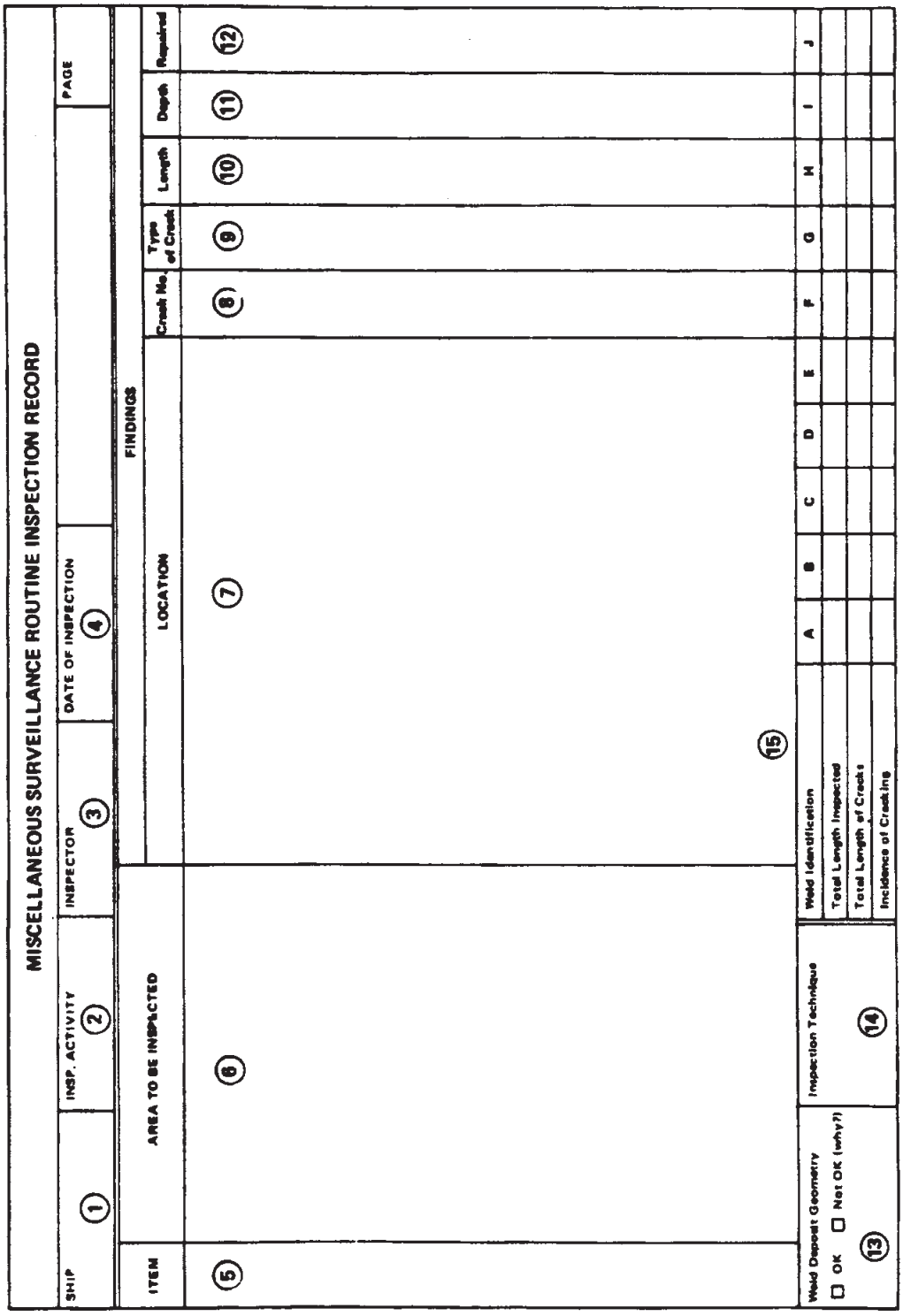



**Figure 091−6. Miscellaneous Surveillance Routine Inspection Record (Sheet 1 of 3)**

Instructions for Completing the Miscellaneous Surveillance Routine Inspection Report

1 Figure 091-6, the Miscellaneous Surveillance Routine Inspection Record, shall be filled out and submitted for each item inspected.

2 The following numbered statements are keyed to the circled numerals on sheet 1:

(1) Insert the prefix and hull number of the submarine being inspected.

(2) Enter the name of the inspecting activity, such as a particular shipyard or submarine tender.

(3) Enter the name of the inspector.

(4) Insert the date of the completion of the inspection.

(5) Insert the item number of the detail being inspected. This number shall agree with the item number found in the inspection tables.

(6) Draw a simple sketch showing the specific welds to be inspected and label the welds for identification, consecutively by letters beginning with A.

(7) Draw (with dimensions indicated) a simple sketch showing the location of any cracks discovered. The locations should be dimensioned from an appropriate bench mark.

(8) Enter a combined numeral-letter identifier. For example, the first crack located in weld A would be identified as 1A, the second, 2A, and so on.

(9) Enter a letter combination identifier to describe the type of crack discovered. For example, if the crack is at the toe of the weld, it should be identified as TC meaning toe crack. In parenthesis following TC should be a word specifying which toe. Examples: (bhd), (tank top), (web), (shell). If the crack is in the body of the weld, it should be identified as LC, meaning longitudinal crack. If the crack is oriented transversely to the length of the weld, it should be labeled CC, meaning cross crack.

(10) Enter the length of the crack. The length to be entered is the maximum length of the actual crack determined during the process of removal.

(11) Enter the depth of the crack. The depth to be entered is the maximum depth of the actual crack determined during the process of removal, measured from the surface of the base plate.

(12) Enter either the word Yes or No to indicate whether or not the area was repair welded.

(13) Place an X in the appropriate block to indicate the condition of the weld geometry. If not OK, briefly note reason in box below the blocks.

(14) Indicate the inspection technique used: MT, PT, RT, UT, or ET.

**Figure 091-6. Miscellaneous Surveillance Routine Inspection Record (Sheet 2 of 3)**

(15) The summary table is self-explanatory in that the following is recorded:

- cumulative lengths of the various lettered welds (from (6)).
- cumulative lengths of the cracks contained in each lettered weld (from (10)).
- the incidence of cracking for each lettered weld (from (8)).

3 If a crack indication is eliminated, during the process of inspection, by being ground to a depth no greater than 1/16-inch, the original indication need not be reported on Figure 091-6 and shall not be included in the summary.

4 Overlapping cracks should be reported separately in columns (7) through (12), but the overlapping portions are not additive when making a determination of the cumulative length of cracks for the summary described in (15).

**Figure 091−6. Miscellaneous Surveillance Routine Inspection Record (Sheet 3 of 3)**

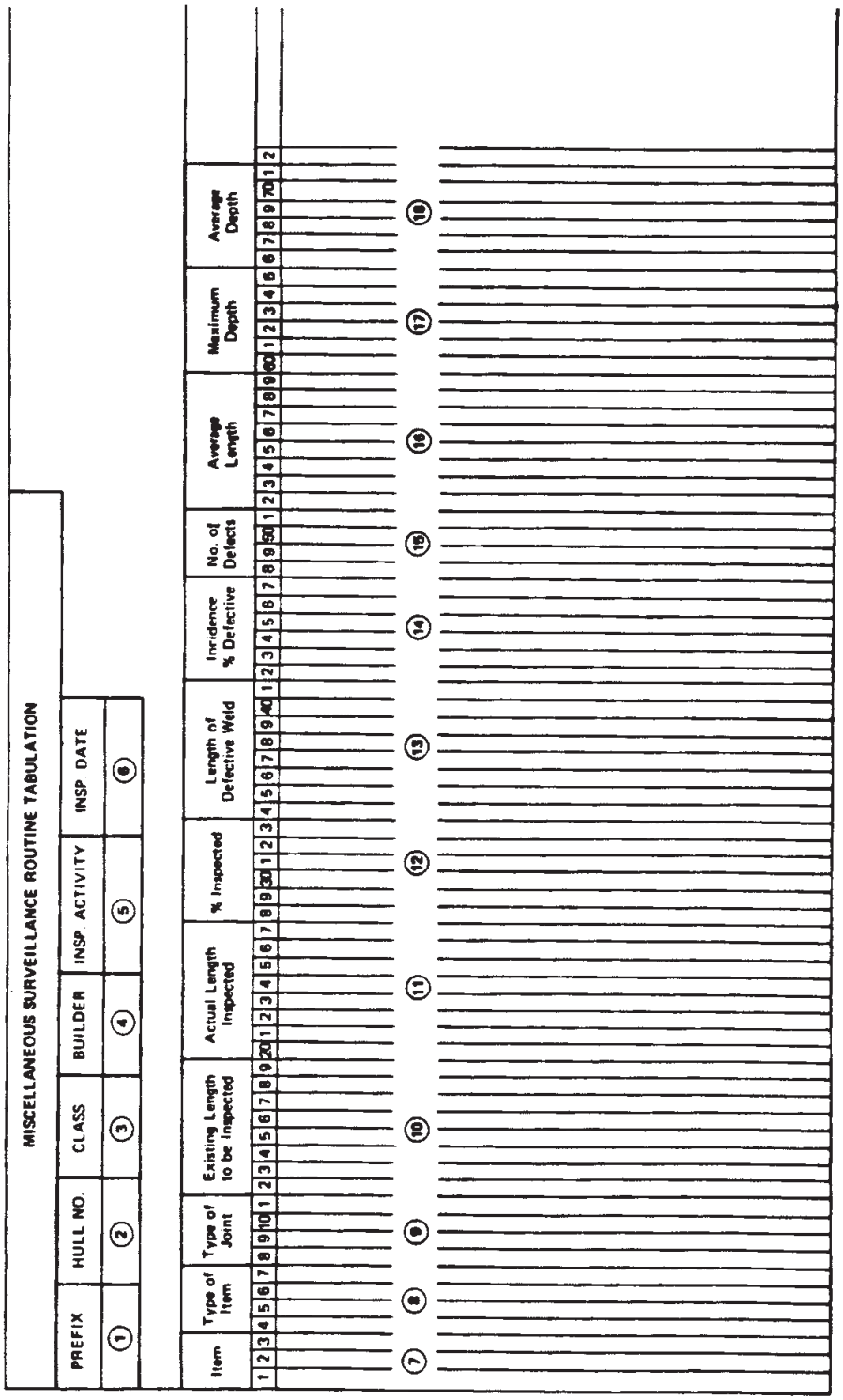



**Figure 091−7. Miscellaneous Surveillance Routine Inspection Tabulation Form (Sheet 1 of 3)**

Instructions for Tabulating the Results of the Miscellaneous Surveillance Routine Inspection

1 Figure 091-7, the miscellaneous surveillance routine tabulation sheet, shall be compiled and submitted for each miscellaneous surveillance routine inspection conducted.

2 The following numbered statements are keyed to the circled numerals on sheet 1:

(1) Enter hull prefix, such as SS, SSN, SSBN, etc.

(2) Enter hull number.

(3) Insert class number.

(4) Insert abbreviation of name of original builder.

(5) Insert abbreviation of inspecting activity.

(6) Enter date of completion of inspection.

(7) In columns 1 through 3, enter the item number of the detail being inspected. This number shall agree with the item number found in the inspection tables.

(8) In columns 4 through 7, enter the category of the item inspected in accordance with the following list:

TRG - for transition ring butt welds

TRK - for trunk welds

TNK - for tank welds

BHD - for bulkheads welds

LPN - for large penetration welds such as torpedo tubes, steering or diving rams, or shaft tubes

SPN - for small penetrations, such as electrical, mechanical, or piping penetrations

(9) In columns 8 through 11, enter the type of weld joints inspected in accordance with the following:

B - for butt welds

C - for corner welds

T - for T-welds

F - for fillet welds

(10) In columns 12 through 19, insert the existing length of the particular line item of weld inspected, give length in inches.

(11) In columns 20 through 27, insert the actual length of the particular line item of weld inspected, give length in inches.

**Figure 091−7. Miscellaneous Surveillance Routine Inspection Tabulation Form (Sheet 2 of 3)**

(12) In columns 28 through 33, enter the percentage of the particular weld inspected.

(13) In columns 34 through 41, enter the length of defective weld, give length in inches.

(14) In columns 42 through 47, enter the incidence of defects. This is computed as follows: length of defective weld, divided by length of weld inspected, multiplied by 100.

(15) In columns 46 through 51, insert the number of individual defects.

(16) In columns 52 through 59, insert the average length of the defects.

(17) In columns 60 through 65, insert the maximum depth recorded.

(18) In columns 66 through 71, insert the average depth of the defects.

**Figure 091−7. Miscellaneous Surveillance Routine Inspection Tabulation Form (Sheet 3 of 3)**

INSPECTION HISTORY

Ship: _____

| Date of Report | Serial No. of Report | Items Inspected |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

**Figure 091−8. Cumulative List of Partial Inspection Report Form**

## SECTION 2. HULL SURVEY

### 091−2.1 INTRODUCTION

**091−2.2 BACKGROUND**. Corrosion of submarine structures is an ever−present, continuing factor. Strength of the submarine pressure−hull structure is of utmost importance; it is mandatory, therefore, that strength members be maintained through conservative but economically justifiable maintenance. It is necessary to insure that the pressure envelope will not deteriorate to a point below acceptable levels for the period of time the submarine will operate.

**091−2.3** Submarine hull surveys in various forms and to varying degrees have been conducted for many years. Requirements described in the following paragraphs represent a continuation of these efforts.

**091−2.4 DEFINITIONS**. Definitions pertaining to hull survey are given in the following paragraphs.

**091−2.5 Exterior Surface Visual Routine**. An exterior surface visual routine inspection of those exterior areas and surfaces of the hull and appendages which are visible in drydock. Normally, interferences are not removed nor are thickness measurements taken. Intent of this inspection is to obtain a cursory review to insure that no unusual corrosive action has begun.

**091−2.6 Hull Structural Survey Routine**. A hull structure survey routine is a complete and comprehensive visual inspection of all pressure structure and also structures in free−flooding spaces. This inspection insures that corrosion has not become prevalent and that structural strength is being maintained.

**091−2.7 GENERAL INFORMATION**. Structures affecting watertight integrity or recoverability of the submarine, are of utmost importance. Since it is not possible to anticipate every conceivable condition that might be encountered, it is vital that individuals at any facility, charged with responsibility for conducting visual examinations of the pressure hull and related structure, should have had prior experience in submarine hull survey work. Similarly, persons responsible for analyzing data obtained as a result of the hull survey inspection should have a working knowledge of submarine structural design. This is considered essential in order to apply criteria properly and determine need for repairs.

**091−2.8** Special attention shall be given to those items and areas that are known to be subject to accelerated corrosion, such as structures in way of exhaust trunks or liners, sumps, and other normally inaccessible areas.

**091−2.9** In cases where corrosion has taken place and measurements are considered necessary, micrometers or other nondestructive thickness measuring instruments shall be used. Only personnel qualified or properly trained in use of the particular instruments involved should be permitted to take thickness measurements. Thickness readings shall be accurate to the nearest one−hundredth of an inch.

**091−2.10** In submarine hull inspection, preservation, and repair, safety of the submarine is the primary consideration. Unproven methods, used in an effort to economize, are not permitted. Whenever doubt exists as to action to be taken in maintaining submarine structure, the conservative approach that tends to maintain hull strength should be used.

### 091−2.11 HULL SURVEY INSPECTIONS FOR CORROSION

**091−2.12 EXTERIOR SURFACE VISUAL ROUTINE**. The scope, method, and procedure for conducting hull survey inspections for corrosion by the exterior surface visual routine are described in paragraphs 091−2.13 through 091−2.22. This exterior surface visual routine shall be conducted to satisfy the requirement imposed by maintenance requirement card (MRC 002) for unrestricted operation (URO), and limited in depth (LID), submarines.

**091−2.13 Scope**. Initial and subsequent exterior surface visual routine inspections shall be conducted on all submarines during each docking. Intervals between delivery and initial inspection, and between subsequent inspections, shall not exceed 30 months.

**091−2.14 Method**. Basic inspection shall be conducted visually. Intent is to inspect the hull and determine if preservative systems effectively have protected areas against corrosion. Where preservation systems have broken down, extent of structural deterioration and the attendant need for repair must be determined. Other non−destructive measuring or inspection techniques shall be used, as necessary, in order to determine condition or structures if basic visual inspection leaves room for doubt, or verification is required.

**091−2.15 Procedure**. Appendix A is an example of the report form for the exterior surface visual routine inspection. To facilitate use of the form, appendix A is comprised of three sheets. Sheet 1 identifies this appendix as Booklet A. Sheet 2 is the form itself with circled numbers keyed to sheet 3 which details instructions for completing the form.

**091−2.16** This report form lists not only a number of typical items, the exterior surfaces of which are to be appraised and evaluated, but also requires information as to conditions of the items inspected and subsequent actions to be taken.

**091−2.17** The areas listed, and any others applicable to the particular submarine, should be inspected visually to the maximum extent possible without resorting to removal of interferences. If tanks are opened; or insulation, sound damping, or other interferences are removed for other reasons, however, the previously−obscured areas also should be visually inspected.

> **NOTE:** Pay particular attention to the area between the waterline and approximately 10 feet below the main axis of the submarine.

**091−2.18** If necessary, external surfaces of the hull and appendages shall be cleaned sufficiently to remove deposits, such as barnacles or verdigris, in order to reveal condition of the structure of preservative coating. Cleaning is done by water jet, high pressure water nozzle, or brush blast.

**091−2.19** After necessary cleaning has been done, the area shall be inspected visually. Condition of the preservative shall be noted and indicated on the report form.

**091−2.20** If the preservative system has broken down and structure corrosion has commenced, additional cleaning may be necessary to evaluate properly the condition of the structure. This shall be judged and inserted on the report form.

> **NOTE:** Make note of depressions, deformation, and cracking in hull structure resulting from causes other than the corrosive effect of the environment, for separate evaluation of the need for repair.

**091−2.21** If visual inspection results in doubt as to the adequacy of scantling sizes or condition, thickness measurements shall be taken for items in question, or MT or ET inspections shall be conducted to insure that the hull is free of cracks. Appendix B includes a form (sheet 5) which also may be used with appendix A if scantling sizes and thickness measurements need verification when conducting the external surface visual routine inspection.

**091−2.22** Upon completion of inspection, and repair if required, the structure shall be represerved in accordance with the ship's approved paint schedule. If repairs are required but can not be accomplished for any reason, the facts should be reported to the Type Commander and NAVSEA.

**091−2.23 Repair**. Repairs, when required, shall be made in accordance with details given in paragraphs 091−2.68 through 091−2.113.

**091−2.24 Reporting**. Reports shall be prepared in accordance with paragraphs 091−2.114 through 091−2.122.

**091−2.25 HULL STRUCTURAL SURVEY ROUTINE**. The scope, method, and procedure for conducting the hull structure survey routine inspection are described in paragraphs 091−2.26 through 091−2.65. This hull structural survey routine shall be conducted to satisfy the requirement imposed by the maintenance requirement card (MRC 003) for unrestricted operation (URO), and limited in depth (LID), submarines.

**091−2.26 Scope**. The hull structural survey routine inspection shall be conducted on all submarines during each overhaul. Intervals between delivery and initial inspection, and between subsequent inspections, shall not exceed 60 months for some structural items and 72 months for other structural items.

**091−2.27 Method**. Basic inspection shall be conducted visually. Intent is to inspect the pressure hull and associated supporting structure to the maximum extent possible in order to determine if preservative systems effectively have protected areas against corrosion. Where preservation systems have broken down, extent of structural deterioration and the attendant need for repair must be determined.

**091−2.28** Additionally, it is intended that all welded attachments to pressure hull frame flanges be inspected visually to insure freedom from cracks.

**091−2.29** Other nondestructive measuring or inspecting techniques shall be used as necessary to determine condition of structure if the visual inspection leaves room for doubt, if verification is required, or if visual inspection is impractical.

**091−2.30 Procedure**. Appendix B is an example of the report format for hull structural survey routine. Appendix B is comprised of eight sheets. Sheet 1 identifies this appendix as Booklet B. Sheets 2, 3, and 4 are three different versions of the summary form with each version listing differing typical items of structure to be inspected. As in appendix A, each version or the form also requires information as to conditions of the items inspected and subsequent actions to be taken.

**091−2.31** Sheet 5 of appendix B is a summary sheet on which can be entered a sketch of an item and a report on problems discovered or repairs accomplished if such details or explanations are needed.

**091−2.32** Sheet 6 is a partial circularity plot and Sheet 7 a full circularity plot. These may be used as appropriate to record and verify acceptable circularity. Other types of plots presently being used by repair activities are also satisfactory for submittal.

**091−2.33** Sheet 8 contains instructions for completing the summary forms (sheets 2, 3, and 4).

**091−2.34** Appendix B specifies the areas to be inspected in the hull structural survey routine along with minimum intervals between inspection. These areas should be inspected visually to the maximum extent possible. It is intended that this inspection cover all structural elements of the submarine.

**091−2.35** Surfaces of the items to be inspected shall be prepared for inspection in the following manner:

1. Use a water jet to clean external surfaces of the structure of barnacles, sea growth, and so forth, to reveal condition of paint systems. Where not sufficiently clean, use water jet or brush blast as necessary.

2. Clean internal surfaces of structure in way of tanks, bilges, and so forth, so they are free of oil, water, and other debris which would conceal condition of the preservative systems.

**091−2.36** Areas prepared for inspection shall be inspected visually in order to identify those in which preservation systems have broken down and corrosion of structural materials might have begun, or where cracking might exist.

**091−2.37** Record conditions observed on the appropriate forms shown in appendix B. Make note of deformations of, and cracking in, hull structural members resulting from causes other than environmental corrosive effects. Make note also of all locations showing evidence of preservation breakdown or other unsatisfactory conditions, so further investigation and corrective action can be taken.

**091−2.38** Clean areas designated for further investigation in order to conduct a thorough visual inspection and determine extent of deterioration or cracking of metal structure.

**091−2.39** Report conditions observed on the appropriate report forms contained in appendix B. Note those areas that are suspect relative to structural adequacy.

**091−2.40** Investigate suspect areas. Where crack−like indications are evident, use the ET nondestructive test method to determine absence of cracks and establish acceptability of the area inspected. If positive readings are obtained on the ET meter, perform MT inspection in accordance with MIL−STD−271 to verify their extent. Indications confirmed as cracks are rejectable defects and must be repaired.

**091−2.41** In those areas where doubt exists as to adequacy of scantling sizes, thickness measurements shall be taken to determine if pitted and generally corroded areas meet acceptance criteria contained in appendix C (see paragraph 091−2.69). Those areas not meeting acceptance criteria must be repaired.

**091−2.42** Several items and areas are so located as to make visual inspection either impossible or impractical. These areas, and efforts to be expended in the inspection and evaluation process, are described in the following paragraphs.

**091−2.43** Visual inspection can not be performed on the inner surface of the pressure hull in way of the primary shield tank. If entry is gained to the primary shield tank for other purposes, however, visual inspection shall be conducted.

**091−2.44** If entry is not gained, the inspecting activity shall establish a 12−inch−square grid pattern on the outside of the pressure hull in way of the primary shield tank and ultrasonically gage the pressure hull thickness at intersections of the grid.

**091−2.45** If it is determined that in some areas thickness of the pressure hull plating is 1/16−inch less than the original thickness, the extent of those under−gage areas shall be established by continuous ultrasonic scanning. If it is determined that in some areas thickness of the pressure hull plating is 1/8−inch (or greater) less than the original

thickness, an area within a 12−inch radius shall be continuously scanned. Results shall be compared with requirements of sheet 1 of appendix C.

**091−2.46** Visual inspections can not be performed on the inner surface of the pressure hull in way of the battery well or wells. The procedures outlined in paragraphs 091−2.43 through 091−2.45 shall be followed for inspection and evaluation of hull condition in these areas.

**091−2.47** Foam−filled or other voids also obscure visual inspection of the pressure hull. In these cases, the procedure described in the following paragraphs shall be accomplished.

**091−2.48** If cracking is noted or seepage or leaking is observed in way of foam filled or other voids a hole shall be drilled − not larger than 1 inch in diameter − in the lowest practical portion of the nonpressure hull boundary of the void, to determine whether or not water is entrapped. If no flooding is evident, the holes shall be weld repaired. If flooding is evident, holes at least 6 inches in diameter should be cut in several judiciously−selected areas. If filler material exists, it shall be removed as necessary to determine whether or not a corrosion problem exists in the void, especially in the pressure hull boundary.

**091−2.49** If a corrosion problem exists, results of further inspections shall be compared with the requirements of sheet 1 or appendix C. If no corrosion problem exists, the filler material shall be reinstalled and the boundary plating rewelded in place.

**091−2.50** Visual inspections also are blocked by lead ballast bins, both internal and external to the pressure hull. The procedure outlined in paragraphs 091−2.43 through 091−2.45 shall be followed for inspection and evaluation of hull condition in way of watertight lead storage bins. If thickness is not satisfactory, remove lead and restore structure as required. Upon completion of repair, tightness of the lead bin shall be insured.

**091−2.51** Free−flooding lead ballast storage bins external to the pressure hull shall be inspected on a sampling basis. Reference shall be made to previous hull survey inspection reports to insure that previously reconditioned bins are not selected for sampling. Remove lead from two aft bins and one forward bin. (Aft bins shall be selected in different ballast tanks.) If two of the three bins inspected are corroded and in need of repair, pull and inspect all remaining bins. If only one of the three bins is bad, pull additional bins.

**091−2.52** If the bad bin is forward, pull two in the vicinity. If at least one of these two is bad, pull and inspect all remaining bins, forward and aft. If the bad bin is aft, pull one in the same vicinity. If this bin is bad, pull all remaining bins, foreward and aft.

**091−2.53** If the three bins initially pulled are in good condition, or if additional bins pulled are in good condition, no further inspection is necessary.

**091−2.54** Some submarines have lined external lead bins which also prevent visual inspection. In addition to the normal sampling inspection described in paragraphs 091−2.51 through 091−2.53, for unlined and unreconditioned bins, one bin, previously lined, shall be inspected by removing lead and inspecting lining for imperfections such as tears or bubbles. If lining is sealed properly and is in satisfactory condition, the bin shall be considered satisfactory. If lining is damaged or loose, it shall be removed and plating in the bin shall be inspected. If the plating is good, no additional inspection is required. Any inspection expansion in way of lined lead bins shall be based on the condition of the plating beneath the lining. If the plating is bad, remove the lead from one additional lined lead bin and inspect as above. If the lining in the second bin is satisfactory, the inspection is considered complete. If the lining is damaged or loose and the plating beneath is good, no additional inspection is required, however, if the plating beneath is bad, all lined lead bins shall be inspected.

**NOTE:** Whenever any lead is removed from a bin to facilitate inspection, the bin shall be repaired if required, represerved, and lined prior to reinstallation of the lead.

**091−2.55** A visual inspection shall be conducted to insure that cracks do not exist in way of welded attachments to pressure hull frame flanges. Basic inspection shall be conducted visually. Other nondestructive inspection techniques shall be used as necessary to determine condition of the structure if the basic visual inspection leaves room for doubt or if verification is required.

**091−2.56** Visually inspect all readily accessible frame flanges (fabricated, rolled, or extruded) throughout the submarine, in way of the following:

1. Areas where lead bin canning plates or remnants of plates, and other attachments spanning between two or more frames, are welded to frame flanges.

2. Areas where struts or other foundation members are welded to frame flanges.

3. Areas where other miscellaneous attachments are welded to any of the frame flange surfaces.

> **NOTE:** The term **readily accessible** is defined as pertaining to those areas that can be inspected without removal of fixed interferences, with the exception that insulation shall be removed and not considered to be a fixed interference. If possible, insulation removed in way of frame attachments shall be made portable.

**091−2.57** If a crack is discovered during visual inspection of readily accessible frame flanges, the following shall be done:

1. Repair the crack in accordance with the requirements of NAVSEA 0900−LP−006−9010 or NAVSEA 0900−LP−000−1000.

2. Expand the inspection already conducted in accordance with the following:

a. If the crack is located solely in the weld of the attachment to the frame or is merely the result of a pull−out or breaking away from the frame, inspection shall be expanded to all **accessible** attachments to the frame flanges of the frame containing the cracked weld, and one adjacent frame both foreward and aft of the subject frame.

b. If the crack is located in the frame flange itself or has propagated from a welded attachment into the frame flange material, inspection shall be expanded to all accessible attachments of all frames in the subject compartment, except those that require **major ripout** in order to gain access for inspection.

> **NOTE:** The term **accessible** is defined as pertaining to those areas that can be inspected upon removal of interferences such as insulation, sound proofing, sound damping, wireways, light fixtures, sheet metal work, sheathing, and protective coatings. As a general rule, components of systems that require more than operational testing, if opened or disturbed for no other reason, should not be opened nor disturbed. The term **major ripout** is defined generally as an action that requires cutting, removal of heavy equipment (greater than 500 lbs), chipping, burning, or other hotwork for removal and reinstallation, or requires that a system be tested upon reinstallation, provided that these actions are not required by other authorized work.

**091−2.58** If additional cracking is discovered during expanded inspections, continued expansion in like manner probably will be required and NAVSEA should be notified immediately.

**091−2.59** During the foregoing inspections, remove any unused attachments such as remnants of canning plates, pipe hangers, wireway brackets, or foundations, to eliminate potential problem areas. Upon removal of any of these items, the weld site shall be ground smooth and MT−inspected for freedom from cracking.

**091−2.60** Visual inspection of small oil tanks need to be made only in conjunction with the accomplishment of other tank work due to the inherent rust−inhibiting characteristics of contained fluids. In the interest of maintaining structural integrity at its highest level of reliability while guarding against unexpected corrosive attack, however, all tanks containing oil (that operate on a compensating basis) shall be opened for inspection at intervals not to exceed 120 months.

**091−2.61** Criteria for evaluating corrosion of structural welds is described in the following paragraphs.

**091−2.62** Corroded butt welds in pressure hull plating should be ground smooth. If the weld surface is not below the adjacent uncorroded plate surface by an amount which exceeds allowable undercut specified in NAVSEA 0900−LP−000−1000 and NAVSEA 0900−LP−006−9010, the weld is acceptable. If butt weld surfaces are corroded below the surface of the adjacent corroded plating, the weld shall be built up as required by NAVSEA 0900−LP−000−1000, NAVSEA 0900−LP−006−9010, and Chapter 074(9920), **Welding and Allied Processes**.

**091−2.63** If the reinforcing fillets of full and partial penetration T−welds are corroded to a point at which they are more than 1/16−inch below their required drawing size, they are rejectable and should be repaired.

**091−2.64** Upon completion of inspection and any required repair, the structure shall be represerved in accordance with the ship's approved paint schedule.

**091−2.65** If repairs are required, but accomplishment is not possible for any reasons, the facts should be reported to the Type Commander.

**091−2.66 Repair**. Repair, when required, shall be made in accordance with paragraphs 091−2.68 through 091−2.113.

**091−2.67 Reporting**. Reports shall be prepared in accordance with appendix B and paragraphs 091−2.114 through 091−2.122.

**091−2.68 REPAIR AND REPLACEMENT**

**091−2.69 STRUCTURE**. Repair and replacement of submarine structure determined by the various inspections are described in the following paragraphs. Appendix C (34 sheets) defines the minimum scantlings criteria for measuring corrosion on pressure hull plating and pressure hull framing. Sheet 1 is a diagram showing the least permissible average thickness of corrosion permitted. Sheets 2 through 34 define the corrosion allowances for specific submarines and submarine classes.

**091−2.70** Appendix D (28 sheets) is comprised of curves plotted for specific submarines or submarine classes based upon the minimum scantlings criteria given in appendix C.

**091−2.71 Pressure Hull Plating**. If visual inspection of pressure hull plating reveals that a corrosive attack has taken place, or if for any other reason doubt exists as to the adequacy of plating thickness, then thickness measurements shall be taken. Measurements shall be taken in sufficient quantity to determine the average thickness of questionable plating. If it is determined that average thickness is less than the minimum required, than the plating must be replaced or repaired to original geometry.

**091−2.72** If average plating thickness, as determined by required measurements is found to be greater than the minimum required, additional measurements shall be made in way of existing pits to determine the remaining thickness of plating under the pits. If the remaining thickness of the plating under the pits and size and spacing of the pits meets the requirements of appendices C and D, the plating is considered satisfactory, provided the total loss of plating area does not exceed that permitted by sheet 1 of appendix C.

**091−2.73** Welding of pits in pressure hull plating usually is done only in those areas where average thickness of plating justifies repairs because it is sufficiently greater than minimum required thickness. Where remaining thickness in way of pits is less than allowed by appendix C, pits may be welded subject to parameters and requirements of chapter 074(9920), **Welding and Allied Processes**.

**091−2.74** In the event plating is replaced, the new plating shall conform to the original design requirement as to thickness and material properties. The experience of past successful submarine construction practice must be brought to bear when it becomes necessary to renew pressure hull plating. Proper laying out of cut lines and establishment of a proper welding sequence are necessary to minimize metallurgical and geometrical discontinuities in the repaired portion of the hull.

**091−2.75 Pressure Hull Framing**. If visual inspection of pressure hull frames reveals that a corrosive attack has taken place, or if for any other reason doubt exists as to the adequacy of flange or web thicknesses, thickness measurements shall be taken. The area of both the web and the standing flange of pressure hull frames is of major importance. Criteria for the area of these elements can be stated in terms of minimum thickness. As a further simplification, the area of the standing flange can be judged from an average two thicknesses measured anywhere on straight flanged H−bar, T−bar, or built up flanges, and at the grip points on tapered flange bars. Some lack of symmetry of the standing flange with respect to the web is permissible. That portion of the standing flange on one side of the web may be thinner than that on the other side, provided that the thinner flange side has and average thickness not less than 95 percent of the required minimum thickness, and provided that the average thickness of the entire flange meets minimum thickness requirements. If these requirements are not met, the frame flange or bar should be replaced.

**091−2.76** If average thickness requirements have been met, some irregularity or pitting of the surfaces of frame bars is acceptable, subject to the following criteria:

1. Depth of the pits shall not exceed 15 percent of the minimum average required thickness.

2. Diameter of the pits shall not exceed two times the thickness of the member.

3. Spacing between adjacent pits shall not be less than two times the thickness of the member.

**091−2.77** If depth of the pits is over 15 percent of the specified minimum thickness of the frame elements, welding of pits is permissible, subject to the following criteria:

1. Diameter of the pit shall not exceed 2 inches.

2. Spacing between the pits shall not be less than two times the diameter of the larger pit.

**091−2.78** In the event that pressure hull frame replacements are required, the new frames shall be checked for thickness and material properties, prior

to installation, to determine their applicability for use on submarines.

**091−2.79** SS212 Class submarines shall use 6−inch by 3.375 inch by 14.75−pound medium steel (MS) I−beams with a minimum average thickness of 0.340−inch on the flanges and 0.320−inch on the web, or a fabricated frame bar of equal or greater size.

**091−2.80** SS285 Class submarines (excluding SS361−364) and SSK−1 Class submarines shall use 6−inch by 22.6−pound HTS H−beams with a minimum average thickness of 0.370−inch on the flanges and 0.300−inch on the web, or a fabricated frame bar of equal or greater size.

**091−2.81** All other classes of submarines shall use shapes conforming to detail drawings and building specifications.

**091−2.82** When it becomes necessary to renew portions of pressure hull frames, consideration should be given to the replacement of a portion extensive enough to eliminate need for similar replacement of an adjacent section prior to the next overhaul. Generally speaking, material costs are a small part of the total cost of repairs. It is questionable long−term economy to save a portion of a frame whose condition is such that the required thickness might not last until the next overhaul and thus would require repairs prior to the next overhaul. This is especially true in those cases where tanks are opened to facilitate renewal.

**091−2.83 Miscellaneous Pressure Structure**. If visual inspection of main ballast tanks or other miscellaneous pressure structure reveals that a corrosive attack has taken place, or if for any other reason doubt exists as to the adequacy of the structure, measurements shall be taken in order to establish existing thicknesses. If existing thicknesses are below the minimum required, repair or replacement should be accomplished. An exception to this rule occurs in the case of flat plate structures where adding additional stiffeners and thus reducing panel size might be an acceptable solution.

**091−2.84** Main ballast tanks are critical structures from the standpoint of providing recoverability in case of a casualty situation. Minimum thickness criteria in appendix C refers to several different types of areas of corrosion which are defined as follows:

1. **Plate−pitting.** Any corroded area 2 inches or less in diameter.

2. **Plate−corroded area.** Any corroded area with a diameter of more than 2 inches, up to and including a diameter of one−third of the frame bay spacing.

3. **Plate−general corrosion.** Any corroded area with a diameter in excess of one−third of the frame bay spacing.

4. **Stiffener−pitting.** Any corroded area 2 inches or less in diameter.

5. **Stiffener−general corrosion.** Any corroded area more than 2 inches in diameter.

**091−2.85** Structure subject to submergence pressure such as closure bulkheads, conning tower plating and framing, hull trunks, access and escape trunks, loading trunks, periscope and mast wells, and other similar structures may be repaired if pitted. Previously−defined rules governing the repair of pits shall be used as guidelines. Other high pressure structures not included in the foregoing categories, or listed elsewhere, shall be reported to NAVSEA for the establishment of minimum scantlings, if measurements fall below 90 percent of the original thickness.

**091−2.86 Low Pressure Structure and Free Flooding Areas**. Low pressure and free flooding structures such as fuel oil tanks, buoyancy tanks, bow structure, stern structure, superstructures, and fairwaters, shall receive visual inspections during each hull survey period. Generally, it will be unnecessary to take measurements of these structures unless there is obvious evidence of deterioration. The following guidelines for repair or replacement apply:

1. If local pits in plating are deeper than 50 percent of the original plating thickness, they shall be repaired in accordance with chapter 074(9920), **Welding and Allied Processes**.

2. Generally, corroded areas of plating, whose average thickness has been reduced 25 percent or more from the original plate thickness, shall be cut out and replaced by the installation of flush−welded insert patch plates of original plate thickness and material properties.

3. All frames (rolled, extruded, or built up), whose average thickness has been reduced 25 percent or more, shall be replaced with new frames having original thicknesses and material properties.

**091−2.87 WORKMANSHIP**. Repairs and replacement of structures must be accomplished with precision. Specifications of high quality workmanship required are described in the following paragraphs.

**091−2.88 Circularity**. The pressure hulls of present operational submarines essentially are ring−stiffened cylindrical shells. In order to respond favorably to the hydrostatic pressures incured during operations, and to insure that the required factor of safety exists, measured circularity must meet specified requirements. The statement of requirements primarily pertains to ring frames themselves, for they maintain the circularity of the frame and shell combination. Any eccentricity of the frame serves to increase the bending stress within the frame and because of this factor, any deviations from true circularity in excess of specified allowances will infringe upon the design collapse depth and, therefore, the operating depth factor of safety. While it is true that out−of−roundness of the shell plating between the frames is undesirable, this has only a secondary effect on the collapse strength of the hull.

**091−2.89** When a pressure hull frame is cut for any reason and renewed or replaced, adequate circularity of the frame must be verified after all major welding is complete. Adequate circularity is insured by meeting the following specifications:

1. The actual trace of the contour of the hull shall not deviate from the mean circle by more than one−half the thickness of the pressure hull plating or one−half inch, whichever is less.

2. The radius of the mean circle shall not deviate from the design radius by more than one−half the thickness of the pressure hull plating or one−half inch, whichever is less.

**091−2.90** The mean circle is defined as the circle whose area is equal to the area enclosed by the actual contour of the pressure hull. In analyzing the data, the mean circle of established radius may be adjusted in position so deviations between the mean circle and the actual contour are minimized.

**091−2.91** To determine whether or not the specified requirements for adequate circularity have been met, it is necessary to make a full circularity check. This is not always possible, and for that reason partial circularity checks have been allowed in an effort to minimize the time−consuming and costly removal of interferences.

**091−2.92** Prior to cutting hull structure, the existing circularity must be established for each frame being cut, unless it is known definitely that a full circularity check will be made after the completion of all major welding. The existing profile of each frame can be established in one or more of the following ways, which are listed in order of preference:

1. By taking full circularity measurements in way of the frames involved.

2. By reference to prior full circularity readings made in way of the frames involved.

3. By taking partial circularity measurements of the structure involved.

**091−2.93** Partial circularity measurements shall extend over a transverse arc length two times the transverse arc length of the proposed cut. The measurements, however, shall not exceed 30 degrees beyond each edge of the cut and shall be centered on the proposed cut, except in those cases where tank tops or rigid longitudinal structure intersects the pressure hull. In this latter case, the partial circularity may terminate at the tank top or rigid longitudinal structure. If the readings gathered as a result of this partial circularity check deviate from the end point readings more than one−half the thickness of the plating, or one−half inch, whichever is less, a full circularity check shall be made.

**091−2.94** When using any of these methods for establishing the existing pre−cut profile of the frames involved, the radial location of end points beyond the edges of the proposed cut shall be established relative to bench marks on adjacent undisturbed frames foreward or aft of the proposed cut. The transverse arc length between end points shall be equal to two times the transverse arc length of the proposed cut but shall not exceed 30 degrees beyond each edge of the cut. End points shall be equidistant from the center of the proposed cut.

**091−2.95** After all welding in connection with renewal or replacement of hull plating or framing has been done, verification of acceptable circularity shall be conducted taking full circularity measurements, or by taking partial circularity measurements similar to those defined in paragraph 091−2.93.

**091−2.96** If partial circularity measurements are made, the radial location of end points shall be remeasured. If end points have changed by more than one−eighth inch from their location prior to cutting, a full circularity will be required. If end point readings are satisfactory, one of the procedures described in the following paragraphs shall be conducted.

**091−2.97** If a full circularity was made prior to cutting, the post−welded partial measurements and end point readings shall be superimposed upon them. Corrections to partial readings may be necessary depending on whether or not end points have shifted. At this stage, a new modified full

circularity profile is available for analysis to determine whether the stated circularity requirements have been met.

**091−2.98** If only a partial circularity was made prior to cutting, then the partial circularity made after welding shall be compared with the precut partial in the following manner:

1. Record all precut offset readings along with precut end point readings.

2. Consider end point readings to be zero points, and correct all other readings to reflect the relative difference between the geometrical profile and the zero points.

3. Record all post−welded offset readings along with post−welded end point readings.

4. Correct post−welded offset readings to reflect the relative differences between the geometrical profile and post−welded zero end points.

5. Compare end point readings first. If no change was recorded, the corrected precut and post−welded profiles then can be compared directly. If a change in location of end point readings was recorded, the post−welded profile must be corrected to reflect such a change. This final profile then can be compared directly with the precut profile. If the comparison reveals a deviation one−eighth inch or less, the circularity shall be considered acceptable. If the comparison reveals a deviation of more than one−eighth inch, however, a full circularity is required.

**091−2.99** Chapter 074(9920), **Welding and Allied Processes**, illustrates an acceptable method of recording and analyzing pre− and post−partial circularity measurements.

**091−2.100** If partial circularity measurements indicate that the procedures described in paragraphs 091−2.88 through 091−2.98 have been followed but doubt remains that the final result is in accordance with specifications, a full circularity check shall be made. (It is possible that the cumulative effect of several minor deviations might become critical in the course of successive removals and replacements of the same hull patch.)

**091−2.101** The method to be used in taking circularity measurements shall be acceptable to the Supervisor of Shipbuilding or Shipyard Commander.

**091−2.102** Portions of hulls of some submarines are designed to be other than truly circular. In these cases, if hull cuts are made for any reason, the method used for taking precut and post−welded partial circularities in circular hulls shall be adapted for use. In essence, the object is to maintain original geometry, and allowable deviations, therefore, shall not exceed those established for normal partial circularities.

**091−2.103** A suggested method for analysis of full circularity readings is described in the following paragraphs.

**091−2.104** Accurate positioning of a template, bridge gage, or optical sights, and accurate measurements of offset readings are important, but these are just the beginning of circularity analysis. To insure the validity of final results, methods used to reduce the data are of vital importance. The purpose of taking offset measurements by any of the given methods is to obtain a representation of hull contour. From these offset readings a trace of the hull contour can be reproduced in full size, on the loft floor. A representation also can be reproduced on the drawing board if equal lengths are subtracted from each radial distance measured from the theoretical center of the template to the line contour.

**091−2.105** From this contour, the determination of circularity must be derived. A center point first must be determined. This can be done by scribing a horizontal axis midway between the crown and keel extremities of the contour and by creating a vertical axis normal to the horizontal axis, midway between the port and starboard extremities of the hull trace. Working from the established center, radii can be measured at uniform intervals. Ten−degree intervals are suggested for hull diameters less than 25 feet with 5−degree intervals suggested for hull diameters greater than 25 feet.

**091−2.106** The radius of the mean circle may be determined by taking an average of the radial measurements. This is not theoretically exact; however, results are within allowable limits.

**091−2.107** The center of the mean circle thus obtained may be made to coincide with the established center of the hull trace, or it can be shifted about in order to minimize the deviations between the hull trace and the mean circle. When a final position is decided upon, measurements shall again be taken. This time, measurements shall be taken from the center of the mean circle to the trace of the hull. These radial measurements shall be compared with the radius of the mean circle.

**091−2.108** It is this comparison that is meaningful in the determination of circularity. These are the deviations that should appear on circularity reports, and these are the deviations that must not exceed the specified requirement of one−half the thickness

of the pressure hull plating or one−half inch, whichever is less.

**091−2.109 Alinement**. When the installation of new or reinstallation of existing, pressure hull plating or framing is required, procedures shall be used to obtain the best practicable alinement. The erection requirements contained in NAVSEA 0900−LP−000−1000 and NAVSEA 0900−LP−006−9010 shall be followed. Where misalinement of existing structure exceeds the allowable values, steps shall be taken to effect the repairs necessary to establish conformance to the stated requirements.

**091−2.110 Welds**. All new welds attaching the pressure hull frames to the pressure hull plating shall be sized in accordance with building specifications for the submarines involved. Exceptions are as follows: in the case of SS212 Class submarine, welds shall be one−quarter−inch; for SS285 Class submarines they shall be three−eighths−inch.

**091−2.111** All existing welds, if found to be smaller than the originally−designed size, shall be built up to meet it.

**091−2.112 General**. Whenever visual inspections are being conducted, inspecting personnel shall be aware of the importance of spotting those items which indicate poor workmanship, violation of specifications, and other details such as weld cracks, laminar indications in plate edges, poor weld geometry, omission of welds, damaged structures and any other item that might tend to degrade the structure.

**091−2.113** All findings shall be recorded and judged to determine whether or not correction is warranted and if so, by what means. The implication is that submarine structures should be maintained in a manner that would provide a reasonable factor of safety, and preclude structural failures due to corrosion and deterioration during the submarines normal operating lifetime.

**091−2.114 REPORTING**

**091−2.115 REPORTS**. A report using the specified forms shall be prepared upon completion of either of the following types of hull survey inspection routines:

1. Exterior surface visual routine
2. Hull structural survey routine

**091−2.116** Upon completion of reports for these inspection routines, copies shall be distributed to the following activities:

1. Naval Sea System Command (SEA 921) − 1 copy
2. Naval Sea System Command (SEA 3232) − 2 copies
3. PERA (SS) − 1 copy

**091−2.117** Letters forwarding reports to the respective activities shall refer to inspections by the particular names designated in this chapter. Copies of forwarding letters also shall be sent to the following, as auditable record of accomplishment:

1. Force Commander
2. Squadron Commander
3. Commanding Officer of the submarine inspected

**091−2.117.1** The accomplishing activity shall retain one copy of the report for 7 years.

**091−2.118 FORMS AND FORMATS**. Because of the many possible reporting activities, it is necessary to standardize reporting formats to facilitate rapid analysis and provide for prompt statements of hull condition, including recommendations for additional inspection, repair work, or future operational restrictions.

**091−2.119** Forms and formats to be used for reporting the results of inspections are given in appendixes A and B.

**091−2.120** Include a summary of frame flange attachment results.

**091−2.121** Provide a complete list of items specified to be inspected which for one reason or another were not inspected.

**091−2.122** Include any information that is of record value and would enhance the completeness of the report.

# APPENDIX A

# BOOKLET A − EXTERIOR SURFACE VISUAL ROUTINE INSPECTION REPORT

**EXTERIOR SURFACE**

**INSPECTION REPORT**

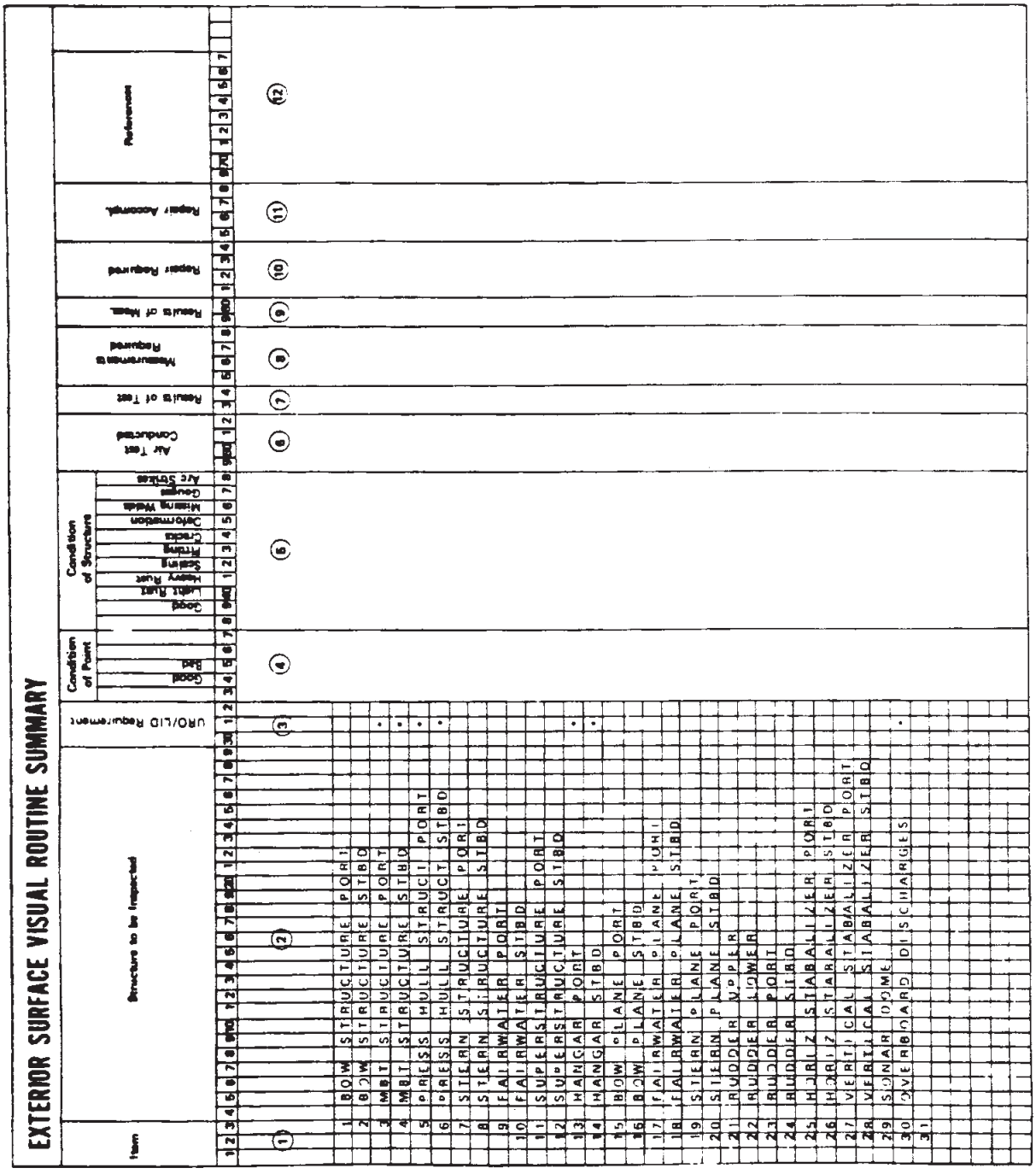
**SHIP**

**INSP. ACITVITY**

**DATE OF INSP.**

**BOOKLET "A"**

**Appendix A (Sheet 1)**




**Appendix A (Sheet 2)**

**Instructions for Completing Exterior Surface Visual Routine Summary**

1 The inspection summary provides a tabular summary of the condition observed.

2 The following numbered statements are keyed to the circled numerals on the summary sheet.

(1) In columns 1 through 3, insert an item number. This is a unique number for the particular item inspected.

(2) In columns 4 through 29 are listed a number of typical items the exterior surfaces of which are to be appraised and evaluated. This list should not be assumed to be complete. Any other appendages or items inspected shall be added to the list for the particular submarine inspected. If the submarine inspected does not have some of the items listed, the item shall be blanked out in the summary for that particular submarine. Line item 30 is labeled overboard discharges. Each overboard discharge inspected should be identified and reported as a separate line item.

(3) The asterisk in column 31 indicates that the inspection of the line item so designated, is mandatory to satisfy URO/LID requirements.

(4) In columns 33 through 37, place an X in the column(s) that most nearly describes the condition of the existing preservation.

(5) In columns 38 through 48, place an X in the column(s) that most nearly describes the condition of the structure being inspected.

(6) Columns 49 through 52 remain blank.

(7) Columns 53 and 54 remain blank.

(8) In columns 55 through 58, insert either Yes or No as appropriate.

(9) In columns 59 and 60, insert either S to denote satisfactory or U to denote unsatisfactory.

(10) In columns 61 through 64, insert either Yes or No as appropriate.

(11) In columns 65 though 68, insert either Yes or No as appropriate.

(12) In columns 69 through 77, insert Sheet and the appropriate sheet number that contains details or explanation of the particular line item, if details or explanation are needed to illustrate a particular condition being reported. (See appendix B for additional sheets which can be used for this purpose.)

**Appendix A (Sheet 3)**

# APPENDIX B

## BOOKLET B − HULL STRUCTURAL SURVEY ROUTINE INSPECTION REPORT

**HULL STRUCTURAL SURVEY ROUTINE**

**INSPECTION REPORT**

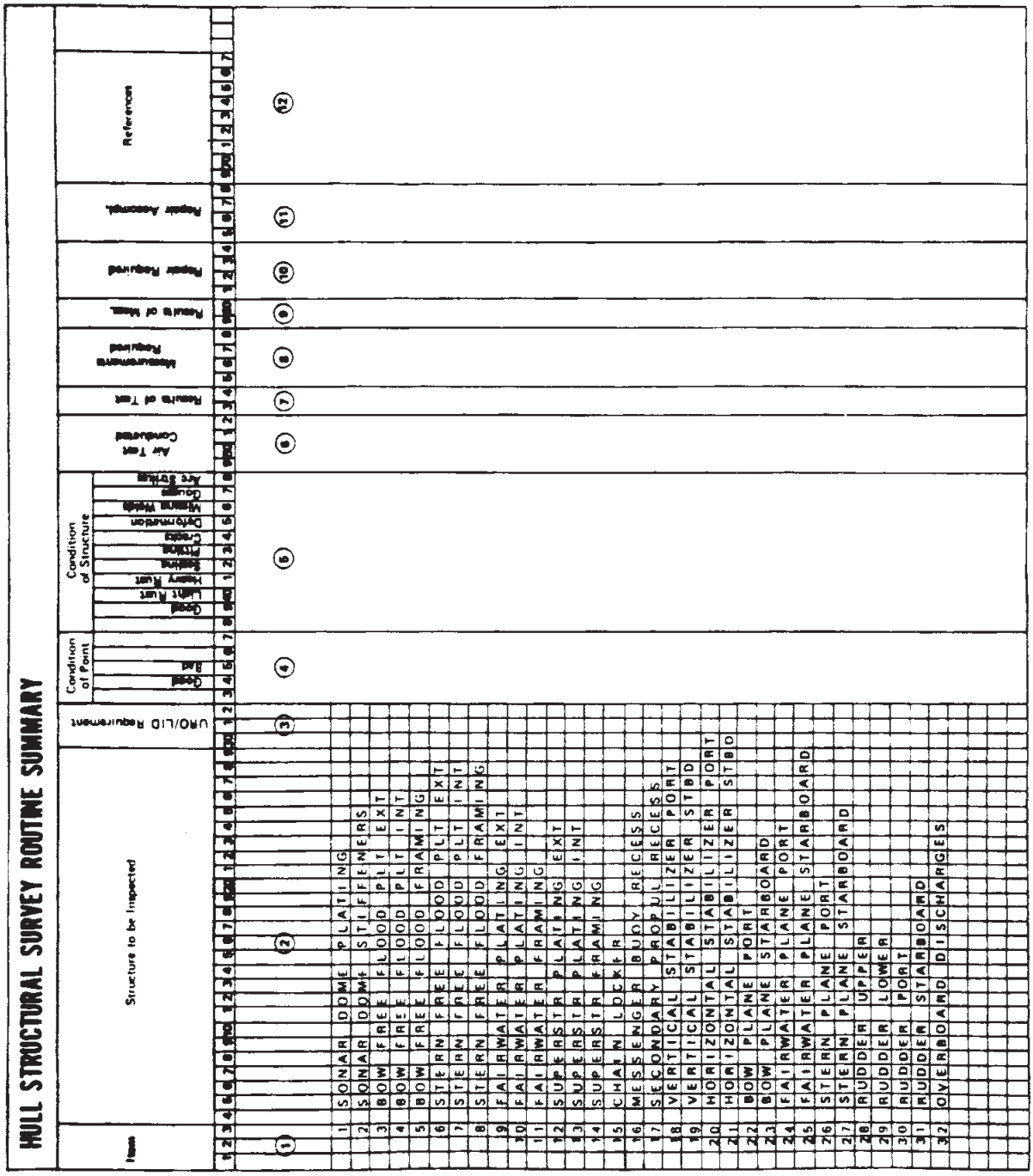
**SHIP**

**INSP. ACITVITY**

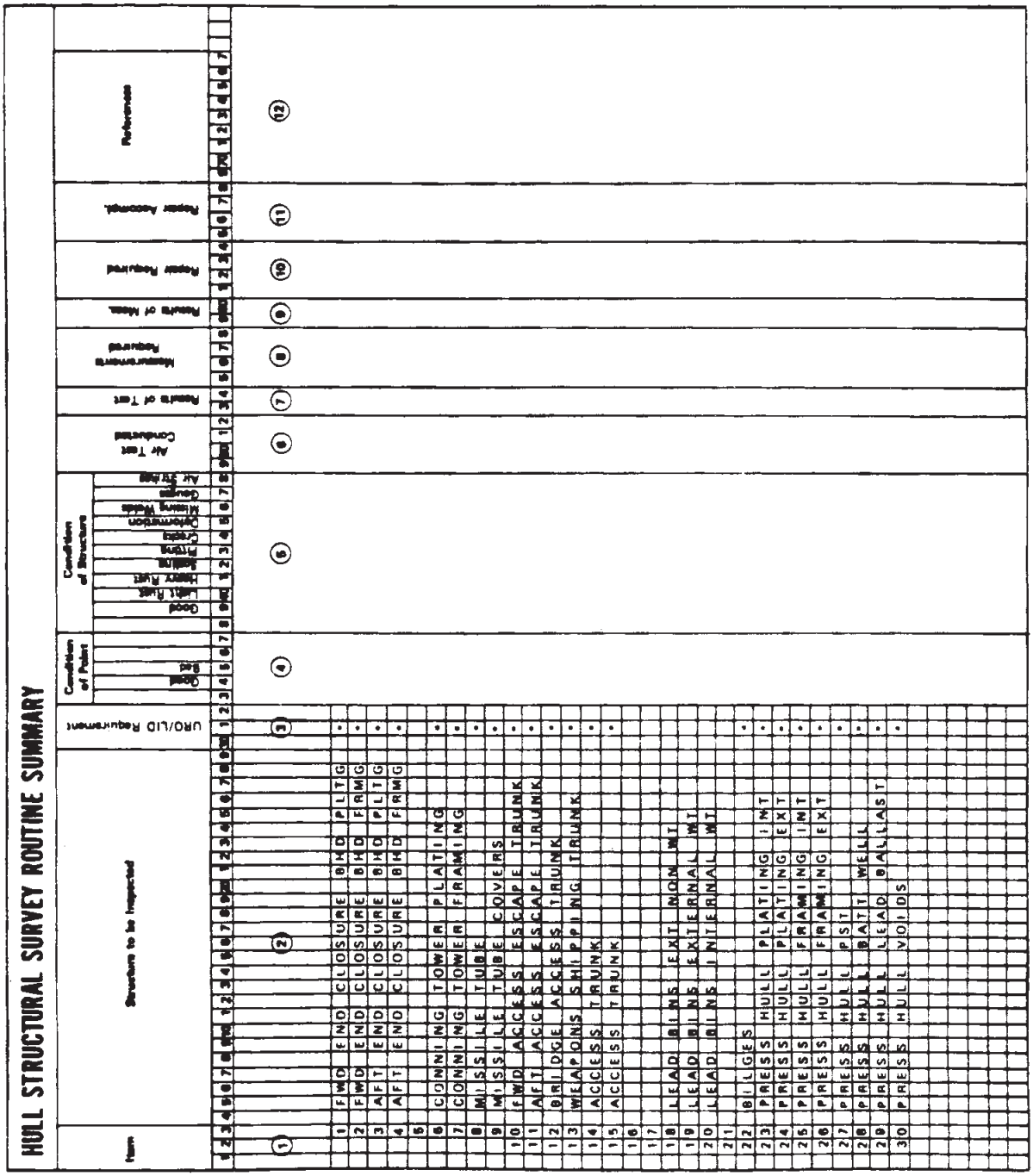
**DATE OF INSP.**

**BOOKLET “B”**

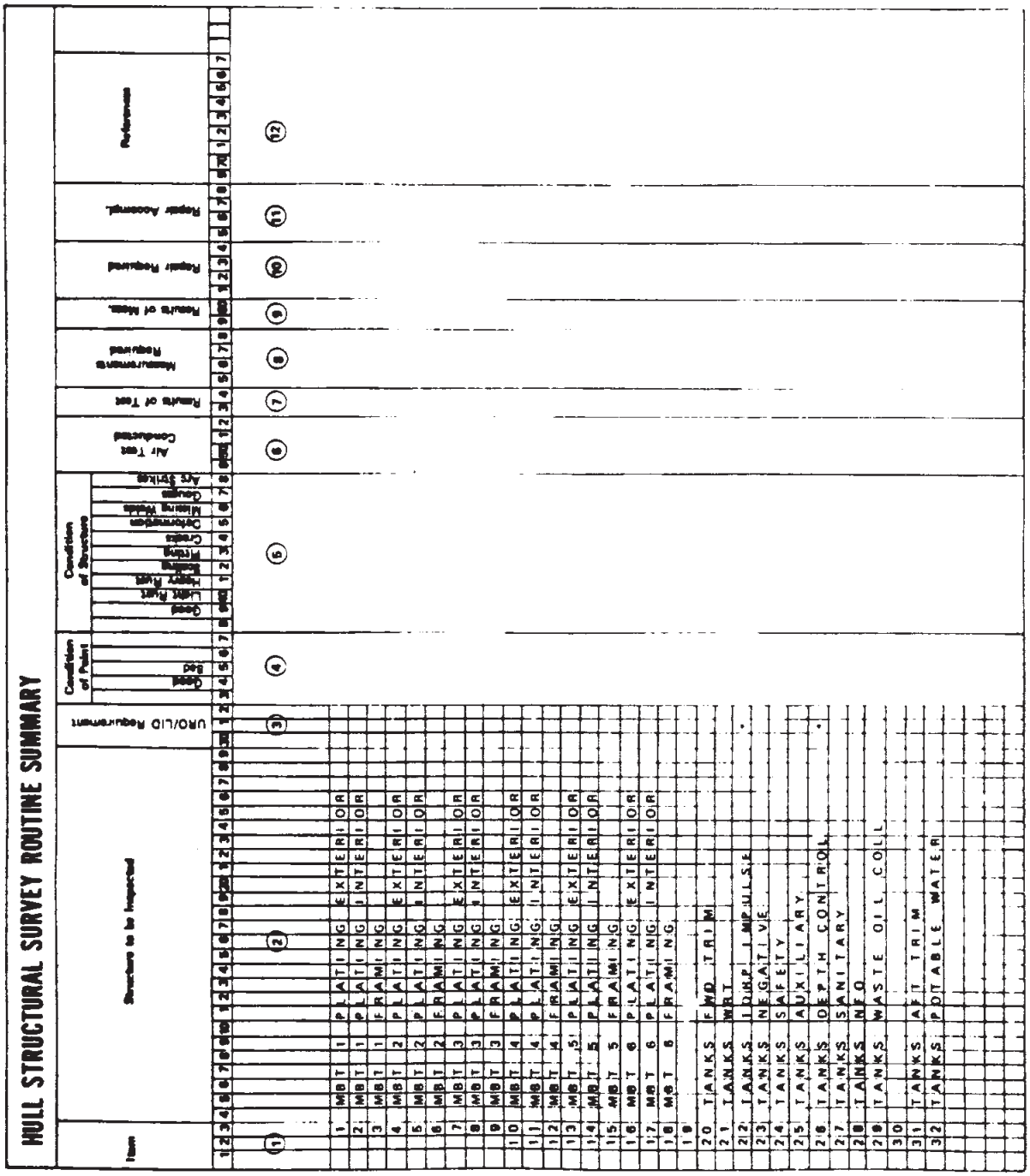
**Appendix B (Sheet 1)**




**Appendix B (Sheet 2)**




**Appendix B (Sheet 3)**




**Appendix B (Sheet 4)**

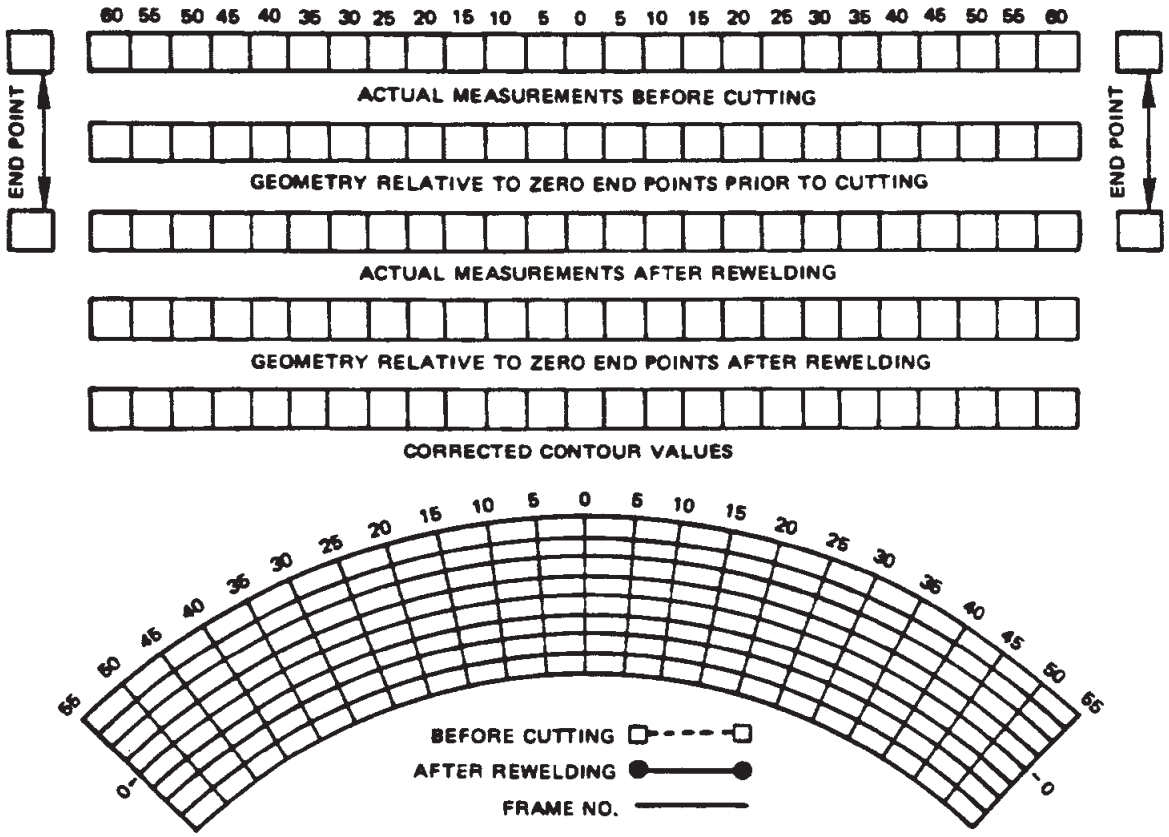
**SKETCH**

| Item | Ident. No. | Plan Thickness | Existing Thickness | % Loss | Remarks |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Repairs Accomplished

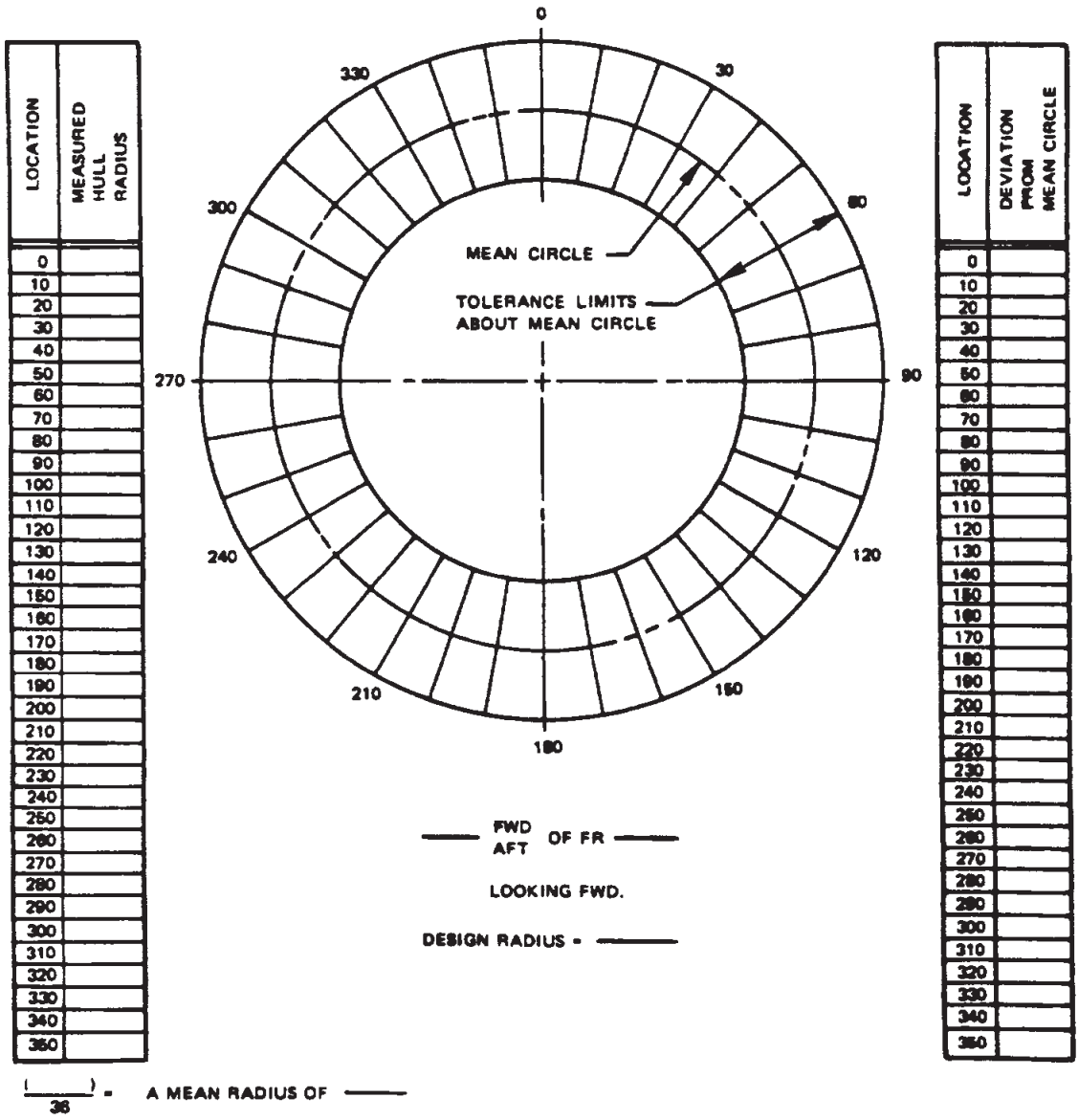
SHEET NO.

**PARTIAL CIRCULARITY PLOT**




**Appendix B (Sheet 6)**

FULL CIRCULARITY PLOT




Appendix B (Sheet 7)

**Instructions for Completing Hull Structural Survey Routine Summary Forms**

1 Appendix B comprised of 8 sheets, provides a comprehensive report of the condition observed along with corrective action taken.

2 The following numbered statements are keyed to the circled numerals on the summary sheets (Sheets 2, 3, and 4).

(1) In columns 1 through 3, insert an item number. This is a unique number for the particular item inspected.

(2) In columns 4 through 29 are listed a number of typical items the condition of which is to be appraised and evaluated. This list should not be assumed to be complete. Any other items inspected shall be added to the list for the particular submarine inspected. If the submarine does not have some of the items listed, then the item shall be blanked out for that particular submarine. Line item 32 is labeled overboard discharges. Each overboard discharge inspected should be identified and reported as a separate line item. Also listed are trunks, lead bins, pressure hull in way of voids, bilges, and tanks. Each trunk, lead bin, void, bilge, and tank inspected should be identified and reported as a separate line item.

(3) The asterisk in column 31 indicates that the inspection of the line item so designated is mandatory to satisfy URO/LID requirements.

(4) In columns 33 through 37, place an X in the column(s) that most nearly describes the condition of the existing preservation.

(5) In columns 38 through 48, place an X in the column(s) that most nearly describe the condition of the structure being inspected.

(6) In columns 49 through 52, insert either Yes or No as appropriate.

(7) In columns 53 and 54, insert either S to denote satisfactory or U to denote unsatisfactory.

(8) In columns 55 through 58, insert either Yes or No as appropriate.

(9) In columns 59 and 60, insert either S to denote satisfactory or U to denote unsatisfactory.

(10) In columns 61 through 62, insert either Yes or No as appropriate.

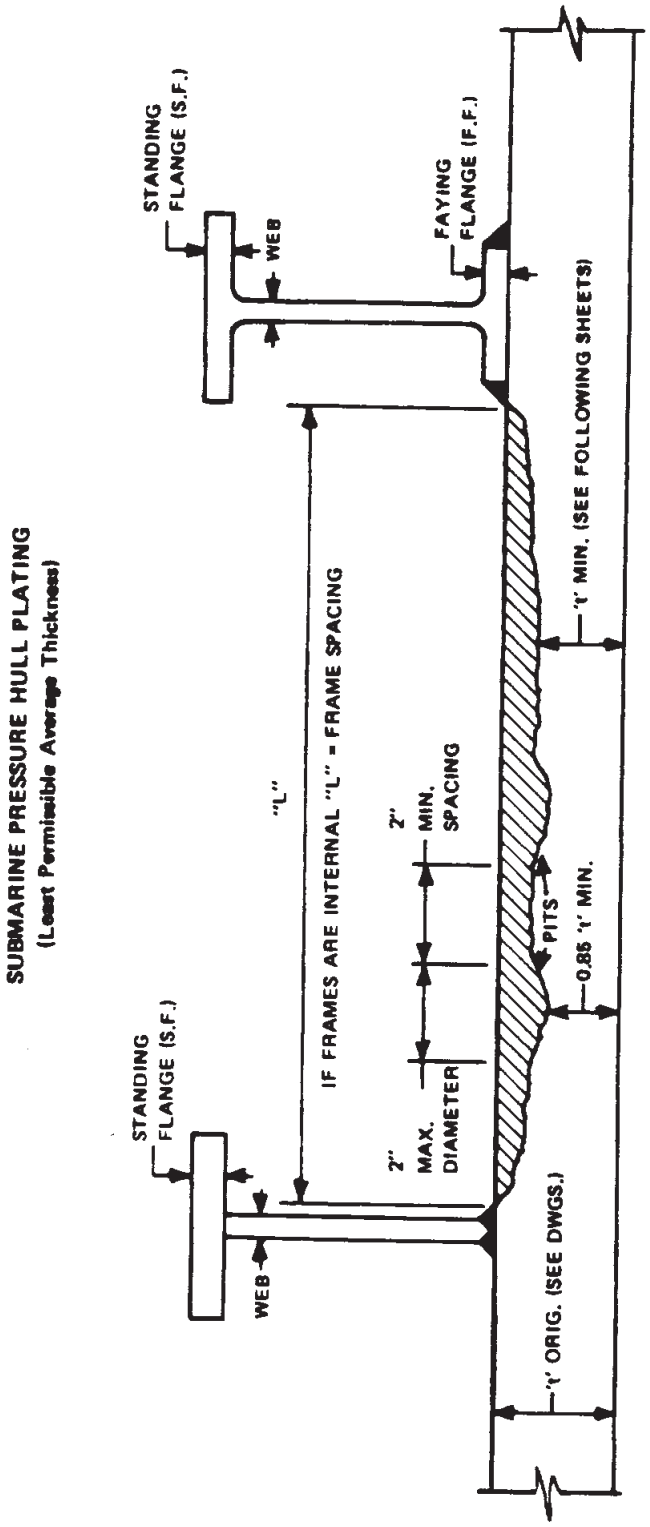
(11) In columns 65 through 68, insert either Yes or No as appropriate.

(12) In columns 69 through 77, insert Sheet and the appropriate sheet number that contains details or an explanation of the particular line item if details or an explanation are needed to illustrate a particular condition being reported.

**Appendix B (Sheet 8)**

# APPENDIX C

# MINIMUM SCANTLINGS CRITERIA




**Appendix C (Sheet 1)**

| MINIMUM THICKNESSES | | | | | | | X-1 |
|---|---|---|---|---|---|---|---|
| PRESSURE HULL PLATING | | | | | | | PRESSURE HULL FRAMING |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| MISCELLANEOUS STRUCTURE | | | |
|---|---|---|---|
| First Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | Curve No. 1 |
| | | HTS | |
| | | HY80 | |
| | CATEGORY II (Occasionally Cycled) | MS | Curve No. 1 |
| | | HTS | |
| | | HY80 | |
| | CATEGORY III (Non-Cycled) | MS | Curve No. 1 |
| | | HTS | |
| | | HY80 | |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | |
| Free-Flooding Structure Plating and Framing | | | |
| Hemispherical and Ellipsoidal Heads | Plating | | |
| | Framing | | |
| | Heads | | |
| Conning Tower | | | |
| | | | |
| | | | |
| Trunks | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

**Appendix C (Sheet 2)**

| MINIMUM THICKNESSES | | | | | | | SS212 CLASS |
|---|---|---|---|---|---|---|---|
| PRESSURE HULL PLATING | | | | | | | PRESSURE HULL FRAMING |
| 13 - 35 | 35 -107 | 107 - 115 | 115 - 123 | 123 - 130 | | | 36 - 106 |
| .63 | .60 | .60 | .53 | .45 | | | WEB .25 / S.F. .27 / F.F. .27 |

| MISCELLANEOUS STRUCTURE | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | Curve No. 2 |
| | | HTS | —— |
| | | HY80 | —— |
| | CATEGORY II (Occasionally Cycled) | MS | Curve No. 2 |
| | | HTS | —— |
| | | HY80 | —— |
| | CATEGORY III (Non-Cycled) | MS | Curve No. 2 |
| | | HTS | —— |
| | | HY80 | —— |
| Framing for High Pressure Plating | | | 85% |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | —— |
| | | | —— |
| | | | —— |
| Canning Tower | Plating | | .50 |
| | Framing | | 50% |
| | Heads | | |
| Trunks | Fwd Access/Escape Frame 28 | | .32 |
| | Torpedo Loading | | |
| | Bridge Access Frame 52 | | |
| | Access Frame 86 | | .20 |
| | Access Frame 97 | | .20 |
| | Aft Access/Escape Frame 115 | | .32 |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 3)**

| MINIMUM THICKNESSES | | | | | | | SSK1 |
|---|---|---|---|---|---|---|---|
| PRESSURE HULL PLATING | | | | | | | PRESSURE HULL FRAMING |
| 15 - 23 | 23 - 31 | 31 - 62 | 62 - 65 | 65 - 72 | 72 - 79 | | 32 - 61 |
| .83 | .97 | .79 | .73 | .66 | .50 | | WEB .25 / S.F. .27 / F.F .27 |

| MISCELLANEOUS STRUCTURE | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | Curve No. 3 |
| | | HTS | ——— |
| | | HY80 | ——— |
| | CATEGORY II (Occasionally Cycled) | MS | Curve No. 3 |
| | | HTS | ——— |
| | | HY80 | ——— |
| | CATEGORY III (Non-Cycled) | MS | Curve No. 3 |
| | | HTS | ——— |
| | | HY80 | ——— |
| Framing for High Pressure Plating | | | 85% |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 14 | | .85 |
| | Frame 74 | | .57 |
| | Frame 79 | | .42 |
| Conning Tower | Plating | | ——— |
| | Framing | | ——— |
| | Heads | | ——— |
| Trunks | Fwd Access/Escape Frame 28 | | .31 |
| | Bridge Access | | |
| | Access Frame 48 | | .27 |
| | Aft Access/Escape Frame 66 | | .31 |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis. — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 4)**

| MINIMUM THICKNESSES | | | | | | | SST 1 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRESSURE HULL PLATING | | | | | | | PRESSURE HULL FRAMING | | | | | | | | |
| 9 - 58 | 59 - 67 | | | | | | | | | | | | | | |
| .34 | .29 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

| MISCELLANEOUS STRUCTURE | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | ——— |
| | | HTS | Curve No. 4 |
| | | HY80 | ——— |
| | CATEGORY II (Occasionally Cycled) | MS | ——— |
| | | HTS | Curve No. 4 |
| | | HY80 | ——— |
| | CATEGORY III (Non-Cycled) | MS | ——— |
| | | HTS | Curve No. 4 |
| | | HY80 | ——— |
| Framing for High Pressure Plating | | | 85% |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | |
| | | | |
| | | | |
| Conning Tower | Plating | | |
| | Framing | | |
| | Heads | | |
| Trunks | Fwd Access/Escape Frame 15 | | .19 |
| | Torpedo Loading | | .19 |
| | Bridge Access | | .21 |
| | Aft Access/Escape Frame 51 | | .19 |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting -- 50 percent of plating thickness.

Plate-corroded area -- 25 percent of plating thickness.

Plate-general corrosion -- 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis -- 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting -- 25 percent of web and flange thickness.

Stiffener-general corrosion -- 1/16 inch on web and flange thickness.

**Appendix C (Sheet 5)**

| MINIMUM THICKNESSES | | | | | | | SS285 CLASS |
|---|---|---|---|---|---|---|---|
| PRESSURE HULL PLATING | | | | | | | PRESSURE HULL FRAMING |
| 13 - 35 | 35 - 107 | 107 - 119 | 119 - 130 | | | | 36 - 106 |
| .82 | .85 | .82 | .52 | | | | WEB .25 / S.F. .27 / F.F. .27 |

| MISCELLANEOUS STRUCTURE | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 5 |
| | | HY80 | —— |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 5 |
| | | HY80 | —— |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 5 |
| | | HY80 | —— |
| Framing for High Pressure Plating | | | 75% |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | —— |
| | | | —— |
| | | | —— |
| Conning Tower | Plating | | .50 |
| | Framing | | 50% |
| | Heads | | |
| Trunks | Fwd Access/Escape Frame 26 | | .38 |
| | Torpedo Loading | | |
| | Bridge Access | | |
| | Access Frame 85 | | .25 |
| | Access Frame 97 | | .25 |
| | Aft Access/Escape Frame 115 | | .38 |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness

**Appendix C (Sheet 6)**

| MINIMUM THICKNESSES | | | | | | | SS563 CLASS |
|---|---|---|---|---|---|---|---|
| PRESSURE HULL PLATING | | | | | | | PRESSURE HULL FRAMING |
| 9 - 19 | 19 - 23 | 23 - 84 | 84 - 89 | 89 - 94 | 94 - 99 | 99 - 103 | 29 - 76 |
| | | | | | | | WEB / S.F. / F.F. |
| .95 | 1.05 | 1.05 | 1.05 | .84 | .74 | .63 | .44 / .58 / .44 |

| MISCELLANEOUS STRUCTURE | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| Framing for High Pressure Plating | | | 85% |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 103 | | .73 |
| | | | |
| | | | |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 28 | | .41 |
| | Bridge Access | | |
| | Access Frame 84 | | .36 |
| | Aft Access/Escape Frame 83 | | .41 |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting -- 50 percent of plating thickness

Plate-corroded area -- 25 percent of plating thickness.

Plate-general corrosion -- 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis -- 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting -- 25 percent of web and flange thickness.

Stiffener-general corrosion -- 1/16 inch on web and flange thickness

**Appendix C (Sheet 7)**

## MINIMUM THICKNESSES — AGSS 569

### PRESSURE HULL PLATING

| 7 - 10 | 10 - 54 | 54 - 59 | 59 - 64 | 64 - 68 | | |
|---|---|---|---|---|---|---|
| .68 | .81 | .75 | .65 | .56 | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

### PRESSURE HULL FRAMING

| 7 - 10 | | | 12 - 13 | | | 15 - 46 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .37 | .50 | .56 | .52 | .52 | .61 | .52 | .52 | .54 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | ——— |
| | | HTS | Curve No. 7 |
| | | HY80 | Curve No. 8 |
| | CATEGORY II (Occasionally Cycled) | MS | ——— |
| | | HTS | Curve No. 7 |
| | | HY80 | Curve No. 9 |
| | CATEGORY III (Non-Cycled) | MS | ——— |
| | | HTS | Curve No. 7 |
| | | HY80 | Curve No. 10 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | Note 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 8 | | .55 |
| | Frame 62 | | .70 |
| | | | |
| Conning Tower | Plating | | ——— |
| | Framing | | ——— |
| | Heads | | ——— |
| Trunks | Fwd Access/Escape Frame 12 | | |
| | Bridge Access | | |
| | Aft Access/Escape Frame 41 | | |
| | | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 8)**

## MINIMUM THICKNESSES — SSN571

### PRESSURE HULL PLATING

| 6 - 11 | 11 - 19 | 19 - 22 | 22 - 25 | 25 - 27 | 27 - 58 | 58 - 73 |
|---|---|---|---|---|---|---|
| .88 | 1.10 | 1.25 | 1.32 | 1.40 | 1.57 | 1.59 |
| 73 - 77 | 78 - 80 | 80 - 82 | 82 - 84 | 84 - 86 | 86 - 89 | 89 - 92 |
| 1.46 | 1.34 | 1.28 | 1.19 | 1.12 | 1.04 | .89 |
| 92 - 96 | 96 - 97 | | | | | |
| .78 | .62 | | | | | |

### PRESSURE HULL FRAMING

| 7 - 15 | | | 17 - 28 | | | 60 - 76 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .34 | .44 | .50 | .51 | .80 | .58 | .52 | .82 | .59 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | Note 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | |
| | | | |
| | | | |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 21 | | |
| | Access Frame 32 | | |
| | Bridge Access | | |
| | Access Frame 84 | | |
| | Aft Access/Escape Frame 79 | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percetn of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness

**Appendix C (Sheet 9)**

| MINIMUM THICKNESSES | | | | | | | SS672 CLASS |
|---|---|---|---|---|---|---|---|
| PRESSURE HULL PLATING | | | | | | | PRESSURE HULL FRAMING |
| 17 - 28 | 28 - 36 | 36 - 114 | 114 - 126 | 126 - 134 | 134 - 138 | 138 - 149 | 36 - 114 |
| .62 | .75 | .79 | .75 | .67 | .62 | .57 | WEB .30 / S.F. .37 / F.F. .43 |

| MISCELLANEOUS STRUCTURE | | | |
|---|---|---|---|
| First Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | ——— |
| | | HTS | Curve No. 11 |
| | | HY80 | ——— |
| | CATEGORY II (Occasionally Cycled) | MS | ——— |
| | | HTS | Curve No. 11 |
| | | HY80 | ——— |
| | CATEGORY III (Non-Cycled) | MS | ——— |
| | | HTS | Curve No. 11 |
| | | HY80 | ——— |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | |
| | | | |
| | | | |
| Conning Tower | Plating | | |
| | Framing | | |
| | Heads | | |
| Trunks | Fwd Access/Escape Fr. 32 | | |
| | Conning Tower Access Fr. 63 | | |
| | Access Fr. 77 | | |
| | Access Fr. 108 | | |
| | Aft Access/Escape Fr. 130 | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 10)**

## MINIMUM THICKNESSES — LPSS574

### PRESSURE HULL PLATING

| 15 - 19 | 19 - Z | 88 - 86 | 86 - 90 | 92 - 96 | 96 - 101 | 101 - 106 |
|---|---|---|---|---|---|---|
| .93 | .93 | 1.06 | .96 | .93 | .81 | .68 |
| 106 - 108 | Hangar | | | | | |
| .56 | .68 | | | | | |
| | | | | | | |
| | | | | | | |

### PRESSURE HULL FRAMING

| 19 - Z | | | 88 - 90 | | | Hangar (Typical) | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S. F. | F. F. | WEB | S. F. | F. F. | WEB | S. F. | F. F. |
| .27 | .50 | - | .31 | .43 | .40 | .27 | .47 | - |
| Hangar (Deep Frame) | | | | | | | | |
| WEB | S. F. | F. F. | | | | | | |
| .45 | .60 | - | | | | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | ——— |
| | | HTS | Curve No. 6 |
| | | HY80 | ——— |
| | CATEGORY II (Occasionally Cycled) | MS | ——— |
| | | HTS | Curve No. 6 |
| | | HY80 | ——— |
| | CATEGORY III (Non-Cycled) | MS | ——— |
| | | HTS | Curve No. 6 |
| | | HY80 | ——— |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | |
| | | | |
| | | | |
| Conning Tower | Plating | | ——— |
| | Framing | | ——— |
| | Heads | | ——— |
| Trunks | Fwd Access/Escape Fr. C | | |
| | Hangar Access P & S Fr. N | | |
| | Torpedo Loading Fr. X | | |
| | Bridge Access | | |
| | Access Fr. 84 | | |
| | Aft Access/Escape Fr. 90 | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting −− 50 percent of plating thickness.

Plate-corroded area −− 25 percent of plating thickness.

Plate-general corrosion −− 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shaft 30 degrees below the main axis −− 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting −− 25 percent of web and flange thickness.

Stiffener-general corrosion −− 1/16 inch on web and flange thickness.

**Appendix C (Sheet 11)**

## MINIMUM THICKNESSES — SSN575

### PRESSURE HULL PLATING

| 5 - 8 | 8 - 11 | 11 - 19 | 19 - 22 | 22 - 25 | 25 - 27 | 27 - 56 |
|---|---|---|---|---|---|---|
| .73 | .76 | 1.09 | 1.24 | 1.30 | 1.38 | 1.57 |
| 57 - 74 | 74 - 77 | 77 - 80 | 80 - 82 | 82 - 84 | 84 - 86 | 86 - 89 |
| 1.59 | 1.46 | 1.33 | 1.28 | 1.18 | 1.12 | 1.03 |
| 89 - 92 | 92 - 95 | 95 - 97 | | | | |
| .88 | .76 | .62 | | | | |

### PRESSURE HULL FRAMING

| 13 - 16 | | | 18 - 26 | | | 58 - 76 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .53 | .62 | .59 | .49 | .58 | .57 | .53 | .62 | .59 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | ——— |
| | | HTS | Curve No. 6 |
| | | HY80 | ——— |
| | CATEGORY II (Occasionally Cycled) | MS | ——— |
| | | HTS | Curve No. 6 |
| | | HY80 | ——— |
| | CATEGORY III (Non-Cycled) | MS | ——— |
| | | HTS | Curve No. 6 |
| | | HY80 | ——— |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | |
| | | | |
| | | | |
| Conning Tower | Plating | | |
| | Framing | | |
| | Heads | | |
| Trunks | Fwd Access/Escape Frame 21 | | |
| | Access Frame 32 | | |
| | Conning Tower Access Frame 38 | | |
| | Access Frame 66 | | |
| | Aft Access/Escape Frame 79 | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 12)**

## MINIMUM THICKNESSES — SS576

### PRESSURE HULL PLATING

| 12 - 16 | 16 - 19 | 19 - 22 | 22 - 25 | 27 - 81 | 82 - 85 | 86 - 88 |
|---|---|---|---|---|---|---|
| .93 | 1.00 | 1.00 | 1.18 | 1.05 | 1.12 | 1.00 |
| 88 - 91 | 91 - 96 | 96 - 102 | 102 - 104 | | | |
| .93 | .81 | .68 | 1.00 | | | |

### PRESSURE HULL FRAMING

| 28 - 80 | | |
|---|---|---|
| WEB | S.F. | F.F. |
| .34 | .48 | — |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | — |
| | | HTS | Curve No. 6 |
| | | HY80 | — |
| | CATEGORY II (Occasionally Cycled) | MS | — |
| | | HTS | Curve No. 6 |
| | | HY80 | — |
| | CATEGORY III (Non-Cycled) | MS | — |
| | | HTS | Curve No. 6 |
| | | HY80 | — |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 104 | | .73 |
| | | | |
| | | | |
| Canning Tower | Plating | | — |
| | Heads | | — |
| | Fwd Access/Escape Fr. 23 | | |
| Trunks | Bridge Access | | |
| | Access Fr. 59 | | |
| | Aft Access/Escape Fr. 87 | | |
| | | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 13)**

## MINIMUM THICKNESSES — SS577

### PRESSURE HULL PLATING

| 12 - 16 | 16 - Z | Z - CC | CC - 81 | 82 - 85 | 86 - 88 | 88 - 91 |
|---|---|---|---|---|---|---|
| .93 | .94 | 1.00 | 1.05 | 1.12 | 1.00 | .93 |
| 91 - 95 | 95 - 102 | 102 - 104 | Hangar | | | |
| .81 | .68 | 1.00 | .52 | | | |
| | | | | | | |
| | | | | | | |

### PRESSURE HULL FRAMING

| A - Y | | | Z - BB | | | CC - 80 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .44 | .51 | – | .50 | .75 | – | .34 | .48 | – |
| Hangar (Typical Frame) | | | Hangar (Deep Frame) | | | | | |
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | | | |
| .25 | .56 | – | .44 | .56 | – | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Hangar Fwd | | .46 |
| | Hangar Aft | | .55 |
| | Frame 104 | | .73 |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 14 | | |
| | Hangar Access P&S Frame N | | |
| | Bridge Access | | |
| | Access Frame 59 | | |
| | Aft Access/Escape Frame 87 | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 14)**

## MINIMUM THICKNESSES — SSN578 CLASS

### PRESSURE HULL PLATING

| 10 - 14 | 14 - 18 | 18 - 22 | 22 - 25 | 25 - 28 | 28 - 48 | 48 - 50 |
|---|---|---|---|---|---|---|
| .87 | .95 | 1.08 | 1.16 | 1.54 | 1.31 | 1.39 |
| **50 - 78** | **78 - 80** | **80 - 82** | **82 - 95** | **95 - 97** | | |
| 1.32 | 1.58 | 1.21 | .92 | .97 | | |

### PRESSURE HULL FRAMING

| 12 - 13 | | | 16 - 17 | | | 18 - 21 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .50 | .87 | – | .50 | .87 | – | .50 | .87 | – |
| **22 - 24** | | | **26 - 27** | | | **83 - 96** | | |
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .50 | .87 | – | .50 | .87 | – | .35 | .54 | – |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY III (Non Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free Flooding Structure Plating and Framing | | | 75 % |
| Hemispherical and Ellipsoidal Heads | Frame 97 | | 87 |
| | | | |
| | | | |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 23 | | |
| | Bridge Access | | |
| | Access Frame 64 | | |
| | Aft Access/Escape Frame 85 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 15)**

## MINIMUM THICKNESSES — SS580 CLASS

### PRESSURE HULL PLATING

| 9 - 13 | 13 - 17 | 17 - 21 | 21 - 59 | 59 - 62 | 62 - 66 | 66 - 71 |
|---|---|---|---|---|---|---|
| .92 | 1.10 | 1.18 | 1.34 | 1.09 | 1.04 | .97 |
| 71 - 73 | 73 - 76 | | | | | |
| .86 | .80 | | | | | |
| | | | | | | |
| | | | | | | |

### PRESSURE HULL FRAMING

| 11 | | | 13 - 17 | | | 17 - 19 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .47 | .73 | – | .44 | .91 | – | .44 | .91 | – |
| **21 - 57** | | | **60 - 62** | | | **63 - 65** | | |
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .44 | .91 | – | .44 | .91 | – | .44 | .91 | – |
| **67 - 70** | | | **72 - 73** | | | **74** | | |
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .46 | .73 | – | .31 | 1.00 | – | .31 | 1.00 | – |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY III (Non Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 77 | | 99 |
| | | | |
| | | | |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 13 | | |
| | Bridge Access | | |
| | Access Frame 48 | | |
| | Aft Access/Escape Frame 61 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1. (Corrosion Allowance)

Plate-pitting -- 50 percent of plating thickness.

Plate-corroded area -- 25 percent of plating thickness.

Plate-general corrosion -- 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis -- 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting -- 25 percent of web and flange thickness.

Stiffener-general corrosion -- 1/16 inch on web and flange thickness.

**Appendix C (Sheet 16)**

## MINIMUM THICKNESSES — SSN586

### PRESSURE HULL PLATING

| 17 · 24 | 24 · 28 | 28 · 31 | 31 · 36 | 36 · 40 | 40 · 44 | 44 · 48 |
|---|---|---|---|---|---|---|
| .87 | .95 | .98 | 1.18 | 1.25 | 1.37 | 1.50 |
| 48 · 56 | 56 · 63 | 63 · 69 | 69 · 116 | 116 · 135 | 135 · 141 | 141 · 149 |
| 1.26 | 1.50 | 1.70 | 1.75 | 1.70 | 1.63 | 1.58 |
| 149 · 155 | 155 · 166 | 166 · 172 | | | | |
| 1.24 | 1.10 | 1.00 | | | | |

### PRESSURE HULL FRAMING

| 48 · 56 | | | 56 · 61 | | | 64 · 69 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .54 | .85 | – | .54 | .85 | – | .54 | .85 | – |
| 71 · 115 | | | 117 · 135 | | | 136 · 141 | | |
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .60 | .68 | – | .54 | .85 | – | .54 | .85 | – |
| 142 · 148 | | | 150 · 155 | | | 156 · 157 | | |
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .54 | .85 | – | .54 | .85 | – | .54 | .85 | – |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY III (Non Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | —— |
| | | | —— |
| | | | —— |
| Canning Tower | Plating | | |
| | Framing | | |
| | Heads | | |
| Trunks | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1 (Corrosion Allowance)

Plate-pitting −− 50 percent of plating thickness.

Plate-corroded area −− 25 percent of plating thickness.

Plate-general corrosion − − 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis − − 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting −− 25 percent of web and flange thickness.

Stiffener-general corrosion −− 1/16 inch on web and flange thickness.

**Appendix C (Sheet 17)**

## MINIMUM THICKNESSES — SSN587

### PRESSURE HULL PLATING

| 11 - 18 | 18 - 22 | 22 - 28 | 28 - 34 | 34 - 41 | 46 - 53 | 53 - 60 |
|---|---|---|---|---|---|---|
| 1.16 | 1.37 | 1.51 | 1.56 | 1.60 | 1.25 | 1.29 |
| **60 - 62** | **62 - 86** | **86 - 88** | **88 - 116** | **116 - 118** | **118 - 120** | **120 - 134** |
| 1.25 | 1.30 | 1.40 | 1.31 | 1.51 | 1.20 | .81 |

### PRESSURE HULL FRAMING

| 14 - 17 | | | 19 - 22 | | | 23 - 28 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .50 | .75 | – | .50 | .75 | – | .62 | .75 | – |
| **29 - 33** | | | **35 - 40** | | | **47 - 51** | | |
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .50 | .75 | – | .53 | .78 | – | .62 | .75 | – |
| **118** | | | **121 - 135** | | | | | |
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | | | |
| .43 | .51 | – | .39 | .43 | – | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| | CATEGORY III (Non Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | —— |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Hangar | | 1.09 |
| | Frame 44 | | .76 |
| | Frame 135 | | .87 |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 17 | | |
| | Hangar to Hull Frame 43 | | |
| | Access Frame 69 | | |
| | Bridge Access | | |
| | Access Frame 101 | | |
| | Aft Access/Escape Frame 121 | | |
| Trunk Framing | | | |

Note 1 (Corrosion Allowance)

Plate-pitting -- 50 percent of plating thickness.

Plate-corroded area -- 25 percent of plating thickness.

Plate-general corrosion -- 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis -- 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting -- 25 percent of web and flange thickness.

Stiffener-general corrosion -- 1/16 inch on web and flange thickness.

**Appendix C (Sheet 18)**

## MINIMUM THICKNESSES — SSN585

### PRESSURE HULL PLATING

| 12 - 15 | 16 - 21 | 21 - 26 | 26 - 31 | 31 - 54 | 54 - 64 | 64 - 75 |
|---|---|---|---|---|---|---|
| .75 | .94 | 1.00 | 1.25 | 1.11 | .93 | 1.06 |
| 75 - 86 | 86 - 94 | | | | | |
| .91 | .74 | | | | | |
| | | | | | | |
| | | | | | | |

### PRESSURE HULL FRAMING

| 18 - 20 | | | 21 - 25 | | | 57 - 63 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .50 | .87 | – | .82 | .87 | – | .80 | .87 | – |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 12 |
| | | HY80 | Curve No. 13 |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 14 |
| | | HY80 | Curve No. 15 |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | Curve No. 16 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | —— |
| | | | —— |
| | | | —— |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 15 | | |
| | Bridge Access | | |
| | Aft Access/Escape Frame 84 | | |
| | | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 19)**

## MINIMUM THICKNESSES — SSN588 CLASS

### PRESSURE HULL PLATING

| 12 - 16 | 16 - 21 | 21 - 26 | 26 - 31 | 31 - 64 | 64 - 64 | 64 - 75 |
|---|---|---|---|---|---|---|
| .75 | .94 | 1.00 | 1.25 | 1.11* | .93 | 1.06 |
| 75 - 85 | 85 - 94 | | | | | |
| .91 | .74 | | | | | |
| | | | | | | |
| | | | | | | |

### PRESSURE HULL FRAMING

| 18 - 20 | | | 21 - 25 | | | 57 - 63 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .50 | .87 | – | .62 | .87 | – | .50 | .87 | – |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 12 |
| | | HY80 | Curve No. 13 |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 14 |
| | | HY80 | Curve No. 15 |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | Curve No. 16 |
| Framing for High Pressure Plating | | | —— |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | —— |
| | | | —— |
| | | | —— |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | |
| Trunks | Fwd Access/Escape Frame 15 | | |
| | Bridge Access | | |
| | Aft Access/Escape Frame 64 | | |
| | | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

*Note 2:

The minimum t for pressure hull plating in way of Frame 46 to 47 for SSN590 shall be 1.12 inches.

Appendix C (Sheet 20)

## MINIMUM THICKNESSES — SSN594 CLASS

### PRESSURE HULL PLATING

| 11 - 28 | 28 - 33 | 34 - 37 | 37 - 86 | 86 - 91 | 91 - 94 | 94 - 72 |
|---|---|---|---|---|---|---|
| 1.14* | 1.59 | 1.75 | 1.75 | 1.76 | 1.74 | 1.27 |
| 72 - 74 | 74 - 84 | 84 - 86 | 86 - 88 | 88 - 90 | 90 - 92 | 92 - 97 |
| 1.36 | 1.78 | 1.71 | 1.80 | 1.56 | 1.53 | 1.48 |
| 97 - 101 | 101 - 104 | | | | | |
| 1.18 | 1.10 | | | | | |

### PRESSURE HULL FRAMING

| 11 - 17 | | | 17 - 28 | | | 88 - 71 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .54 | 1.04 | – | .54 | 1.04 | – | .87 | 1.23 | – |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 17 |
| | | HY80 | Curve No. 18 |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 19 |
| | | HY80 | Curve No. 20 |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 21 |
| | | HY80 | Curve No. 22 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 10 | | 2.28 |
| | Frame 108 | | 2.28 |
| | | | |
| Conning Tower | Plating | | |
| | Framing | | |
| | Heads | | |
| Trunks | Fwd Access/Escape Frame 19 | | |
| | Bridge Access | | |
| | Torpedo Loading | | |
| | Aft Access/Escape Frame 74 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

*Note 2:

The minimum t for pressure hull plating in way of Frame 27 to 28 for SSN604 shall be 1.15 inches

Appendix C (Sheet 21)

## MINIMUM THICKNESSES — SSN605

### PRESSURE HULL PLATING

| 11 - 28 | 28 - 33 | 34 - 37 | 37 - 55 | 55 - 61 | 61 - 64 | 64 - 72 |
|---|---|---|---|---|---|---|
| 1.14 | 1.59 | 1.75 | 1.75 | 1.76 | 1.74 | 1.27 |
| 72 - 74 | 74 - 78 | 78 - 86 | 86 - 89 | 89 - 91 | 91 - 93 | 93 - 95 |
| 1.35 | 1.78 | 1.77 | 1.81 | 1.57 | 1.53 | 1.49 |
| 95 - 101 | 101 - 105 | 105 - 108 | | | | |
| 1.46 | 1.20 | 1.11 | | | | |

### PRESSURE HULL FRAMING

| 11 - 17 | | | 17 - 28 | | | 68 - 71 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .54 | 1.04 | – | .54 | 1.04 | – | .67 | 1.23 | – |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 17 |
| | | HY80 | Curve No. 18 |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 19 |
| | | HY80 | Curve No. 20 |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 21 |
| | | HY80 | Curve No. 22 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 10 | | 2.28 |
| | Frame 108 | | |
| | | | |
| Canning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 19 | | |
| | Bridge Access | | |
| | Torpedo Loading | | |
| | Aft Access/Escape Frame 74 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 22)**

## MINIMUM THICKNESSES — SSN597

### PRESSURE HULL PLATING

| D - B | B - O | O - 17 | 17 - 22 | 22 - 26 | 26 - 31 | 31 - 33 |
|---|---|---|---|---|---|---|
| .58 | .68 | .68 | .96 | .95 | .85 | .92 |
| 33 - 40 | 40 - 42 | 42 - 86 | 86 - 72 | 72 - 88 | | |
| .87 | .85 | .86 | .88 | .86 | | |
| | | | | | | |
| | | | | | | |

### PRESSURE HULL FRAMING

| 1 - 16 | | |
|---|---|---|
| WEB | S.F. | F.F. |
| .36 | .56 | – |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 12 |
| | | HY80 | Curve No. 13 |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 14 |
| | | HY80 | Curve No. 15 |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | Curve No. 16 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | —— |
| | | | —— |
| | | | —— |
| Canning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 5 | | |
| | Bridge Access | | |
| | Torpedo Loading | | |
| | Aft Access/Escape Frame 58 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 23)**

## MINIMUM THICKNESSES — SSBN598 CLASS

### PRESSURE HULL PLATING

| 12 - 16 | 16 - 21 | 21 - 26 | 26 - 31 | 31 - M1 | M1 - M19 | M19 - M44 |
|---|---|---|---|---|---|---|
| .75 | .94 | 1.00 | 1.26 | 1.11 | 1.75 | 1.87 |
| M44 - 42 | 42 - 54 | 54 - 64 | 64 - 75 | 75 - 85 | 85 - 94 | |
| 1.75 | 1.11 | .93 | 1.06 | .91 | .74 | |
| | | | | | | |
| | | | | | | |

### PRESSURE HULL FRAMING

| 18 - 20 | | | 21 - 25 | | | 57 - 63 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .50 | .87 | – | .62 | .87 | – | .50 | .87 | – |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 12 |
| | | HY80 | Curve No. 13 |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 14 |
| | | HY80 | Curve No. 15 |
| | CATEGORY III (Non Cycled) | MS | —— |
| | | HTS | Curve No. 6 |
| | | HY80 | Curve No. 16 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | —— |
| | | | —— |
| | | | —— |
| Canning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 16 | | |
| | Bridge Access | | |
| | Access Frame M10 | | |
| | Access Frame M48 | | |
| | Aft Access/Escape Frame 64 | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness

**Appendix C (Sheet 24)**

## MINIMUM THICKNESSES — SSBN608 CLASS

### PRESSURE HULL PLATING

| 15 - 31 | 31 - 88 | 88 - 94 | 94 - 104 | 104 - 119 | 119 - 132 | 132 - 136 |
|---|---|---|---|---|---|---|
| 1.14 | 1.86 | 1.86 | 1.83 | 1.40 | 1.80 | 1.82 |
| 136 - 140 | 140 - 143 | 143 - 147 | 147 - 152 | 152 - 164 | | |
| 1.52 | 1.42 | 1.21 | 1.11 | 2.00 | | |

### PRESSURE HULL FRAMING

| 15 - 30 | | | 32 - 34 | | | 105 - 118 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .67 | 1.17 | – | .75 | 1.75 | – | .88 | 1.31 | – |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 17 |
| | | HY80 | Curve No. 18 |
| | CATEGORY II (Occasionally Cycled) | MS | |
| | | HTS | Curve No. 19 |
| | | HY80 | Curve No. 20 |
| | CATEGORY III (Non-Cycled) | MS | |
| | | HTS | Curve No. 21 |
| | | HY80 | Curve No. 22 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 14 | | 2.00 |
| | Frame 155 | | 2.00 |
| | | | |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Hoods | | —— |
| Trunks | Fwd Access/Escape Frame 27 | | |
| | Bridge Access | | |
| | Access Frame 86 | | |
| | Aft Access/Escape Frame 119 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

Appendix C (Sheet 25)

## MINIMUM THICKNESSES — SSBN616 CLASS

### PRESSURE HULL PLATING

| 15 - 31 | 31 - 88 | 88 - 94 | 94 - 104 | 104 - 119 | 119 - 132 | 132 - 138 |
|---|---|---|---|---|---|---|
| 1.14 | 1.86 | 1.86 | 1.83 | 1.40 | 1.80* | 1.62* |

| 138 - 140 | 140 - 143 | 143 - 147 | 147 - 152 | 152 - 164 |
|---|---|---|---|---|
| 1.62 | 1.42 | 1.21 | 1.11 | 2.00 |

### PRESSURE HULL FRAMING

| 15 - 30 | | | 32 - 34 | | | 105 - 118 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .67 | 1.17 | – | .75 | 1.75 | – | .88 | 1.31 | – |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 17 |
| | | HY80 | Curve No. 18 |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 19 |
| | | HY80 | Curve No. 20 |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 21 |
| | | HY80 | Curve No. 22 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 14 | | 2.00 |
| | Frame 155 | | 2.00 |
| | | | |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 27 | | |
| | Bridge Access | | |
| | Access Frame 86 | | |
| | Aft Access/Escape Frame 119 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

*Note 2.

The minimum t for pressure hull plating from Frame 126 to Frame 129 for SSBN624 only, shall be 2.00 inches.

The minimum t for pressure hull plating in way of Frame 132 to 133 for SSBN620 shall be 1.63 inches.

**Appendix C (Sheet 26)**

## MINIMUM THICKNESSES — SSBN640 CLASS

### PRESSURE HULL PLATING

| 15 - 31 | 31 - 88 | 88 - 94 | 94 - 104 | 104 - 119 | 119 - 132 | 132 - 136 |
|---|---|---|---|---|---|---|
| 1.14 | 1.86 | 1.86 | 1.83 | 1.40 | 1.80 | 1.82 |

| 136 - 140 | 140 - 143 | 143 - 147 | 147 - 152 | 152 - 154 | | |
|---|---|---|---|---|---|---|
| 1.52 | 1.42 | 1.21 | 1.11 | 2.00 | | |

### PRESSURE HULL FRAMING

| 15 - 30 | | | 32 - 34 | | | 105 - 116 | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .67 | 1.17 | – | .75 | 1.75 | – | .88 | 1.31 | – |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 17 |
| | | HY80 | Curve No. 18 |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 19 |
| | | HY80 | Curve No. 20 |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 21 |
| | | HY80 | Curve No. 22 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 14 | | 2.00 |
| | Frame 188 | | 2.00 |
| | | | |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 27 | | |
| | Bridge Access | | |
| | Access Frame 86 | | |
| | Aft Access/Escape Frame 119 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 27)**

## MINIMUM THICKNESSES — SSN637 CLASS

### PRESSURE HULL PLATING

| 11 - 28 | 28 - 35 | 35 - 62 | 62 - 69 | 69 - 77 | 77 - 84 | 84 - 89 |
|---|---|---|---|---|---|---|
| 1.15 | 1.52 | 1.76* | 1.81 | 1.28 | 1.76 | 1.76 |
| 89 - 91 | 91 - 94 | 94 - 97 | 97 - 103 | 103 - 108 | 108 - 109 | |
| 1.72 | 1.60 | 1.54 | 1.48 | 1.20 | 1.14 | |
| | | | | | | |
| | | | | | | |

### PRESSURE HULL FRAMING

| 12 - 27 | | | 70 - 76 | | | | | |
|---|---|---|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. | | | |
| .54 | 1.04 | – | .62 | 1.19 | – | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 17 |
| | | HY80 | Curve No. 18 |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 19 |
| | | HY80 | Curve No. 20 |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 21 |
| | | HY80 | Curve No. 22 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 11 | | 2.28 |
| | Frame 109 | | 2.28 |
| | | | |
| Canning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 19 | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

*Note 2:

The minimum t for pressure hull plating in way of Frame 44 for SSN673, and in way of Frame 61 for SSN674 and SSN676 only, shall be 1.78 inches.

**Appendix C (Sheet 28)**

## MINIMUM THICKNESSES — SSN671

### PRESSURE HULL PLATING

| 14 - 30 | 30 - 34 | 34 - 41 | 41 - 73 | 73 - 86 | 86 - 96 | 96 - 101 |
|---|---|---|---|---|---|---|
| 1.19 | 1.87 | 1.81 | 1.86 | 1.78 | 1.74 | 1.58 |
| 101 - 108 | | | | | | |
| 1.41 | | | | | | |
| | | | | | | |
| | | | | | | |

### PRESSURE HULL FRAMING

| 14 - 30 | | | 30 - 34 | | |
|---|---|---|---|---|---|
| WEB | S.F. | F.F. | WEB | S.F. | F.F. |
| .51 | 1.01 | | .74 | 1.62 | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

### MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 17 |
| | | HY80 | Curve No. 18 |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 19 |
| | | HY80 | Curve No. 20 |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 21 |
| | | HY80 | Curve No. 22 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 12 | | 2.36 |
| | Frame 110 | | 2.37 |
| | | | |
| Canning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 22 | | |
| | Bridge Access | | |
| | Torpedo Loading | | |
| | Aft Access/Escape Frame 83 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 29)**

| MINIMUM THICKNESSES | | | | | | | AGSS555 |
|---|---|---|---|---|---|---|---|
| PRESSURE HULL PLATING | | | | | | | PRESSURE HULL FRAMING |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| MISCELLANEOUS STRUCTURE | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | —— |
| | | HY80 | —— |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | —— |
| | | HY80 | —— |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | —— |
| | | HY80 | —— |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 11 | | |
| | Frame 78 | | |
| | | | |
| Conning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 30)**

| MINIMUM THICKNESSES | | | | | | | NR-1 |
|---|---|---|---|---|---|---|---|
| PRESSURE HULL PLATING | | | | | | | PRESSURE HULL FRAMING |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| MISCELLANEOUS STRUCTURE | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | |
| | | HTS | |
| | | HY80 | |
| | CATEGORY II (Occasionally Cycled) | MS | |
| | | HTS | |
| | | HY80 | |
| | CATEGORY III (Non-Cycled) | MS | |
| | | HTS | |
| | | HY80 | |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | | | |
| | | | |
| | | | |
| Conning Tower | Plating | | |
| | Framing | | |
| | Heads | | |
| Trunks | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

**Appendix C (Sheet 31)**

| MINIMUM THICKNESSES | | | | | | | SSN685 |
|---|---|---|---|---|---|---|---|
| PRESSURE HULL PLATING | | | | | | | PRESSURE HULL FRAMING |
| 16 - 34 | 41 - 88 | 89 - 107 | 107 - 116 | 116 - 121 | | | 16 - 33 |
| 1.16 | 1.76 | 1.73 | 1.67 | 1.56 | | | WEB / S.F. / F.F.: .84 / 1.14 / – |

| MISCELLANEOUS STRUCTURE | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | —— |
| | | HTS | Curve No. 17 |
| | | HY80 | Curve No. 18 |
| | CATEGORY II (Occasionally Cycled) | MS | —— |
| | | HTS | Curve No. 19 |
| | | HY80 | Curve No. 20 |
| | CATEGORY III (Non-Cycled) | MS | —— |
| | | HTS | Curve No. 21 |
| | | HY80 | Curve No. 22 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 16 | | 2.26 |
| | Frame 122 | | 1.96 |
| | | | |
| Canning Tower | Plating | | —— |
| | Framing | | —— |
| | Heads | | —— |
| Trunks | Fwd Access/Escape Frame 22 | | |
| | Bridge Access | | |
| | Torpedo Loading | | |
| | Aft Access/Escape Frame 91 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting — 25 percent of web and flange thickness.

Stiffener-general corrosion — 1/16 inch on web and flange thickness.

Appendix C (Sheet 32)

| MINIMUM THICKNESSES | | | | | | | | SSN688 |
|---|---|---|---|---|---|---|---|---|
| PRESSURE HULL PLATING | | | | | | | PRESSURE HULL FRAMING | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | ——— |
| | | HTS | Curve No. 23 |
| | | HY80 | Curve No. 24 |
| | CATEGORY II (Occasionally Cycled) | MS | ——— |
| | | HTS | Curve No. 25 |
| | | HY80 | Curve No. 26 |
| | CATEGORY III (Non Cycled) | MS | ——— |
| | | HTS | Curve No. 27 |
| | | HY80 | Curve No. 28 |
| Framing for High Pressure Plating | | | ——— |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 26 | | |
| | Frame 125 | | |
| | | | |
| Conning Tower | Plating | | ——— |
| | Framing | | ——— |
| | Heads | | ——— |
| Trunks | Torpedo Loading | | |
| | Bridge Access | | |
| | Fwd Access/Escape Fr. 62 | | |
| | Aft Access/Escape Fr. 85 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1 (Corrosion Allowance)

Plate-pitting -- 50 percent of plating thickness.

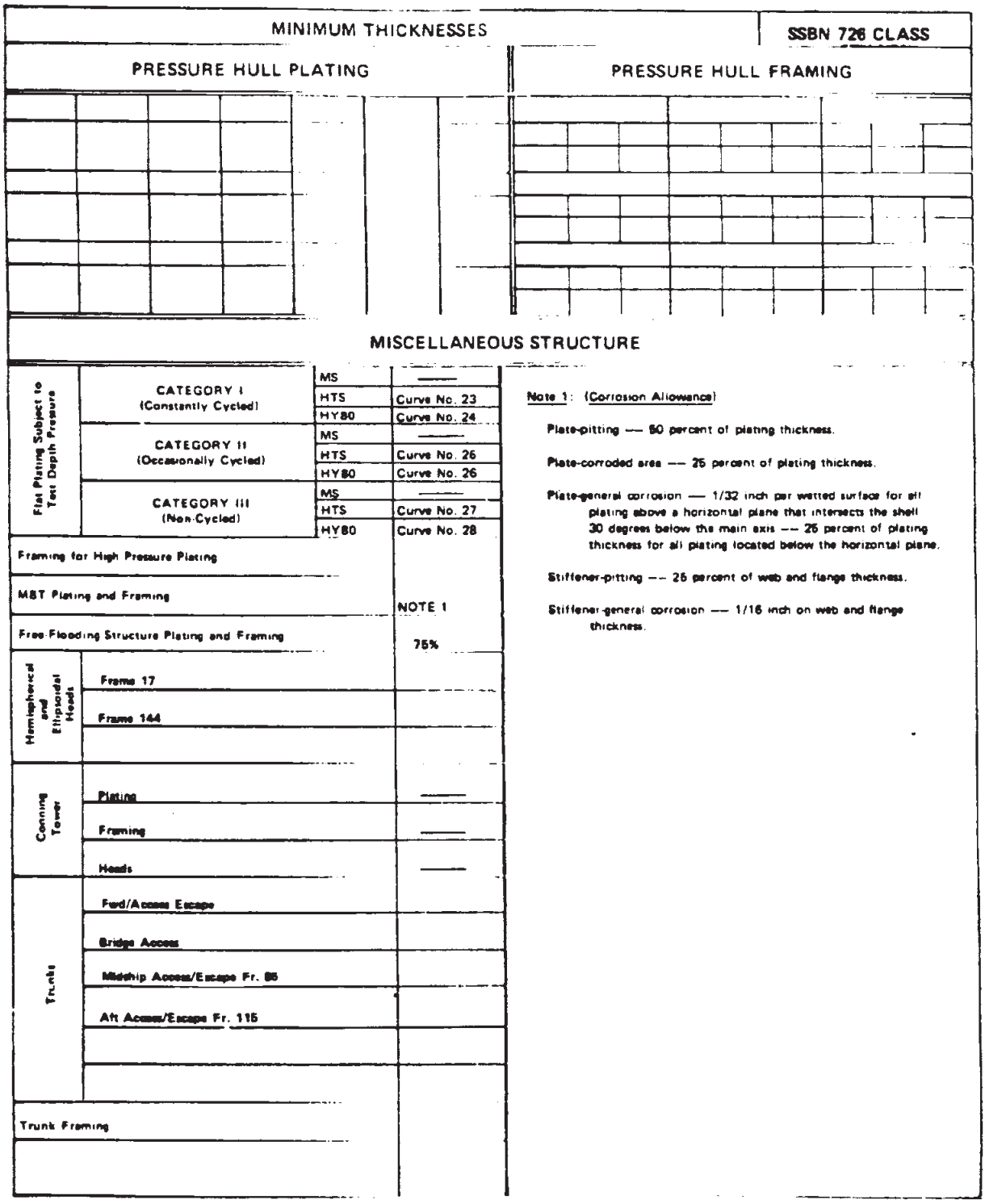
Plate-corroded area -- 25 percent of plating thickness.

Plate-general corrosion -- 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis -- 25 percent of plating thickness for all plating located below the horizontal plane.

Stiffener-pitting -- 25 percent of web and flange thickness.

Stiffener-general corrosion -- 1/16 inch on web and flange thickness

**Appendix C (Sheet 33)**



MINIMUM THICKNESSES — SSBN 726 CLASS

| PRESSURE HULL PLATING | | | PRESSURE HULL FRAMING |
|---|---|---|---|
| | | | |

MISCELLANEOUS STRUCTURE

| | | | |
|---|---|---|---|
| Flat Plating Subject to Test Depth Pressure | CATEGORY I (Constantly Cycled) | MS | ——— |
| | | HTS | Curve No. 23 |
| | | HY80 | Curve No. 24 |
| | CATEGORY II (Occasionally Cycled) | MS | ——— |
| | | HTS | Curve No. 26 |
| | | HY80 | Curve No. 26 |
| | CATEGORY III (Non-Cycled) | MS | ——— |
| | | HTS | Curve No. 27 |
| | | HY80 | Curve No. 28 |
| Framing for High Pressure Plating | | | |
| MBT Plating and Framing | | | NOTE 1 |
| Free-Flooding Structure Plating and Framing | | | 75% |
| Hemispherical and Ellipsoidal Heads | Frame 17 | | |
| | Frame 144 | | |
| | | | |
| Canning Tower | Plating | | ——— |
| | Framing | | ——— |
| | Heads | | ——— |
| Trunks | Ford/Access Escape | | |
| | Bridge Access | | |
| | Midship Access/Escape Fr. 85 | | |
| | Aft Access/Escape Fr. 115 | | |
| | | | |
| | | | |
| Trunk Framing | | | |
| | | | |

Note 1: (Corrosion Allowance)

Plate-pitting — 50 percent of plating thickness.

Plate-corroded area — 25 percent of plating thickness.

Plate-general corrosion — 1/32 inch per wetted surface for all plating above a horizontal plane that intersects the shell 30 degrees below the main axis — 25 percent of plating thickness for all plating located below the horizontal plane.

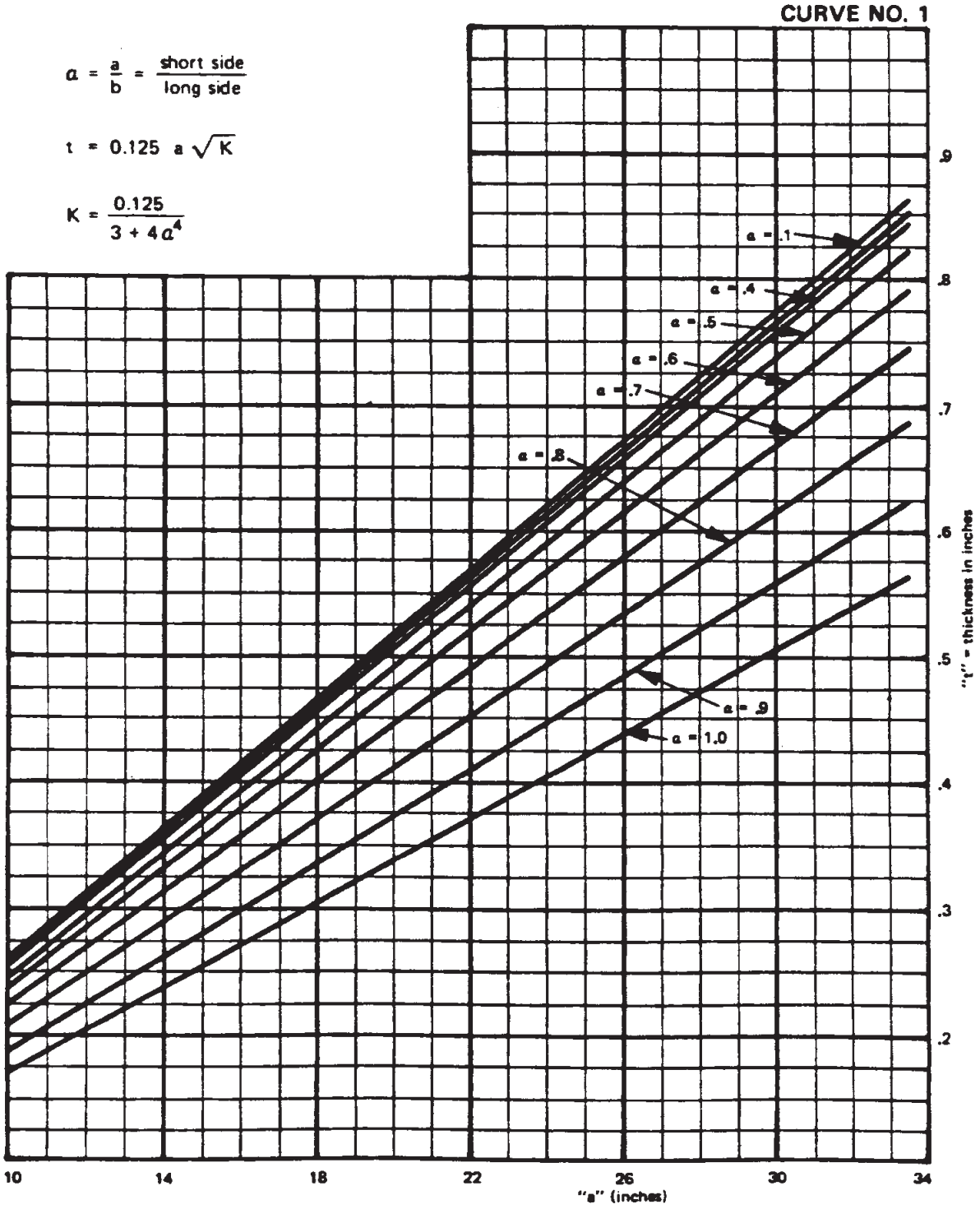
Stiffener-pitting — 25 percent of web and flange thickness.

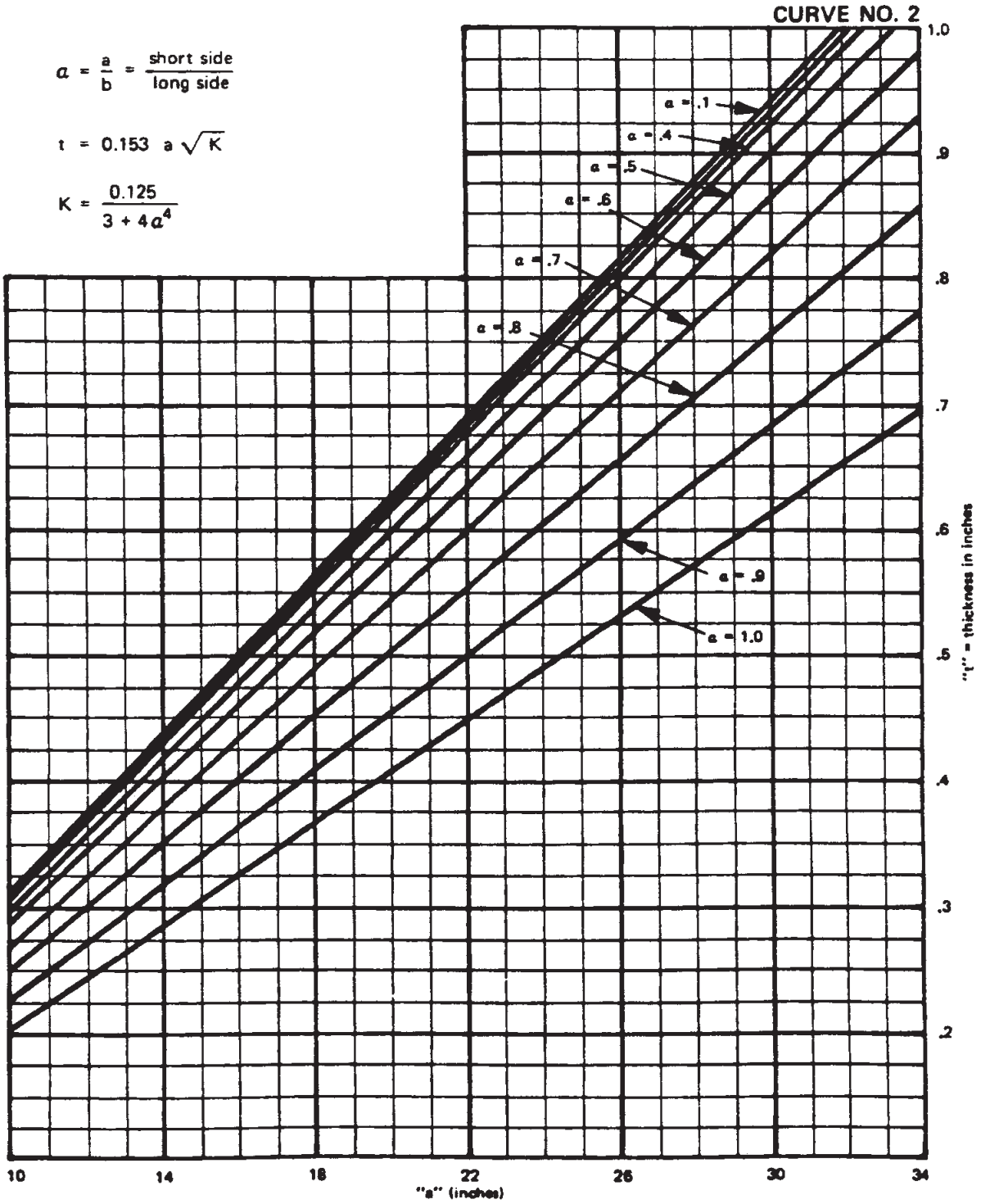
Stiffener-general corrosion — 1/16 inch on web and flange thickness.

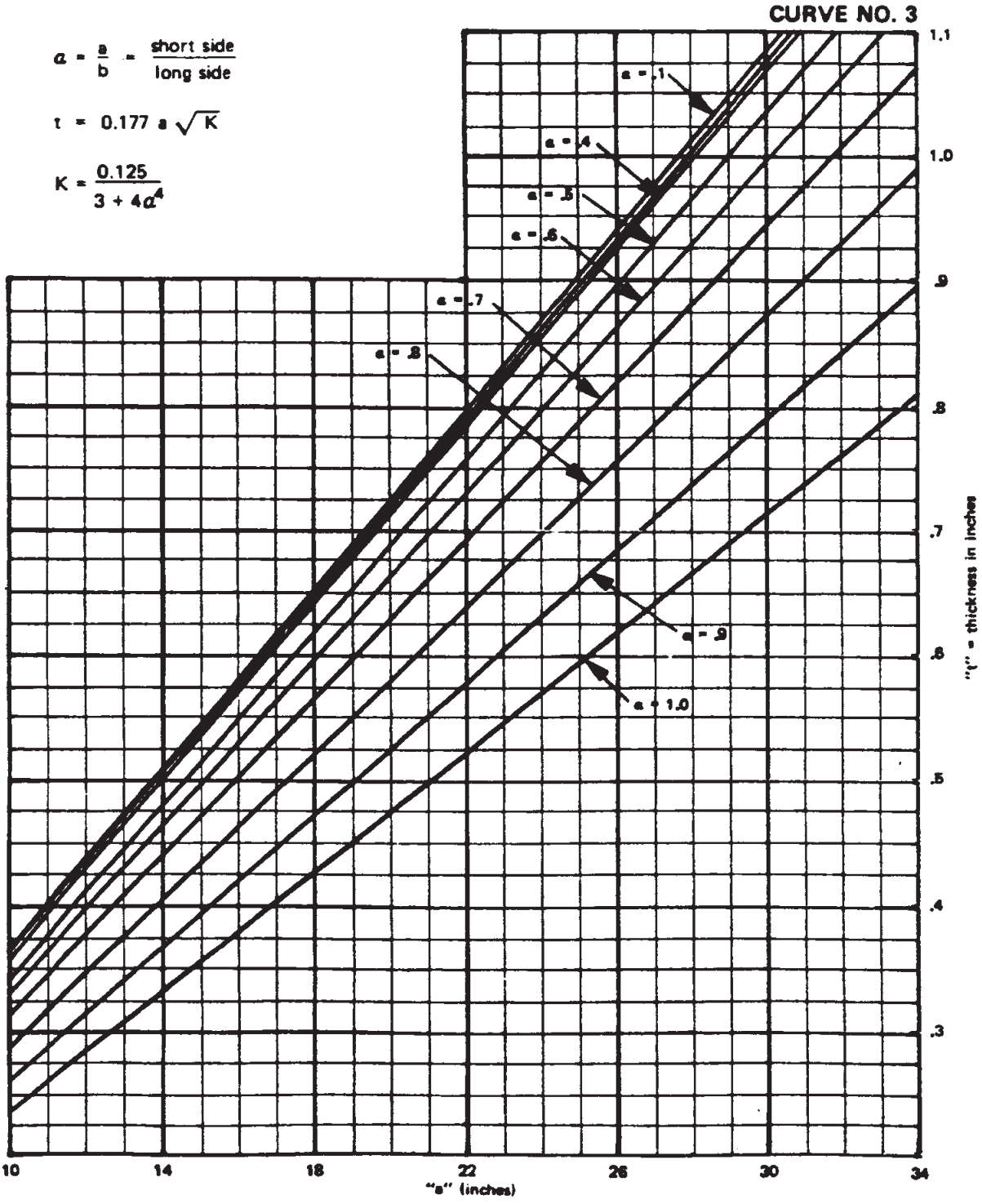
**Appendix C (Sheet 34)**

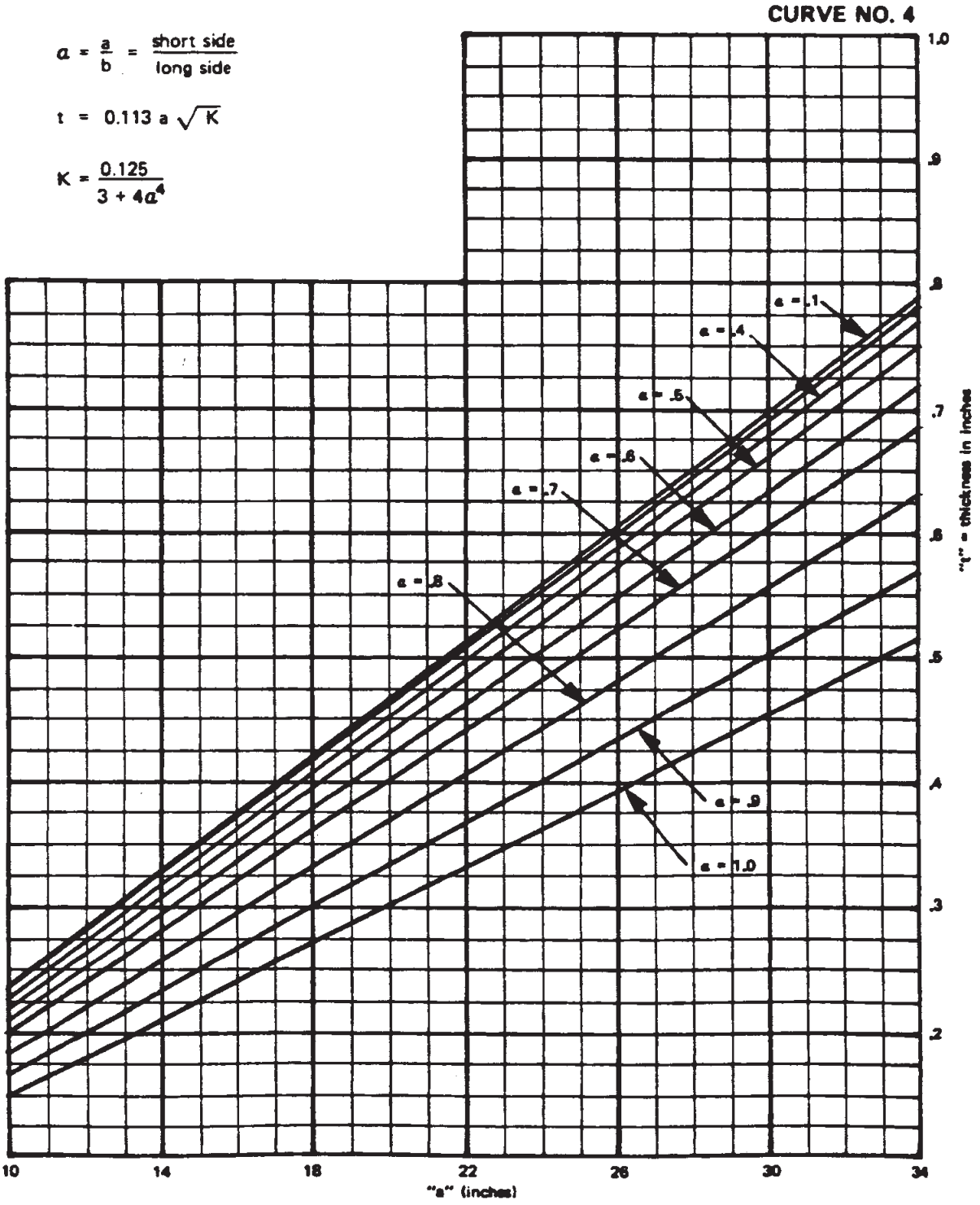
# APPENDIX D

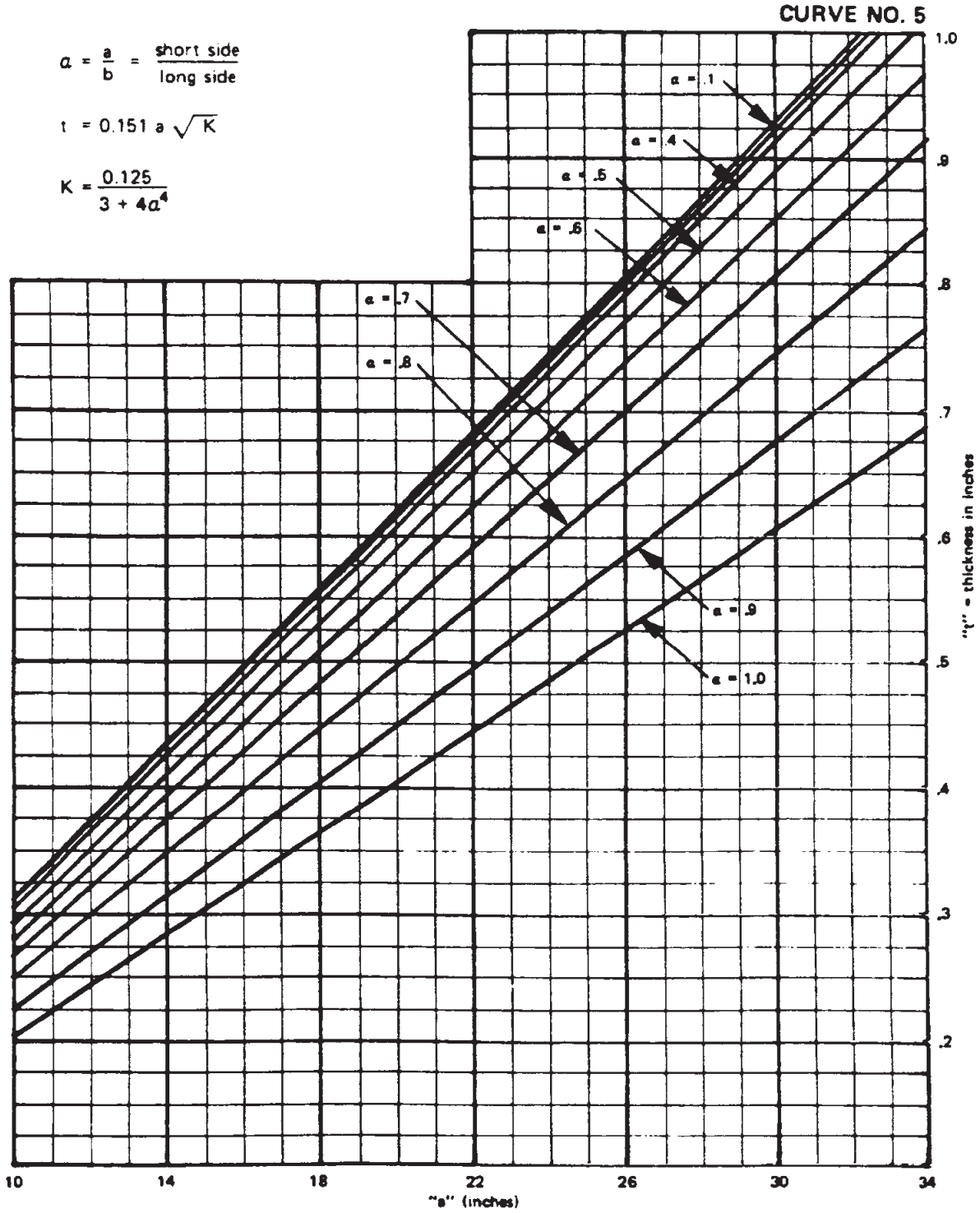
# MINIMUM SCANTLINGS CRITERIA CURVES

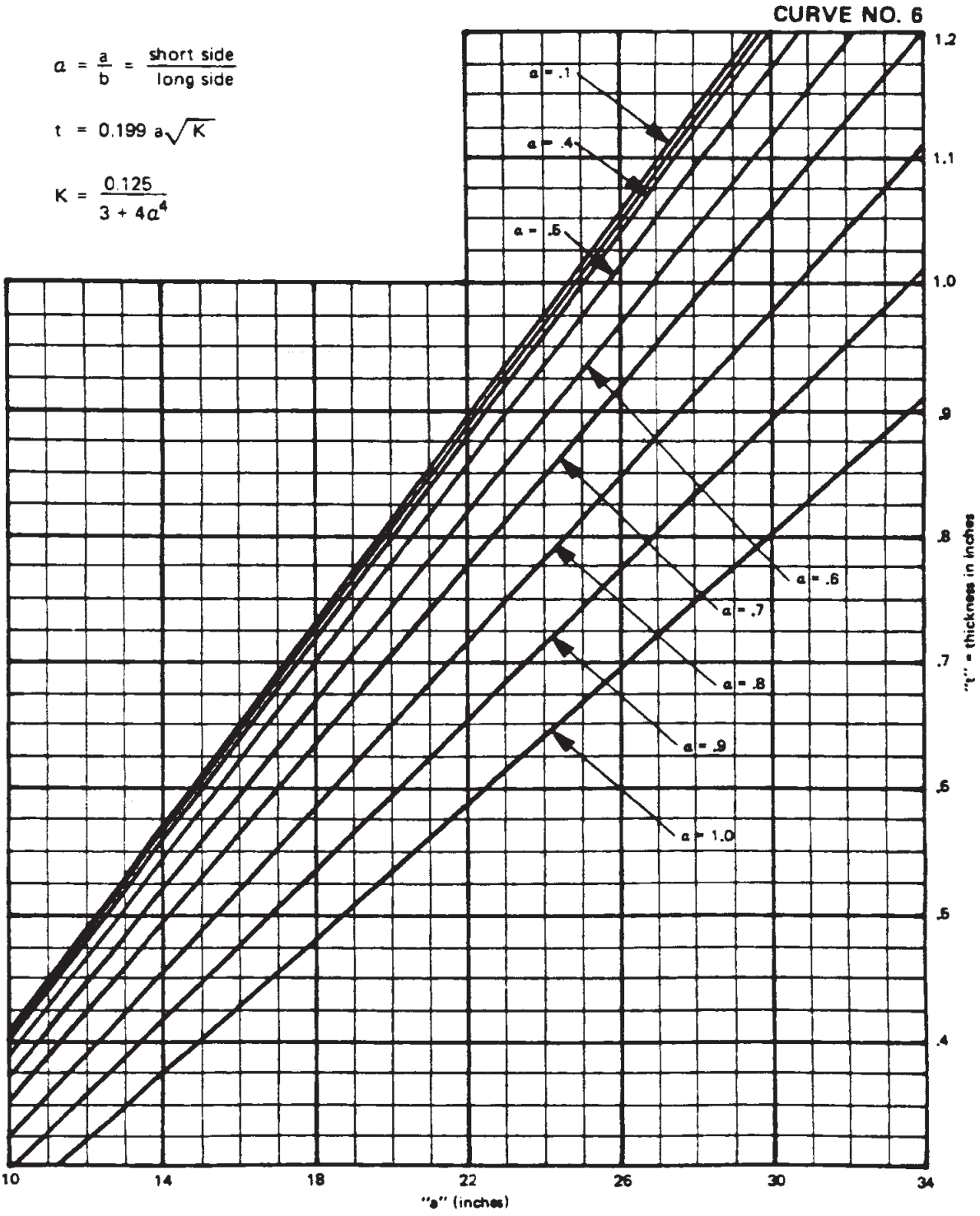

CURVE NO. 1
$\alpha = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.125\ a\sqrt{K}$
$K = \frac{0.125}{3 + 4\alpha^4}$
α = .1
α = .4
α = .5
α = .6
α = .7
α = .8
α = .9
α = 1.0
10
14
18
22
26
30
34
"a" (inches)
.9
.8
.7
.6
.5
.4
.3
.2
"t" = thickness in inches

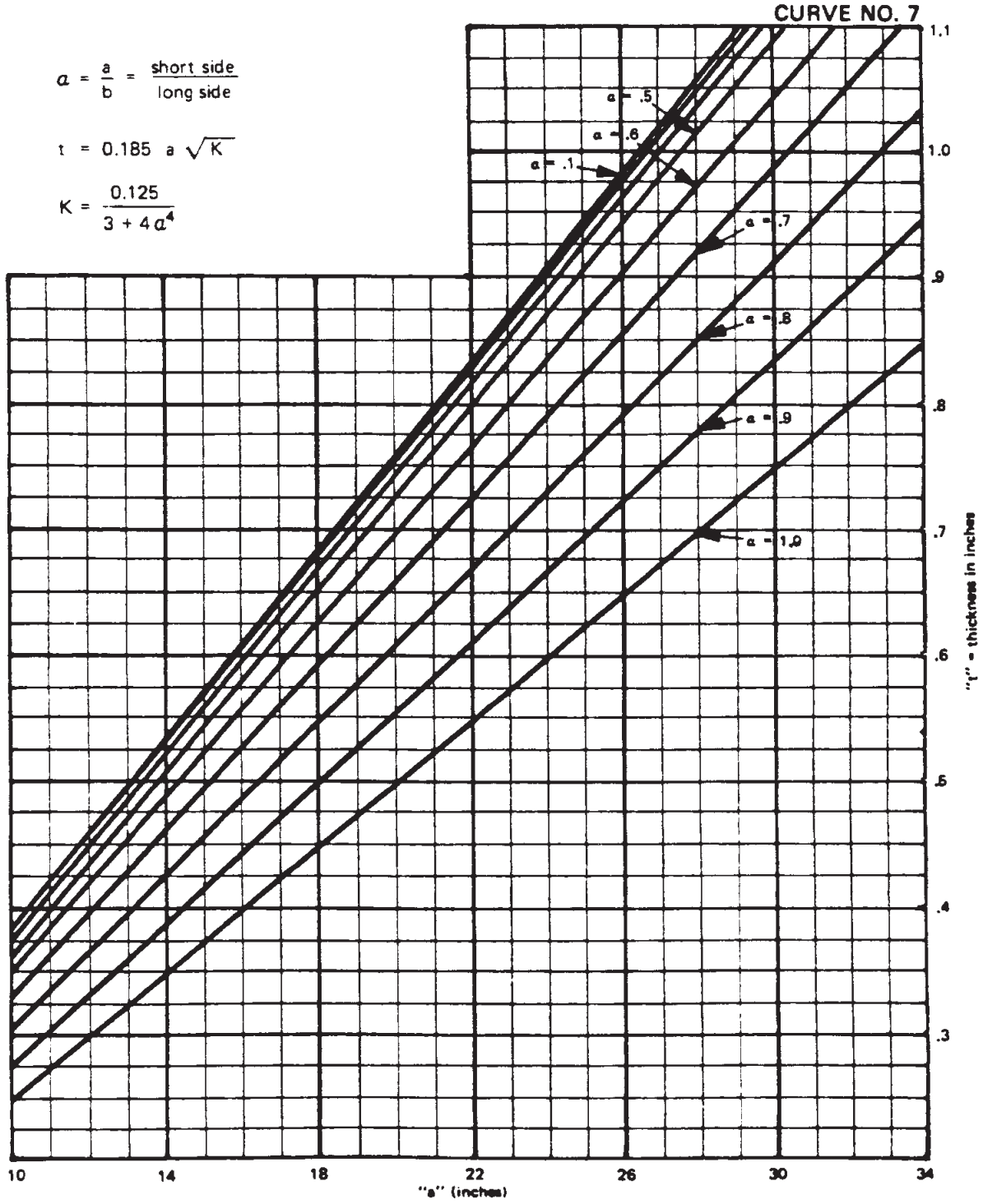

CURVE NO. 2
$\alpha = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.153\ a\sqrt{K}$
$K = \frac{0.125}{3 + 4\alpha^4}$
α = .1
α = .4
α = .5
α = .6
α = .7
α = .8
α = .9
α = 1.0
1.0
.9
.8
.7
.6
.5
.4
.3
.2
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

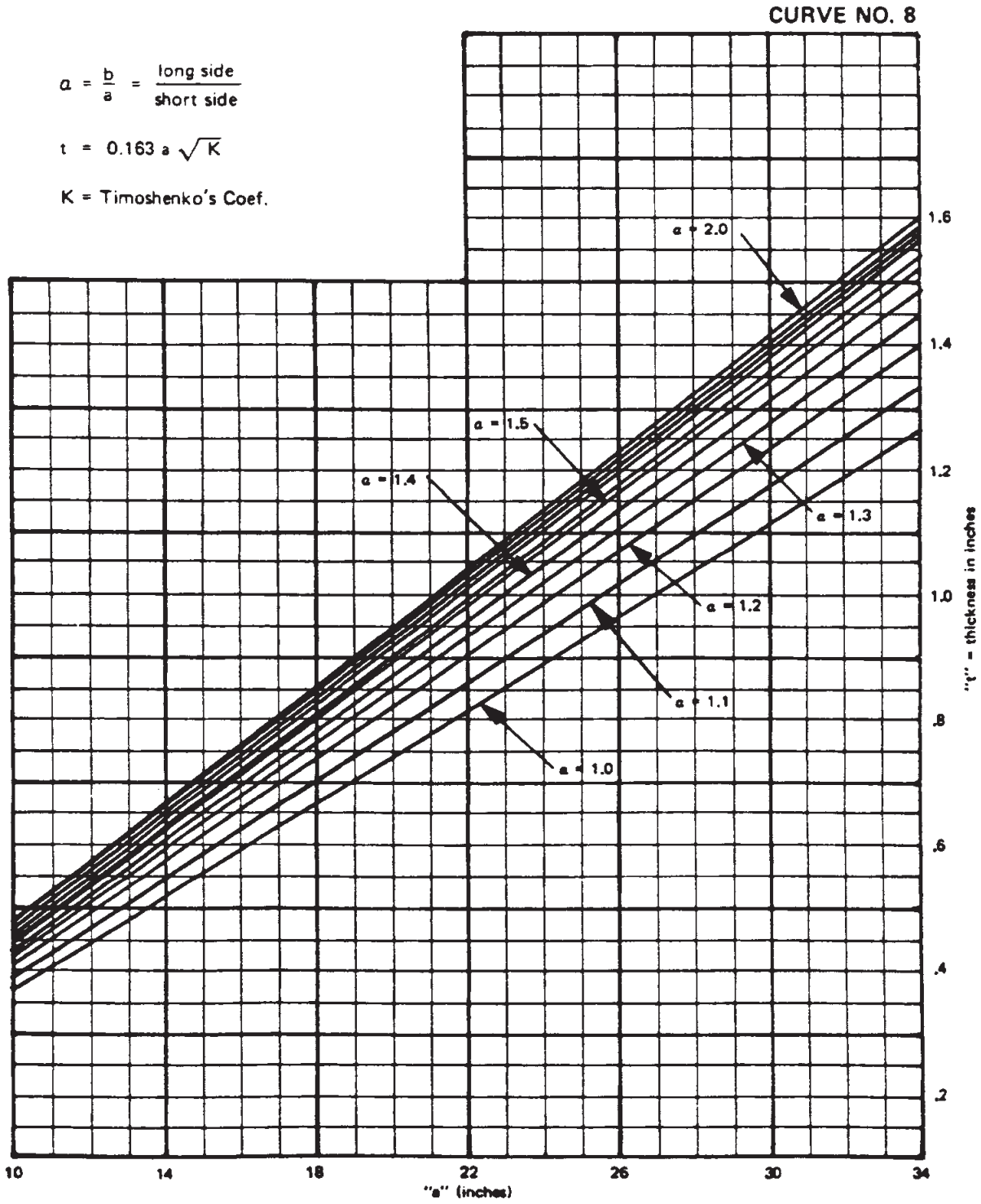

CURVE NO. 3
$a = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.177\, a \sqrt{K}$
$K = \frac{0.125}{3 + 4a^4}$
a = .1
a = .4
a = .5
a = .6
a = .7
a = .8
a = .9
a = 1.0
1.1
1.0
.9
.8
.7
.6
.5
.4
.3
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

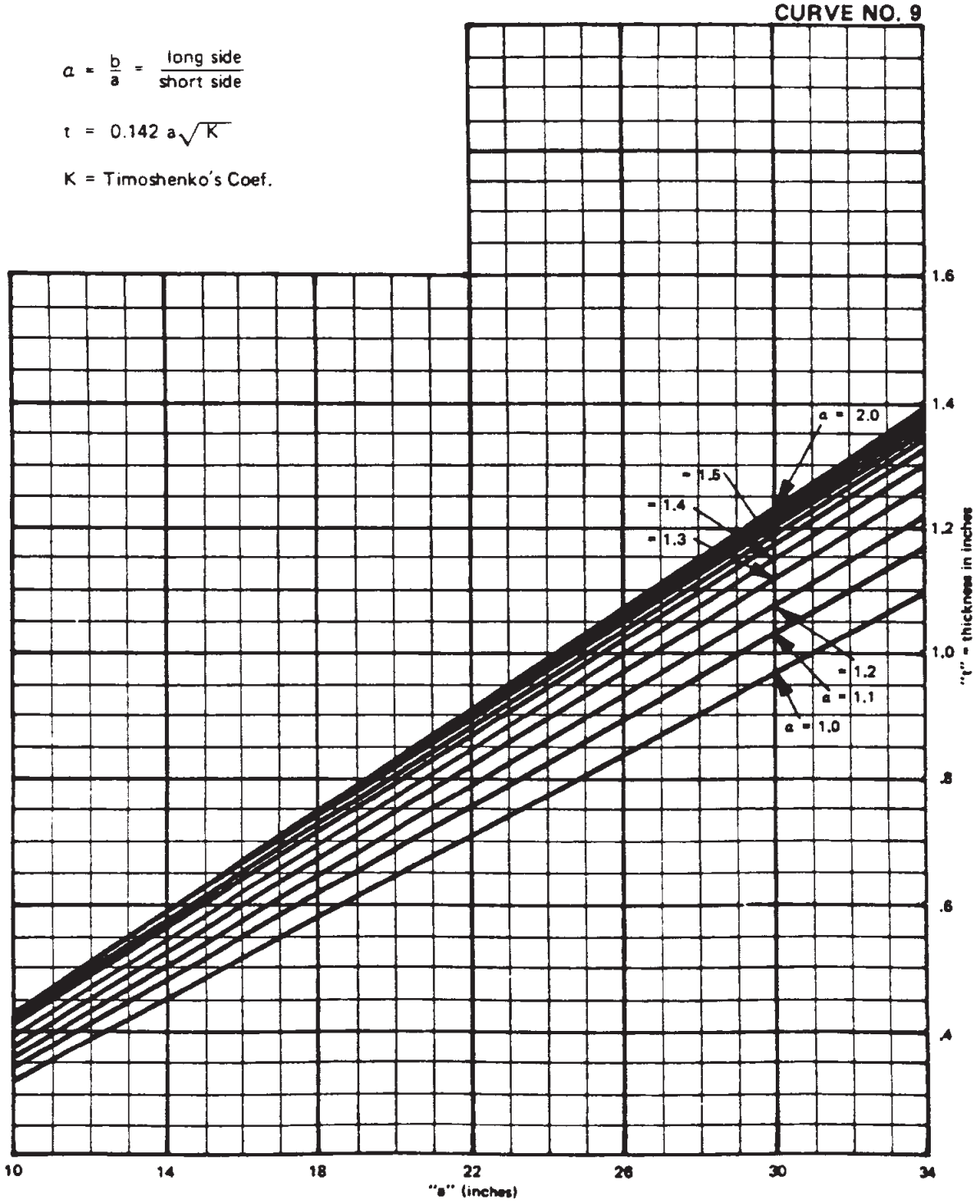

CURVE NO. 4
$a = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.113\ a\ \sqrt{K}$
$K = \frac{0.125}{3 + 4a^4}$
a = .1
a = .4
a = .5
a = .6
a = .7
a = .8
a = .9
a = 1.0
1.0
.9
.8
.7
.6
.5
.4
.3
.2
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

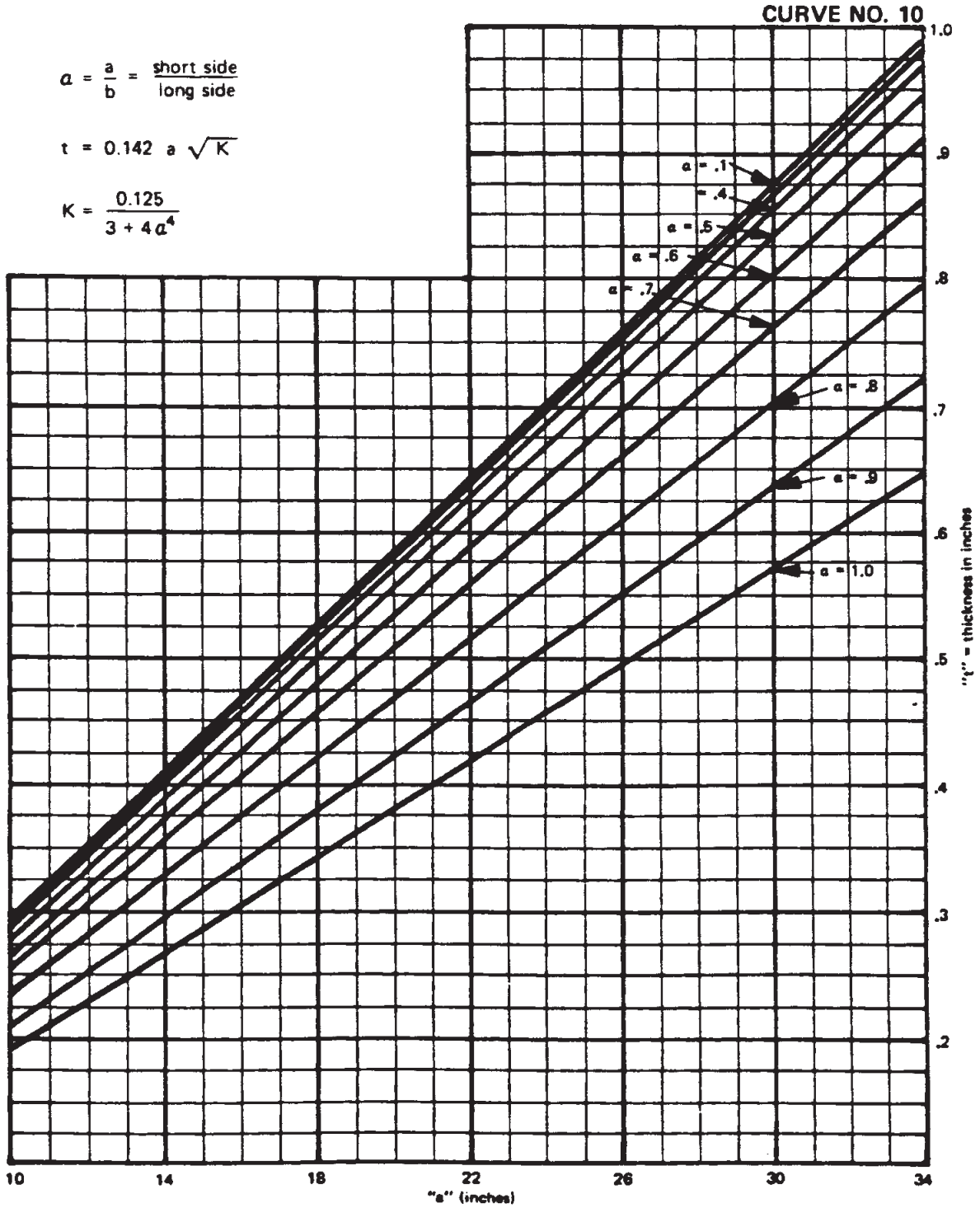

CURVE NO. 5
$\alpha = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.151\, a \sqrt{K}$
$K = \frac{0.125}{3 + 4\alpha^4}$
α = .1
α = .4
α = .5
α = .6
α = .7
α = .8
α = .9
α = 1.0
1.0
.9
.8
.7
.6
.5
.4
.3
.2
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

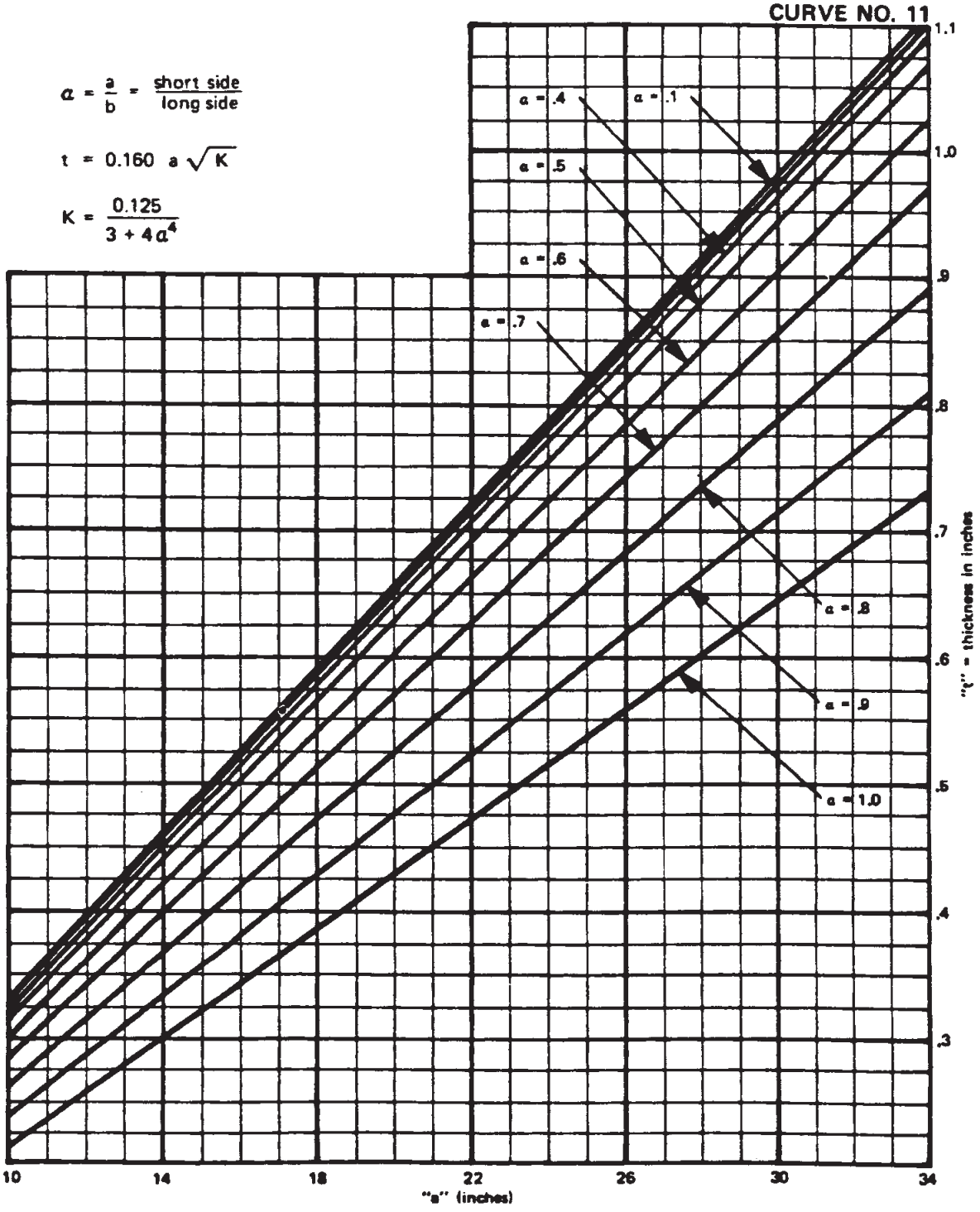

CURVE NO. 6
$\alpha = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.199\, a\sqrt{K}$
$K = \frac{0.125}{3 + 4\alpha^4}$
α = .1
α = .4
α = .5
α = .6
α = .7
α = .8
α = .9
α = 1.0
1.2
1.1
1.0
.9
.8
.7
.6
.5
.4
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

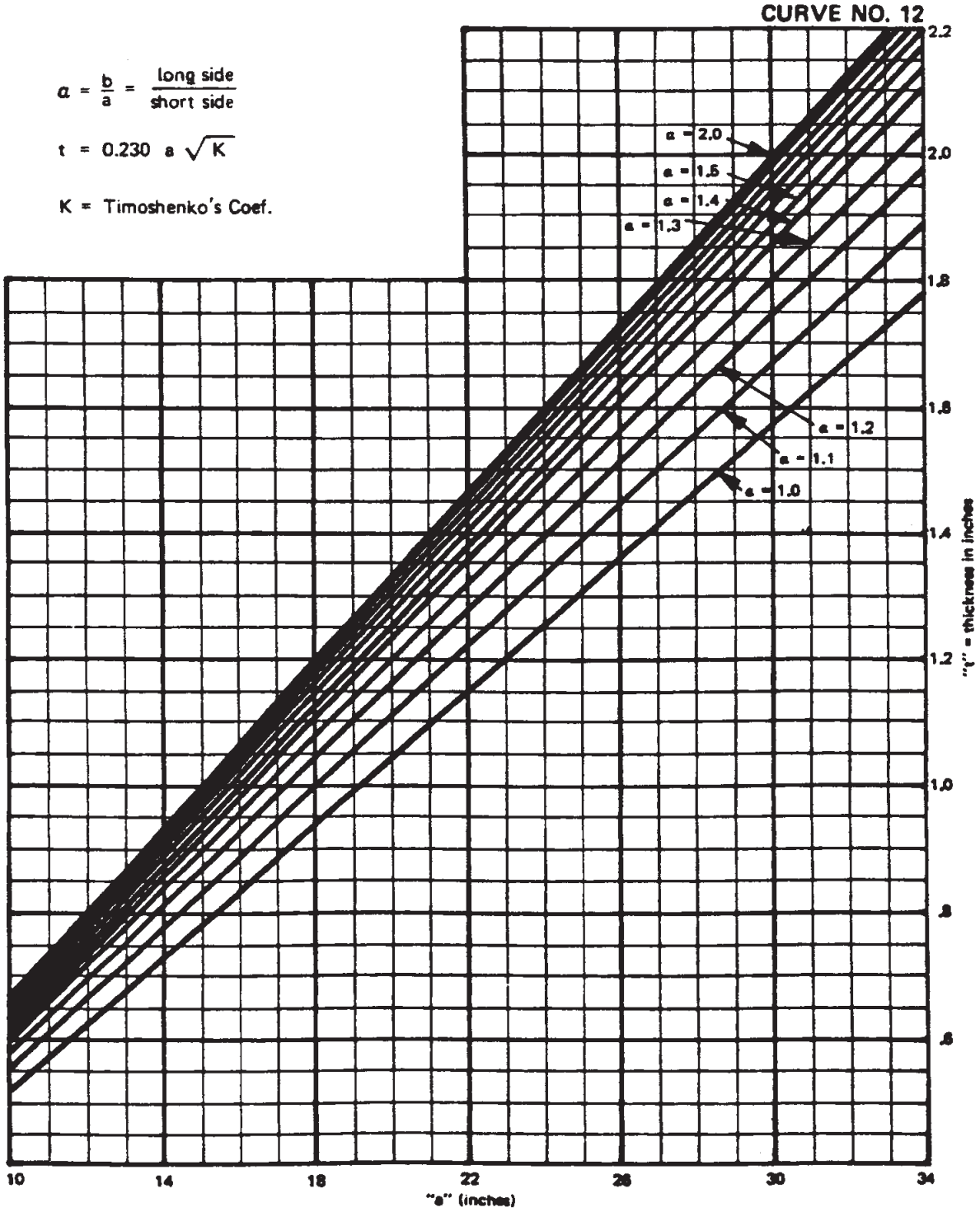

CURVE NO. 7
$\alpha = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.185\ a\ \sqrt{K}$
$K = \frac{0.125}{3 + 4\alpha^4}$
α = .5
α = .6
α = .1
α = .7
α = .8
α = .9
α = 1.0
1.1
1.0
.9
.8
.7
.6
.5
.4
.3
10
14
18
22
26
30
34
"a" (inches)
"t" = thickness in inches

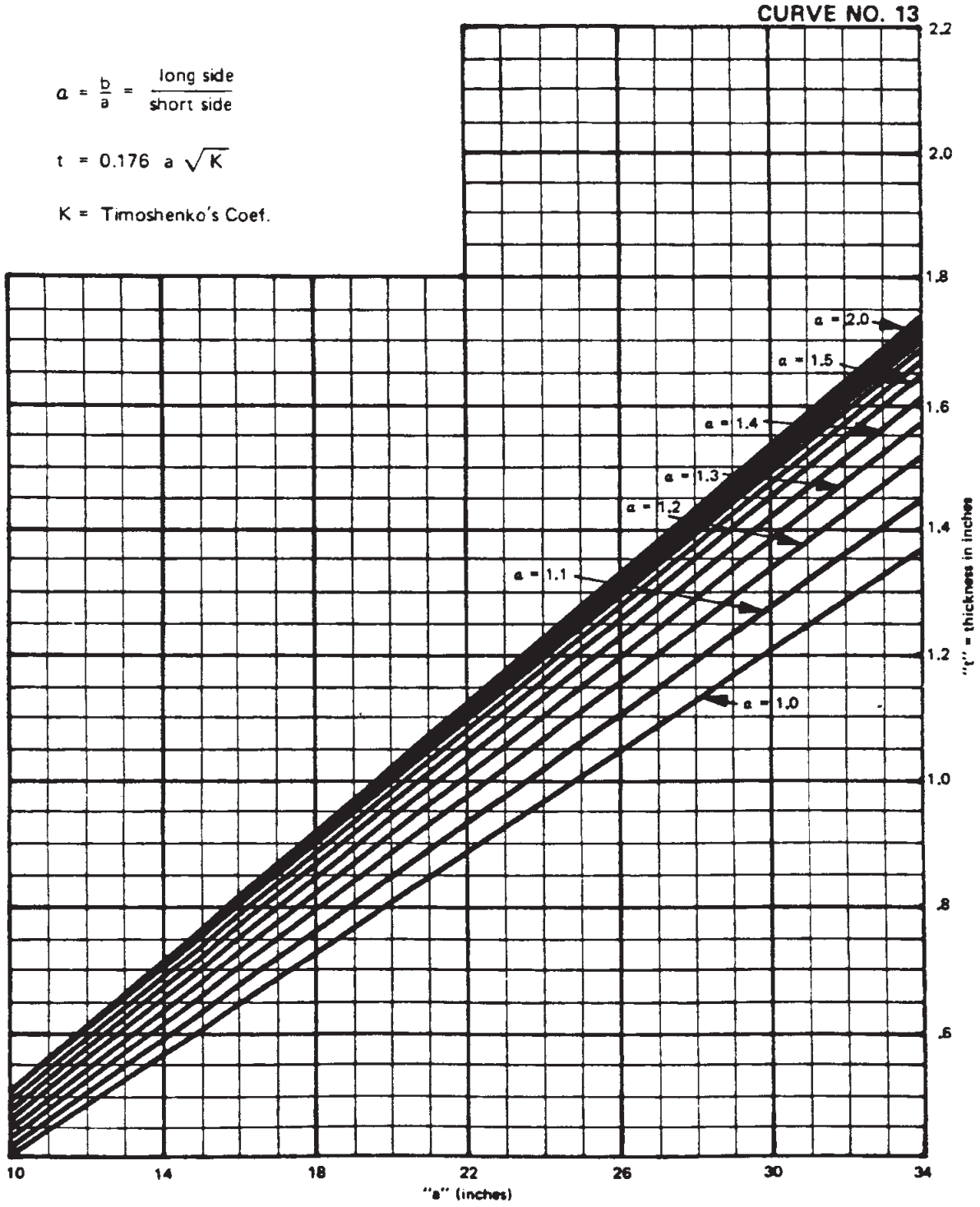

CURVE NO. 8
$\alpha = \frac{b}{a} = \frac{\text{long side}}{\text{short side}}$
$t = 0.163\, a \sqrt{K}$
K = Timoshenko's Coef.
α = 2.0
α = 1.5
α = 1.4
α = 1.3
α = 1.2
α = 1.1
α = 1.0
1.6
1.4
1.2
1.0
.8
.6
.4
.2
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

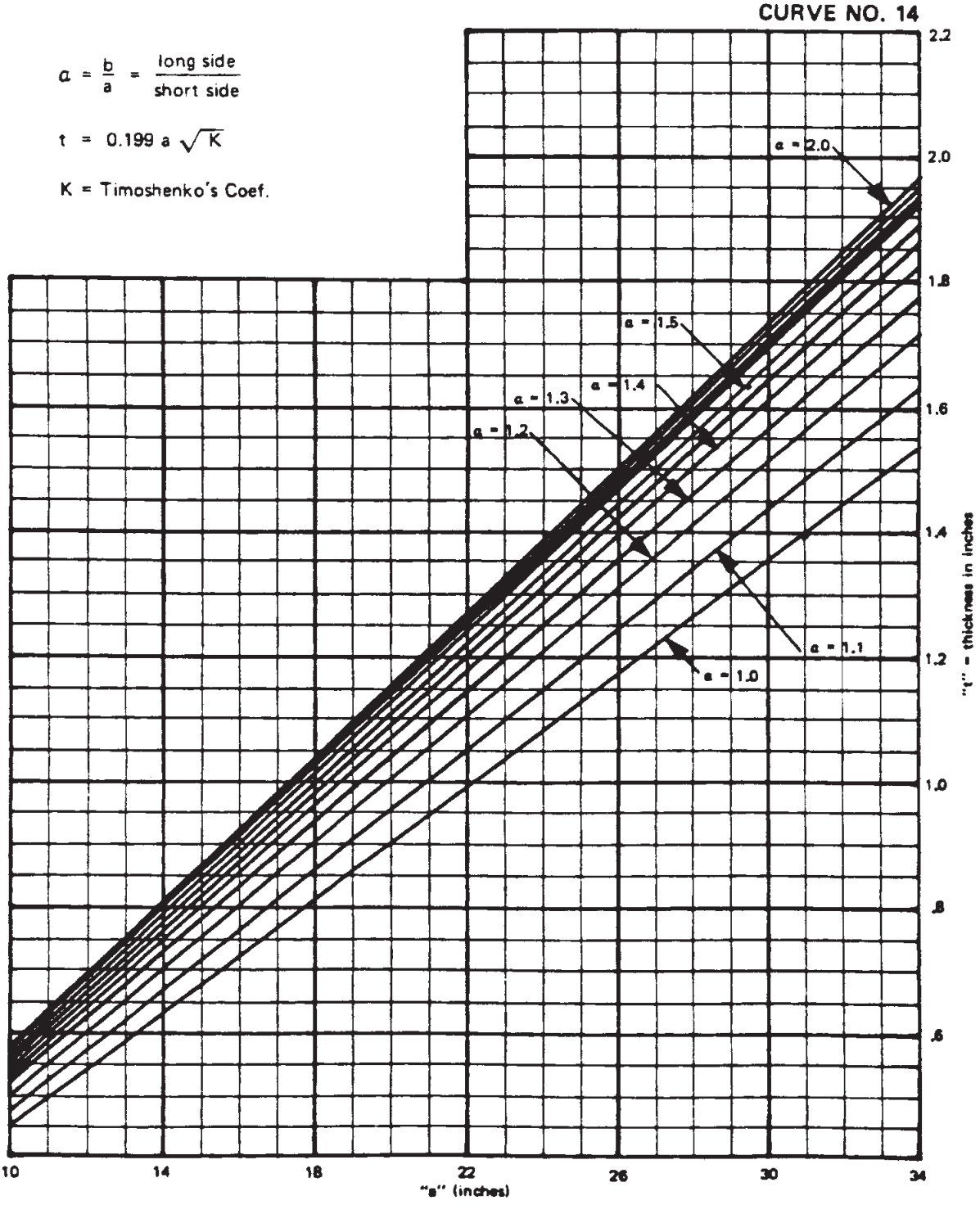

CURVE NO. 9
$a = \frac{b}{a} = \frac{\text{long side}}{\text{short side}}$
$t = 0.142\, a\sqrt{K}$
K = Timoshenko's Coef.
a = 2.0
= 1.5
= 1.4
= 1.3
= 1.2
a = 1.1
a = 1.0
1.6
1.4
1.2
1.0
.8
.6
.4
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

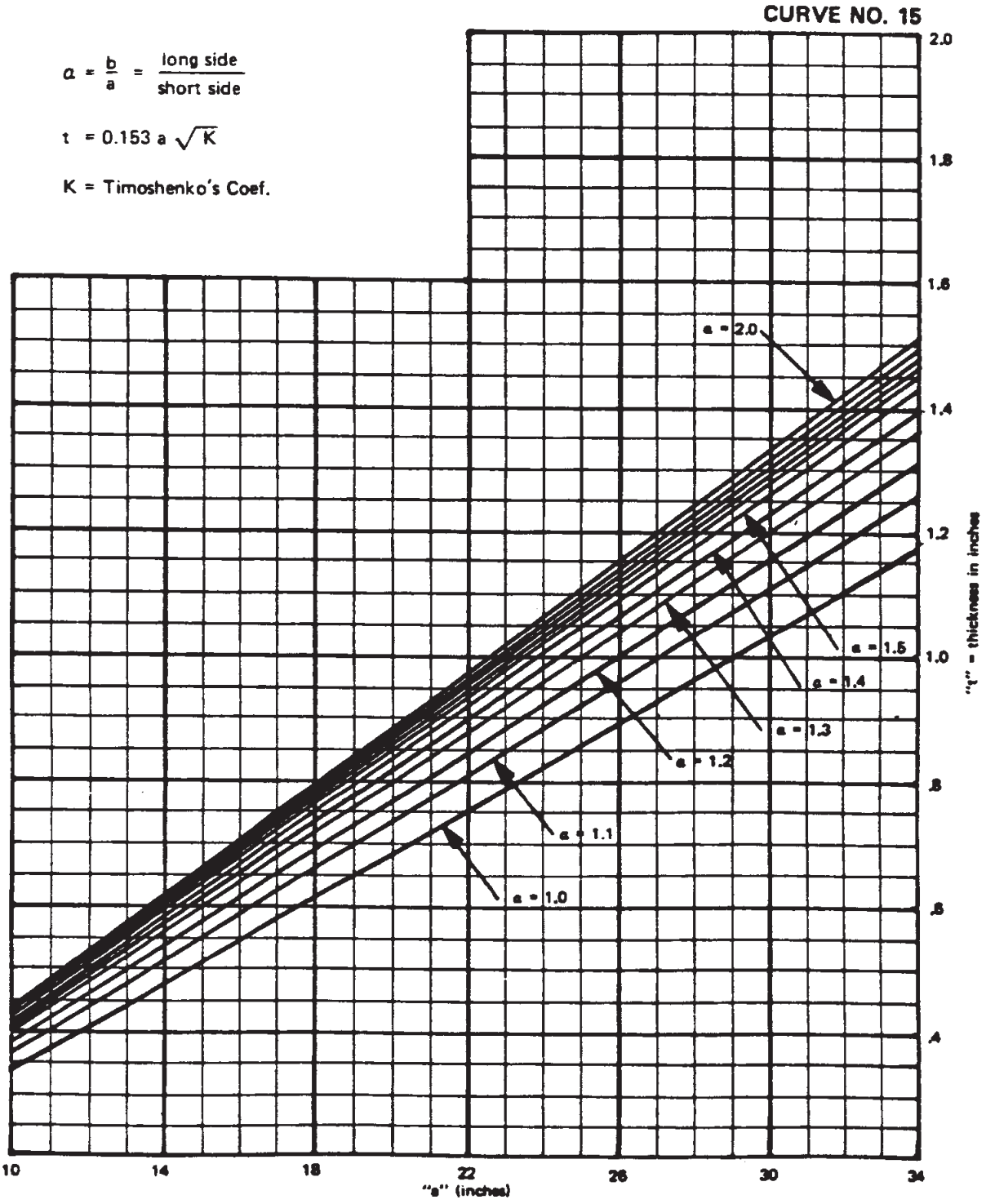

CURVE NO. 10
$a = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.142\ a\ \sqrt{K}$
$K = \frac{0.125}{3 + 4a^4}$
a = .1
= .4
a = .5
a = .6
a = .7
a = .8
a = .9
a = 1.0
1.0
.9
.8
.7
.6
.5
.4
.3
.2
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

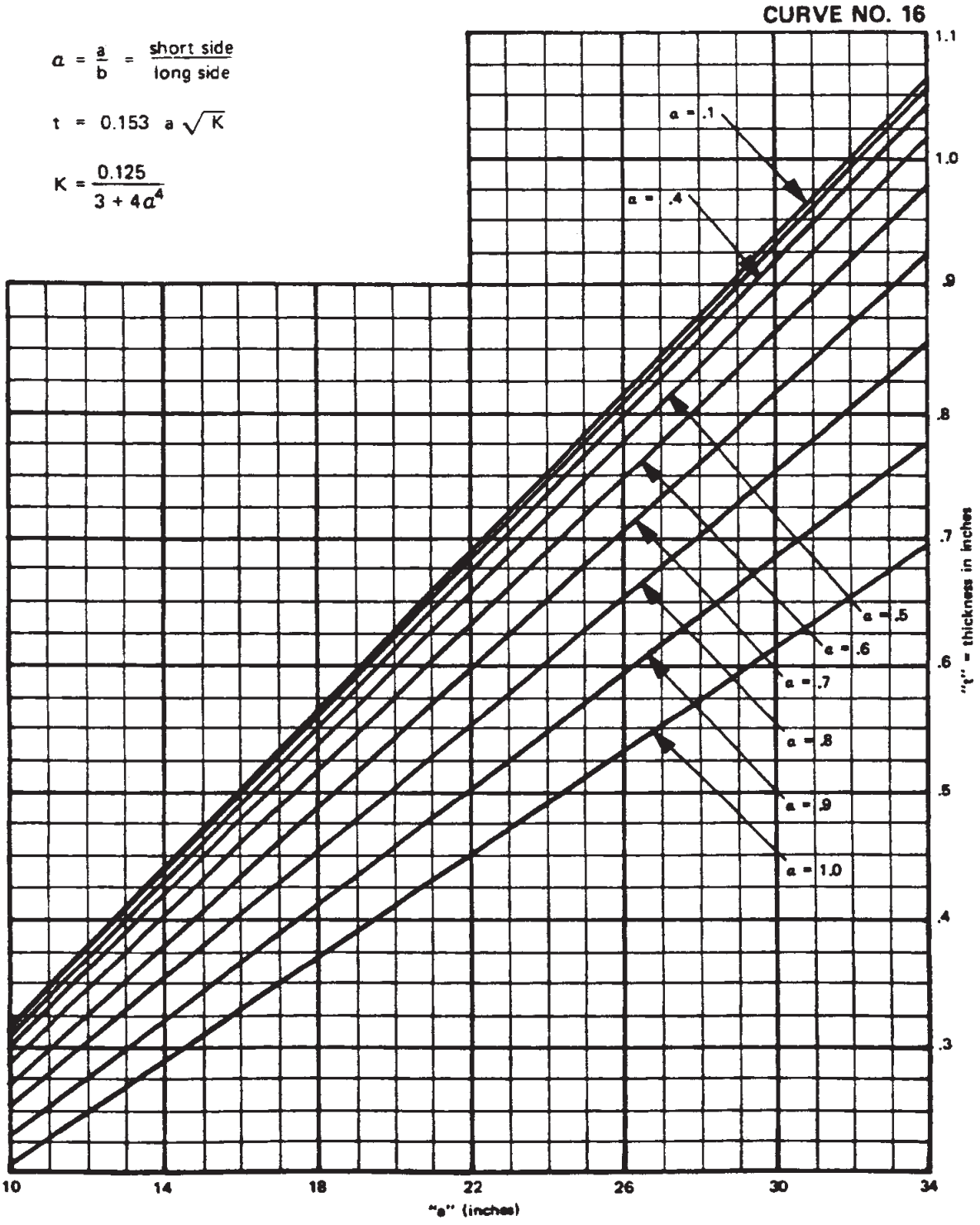

CURVE NO. 11
$\alpha = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.160\ a\sqrt{K}$
$K = \frac{0.125}{3 + 4\alpha^4}$
α = .4
α = .1
α = .5
α = .6
α = .7
α = .8
α = .9
α = 1.0
1.1
1.0
.9
.8
.7
.6
.5
.4
.3
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

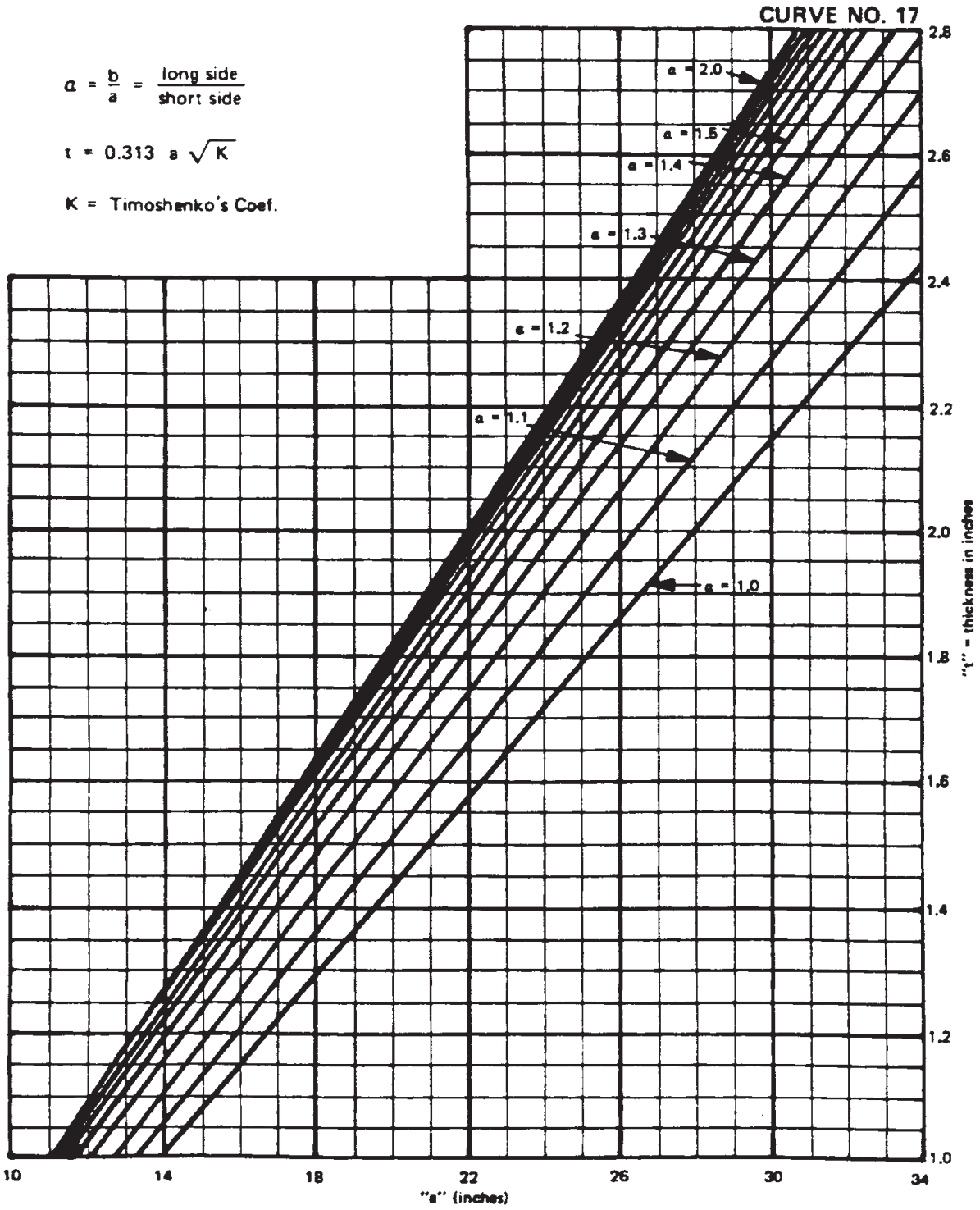

CURVE NO. 12
α = b/a = long side / short side
t = 0.230 a √K
K = Timoshenko's Coef.
α = 2.0
α = 1.5
α = 1.4
α = 1.3
α = 1.2
α = 1.1
α = 1.0
2.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

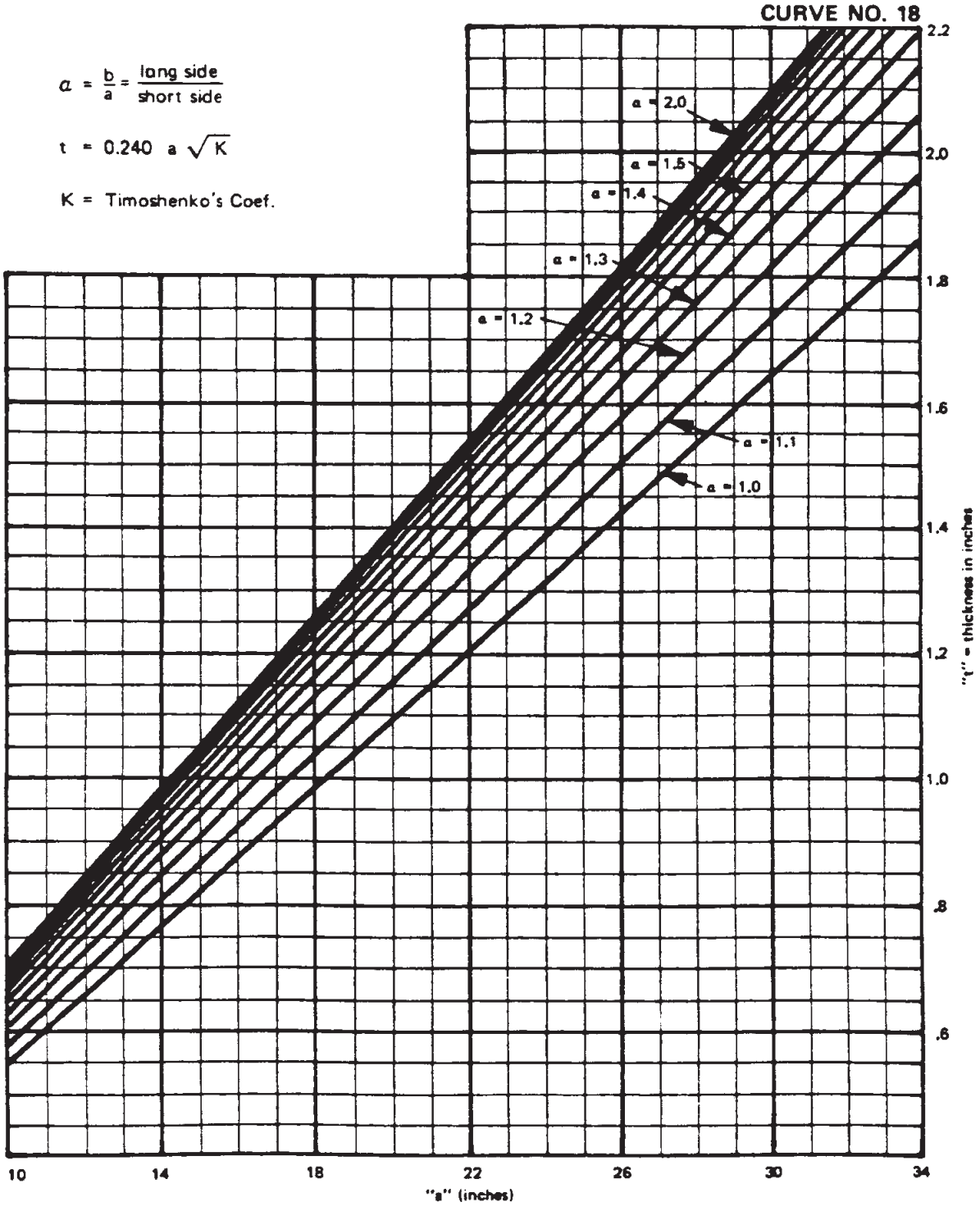

CURVE NO. 13
$a = \frac{b}{a} = \frac{\text{long side}}{\text{short side}}$
$t = 0.176\ a\ \sqrt{K}$
K = Timoshenko's Coef.
a = 2.0
a = 1.5
a = 1.4
a = 1.3
a = 1.2
a = 1.1
a = 1.0
2.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

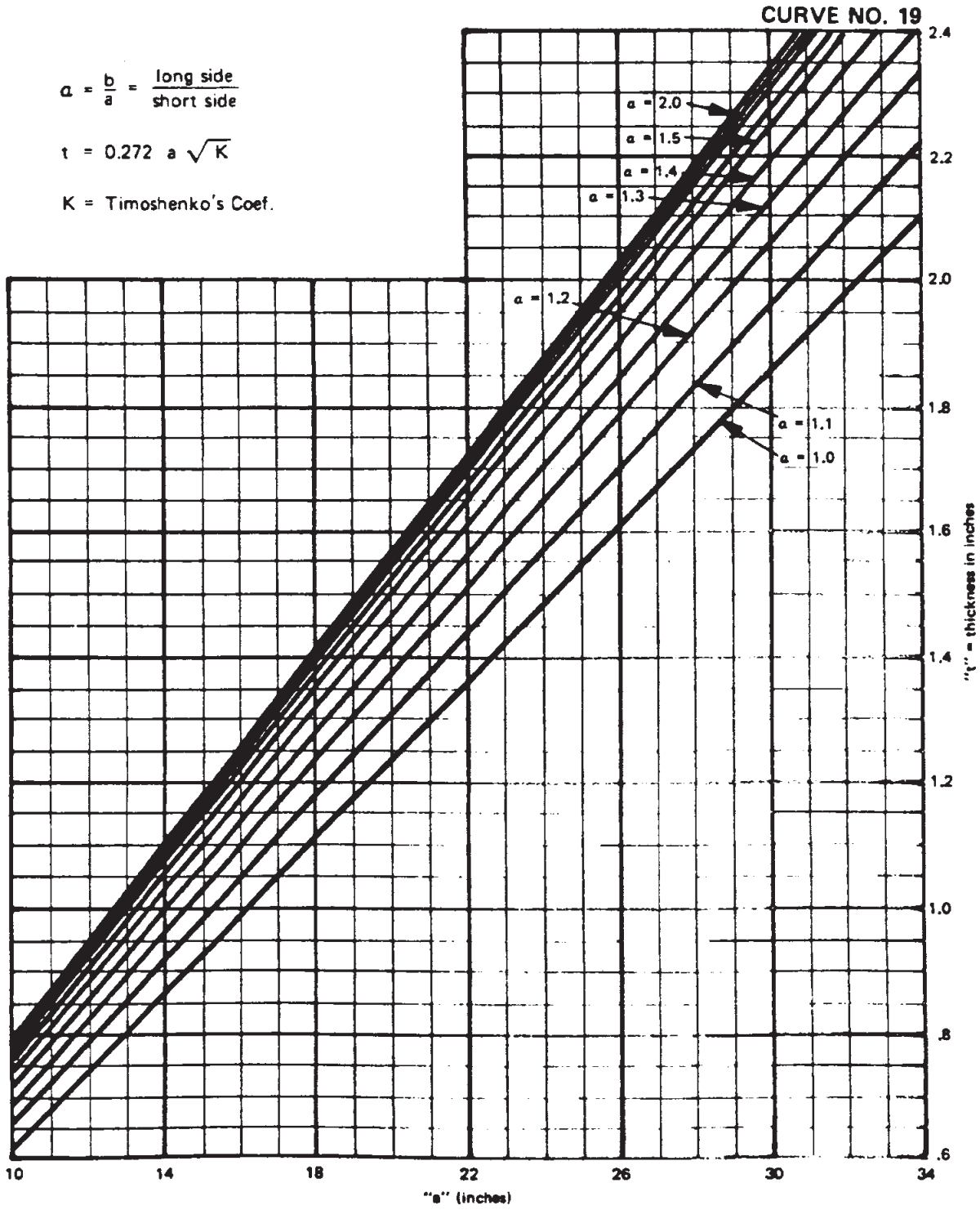

CURVE NO. 14
α = b/a = long side / short side
t = 0.199 a √K
K = Timoshenko's Coef.
α = 2.0
α = 1.5
α = 1.4
α = 1.3
α = 1.2
α = 1.1
α = 1.0
2.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

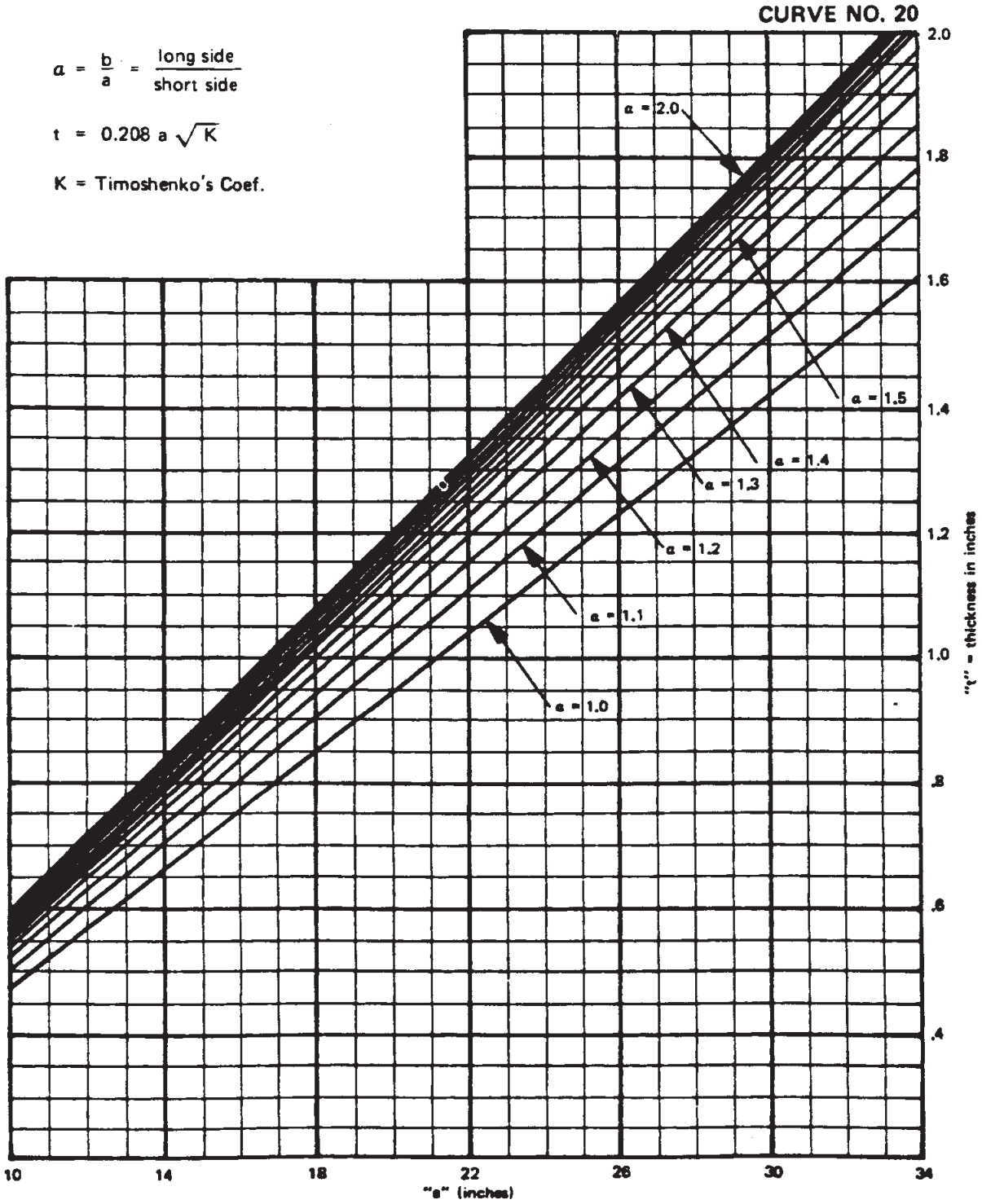

CURVE NO. 15
$\alpha = \frac{b}{a} = \frac{\text{long side}}{\text{short side}}$
$t = 0.153\ a\ \sqrt{K}$
K = Timoshenko's Coef.
α = 2.0
α = 1.5
α = 1.4
α = 1.3
α = 1.2
α = 1.1
α = 1.0
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

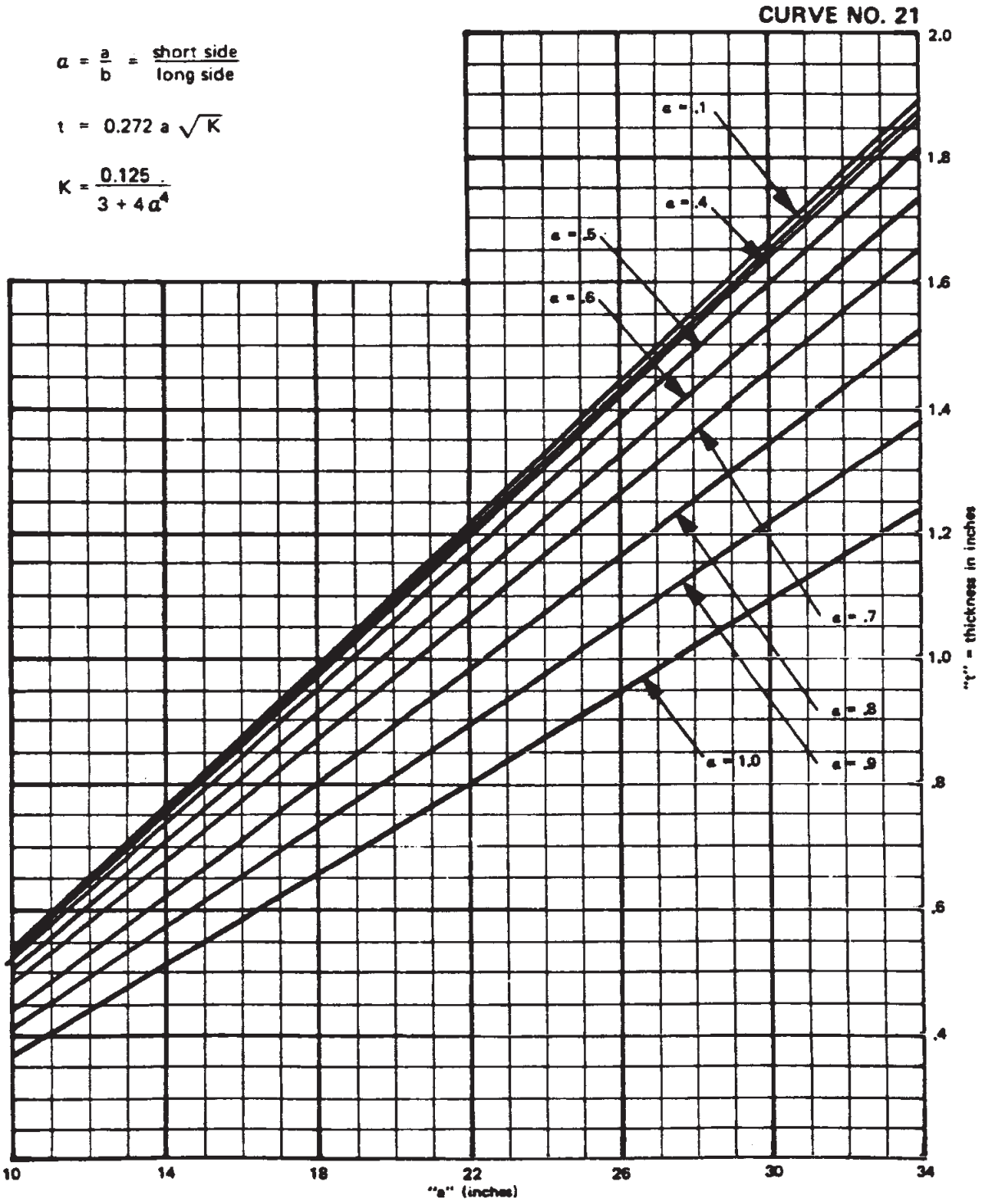

CURVE NO. 16
$a = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.153\ a\sqrt{K}$
$K = \frac{0.125}{3 + 4a^4}$
a = .1
a = .4
a = .5
a = .6
a = .7
a = .8
a = .9
a = 1.0
1.1
1.0
.9
.8
.7
.6
.5
.4
.3
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

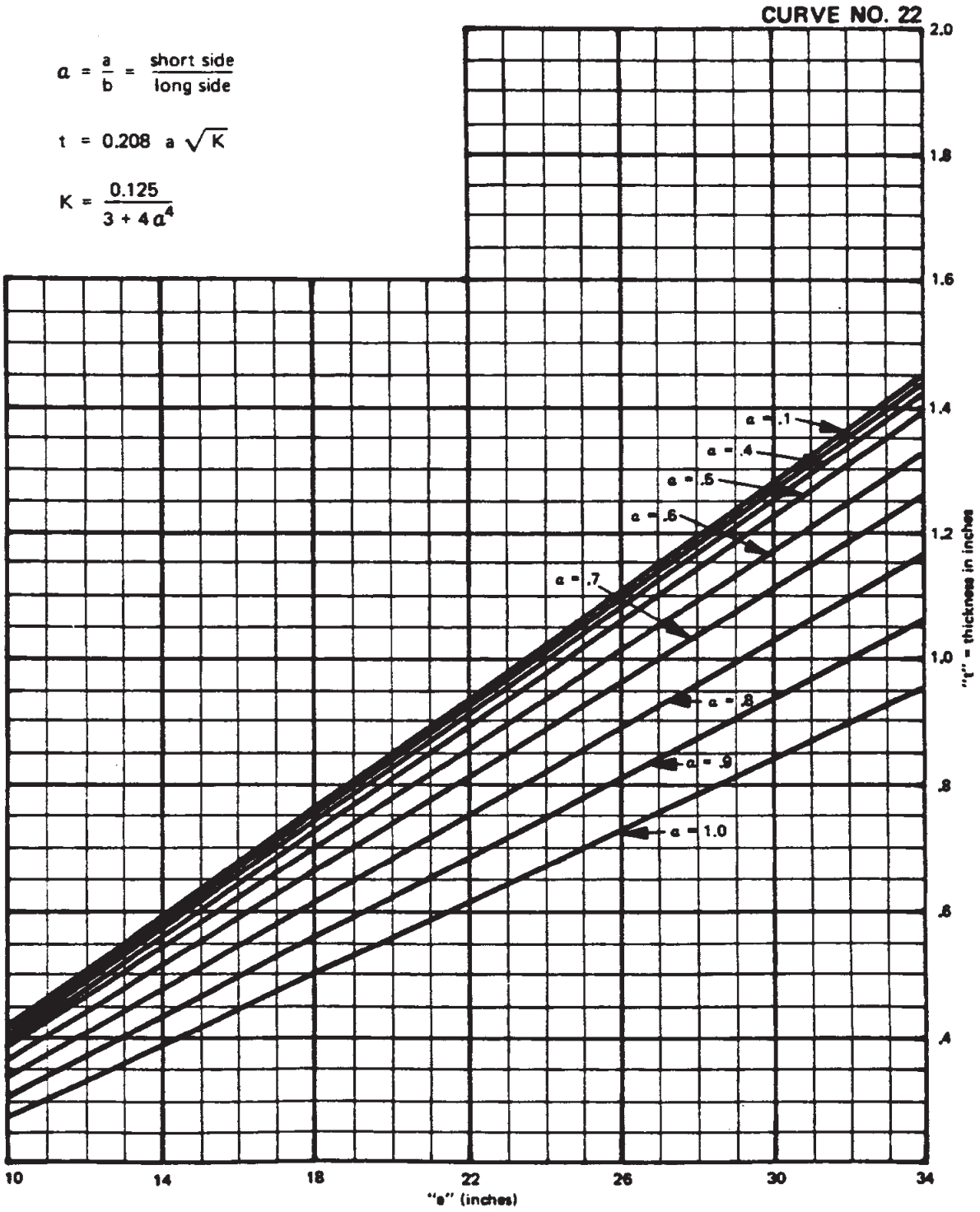

CURVE NO. 17
α = b/a = long side / short side
t = 0.313 a √K
K = Timoshenko's Coef.
α = 2.0
α = 1.5
α = 1.4
α = 1.3
α = 1.2
α = 1.1
α = 1.0
"t" = thickness in inches
"a" (inches)
10
14
18
22
26
30
34
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8

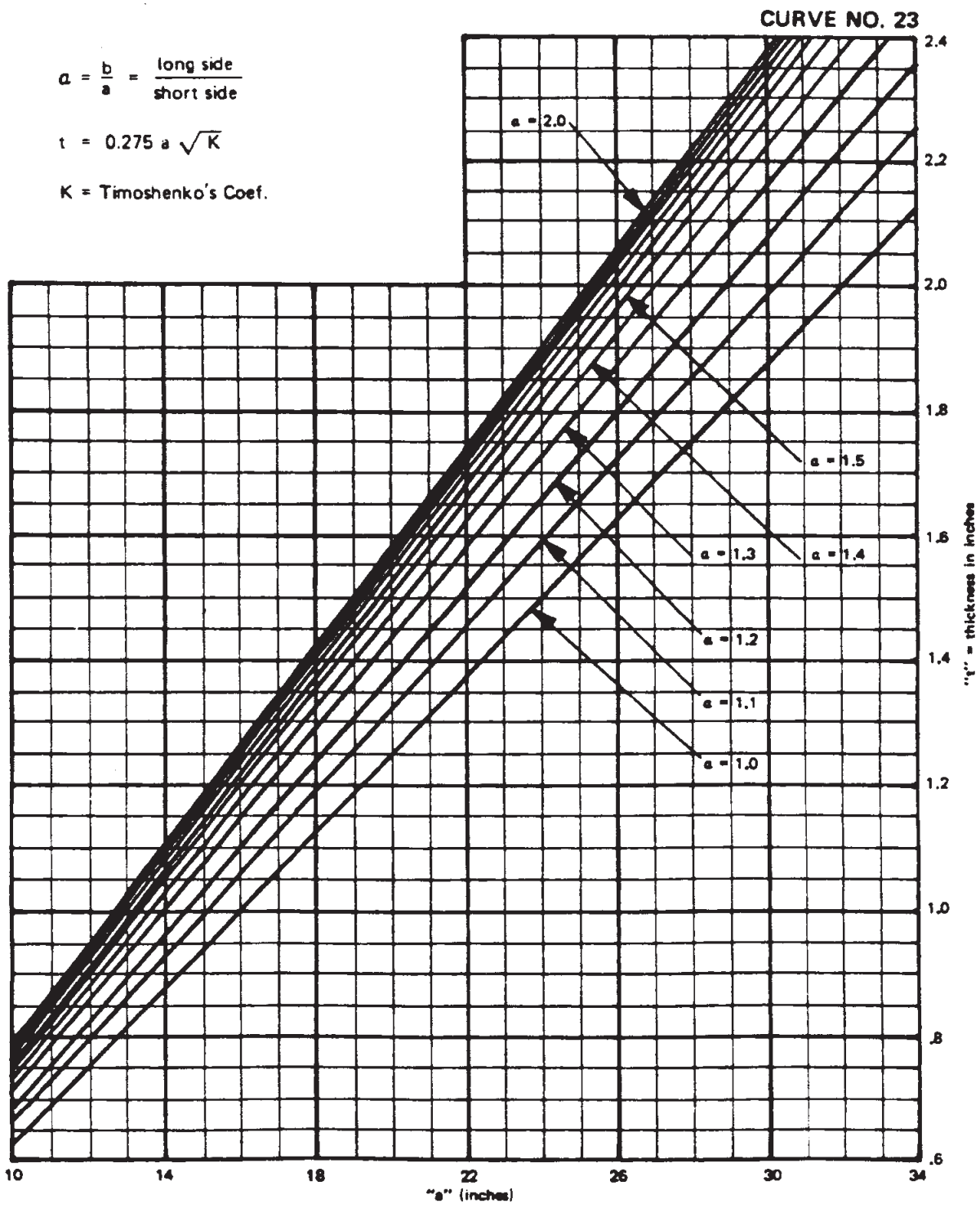

CURVE NO. 18
α = b/a = long side / short side
t = 0.240 a √K
K = Timoshenko's Coef.
α = 2.0
α = 1.5
α = 1.4
α = 1.3
α = 1.2
α = 1.1
α = 1.0
2.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

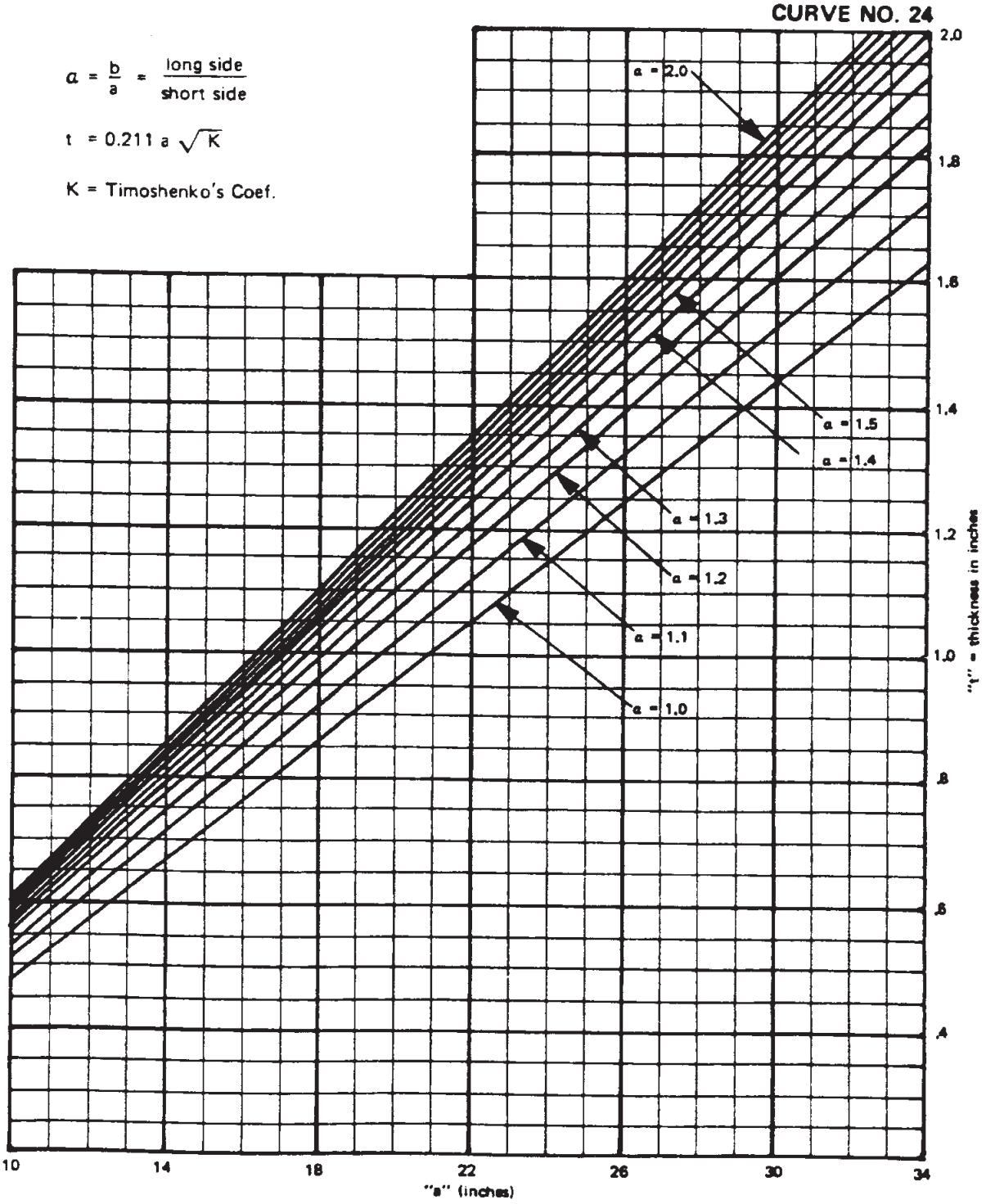

CURVE NO. 19
α = b/a = long side / short side
t = 0.272 a √K
K = Timoshenko's Coef.
α = 2.0
α = 1.5
α = 1.4
α = 1.3
α = 1.2
α = 1.1
α = 1.0
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

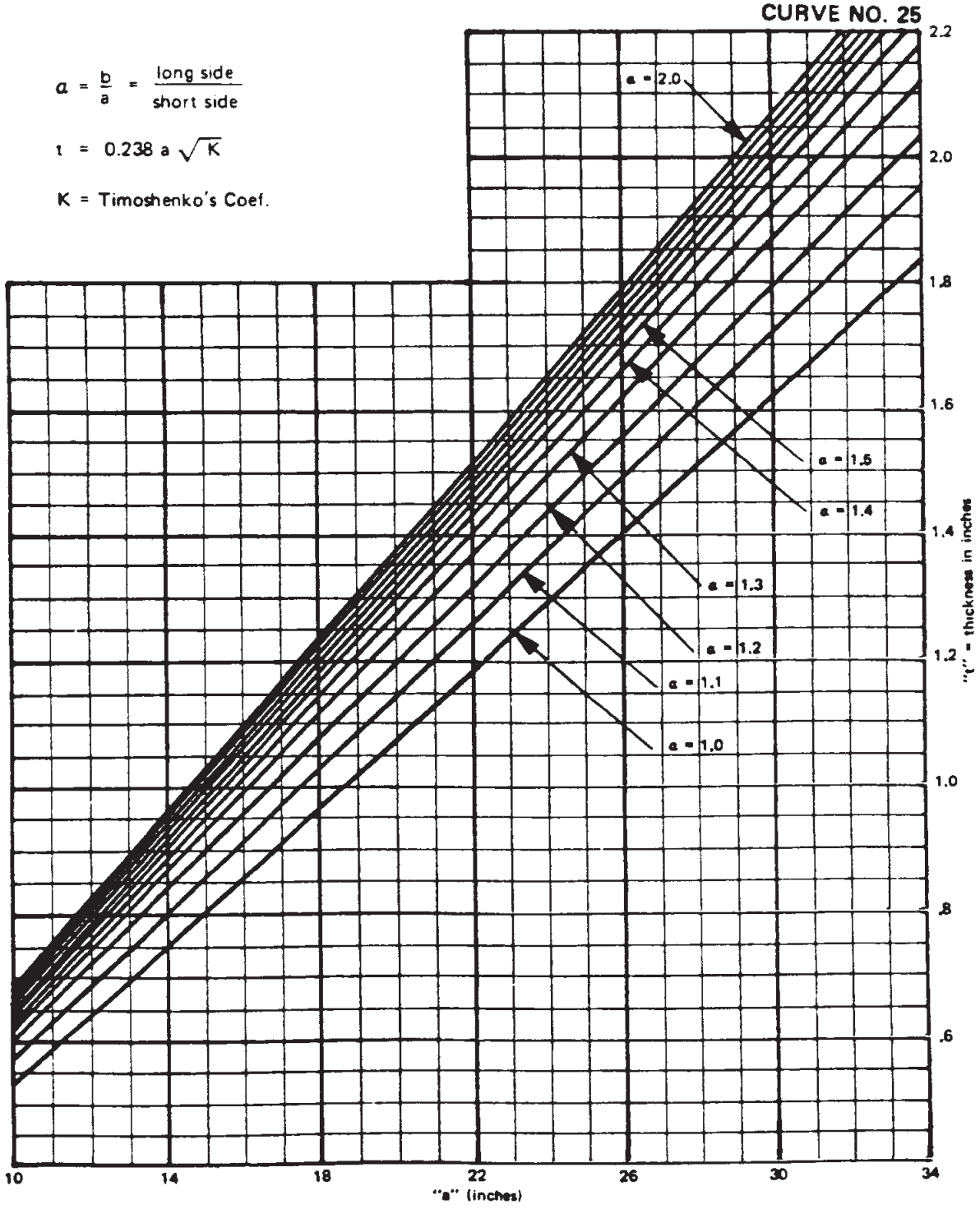

CURVE NO. 20
α = b/a = long side / short side
t = 0.208 a √K
K = Timoshenko's Coef.
α = 2.0
α = 1.5
α = 1.4
α = 1.3
α = 1.2
α = 1.1
α = 1.0
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

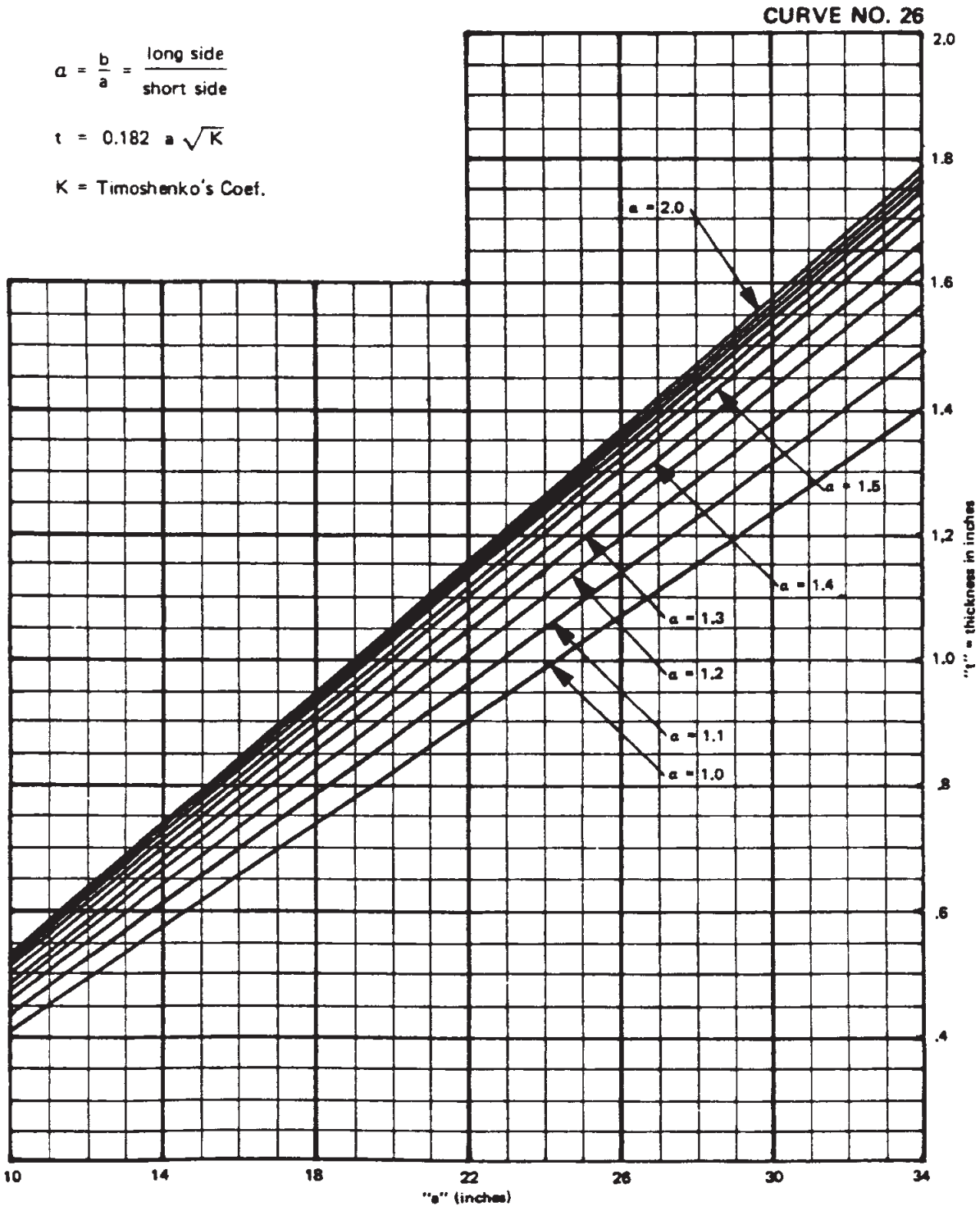

CURVE NO. 21
$\alpha = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.272\ a\ \sqrt{K}$
$K = \frac{0.125}{3 + 4\alpha^4}$
α = .1
α = .4
α = .5
α = .6
α = .7
α = .8
α = .9
α = 1.0
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

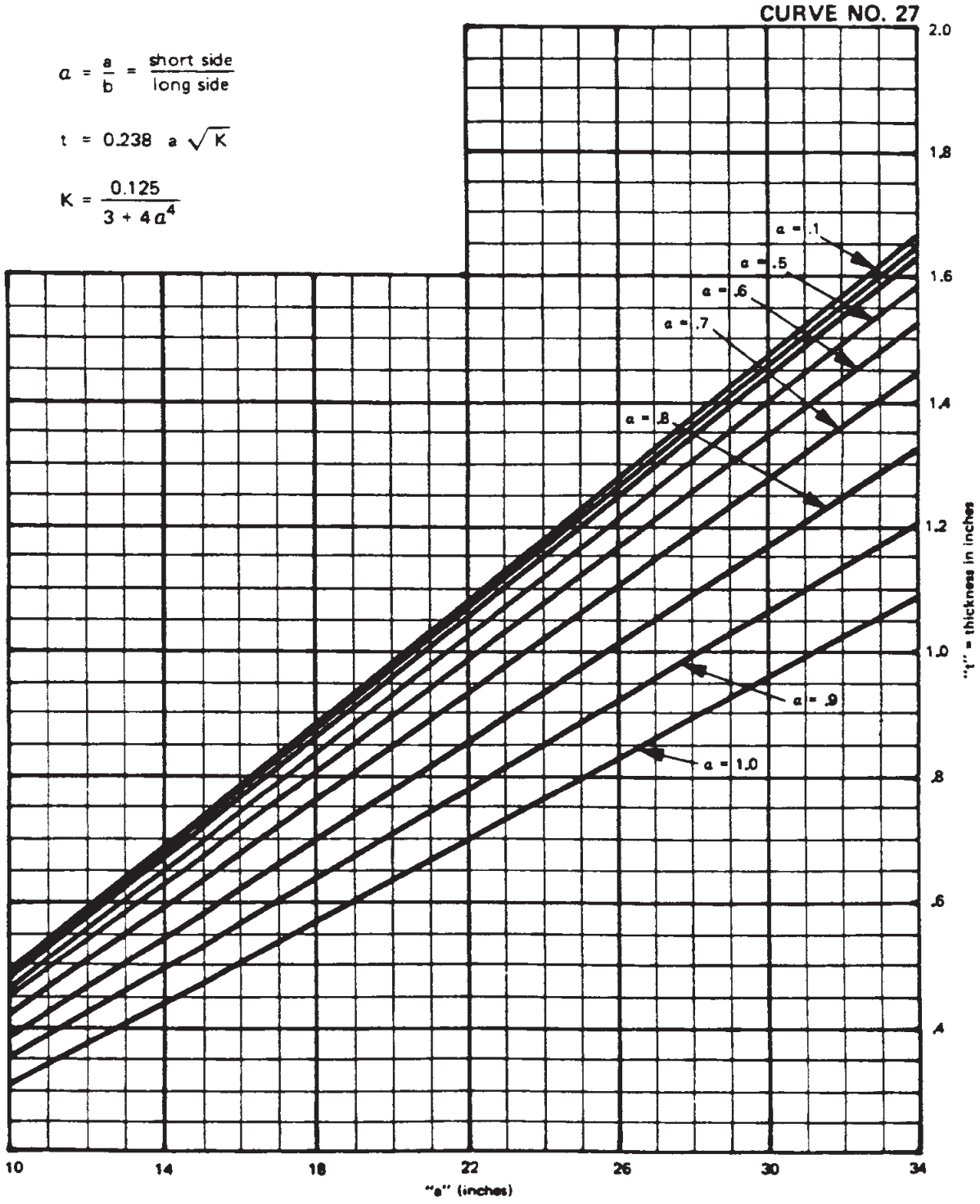

CURVE NO. 22
$\alpha = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.208\ a\ \sqrt{K}$
$K = \frac{0.125}{3 + 4\alpha^4}$
α = .1
α = .4
α = .5
α = .6
α = .7
α = .8
α = .9
α = 1.0
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)

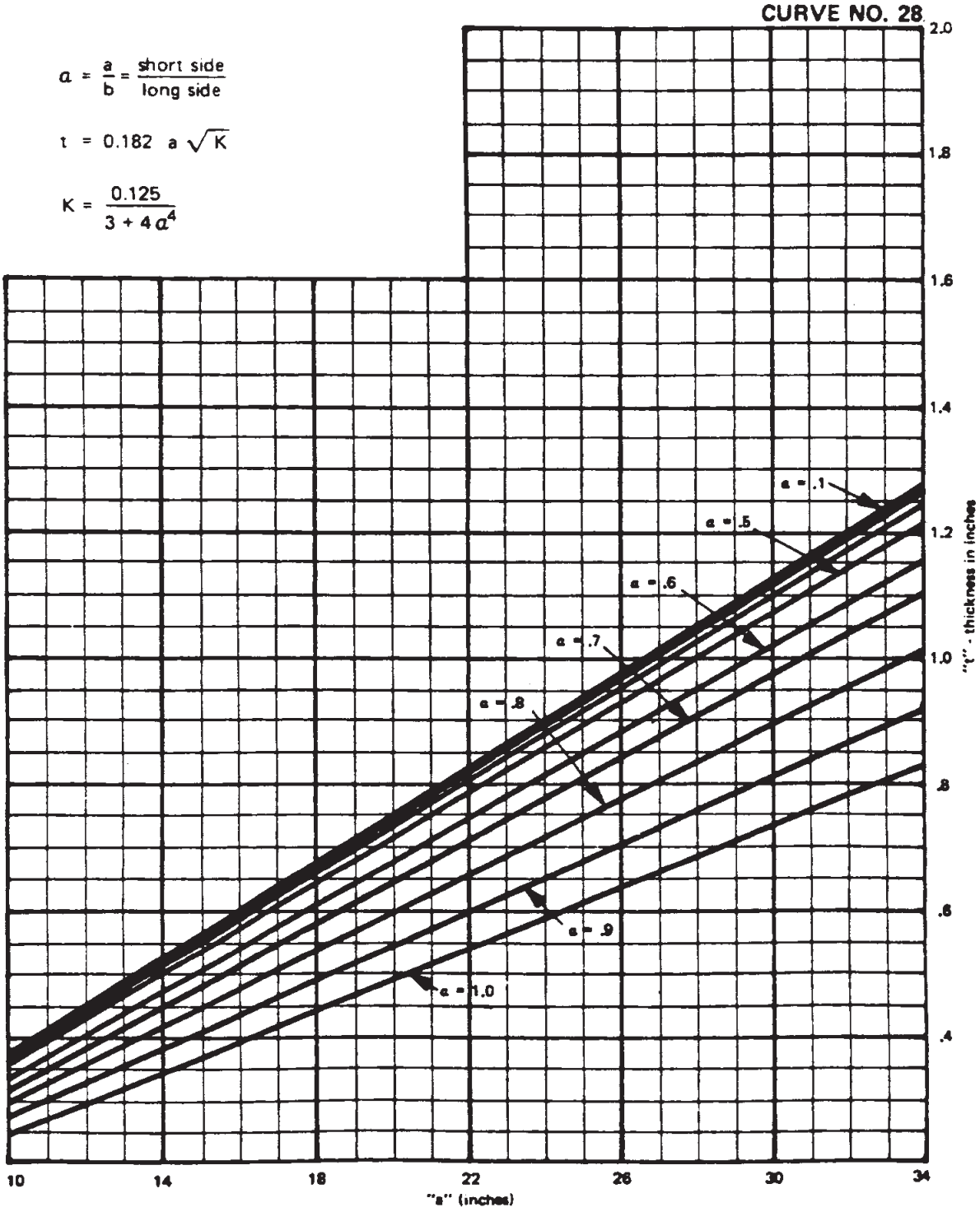

CURVE NO. 23
$\alpha = \frac{b}{a} = \frac{\text{long side}}{\text{short side}}$
$t = 0.275\, a \sqrt{K}$
K = Timoshenko's Coef.
α = 2.0
α = 1.5
α = 1.4
α = 1.3
α = 1.2
α = 1.1
α = 1.0
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)


CURVE NO. 24
$\alpha = \frac{b}{a} = \frac{\text{long side}}{\text{short side}}$
$t = 0.211\, a \sqrt{K}$
K = Timoshenko's Coef.
α = 2.0
α = 1.5
α = 1.4
α = 1.3
α = 1.2
α = 1.1
α = 1.0
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)


CURVE NO. 25
$\alpha = \frac{b}{a} = \frac{\text{long side}}{\text{short side}}$
$t = 0.238\ a\ \sqrt{K}$
K = Timoshenko's Coef.
α = 2.0
α = 1.5
α = 1.4
α = 1.3
α = 1.2
α = 1.1
α = 1.0
2.2
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)


CURVE NO. 26
$a = \frac{b}{a} = \frac{\text{long side}}{\text{short side}}$
$t = 0.182\ a\sqrt{K}$
K = Timoshenko's Coef.
a = 2.0
a = 1.5
a = 1.4
a = 1.3
a = 1.2
a = 1.1
a = 1.0
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)


CURVE NO. 27
$a = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.238\ a\sqrt{K}$
$K = \frac{0.125}{3 + 4a^4}$
a = .1
a = .5
a = .6
a = .7
a = .8
a = .9
a = 1.0
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
"t" = thickness in inches
10
14
18
22
26
30
34
"a" (inches)


CURVE NO. 28
$\alpha = \frac{a}{b} = \frac{\text{short side}}{\text{long side}}$
$t = 0.182\ a\sqrt{K}$
$K = \frac{0.125}{3 + 4\alpha^4}$
α = .1
α = .5
α = .6
α = .7
α = .8
α = .9
α = 1.0
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
"t" - thickness in inches
10
14
18
22
26
30
34
"a" (inches)

NAVSEA (USER) TECHNICAL MANUAL DEFICIENCY/EVALUATION REPORT (TMDER)

(Use this report to indicate deficiencies, user remarks and recommendations relating to the publication. Fold on dotted line, staple, and mail to NAVAL SEA DATA SUPPORT ACTIVITY.)

NAVSEA 5600/ REPORT DATE:

| 1. NAVSEA NO. | 2. VOLUME NO. | 3. TITLE (NOMENCLATURE) | | |
|---|---|---|---|---|
| 4. (TM/CHG/REV.DATE) | MICROFILM/MICROFICHE | | | |
| | 5. CART/FICHE NO. | 6. CART/FICHE DATE | 7. FRAME NO. | 8. OTHER I.D. NO. |

| 9. SYSTEM/EQUIPMENT | 10. IDENTIFICATION (MK/MOD/AN) | 11. PRIORITY |
|---|---|---|
| | | |

12. USER EVALUATION

MANUAL IS: ☐ EXCELLENT ☐ GOOD ☐ FAIR ☐ POOR ☐ COMPLETE ☐ INCOMPLETE

RELATED REMARKS:

13. ☐ PROBLEM ☐ QUESTION ☐ SUGGESTION ☐ COMMENT: (Check One)

14. RECOMMENDED CHANGE TO PUBLICATION

| PAGE NO. | PARA-GRAPH | LINE NO. | FIGURE NO. | TABLE NO. | RECOMMENDED CHANGES AND REASON (Use Blank Continuation Sheets as Required) |
|---|---|---|---|---|---|
| | | | | | |

| 15. ORIGINATOR | 16. RANK/RATE/TITLE |
|---|---|
| 17. WORK CENTER | 18. SUPERVISOR |

19. SHIP HULL NO. AND/OR STATION ADDRESS

20. NSDSA USE ONLY

| a. CONTROL NO. | b. COG ISEA | DATE | | | f. | g. | h. | i. | j. | k. NSDSA PRIORITY | l. FINAL PRIORITY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | c. REC. | d. F'D | e. DUE | | | | | | | |
| | | | | | | | | | | | |

Fold

DEPARTMENT OF THE NAVY

NAVAL SHIP WEAPON SYSTEMS
ENGINEERING STATION
PORT HUENEME, CALIFORNIA 93043

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300
11ND-NSWSES-2700/11 (8-78)

POSTAGE AND FEES PAID
DEPARTMENT OF THE NAVY
DoD-316

U.S.MAIL

COMMANDING OFFICER
NAVAL SHIP WEAPON SYSTEMS ENGINEERING STATION
NAVAL SEA DATA SUPPORT ACTIVITY
CODE 5700
PORT HUENEME, CA 93043

Fold

NAVSEA (USER) TECHNICAL MANUAL DEFICIENCY/EVALUATION REPORT (TMDER)

(Use this report to indicate deficiencies, user remarks and recommendations relating to the publication. Fold on dotted line, staple, and mail to NAVAL SEA DATA SUPPORT ACTIVITY.)

NAVSEA 5600/ REPORT DATE:

| 1. NAVSEA NO. | 2. VOLUME NO. | 3. TITLE (NOMENCLATURE) | | |
|---|---|---|---|---|
| 4. (TM/CHG/REV.DATE) | MICROFILM/MICROFICHE | | | |
| | 5. CART/FICHE NO. | 6. CART/FICHE DATE | 7. FRAME NO. | 8. OTHER I.D. NO. |

| 9. SYSTEM/EQUIPMENT | 10. IDENTIFICATION (MK/MOD/AN) | 11. PRIORITY |
|---|---|---|

12. USER EVALUATION

MANUAL IS: ☐ EXCELLENT ☐ GOOD ☐ FAIR ☐ POOR ☐ COMPLETE ☐ INCOMPLETE

RELATED REMARKS:

13. ☐ PROBLEM ☐ QUESTION ☐ SUGGESTION ☐ COMMENT: (Check One)

14. RECOMMENDED CHANGE TO PUBLICATION

| PAGE NO. | PARA-GRAPH | LINE NO. | FIGURE NO. | TABLE NO. | RECOMMENDED CHANGES AND REASON (Use Blank Continuation Sheets as Required) |
|---|---|---|---|---|---|
| | | | | | |

| 15. ORIGINATOR | 16. RANK/RATE/TITLE |
|---|---|
| 17. WORK CENTER | 18. SUPERVISOR |

19. SHIP HULL NO. AND/OR STATION ADDRESS

20. NSDSA USE ONLY

| a. CONTROL NO. | b. COG ISEA | DATE | | | f. | g. | h. | i. | j. | k. NSDSA PRIORITY | l. FINAL PRIORITY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | c. REC. | d. FWD | e. DUE | | | | | | | |
| | | | | | | | | | | | |