

SEALTH PROCESS SPECIFICATION

SPS-510
WORKMANSHIP
(MANUFACTURING)

First Issue: APR 27/15
Revision C

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1. PURPOSE

Workmanship: “The quality imparted to an item in the process of being made”; or, “The art or skill of a workman”.

The purpose of this specification is to attempt, as best as possible, to define and explain the “Standards” or “Minimum Requirements” necessary to produce items by and for Sealth Aero Marine.

2. SCOPE

This specification is applicable to all items produced by and for Sealth Aero Marine, and is to be considered a part of each Engineering Drawing, Purchase Order and Work Order.

Where specific dimensional or finish criteria are listed on a Drawing or Purchase Order, that characteristic shall take precedence over the criteria in this specification.

The criteria listed in this specification apply to all “end user” visible areas of a part and areas where other “mating” parts interact or function with the part being reviewed.

3. RESPONSIBILITIES

Employees and Inspectors performing work by and for Sealth Aero Marine are responsible for verifying that their work meets the requirements established by this specification.

Sealth Aero Marine supervisory and Inspection personnel are required to be familiar with the requirements of this specification and are required to assure that all work leaving their areas of responsibility comply with the requirements within.

4. APPLICABLE DOCUMENTS

QP 7.1.3	SAM Configuration Management Procedure
QP 7.4.1	SAM Supplier Quality Requirements
QP 7.5.1	SAM Product Realization Procedure
QP 7.5.1.1	SAM First Article Inspection Procedure
QP 8.2.4	SAM Inspection Procedure

5. **DEFINITIONS & ACRONYMS**

For the purpose of this Specification, the definitions in the referenced documents shall apply

6. **NOTE**

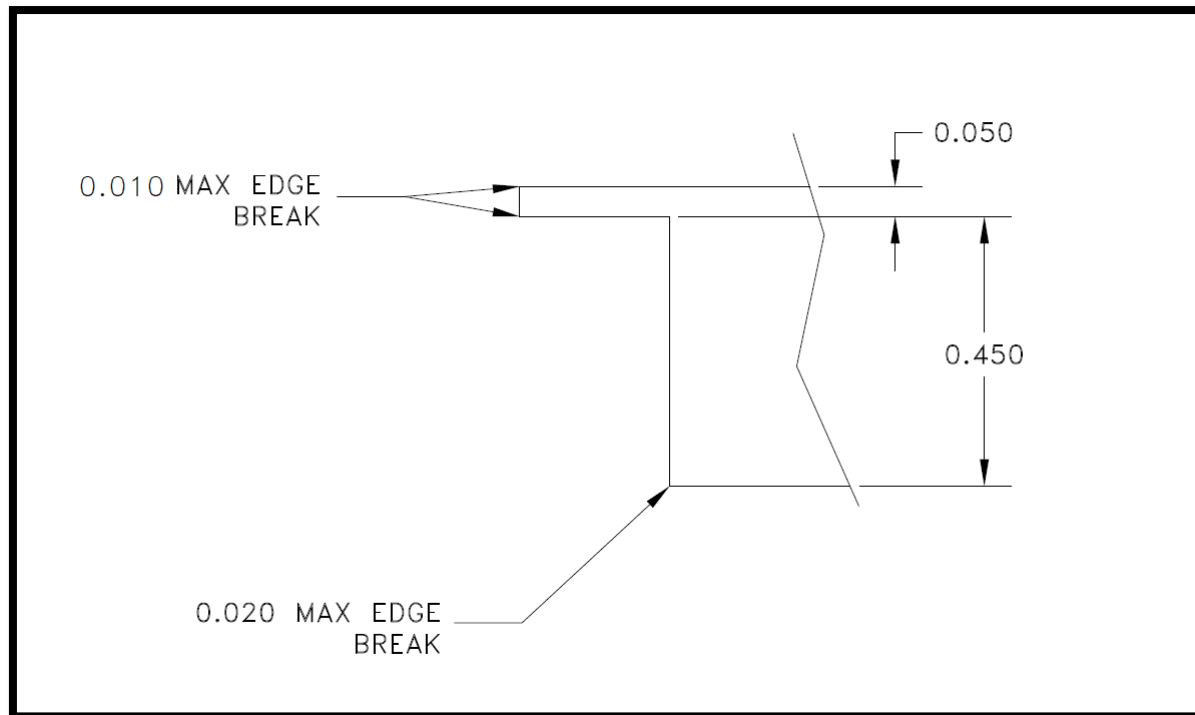
This release contains workmanship or manufacturing standards for Sealth Aero Marine hardware. This document may be expanded to include all applicable requirements as they are required.

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7. GENERAL MANUFACTURING

7.1 Breaking Sharp Edges

Unless otherwise stated on the drawing, the standard to which sharp edges must be broken is from 0.005 to 0.020 inch or no greater than 1/5 the intersecting surfaces widths. Any method may be used to break such edges, provided a radius or a flat without sharp corners is produced within the tolerance given.



A sharp-cornered flat or a concave radius at the edge is not acceptable. If a sharp corner is required, the drawing will so specify. Dimensions to intersecting surfaces shall be made before breaking or shall be measured to the intersections, which existed before breaking. On sheet metal parts of 1/32 inch (0.03125) thickness or less, the breaking of edges is not mandatory; however, such edges shall be free from burrs. The breaking of edges does not apply to elastomers such as rubber and soft plastics.

A “broken edge” will be smoothed to the extent that finger nails will slide over the edges without getting stuck or caught, and hands or fingers will not be cut. Electrical wires, mating parts or clothes will not score or fray in any way if in contact with the edge.

7.2 Dimensions of Finished Parts

Unless otherwise specified, all dimensions on detail components shall be measured prior to all finishing operations. Processes such as heat-treating, stress relieving, aging and passivation are not considered “finishes” for this purpose.

Since the end product may be either finished or unfinished, processed such as plating, painting, dry-lube, sand blasting, graining and buffing shall be performed following the final dimensional inspection. If these operations are required to maintain dimensional stability, this shall be specified on the drawing.

NOTE: Any product that receives an abrasive cosmetic finish such as graining or buffing, machine all cosmetic surfaces (typically flange thickness, countersink diameters, overall diameters) to the higher end of the tolerance to allow for material removal.

7.3 Blending Surfaces

Connecting curved surfaces or curved and plain surfaces shown as a tangent must blend smoothly (See 7.4). Attention is drawn to any drawing radius dimension and tolerance call-out which are required to be maintained.

7.4 Mismatch of Machined Surfaces

When two or more machining cuts are required to produce a surface delineated on the drawing as being a theoretical single surface, the maximum misalignment between intersecting or adjacent surfaces shall not exceed 24 times the largest surface texture value specified for the features. Surfaces shall also fall within the tolerance of size or form for the features. See Table

Specified Ra (micro-inches)	Maximum Mismatch (inches)
8	0.0002
16	0.0004
32	0.0008
63	0.0016
125	0.003
250	0.006
500	0.013

7.5 Surface Finish and Roughness

Sealth Aero Marine produces decorative, interior parts. The surface roughness and finish are of the utmost importance. Unless otherwise specified, the following table shall be used for surface roughness and finish minimum requirements.

Surface Type	Roughness Height, Maximum Ra (in micro inches)
When specified for plated parts, on the cosmetic surfaces	32
Surface/Stitch Milled, shaped splines, rolled serrations, reamed holes	63
Spot face or counter bore flats, broached splines or holes, countersinks	125
Finished turned surfaces, milled surfaces, drilled holes of 1/4inch diameter or less	125
Machined surfaces not listed above or otherwise limited by drawing notes (this is not applicable to pierced or sheared surfaces)	125

7.6 Materials

The final product shall incorporate the materials specified on the drawing and modified by any specific process, such as heat treatment, anodizing, plating, etc...., as applicable.

Note: A36 steel is interchangeable with the steel series designated AISI 1018 to AISI 1025.

7.7 Radii

Unless otherwise specified on the drawing, radii are to be full and tangent to intersecting geometry. Unless surface finishes are designated on small radii or changes in contour, the finish is to be equivalent to the lowest Ra or surface finish required on adjoining surfaces

7.8 Cleanliness

7.8.1 General Cleanliness

Parts for which no cleaning specification is specified on the drawing shall be sufficiently cleaned to be used for the application intended. Such parts shall be free of cutting oil, dirt, chips, and scale. Particular attention shall be given to parts having threads, recesses, or cavities, to ensure that these areas are clean and free from burrs.

7.8.2 Surface Cleanliness

The surface of material of parts that are subjected to heat treatment, welding, or both, shall be clean and free of markings from lead pencils, wax crayons, grease pencils, carbon, and other foreign substances.

8. HOLES

8.1 Blind Holes

Unless otherwise specified on the drawing, the depth of blind holes is the depth of the full diameter, including spotfaces. Standard drill points for blind holes are 135°, and where permitted 118° drill points can be used. Blind holes that require flat bottoms will be annotated on the drawing.

8.2 Countersunk Holes

Unless otherwise specified on the drawing, countersink diameters will take precedence over hole diameters on thin features where both conditions cannot be met. Holes made oversized by the countersink shall be deburred or a drilled oversized to leave an apparent flat, (approximately 0.002 to 0.005).

8.3 Counter bored Holes

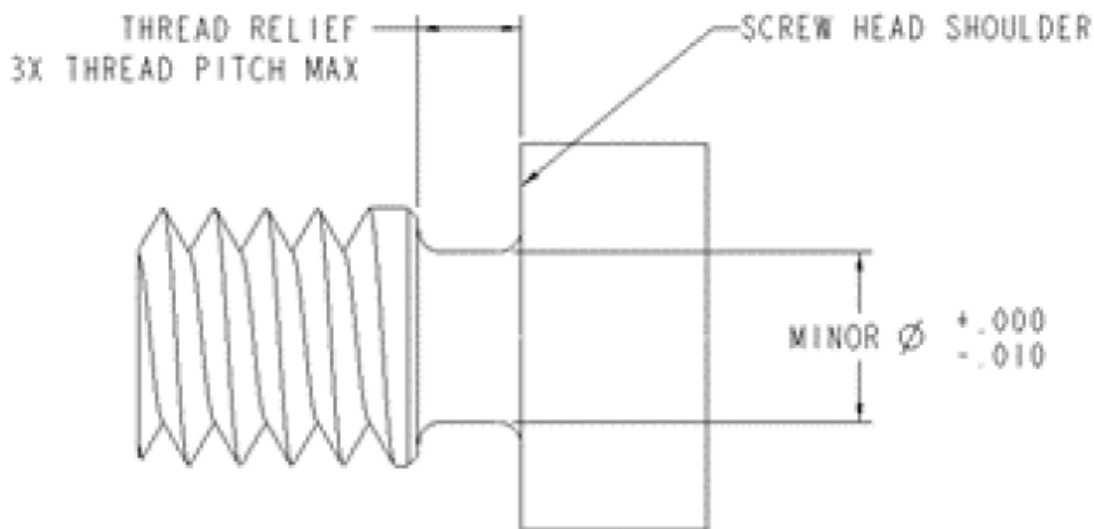
Unless otherwise specified on the drawing, counter bore depths will be determined from the same plane that the holes originate from. Counter bores should be concentric to their corresponding holes within 0.003 inch.

9. THREADS

9.1 Thread Length

The thread length dimensions indicated on the drawing are the gauging length or the length of thread having full form. Three perfect or imperfect threads are allowable beyond such limit for lead of tap where hole depth permits.

A drawing delineating full threads to the screw head shoulder, with no relief depicted or defined in accordance with a space specification, shall be manufactured so that the gage will thread tightly to the shoulder without interference. A thread relief shall be permitted so that the gage will thread tightly to the shoulder without interference. Thread reliefs shall not exceed 3x the pitch and no deeper than the minor diameter of the threads.



9.2 Chamfers for Internal Thread Ends

Unless otherwise specified on the drawing, a chamfer with an included angle of 80 to 120 degrees shall be used at internal thread start. The minimum diameter of the chamfer shall be the major diameter of the thread. The maximum diameter of the chamfer shall be the major diameter of the thread plus 0.020 inch.

9.3 Chamfers for External Thread Ends

Chamfers shall be provided at the ends of externally threaded parts. The chamfer shall extend to the minor diameter of the thread. The angle of the chamfer shall be $45 \pm 3^\circ$. The minimum length of the chamfer shall be the height of the external thread.

10. 3D MODELS

Unless specified on the drawing, 3D CAD files supplied by SAM are to be used as reference only aid in manufacturing. When part geometry is defined by the 3D file, all geometry shall be basic and held to the three decimal tolerance found on the drawing. Dimensions featured on the drawing take precedence over the 3D files. The revision of the drawing and the 3D file shall be the same.

