MIL—S—13165B

AMENDMENT-2
25 June 1979
SUPERSEDING
AMENDMENT-1
15 October 1976

MILITARY SPECIFICATION

SHOT PEENING OF METAL PARTS

AMENDMENT-2
25 June 1979
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15 October 1976

MIL-S-13165B
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26 March 1956

MILITARY SPECIFICATION

SHOT PEENING OF METAL PARTS

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers procedure requirements for shot peening of metal parts, to induce residual compressive stresses in specified surfaces, for the purpose of increasing the fatigue strength and resistance to stress corrosion cracking (see 6.1).

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL

QQ-W-423 - Wire, Steel, Corrosion Resisting
RR-S-366 - Sieves, Standard for Testing Purposes

MILITARY

MIL-S-851 - Steel Grit, and Cut Wire Shot; and Iron Grit and Shot Blast Cleaning and Peening

MIL-S-5002 - Surface Treatments and Metallic Coatings for Metal Surfaces of Weapons Systems

MIL-A-9954 - Abrasive; Glass Beads

STANDARDS

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

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

3. MATERIALS AND EQUIPMENT

3.1 Shot.

3.1.1 Type. The shot used shall be made from cast iron, cast steel cut steel wire or glass as specified or approved. Steel and iron shot shall conform to MIL-S-851. Glass beads shall conform to MIL-A-9954 except for sieve analysis. Stainless steel cut wire material shall conform to QQ-W-423, composition 304, annealed (condition A).

3.1.2 Size. Unless otherwise specified, the nominal size of shot charged into the machine shall be at the option of the contractor and shall be as specified in table I (cast sizes), table II (cut wire sizes), or table III (glass bead sizes) as applicable (see 4.2.2.2 and 4.2.2.3).

Table I. Cast shot numbers and screening tolerances

Peening Shot	All pass U.S. screen size	Max. 2% on U.S. screen	Max. 50% on U.S. screen	Cumulative min. 90% on U.S. screen	Max. 8% on U.S. screen	Max. number of deformed shot acceptable
930	5 (.157)	6 (.1320)	7 (.1110)	8 (.0937)	10 (.0787)	5 per area 1 inch square
780	6 (.132)	7 (.1110)	8 (.0937)	10 (.0787)	12 (.0661)	5 per area 1 inch square
660	7 (.111)	8 (.0937)	10 (.0787)	12 (.0661)	14 (.0555)	12 per area 1 inch square
550	8 (.0937)	10 (.0787)	12 (.0661)	14 (.0555)	16 (.0469)	12 per area 1 inch square
460	10 (.0787)	12 (.0661)	14 (.0555)	16 (.0469)	18 (.0394)	15 per area 1 inch square
390	12 (.0661)	14 (.0555)	16 (.0469)	18 (.0394)	20 (.0331)	20 per area 1 inch square
330	14 (.0555)	16 (.0469)	18 (.0394)	20 (.0331)	25 (.0280)	20 per area 1/2 inch square
280	16 (.0469)	18 (.0394)	20 (.0331)	25 (.0280)	30 (.0232)	20 per area 1/2 inch square
230	18 (.0394)	20 (.0331)	25 (.0280)	30 (.0232)	35 (.0197)	20 per area 1/2 inch square
190	20 (.0331)	25 (.0280)	30 (.0232)	35 (.0197)	40 (.0165)	20 per area 1/2 inch square
170	25 (.0280)	30 (.0232)	35 (.0197)	40 (.0165)	45 (.0138)	20 per area 1/2 inch square
130	30 (.0232)	35 (.0197)	40 (.0165)	45 (.0138)	50 (.0117)	30 per area 1/4 inch square
110	35 (.0197)	40 (.0165)	45 (.0138)	50 (.0117)	80 (.0070)	40 per area 1/4 inch square
70	40 (.0165)	45 (.0138)	50 (.0117)	80 (.0070)	120 (.0049)	40 per area 1/4 inch square

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Table II. Cut steel wire shot size classification

Shot No.	Wire diameter, inches	Length of ten pieces, inches[1/]	Weight of fifty pieces, grams[2/]
CW-62	.0625 ± .002	.620 ± .040	1.09 to 1.33
CW-54	.054 ± .002	.540 ± .040	.72 to .88
CW-47	.047 ± .002	.470 ± .040	.48 to .58
CW-41	.041 ± .002	.410 ± .040	.31 to .39
CW-35	.035 ± .001	.350 ± .030	.20 to .24
CW-32	.032 ± .001	.320 ± .030	.14 to .18
CW-28	.028 ± .001	.280 ± .030	.10 to .12
CW-23	.023 ± .001	.230 ± .020	.05 to .07
CW-20	.020 ± .001	.200 ± .020	.04 to .05

1/ Shot particles to be checked for length shall be mounted and ground and polished to expose a central longitudinal section. The combined length of ten random particles shall be within the tolerances shown in table II above.

2/ At the option of the contractor the particles may be weighed instead of mounted and measured as stated in note (1) above. When weighed, the total weight of fifty randomly selected particles shall be within the limits specified in table II above.

Table III. Glass bead sizes

Nominal glass bead size	100% shall pass sieve 1/	98% shall pass sieve 1/	Max 8% shall pass sieve 1/	0% shall pass sieve 1/
331	18	20	30	35
280	20	25	35	40
232	25	30	40	45
197	30	35	45	50
165	35	40	50	60
138	40	45	60	70
117	45	50	70	80
98	50	60	80	100
83	60	70	100	120
70	70	80	120	140
59	80	100	140	170
49	100	120	170	200
41	120	140	200	230
35	140	170	230	270
29	170	200	270	325
24	200	230	325	400

1/ Sieves specified in RR-S-366

3.1.3 Uniformity. The shot or beads shall be free from sharp edges and broken pieces (see 5.2.1, 5.2.3 and table I). Cut wire shot, if used, shall be preused or otherwise conditioned to eliminate sharp edges.

3.2 Equipment. The machine used for shot peening shall provide means for propelling shot by air pressure or centrifugal force against the work, and mechanical means for moving the work through the shot stream in either translation or rotation, or both, as required. The machine shall be capable of reproducing consistently the shot peening intensities required. Except for wet glass bead peening (see 4.2.2.4) the equipment shall include a separator for continuous removal of broken or defective shot during peening.

4. PROCEDURE

4.1 Preparation.

4.1.1 Dimensions and condition of parts. Areas of parts to be shot peened shall be within dimensional requirements before peening. Except as otherwise permitted (see 4.3.2.1) all heat treatment, machining and grinding shall be completed before shot peening.

4.1.1.1 Except as otherwise specified or permitted, all areas to be peened shall be cleaned in accordance with MIL-S-5002. Procedures for stripping coatings shall be as specified or approved in the contract or on the applicable drawings.

4.1.2 Masking. Areas of the part or work piece which are designated in the contract or applicable drawing to be free from any shot peening marks shall be suitably masked or otherwise handled to protect such surfaces from the blast stream or subsequent damage. When it is impractical to mask or otherwise protect areas designated to be free from shot peening marks sufficient stock may be provided in these areas for subsequent removal of affected material for compliance with dimensional requirements of the applicable drawing. Areas not requiring peening and not required to be masked shall be considered optional.

4.1.3 Magnetic particle or penetrant inspection. Except as otherwise specified when magnetic particle or dye penetrant inspection is required, parts shall be subjected to such inspection before peening.

4.1.4 Unless otherwise specified or permitted parts shall be free from externally applied loads or forces during shot peening.

4.2 Shot peening procedures.

4.2.1 Peening intensity. Unless otherwise specified on the drawing or in the contract, the intensity value of the blast of peening used on the part shall be as specified in table IV for the thickness involved.

Table IV. Shot peening intensity

Material[1]	Steel under 200,000 psi	Steel over 200,000 psi and titanium	Aluminum alloys (stainless steel shot)	Aluminum alloys (glass beads)
Under .090 inch thickness	-	-	-	.004 to .008 N
.090 to .375 inch thickness	.008 to .012 A[2]	.006 to .010 A	.006 to .010 A	.008 to .012 N
Over .375 inch thickness	.012 to .016 A[3]	.006 to .010 A	.010 to .014 A	.012 to .016 N

[1] Magnesium alloys response to shot peening is different from the response of other materials. It is essential to avoid broken or deformed peening material. Peening must be done with materials and under conditions which do not induce cracks.

[2] The suffix letter A indicates that the values have been determined by the use of test strip A (see fig. 1).

[3] Test strip A is used for arc heights up to 0.024A. For greater peening intensity test strip C should be used. Test strip N is used if the intensity is less than 0.004A (see fig. 2 and 3).

4.2.2 Coverage. Areas of parts shot peened in compliance with design information shall be peened to complete visual coverage (see 5.3.1, 6.10 and 6.11) except that when a surface on which peening is required is obstructed and it is impossible to obtain complete visual coverage, the amount of visual coverage shall be as specified on the drawing or in the contract. Full coverage will not be required if the part is peened only for forming or straightening.

4.2.2.1 Unless otherwise specified, the variation in boundaries of areas to be peened, when limited, shall be -0 to + 1/8 inch.

4.2.2.2 Fillets and shielded areas. Unless otherwise specified the nominal size of shot used on fillet surfaces shall not be greater than one-half the fillet radius. For slots or other apertures, through which shot must pass to peen shielded critical areas, the nominal shot diameter shall not be greater than 1/4 the diameter or width of such aperture.

4.2.2.3 Except as otherwise specified or permitted, such as when shield areas are involved, nonferrous materials shall not be peened with shot smaller than the following for the intensities given:

Intensity	Shot size
.012A	S-280 or CW28
.016A	S-390 or CW41
.020A	S-550 or CW54

4.2.2.4 Shot maintenance. Metallic shot shall be maintained in the machine so that not more than 20% of the particles, by weight, shall pass through the screen size specified in table V for the shot size used. Glass beads shall be checked at least every two hours of operation to assure that not more than 15% of the beads are broken. When wet glass peening is used, the entire slurry charge shall be changed at frequent intervals for compliance with this requirement.

Table V. Uniformity of shot in machine

Cast shot sizes	Cut wire sizes	Maximum 20% passing U.S. standard screen size
780	-	18 (.0394)
660	CW62	20 (.0331)
550	CW54	25 (.028)
460	CW47	30 (.0232)
390	CW41	35 (.0197)
330	CW35	40 (.0165)
-	CW32	40 (.0165)
-	CW28	45 (.0138)
230	CW23	50 (.0117)
170	CW20	70 (.0083)
110	-	120 (.0049)
70	-	170 (.0035)

4.3 Post treatments.

4.3.1 No manufacturing operations which relieve stresses developed by peening or which develop detrimental residual stresses shall be permitted after shot peening. When peened parts are heated after shot peening as for baking of paint or protective coatings, embrittlement relief after electroplating or other thermal treatment the temperatures employed shall be limited as follows (see 6.13):

Material	Temperature
Steel parts	475°F maximum
Aluminum alloy parts	200°F maximum
Magnesium alloy parts	200°F maximum
Titanium alloy parts	800°F maximum

4.3.2 After shot peening and removal of protecting masks, all shot and shot fragments shall be removed from surfaces of articles. Only methods which will not erode or scratch surfaces shall be used.

4.3.2.1 It is permissible to improve the surface finish after peening by polishing, lapping, honing or blasting providing the applicable temperature limitations are not exceeded and material removal is less than 10% of the "A" intensity arc height (for example, up to 0.0007 inches may be removed from a part peened to 0.007A).

4.3.2.2 Aluminum alloy parts which have been shot peened shall be cleaned by either an approved cleaning solution or by glass bead blasting to remove all iron contaminants. Glass bead blasting shall be controlled for compliance with 4.3.2.1.

4.3.3 Protection from corrosion. Shot peened parts shall be protected from corrosion during processing and until final coating or packaging is completed. The method of protection shall be as specified or approved in the contract or order.

5. QUALITY CONTROL

5.1 Shot peening intensity.

5.1.1 Sampling. At least one intensity determination as defined in 5.1.3 shall be made to represent each machine for each two hours of continuous operation or fraction thereof where cast iron shot or glass beads are used, and for each eight hours of continuous operation or fraction thereof where cast steel or cut steel wire shot is used. In all cases, at least one determination shall be made at the beginning and one at the end of each period of operation.

5.1.2 Test specimens. Two test specimens conforming in dimensions and mechanical properties to figures 1, 2 or 3 shall be used for each intensity determination.

5.1.3 Test procedure. The test specimens selected in accordance with 5.1.1 shall be attached as shown in figure 5, to holders of the form and dimensions shown in figure 4, and mounted on a fixture or article and exposed to the blast stream in a manner and for a time which simulates conditions used for the articles. After exposure the test strips shall be removed from the holders and the amount of deflection measured with a micrometer gage, of the form and dimensions shown in figure 6, and the values compared with the requirements of 4.2.1. In using the micrometer

gage the central portion of the unpeened side of the test strip shall be placed against the indicator stem of the gage. A peened test strip shall not be re-peened after being removed from the test strip holder.

5.1.4 Test specimens shall accompany peened parts, and be inspected along with the appropriate lot. The following information shall be recorded for each specimen:

(a) Lot number and other production control numbers
(b) Part number
(c) Number of parts in lot
(d) Date peened
(e) Shot peening machine used and machine settings
(f) Specified peening intensity and actual peening intensity
(g) Shot size and time length of exposure to shot blast
(h) Percent coverage

This information will be kept on file for the period of the contract.

5.2 Shot size and uniformity.

5.2.1 Sampling. At least one determination for shot size and uniformity shall be made in accordance with 4.2.2.4 for each 2 hours of continuous operation where cast iron shot is used, and for each eight hours of continuous operation or fraction thereof where cast steel or cut steel wire shot is used. In all cases, at least one determination shall be made at the beginning and one at the end of each period of operation. Where cut wire shot is used, it shall be inspected for absence of sharp edges (see 3.1.3).

5.2.2 Test procedure. Tests for shot size and uniformity for compliance with the requirements of 3.1 shall be made using sieves conforming to Specification FF-S-366.

5.2.3 Visual examination. Samples of shot for visual examination shall consist of the number of shot in one layer which completely fills an area of 1, 1/2, or 1/4 square inch as applicable. Acceptable and unacceptable shapes are shown in figure 7.

5.3 Inspection of shot peened articles.

5.3.1 Shot peened coverage. Articles shall be visually inspected for compliance with the coverage requirements of 4.2.2. Surfaces of articles shall be bare or coated with light transparent oil.

5.3.2 Inspection lot. Lots shall be formed by the inspector provided that not more than the output of one machine during one 8-hour work period may be included in a lot.

5.3.3 Sampling. Samples shall be selected in accordance with MIL-STD-105, at inspection level III.

5.3.4 Quality level. Unless otherwise specified, acceptance and rejection of lots shall be in accordance with A.Q.L. 1.5 percent defective.

6. NOTES

6.1 Intended use. Shot peening is intended to reduce surface tensile stresses in metal parts which are subjected to repeated applications of complex load patterns such as axles, springs (helical, torsional and leaf), gears, shafting, aircraft alighting gear and structural parts etc., for the purpose of improving resistance to fatigue and stress corrosion cracking. Shot peening is also used for applications such as to close porosity in castings, and to straighten or form applicable parts. Glass bead peening, either wet or dry, is used when a very shallow compressive layer is required or when iron contamination of non-ferrous parts or surface finish are particularly important. Shot peening may be followed by glass bead peening to improve the surface finish and to eliminate iron contamination on non-ferrous parts.

6.2 Ordering data. The following shall be as specified or approved in the contract or in the applicable drawings:

(a) The type of shot to be used (see 3.1.1 and 4.2.2.3).

(b) Shot size, if particular size required (see 3.1.2 and 6.8).

(c) Methods for cleaning surfaces if other than in 4.1.1.1 and methods for stripping coatings, if applicable (see 6.12).

(d) Designation of locations to be peened, or locations to be free from peening as applicable (see 4.1.2).

(e) If magnetic particle or fluorescent inspection is required on peened parts (see 4.1.3).

(f) If externally applied forces are permissible during peening (see 4.1.4).

(g) Intensity requirements if other than 4.2.1.

(h) Requirements for coverage or shot size limitations in obstructed areas, boundaries and other peening operations (see 4.2.2 through 4.2.2.3).

(i) Cleaning solutions for peened parts, if applicable (see 4.3.2.2).

(j) Method of protecting shot peened parts from corrosion (see 4.3.3).

6.3 Shot peening, to have the desired effect, requires that the specified intensity and coverage be achieved on critical areas, where high tension stresses or stress ranges are most likely to cause fatigue or stress corrosion failures in service. Actual experience with service failures or fatigue tests may sometimes be required to discover or confirm the location of such areas subjected to critical stressing, as a result of any combination of service, design, and manufacturing conditions.

6.4 Shielded or partially shielded areas, walls of deep recesses, or other areas less accessible to the maximum effect of the blast stream will receive less peening as to intensity and coverage than more exposed or more favorably oriented areas.

6.5 The peening of very thin or small sections to high intensities should be avoided because of the distortion and high residual tensile stresses in the core material that may result from such peening. This is particularly true where the part has surfaces finished after heat treatment, or is used as a tension member.

6.6 Where special procedure is required, applicable drawings or contract must definitely designate such critical areas referred to in 6.3 as required by section 3. This is particularly important in instances referred to in 6.4 where such less accessible and unfavorably oriented surfaces are, or contain, areas subjected to critical stressing.

6.7 Relatively simple shapes and many open-pitched helical spring designs may not require special mention as to critical areas since such areas are generally accessible for full peening effect when uniformly exposed to the blast stream.

6.8 Shot size selection. In selecting shot sizes consideration should be given to the following factors:

(a) Shape of parts
(b) Size of fillets or scratches (small shot to get into small fillets, etc.)
(c) Intensity desired (The size of shot limits the intensity which can be obtained in a given peening machine. Therefore, it may be necessary to use a larger shot to obtain a high intensity or to reduce intensity requirements when shot must be small for consideration (b)).
(d) Finish (at equal intensities large shot will produce a finer finish, however, the time required for coverage increases rapidly with shot size).

(e) Abrasive effect
(f) Coverage is achieved faster with small shot
(g) Small shot should not be used in high intensity on aluminum.

6.9 Intensity comparisons. For comparisons of the nominal intensity designations, type C test specimen deflection may be multiplied by 3.5 to obtain the approximate deflection of a type A specimen when shot peened with the same intensity. Test strip "A" is ordinarily used for arc heights up to 0.024 inch; for greater degrees of peening, test strip C is used. For intensities below .004A the type "N" test specimen should be used. For comparison of the nominal intensity designations, type "A" test specimen deflection may be multiplied by three to obtain the approximate deflection of a type "N" specimen when shot peened at the same intensity (see figures 1, 2, and 3).

6.10 Complete visual coverage is defined as uniform denting or obliterating of the original surface of the part or work piece as determined by either of the following methods:

(a) Visual examination using a ten power magnifying glass.

(b) Dyescan tracer liquid used in the Peenscan process described as follows:

Prepare a control specimen of the same material as the actual work piece. Coat this control specimen with tracer liquid called Dyescan #220 and/or #226 by dipping, spraying, or painting and allow the Dyescan liquid to dry. Check coating under a black light to insure complete coverage of the coated area to be shot peened has been accomplished. Shot peen control specimen under proper shot peening conditions for the required intensity and coverage as prescribed. Re-examine under the black light in order to determine if the Dyescan liquid has been completely removed. Full coverage is indicated by complete removal of the Dyescan liquid.

Areas which do not produce full coverage will show a white color under the black light whereas full coverage will give off a dark color.

Coverage of actual production pieces can be established by using the same procedure used for control specimens. This can be done by utilizing the Dyescan liquid for each part or on a statistical sampling basis.

6.11 Coverage. Full coverage can be established by plotting a saturation intensity curve, as shown in figure 8, and assuring that the correct intensity (determined by the arc height of the test strip) falls on the right side of the knee of the curve. By doubling the time of exposure, the arc height of a test strip should not increase by more than 10%.

6.12 Procedures for stripping of anodic coatings from aluminum and magnesium alloys are given in MIL-A-8625 and MIL-M-45202 respectively.

6.13 Processing or service temperatures of shot peened parts shall be limited to the temperatures in 4.3.1 unless test data for specific applications support the satisfactory use of higher temperatures.

Custodians:
Army - MR
Navy - AS
Air Force - 11

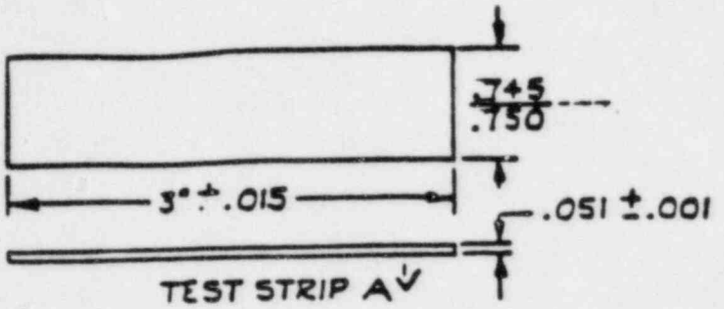
Preparing activity:
Army - MR

Project No. MFFP-0182

Review activities:
Army - MI, AR, AL
Navy - OS
Air Force - 85, 11, 69

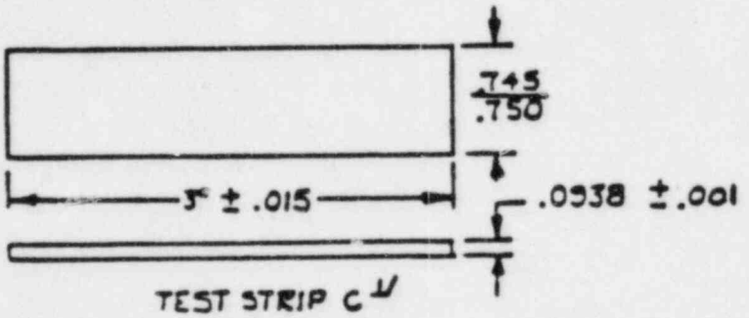
User activities:
Army - AT, ME, AV
Navy - SH
Air Force - 99

Review/User information is current as of the date of this document; draft circulation should be based on the information in the current DODISS.



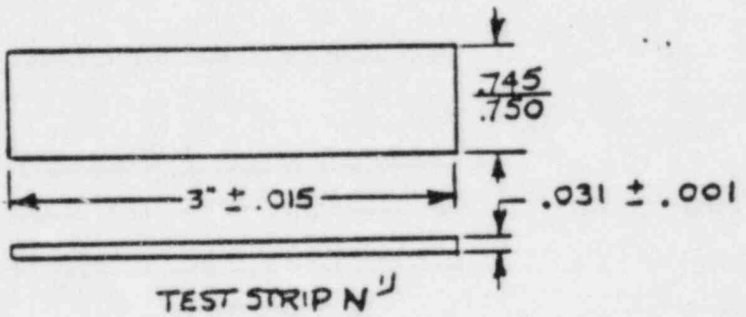
TEST STRIP A 1/

FIGURE 1.



TEST STRIP C 1/

FIGURE 2.



TEST STRIP N 1/

FIGURE 3

1/ TEST STRIP SPECIFICATIONS

ANALYSIS OF STOCK - SAE 1070
COLD ROLLED SPRING STEEL
SQUARE EDGE NUMBER ONE (ON 3" EDGE)
FINISH - BLUE TEMPER (OR BRIGHT)
UNIFORMLY HARDENED AND TEMPERED TO 44-50 RC
FLATNESS - ± .0015" ARC HEIGHT AS MEASURED ON GAUGE SHOWN IN FIGURE 6.

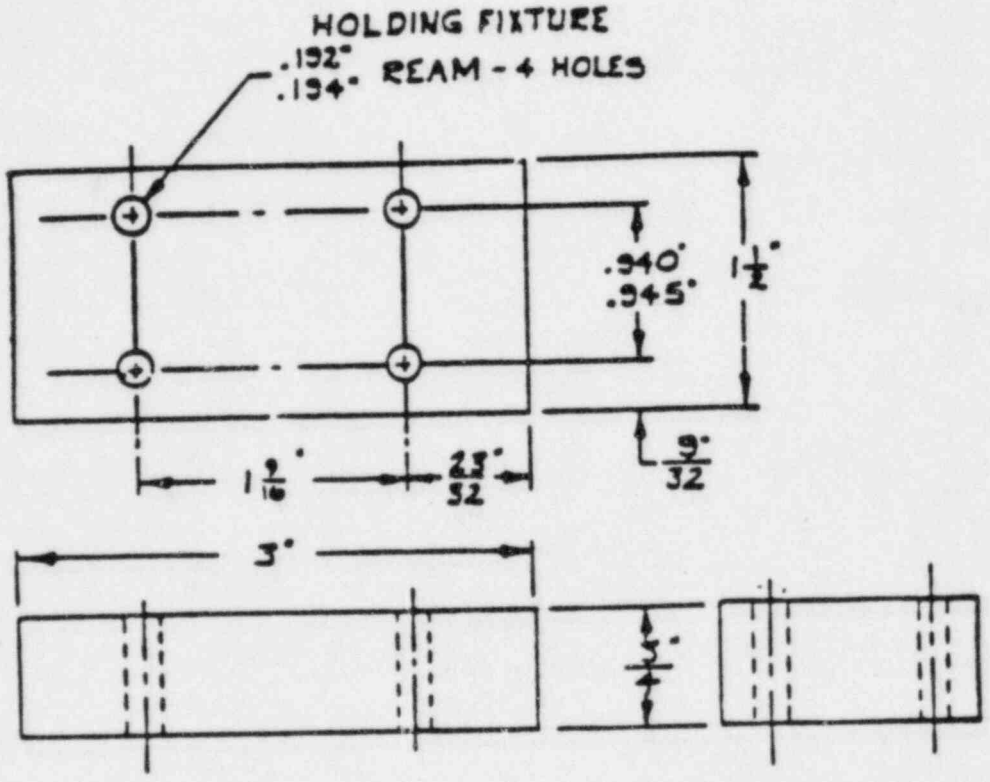

HOLDING FIXTURE
.192"
.194" REAM - 4 HOLES
.940"
.945"
1 1/2"
1 9/16"
25/32"
9/32"
3"
1/2"

FIGURE 4

ASSEMBLED TEST STRIP AND HOLDING FIXTURE

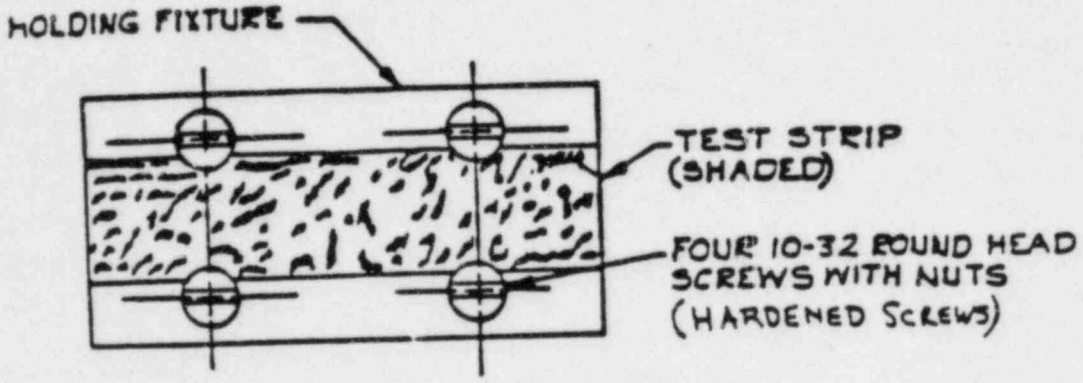
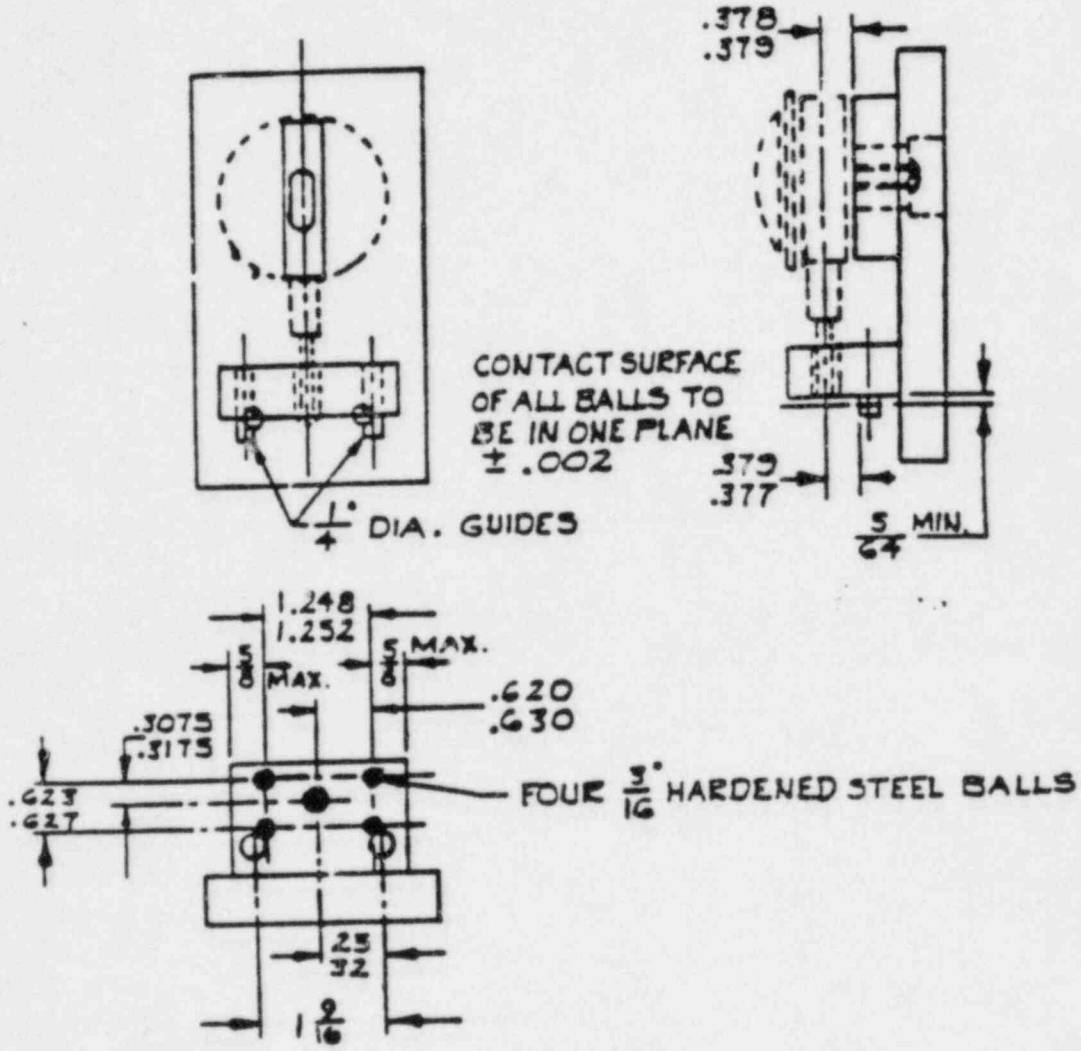


FIGURE 5

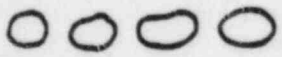
DIAL INDICATOR, MAX. VALUE OF GRADUATION .001 - COUNTER-CLOCKWISE BACK ADJUSTABLE BRACKET, LOW FRICTION JEWELED BEARINGS, EQUIPPED WITH EXTENSION POINT.



TEST GAUGE

FIGURE 6

1. Acceptable Shapes



2. Unacceptable Shapes, limited to Table I

3. Unacceptable Shapes

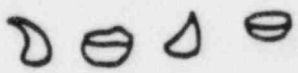
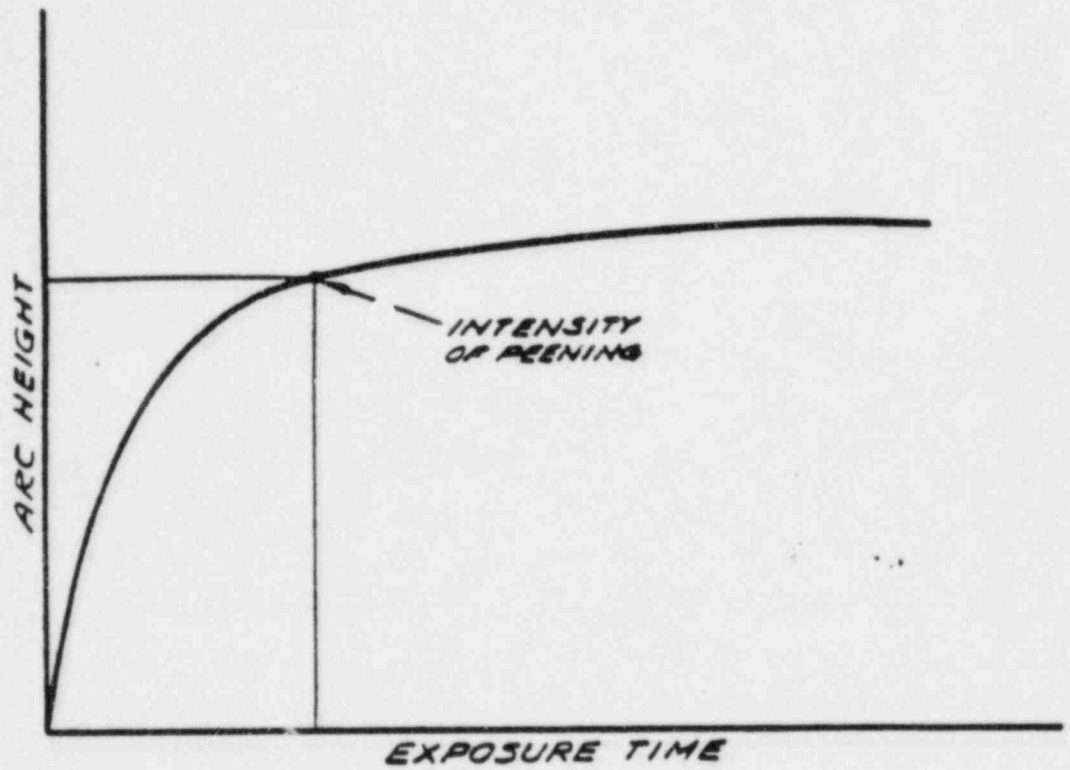


Figure 7.



INTENSITY DETERMINATION CURVE

Figure 8.

METAL IMPROVEMENT COMPANY, INC.

EXECUTIVE OFFICE
10 Forest Avenue
Paramus, New Jersey 07652
Tel: (201) 843-7800
Telex: 134489

NEW JERSEY DIVISION
472 Barrell Avenue
Carlstadt, N.J. 07072
Tel: (201) 935-1800
Telex: 133476

ORANGEBURG PLANT
80 Blaisdell Road
Orangeburg, N.Y. 10962
Tel: (914) 359-4736

CONNECTICUT DIVISION
145 Addison Road
Windsor, Conn. 06095
Tel: (203) 688-6201
Telex: 99283

BOSTON PLANT
26 Alley Street
Lynn, Mass. 01902
Tel: (617) 599-4165

LONG ISLAND DIVISION
280 Adams Boulevard
Farmingdale, N.Y. 11735
Tel: (516) 293-4990
Telex: 961489

CHICAGO DIVISION
678 Winthrop Avenue
Addison, Ill. 60101
Tel: (312) 543-4950
Telex: 721450

WATERLOO PLANT
2729 Wagner Road
Waterloo, Iowa 50701
Tel: (319) 233-7900

MILWAUKEE DIVISION
5801 North 94th Street
Milwaukee, Wisc. 53225
Tel: (414) 466-3151
Telex: 26605

CLEVELAND DIVISION
18683 S. Miles Road
Cleveland, Ohio 44128
Tel: (216) 662-8408
Telex: 980478

CINCINNATI DIVISION
5731 Creek Road
Blue Ash, Ohio 45242
Tel: (513) 891-0001
Telex: 214235

NORTH CAROLINA DIVISION
10,000 Old Pineville Road
P.O. Box 519
Pineville, N.C. 28134
Tel: (704) 889-7658
Telex: 800564

ATLANTA DIVISION
3470 Lake Drive
Smyrna, Georgia 30080
Tel: (404) 435-1053
Telex: 543539

FLORIDA DIVISION
1940 N.W. 70th Avenue
Miami, Florida 33126
Tel: (305) 592-5960
Telex: 518848

DALLAS DIVISION
2671 Freewood Drive
Dallas, Texas 75220
Tel: (214) 351-6475
Telex: 732669

HOUSTON DIVISION
3851 Distribution Boulevard
Houston, Texas 77016
Tel: (713) 691-0257
Telex: 791271

LOS ANGELES DIVISION
3239 East 16th Street
Vernon, Calif. 90058
Tel: (213) 585-2168
Telex: 677613

BURBANK VALLEY PLANT
12510 Montague Street
Pacoima, Calif. 91331
Tel: (213) 896-2441

FRENCH DIVISION
Zone Industrielle d'Amilly
45200 Montargis, France
Tel: (38) 855807
Telex: 780082

TORONTO DIVISION
105 Alfred Kuehne Blvd.
Brampton, Ontario
Canada L6T 4K3
Tel: (416) 791-8002
Telex: 97763

U.K. DIVISION
276 Osmaston Road
Derby, England
Tel: (332) 45633
Telex: 37348

NEWBURY PLANT
Hamoridge Lane
Newbury, Berkshire, England
Tel: (0635) 31071

W. GERMAN DIVISION
Otto Hahn Strasse 3
4750 Unna, W. Germany

NUCLEAR REGULATORY COMMISSION

Docket No. 50-322-OL Official Exh. No. C-29

In the matter of LILCO Shoreham

Staff		IDENTIFIED	✓
Applicant	✓	RECEIVED	✓
Intervenor		REJECTED	
Cont'g Off'r			
Contractor		DATE	9-20-84
Other		Witness	Panel
Reporter	ACE		

GINNS