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Report Issued: FEB 9 1987 Report 500-87.25

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF ENGINEERING RESEARCH
3400 Crow Canyon Road
San Ramon, California 94583

LABORATORY TEST REPORT

SUBJECT: EVALUATION OF J-HOOKS AND EYES FROM 115KV OLEUM G-LINE

Introduction

Tests were conducted on two J-Hooks and two attaching plates taken from a 115 KV Oleum G-Line tower.

Both of the J-Hooks and their attaching plates had grooves worn in them and there was a concern that they may not be able to hold the weight of insulator strings that are suspended from them,(See Figures 1 and 2).

Tests were requested by Mr. G. Schauer of East Bay Region T&D.

Objective

The objective was to establish the tension required to fail the hook or the attaching plate. The ultimate rating for 115 KV lines is 30,000 Lbs., (See Manufacturers' Literature in Appendix A).

Test Procedure

The tensile test was accomplished by making a fixture to hold the hook and the plate in the same position it would be while in service and applying tension using the Tinius Olsen universal test machine, (See Figure 3). American National Standards Institute, (ANSI), B30.10-1975 was used as a guideline, (See Appendix B).

Test Results

Both hooks failed at 11,500 lbs., (See Figures 4 and 5). Since the plates did not fail during this test an additional test was done on one of the plates. A shackle was attached to the eye of the plate and tension was applied. The eye failed at 19,600 lbs., (See Figure 6).

Distribution: ESElliott
CDPaquin
GSchauer
CBScott

DATE 2/6/87
TESTED BY
APPROVED
FILE NO. 500 (6572)

2801a/mak11

Conclusion

As shown in the results the hooks failed at 11,500 Lbs. tension. According to the Manufacturers' drawings, the rating of a 115 KV line supporting hook is 30,000 Lbs. Because of the low failure points of the two hooks, an additional hook was brought in and tested. This hook had no visible grooves or scratching in the surface as the two samples in the original test did.

The hook failed at 6900 Lbs.

Recommendation

The hook without visible flaws failed at 6900 Lbs. and the rating for these hooks is 30,000 Lbs.. This would suggest that a test be done on some random samples of different manufacturers' hooks from PG&E stores to check their strength against their specifications.

Figure 1. As shown in the Figure above a wear pattern was formed in the bowl-saddle of the J-Hook. This was possibly caused by the insulator string swinging in the wind over a period of time.

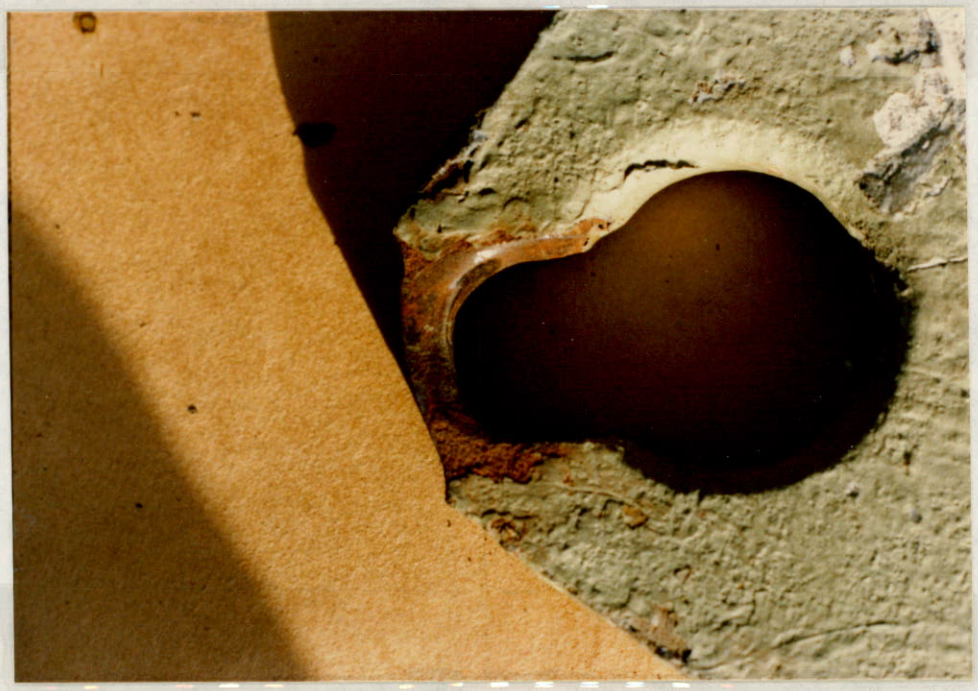


Figure 2. This Figure shows the key-hole wear in the plate eye caused by the J-Hook while in service.

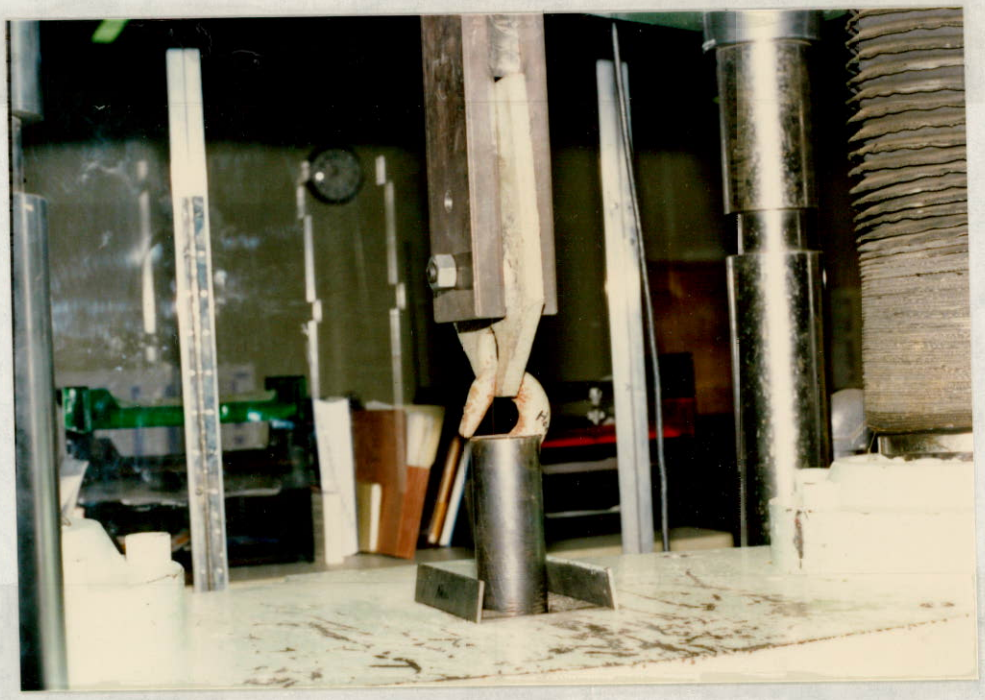


Figure 3. This shows the fixture holding the plate and J-Hook in the simulated position it would be in service.

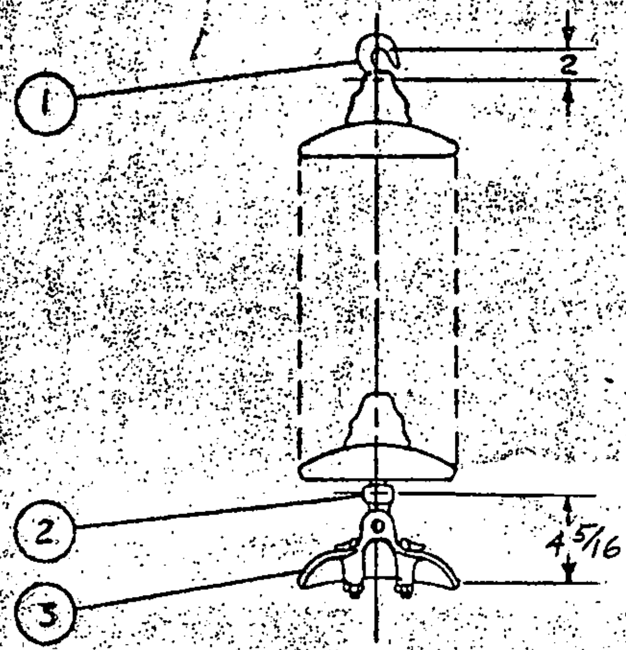
Figure 4. This hook shows the point of failure to be in the worn section of the bowl-saddle.

Figure 5. This hook failed at the heel even though it had approximately the same wear pattern in the bowl-saddle as the hook in Figure 4.

Figure 6. This Figure shows the failure of the eye in the plate when a shackle was pulled through it.

APPENDIX A

Manufacturers Literature and Company Standards



PG&E CODE	CAT. NO.	TYPE
11-0145	C-11075	SC

NOTES:
1. REFERENCE: PACIFIC GAS & ELECTRIC DWG. NO.-056414 SHT. 3 TYPE -SC
2. ASSEMBLY RATING- 16,000 LBS.
3. CLAMPING RANGE- .200-.600

P. G. & E. DRAWING NO. 690134

ITEM NO.	PART NO	DESCRIPTION	MATERIAL	ULT. STR. LBS.	QTY	SPEC. NO.	WEIGHT
1	HB-30	HOOK BALL	GALV. FORGED STEEL	30,000	1	ASTM A-153-64	1.00
2	SA-04	EYE SOCKET	GALV. DUCTILE IRON	20,000	1	ASTM A536-65T	1.25
3	BRS-60-N	SUSP. CLAMP	112 ALUM. BRZ.	16,000	1	ANDERSON 2000	2.90

[redacted]

REVISIONS: DATE | NO. | DESCRIPTION | BY

MR-1960

R/o

DATE 3-4-76
DWN BY [illegible] CKD BY [illegible]
APPROVED HEL
SCALE DO NOT

44-115 KV SINGLE STRING
SINGLE CONDUCTOR
SUSPENSION ASSY.

ANDERSON ELECTRIC CORP.
LEEDS ALABAMA

CAT. NO. C-11075
DWG. NO. C-11075

APPENDIX B

ANSI B30.10-1975

AMERICAN NATIONAL STANDARD

SAFETY STANDARDS FOR CABLEWAYS, CRANES, DERRICKS, HOISTS, HOOKS, JACKS, AND SLINGS

HOOKS

ANSI B30.10 - 1975

SECRETARIAT

NAVAL FACILITIES ENGINEERING COMMAND,
U.S. DEPARTMENT OF THE NAVY
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

PUBLISHED BY

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

United Engineering Center 345 East 47th Street New York, N. Y. 10017

FOREWORD

This American National Standard, Safety Standards for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks and Slings, has been developed under the procedures of the American National Standards Institute (formerly the United States of America Standards Institute). This specific standard had its beginning in December 1916, with a Code of Safety Standards for Cranes, prepared by an ASME committee on the Protection of Industrial Workers, was presented to the annual meeting of the ASME.

Meetings and discussions regarding safety on cranes, derricks and hoists were held from 1920 to 1925, involving the ASME Safety Code Correlating Committee, the Association of Iron and Steel Electrical Engineers, the American Museum of Safety, the American Engineering Standards Committee (later changed to American Standards Association and subsequently to the USA Standards Institute). Department of Labor, State of New Jersey, Department of Labor and Industry, State of Pennsylvania, and Locomotive Crane Manufacturers Association. On June 11, 1925 the American Engineering Standards Committee approved the ASME Safety Code Correlating Committee's recommendation and authorized the project with U.S. Department of the Navy, Bureau of Yards and Docks and the ASME as sponsors.

In March 1926 invitations were issued to 50 organizations to appoint representatives to a Sectional Committee. The call for organization of this Sectional Committee was sent out October 2, 1926 and the Committee organized November 4, 1926 with 57 members representing 29 national organizations. From the 3-page document, referred to in the first paragraph, came the Safety Code for Cranes, Derricks, and Hoists ASA B30.2-1943. This document was reaffirmed in 1952 and widely accepted as a Safety Standard.

Due to the changes in design, advancement in techniques, and general interest of labor and industry in safety, the Sectional Committee now known as the American National Standards Committee, under joint sponsorship of the ASME and the Naval Facilities Engineering Command–U.S. Department of the Navy–was reorganized on January 31, 1962 with 39 members representing 27 national organizations. At the time B30.3 was approved by the Committee, the membership had increased to 57 members and alternates representing 36 organizations.

The format of the previous Code was changed so that separate Standards, each complete as to construction and installation; inspection, testing, and maintenance; and operation, will cover the different types of equipment included in the scope of B30.

This Standard presents a coordinated set of rules which may serve as a guide to government and other regulatory bodies and municipal authorities responsible for the guarding and inspection of the equipment falling within its scope. The suggestions leading to accident prevention are given both as mandatory and advisory provisions and compliance with both types may be required by employers of their employees.

This Standard, which was approved by the American National Standards Committee B30 and by the two sponsor organizations, was approved and designated as an American National Standard by the American National Standards Institute on November 14, 1975.

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CONTENTS

AMERICAN NATIONAL STANDARD

SAFETY STANDARDS FOR CABLEWAYS, CRANES, DERRICKS, HOISTS, HOOKS, JACKS AND SLINGS

INTRODUCTION

General

This Standard is one of a series of safety standards on various subjects which have been formulated under the general auspices of the American National Standards Institute. One purpose of the Standard is to serve as a guide to governmental authorities having jurisdiction over subjects within the scope of the Standard. It is expected, however, that the Standard will find a major application in industry, serving as guide to both manufacturers of the equipment and to the purchasers and users of the equipment.

For the convenience of the user, the Standard has been divided into separate volumes such as the following:

B30.1 Jacks
B30.2 Overhead & Gantry Cranes
B30.3 Hammerhead Tower Cranes
B30.4 Portal, Tower and Pillar Cranes
B30.5 Crawler, Locomotive and Truck Cranes
B30.6 Derricks
B30.7 Base Mounted Drum Hoists
B30.8 Floating Cranes and Floating Derricks
B30.9 Slings
B30.10 Hooks
B30.11 Monorail Systems and Underhung Cranes
B30.12 Handling Loads Suspended from Rotorcraft
B30.13 Controlled Mechanical Storage Cranes
B30.14 Side Boom Tractors
B30.15 Mobile Hydraulic Cranes
B30.16 Overhead Hoists
B30.17 Single Girder Top Running Cranes
B30.18 Overhead Stacker Cranes
B30.19 Cableways
B30.20 Below the Hooklifting Devices

If adopted for governmental use, the references to other national codes and standards in the specific volumes may be changed to refer to the corresponding regulations of the governmental authorities.

The use of cranes, derricks, hoists, hooks, jacks and slings is subject to certain hazards that cannot be met by mechanical means, but only by the exercise of intelligence, care and common sense. It is therefore essential to have competent and careful operators, physically and mentally fit, trained in the safe operation of the equipment and the handling of the loads. Serious hazards are overloading, dropping or slipping of the load caused by improper hitching or slinging, obstruction to the free passage of the load, using equipment for a purpose for which it was not intended or designed.

The standards committee fully realizes the importance of proper factors of safety, minimum or maximum sizes and other limiting dimensions of wire rope and their fastenings, sheaves, drums and similar equipment covered by the Standard, all of which are closely connected with safety. Safe sizes, strengths, and similar criteria are dependent on many different factors, often varying with the installation and uses. These factors also depend on the condition of the equipment or material; on the loads; on the acceleration, or speed of the ropes, sheaves or drums; on the type of attachments; on the number, size and arrangement of sheaves, or other parts; on weather, and other atmospheric conditions tending toward corrosion, or wear; and on so many variable factors that must be considered in each individual case. The rules given in the Standard must be interpreted accordingly and judgment used in deter-

mining their application.

The standards committee will be glad to receive criticisms of the Standard requirements and suggestions for the improvement, especially such as are based on actual experience in the application of the rules. Revised editions will be issued from time to time with such changes as experience in its application and improvements in the arts may dictate.

Section I Scope

This Standard applies to the construction, installation, operation, inspection and maintenance of jacks; power operated cranes, monorails and crane runways; power operated and manually operated derricks and hoists; lifting hooks and slings.

This Standard does not apply to track and automotive jacks, railway or automobile wrecking cranes, shipboard cranes, shipboard cargo handling equipment, well drilling derricks, skip hoists, mine hoists, truck body hoists, car or barge pullers, lever operated pulling devices, conveyors, excavating equipment nor to equipment coming within the scope of the following American National Standards Committees: A10, A17, A90, A92, A113, A120, B56 and B77.

Section II Purpose

This Standard is designed (1) to guard against and minimize injury to workers and otherwise provide for the protection of life, limb, and property by prescribing minimum safety requirements, (2) to provide direction to owners, employers, supervisors and others concerned with, or responsible for its application and (3) to guide governments and other regulatory bodies in the development, promulgation, and enforcement of appropriate safety directives.

Section III Exceptions and Interpretations

In case of practical difficulties or new developments, or unnecessary hardship, the administrative or regulatory authority may grant exceptions from the literal requirements or permit the use of other devices or methods, but only when it is clearly evident that an equivalent degree of protection is thereby secured.

NOTE: To secure uniform application and interpretation of this Standard, administrative or regulatory authorities are urged, before rendering decisions on disputed points, to consult the committee which formulated it through the office of The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, New York 10017.

Section IV New and Old Installations

One year after the date on which this Standard becomes effective, all new construction and installations shall conform to its rules. The performance of any equipment installed prior to one year after the effective date shall be evaluated by a qualified person selected by the user. If past performance discloses actual circumstances that have caused or might have caused property/equipment damage or injuries to personnel resulting from functional performance or from the configuration of the equipment that result from deviation of the equipment from the Standard the equipment shall be evaluated to determine specifically how it deviates from this Standard. A qualified person, having made this evaluation, shall then recommend the degree to which changes should be made to bring the equipment into compliance with the intent of this Standard and changes should be accomplished within two years from the effective date. A complete record of the evaluations, recommended changes and actual changes shall be retained.

Section V Mandatory and Advisory Rules

Mandatory rules of this Standard are characterized by the use of the work "shall". If a provision is of an advisory nature it is indicated by the use of the word "should" and is a recommendation considered to be the advisability of which depends on the facts in each situation.

CHAPTER 10-0
SCOPE, DEFINITIONS, REFERENCES

Section 10-0.1 Scope of B30.10

Within the general scope defined in Section I, American National Standard B30.10 applies to all types of hooks used in conjunction with equipment described in other volumes of the B30 standards. This applies to all hoisting hooks that support a load in a direct-pull configuration and such load is carried in the base (bowl-saddle) of the hook. This also applies to other hooks specifically defined within this chapter that do not support a load in a direct-pull configuration.

Section 10-0.2 Definitions

10-0.2.1 Administrative or Regulatory Authority Governmental Agency or the employer in the absence of governmental jurisdiction.

10-0.2.2 Appointed. Assigned specific responsibilities by the employer or the employer's representative.

10-0.2.3 Crack. A crevice type discontinuity of the material.

10-0.2.4 Designated. Selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.

10-0.2.5 Dye Penetrant Testing. A non-destructive test method for detecting surface discontinuity based on capillary action. A liquid penetrant is applied to the surface. The excess penetrant is then removed and any subsequent bleeding indicates seams, laps, and cracks.

10-0.2.6 Forging Lap. A defect caused by folding over surface metal and then forging into the material surface without cohesion.

10-0.2.7 Heavy Service. Service which involves operating at 85 percent to 100 percent of rated capacity as a regular specified procedure.

10-0.2.8 Hot Tear. A defect caused by the rupture of metal while cooling from the molten to the solid state.

10-0.2.9 Latch. A device used to bridge the throat opening of a hook.

10-0.2.10 Load. The total weight imposed on the hook.

10-0.2.11 Magnetic Particle Testing. A non-destructive test method for revealing discontinuities in ferromagnetic materials, by means of finely divided magnetic particles applied to the magnetized part.

10-0.2.12 Nick or Gouge. Sharp notch in hook surface which may act as stress raiser in the area of the notch.

10-0.2.13 Normal Service. Service which involves operating at less than 85 percent rated capacity except for isolated instances.

10-0.2.14 Proof Load. The specific load applied in performance of the proof test.

10-0.2.15 Proof Test. A non-destructive load test made by the hook manufacturer to verify construction and workmanship of the hook.

10-0.2.16 Qualified. A person who, by possession of a recognized degree, certificate or professional standing or who by extensive knowledge, training, and experience, has demonstrated the ability to solve problems relating to the subject matter and work.

10-0.2.17 Radiography. A non-destructive test employing x-ray or gamma radiation for revealing internal discontinuities.

10-0.2.18 Rated Load (R/L). The maximum allowable working load.

10-0.2.19 Seam. A crack-like discontinuity caused by rolling or working in defects.

10-0.2.20 Severe Service. Heavy service coupled with the possibility of abnormal unforeseen conditions.

10-0.2.21 Ultrasonic Testing. A non-destructive test method for revealing discontinuities in dense homogenous materials, by means of acoustic waves of frequencies above the audible range.

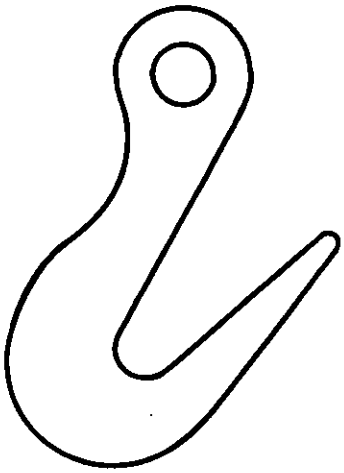

FIG. 1 SORTING HOOK

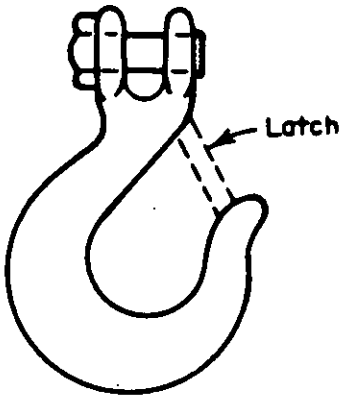

FIG. 2 CLEVIS HOOK
(Latch is optional)

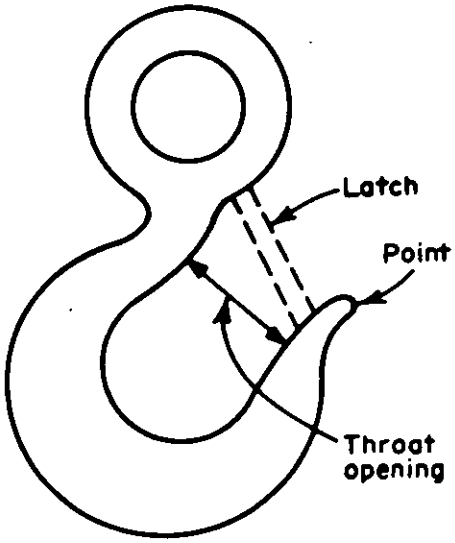

FIG. 3 EYE HOOK
(Latch is optional)

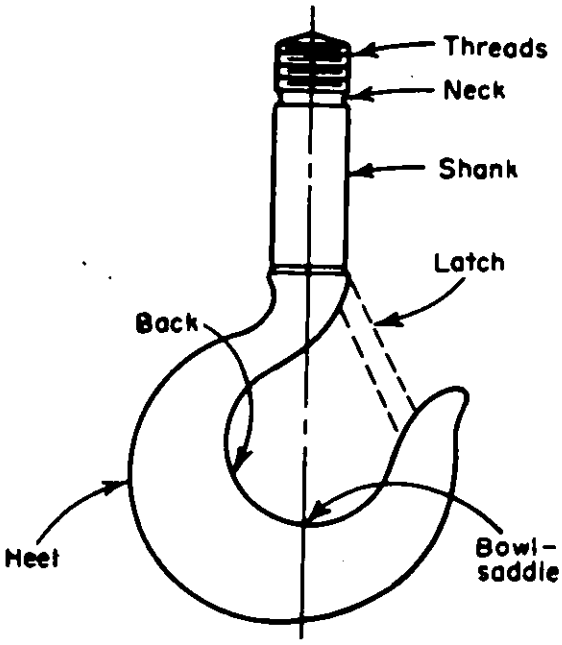

FIG. 4 SHANK HOOK
(Latch is optional)

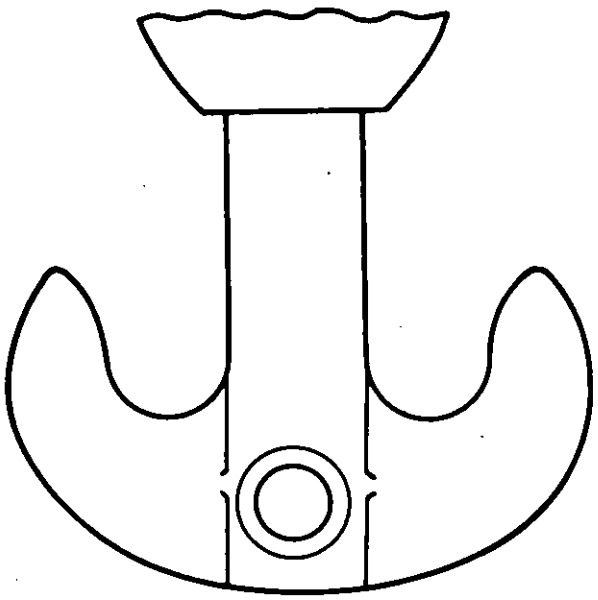

FIG. 5 DUPLEX HOOK (SISTER)
(Pinhole is optional)

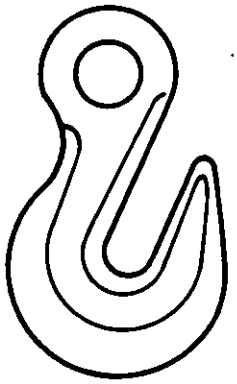

FIG. 6 EYE GRAB HOOK

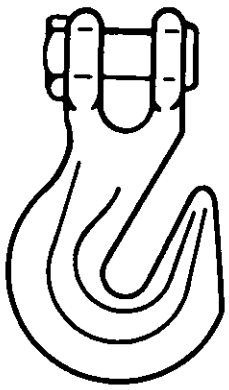

FIG. 7 CLEVIS GRAB HOOK

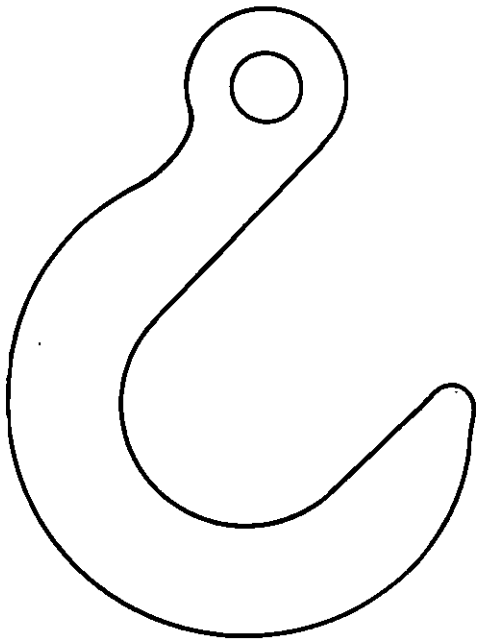

FIG. 8 FOUNDRY HOOK

FIG. 9 LAMINATED HOOK

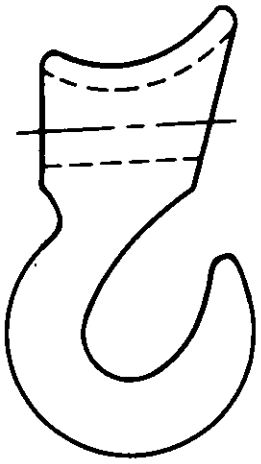

FIG. 10 CHOKER HOOK

CHAPTER 10-1
HOOKS, HOISTING

This chapter applies to all hooks that support a load in a direct pull configuration and such load is carried in the base (bowl-saddle) of the hook. Refer to Figures 2, 3, 4, 5 and 9.

Section 10-1.1 Hook Characteristics

10-1.1.1 The hook material shall have sufficient ductility to permanently deform before failure at the temperatures at which the specific hook will be used.

10-1.1.2 When proof tests are used to verify manufacturing process, material or configuration, the hooks shall be able to withstand the proof load application without permanent deformation when the load is applied for a minimum of 15 seconds. This condition shall be considered to have been satisfied if the permanent increase in the throat opening does not exceed 1/2 percent. For such tests, Table 1 states the proof load that shall be applied to a hook with a rated load capacity.

10-1.1.3 For a duplex (sister) hook having a pin eye, the proof load for the eye shall be in accordance with Table 1.

Section 10-1.2 Hook Identification

Manufacturer's identification should be forged, cast or die stamped on a low stress and non-wearing area of the hook.

Section 10-1.3 Attachments

10-1.3.1 Where required, a latch shall be provided, or a hook's design shall be used to retain such items as, but not limited to, slings and chains under slack conditions.

10-1.3.2 When a handle or latch support is welded to a hook, whose design requires heat treating, welding shall be done prior to final heat treating.

Table 1 Proof Test Load

Rated Load		Proof Load (Minimum)		
Tons (2000 lbs)	Kg	Percent of R/L	Tons (2000 lbs)	Kg
1/2	453.6	200	.1	907.2
1	907.2	200	2	1814.4
5	4536	200	10	9072
10	9072	200	20	18144
15	13608	200	30	27216
20	18144	200	40	36288
25	22680	200	50	45360
30	27216	200	60	54432
35	31752	200	70	63504
40	36288	200	80	72576
45	40824	200	90	81648
50	45360	200	100	90720
60	54432	193	116	105235.2
75	68040	183	137	124286.4
100	90720	166	166	150595.2
125	113400	150	188	170553.6
150	136080	133	200	181440
175	158760	133	233	211377.6
200	181440	133	266	241315.2
250	226800	133	333	302097.6
300	272160	133	399	361972.8
350	317520	133	465	421848
400	362880	133	532	482630.4
450	408240	133	598	542505.6
500	453600	133	665	603288
Above 500	>453600	133		

Note: 1 ton (short, 2000 lbs) = 907.2 Kg

For hooks with rated load ratings not shown in the above table, use the next lower rated load rating for determining the percent of rated load to be applied as excess load.

Section 10-1.4 Inspection, Performance Testing and Maintenance

10-1.4.1 Inspection Classification

a. *Initial Inspection.* Prior to initial use, all new and repaired hooks shall be inspected to assure compliance with the provisions of **10-1.4.2.**

b. Inspection procedure for hooks shall be governed by the kind of equipment in which they are used. When such requirements for hooks are stated in standards for these specific equipments, they shall take precedence over the following. Otherwise there shall be two general classifications based upon intervals at which examination shall be performed. The classifications are herein designated "frequent" and "periodic" with intervals between examinations as defined below:

1. *Frequent Inspection*–Visual examinations by the operator other designated personnel with records not required of items listed in **10-1.4.2**:

a. Normal service–Monthly

b. Heavy service–Weekly to Monthly

c. Severe service–Daily to Weekly

d. Special or infrequent service as authorized by qualified person–before and after each occurrence with records of the operation.

2. *Periodic Inspection*–Visual inspections by appointed person making records of apparent external contidions to provide the basis for continuing evaluation as noted in **10-1.4.3**:

a. Normal Service–Equipment in place–Yearly.

b. Heavy Service–As in **10-1.4.1**.b.2a unless external conditions indicate that disassembly should be done to permit detailed inspection–Yearly.

c. Severe Service–As in **10-1.4.1**.b.2b except that the detailed inspection may show the need for use of non-destructive type of testing–Quarterly.

d. Special or infrequent service as authorized by a qualified person–before the first such occurrence and as directed by the qualified individual for any subsequent occurrences.

10-1.4.2 Frequent Inspection

Hooks in regular use should be examined for the following items as noted in **10-1.4.1** (See **10-1.4.6**)

a. Distortion such as bending, twisting or increased throat opening.

b. Wear

c. Cracks, severe nicks or gouges.

d. Latch engagement, damaged or malfunctioning latch (if latch is provided).

e. Hook attachment and securing means.

10-1.4.3 Periodic Inspection

Hooks in regular use should be inspected for the deficiencies listed in **10-1.4.2.**

10-1.4.4 Hooks not in regular use

Hooks not in regular use should be inspected in accordance with **10-1.4.2** before being returned to service.

10-1.4.5 Performance Testing

No performance testing of hooks shall be required except as is necessary to conform to the requirements for the equipment of which they are a part.

10-1.4.6 Maintenance

a. Hooks having any of the following deficiencies shall be removed from service, unless a qualified person approves their continued limited use:

1. Crack(s)

2. Wear exceeding 10 percent (or as recommended by the manufacturer) of the original dimension.

3. A bend or twist exceeding 10 degrees from the plane of the unbent hook.

4. Increase in throat opening exceeding 15 percent or as recommended by the manufacturer.

5. If a latch is provided and it becomes inoperative because of wear or deformation, or fails to fully bridge the throat opening, the hook should be removed from service until the device has been repaired or replaced.

6. If hooks are painted, a visual inspection should take this coating into consideration. Surface variations can disclose evidence of heavy or severe service to require more detailed analysis of paragraph **10-1.4.1**.b.2b or **10-1.4.1**.b.2c. The surface condition may then call for stripping the paint in such instances.

b. Repair of nicks and gouges may be carried out by a designated person by grinding longitudinally following the contour of the hook, provided that no di-

mension is reduced more than 10 percent (or as recommended by the manufacturer) of its original value (A qualified person may authorize continued use if the reduced area is not critical.)

c. All other repairs shall be performed by the manufacturer or other qualified person.

Section 10-1.5 Operating Practices

Personnel using hooks shall be instructed in the following practices:

a. Determine that the weight of the load to be lifted does not exceed the load rating of the hook.

b. Shock loading shall be avoided.

c. Load shall be centered in the base (bowl-saddle) of the hook to prevent point loading of the hook.

d. Hooks shall not be used in such a manner as to place a side or backload on the hook.

e. When using a device to bridge the throat opening of the hook, care shall be used that the load in no way is carried by the bridging device.

f. Hands and fingers shall be kept from between hook and load.

g. Duplex (sister) hooks shall be loaded equally on both sides unless the hook is specifically designed for single loading.

h. The pin hole in Duplex (sister) hooks shall not be loaded beyond the rated load of the hook.

CHAPTER 10-2
HOOKS, MISCELLANEOUS

This chapter applies to all hooks that do not support a load in a direct pull configuration; such as, grab hooks, foundry hooks, sorting hooks, and choker hooks. Refer to Figures 1, 6, 7, 8 and 10.

Section 10-2.1 Hook Properties

10-2.1.1 The hook material shall have sufficient ductility to permanently deform before failure at the temperatures at which the specific hook will be used.

10-2.1.2 Rated loads for a hook, when used in the manner for which intended, shall be equal to or exceed the rated load of the chain, wire rope or other suspension members to which it is attached. In those instances when this is not feasible, special precautions shall be taken to assure that the rated load limit of the hook is not exceeded.

Section 10-2.2 Hook Identification

Manufacturer's identification should be forged, cast or die stamped on a low stress and non-wearing area of the hook.

Section 10-2.3 Inspection, Performance Testing and Maintenance

10-2.3.1 Inspection Classification

a. *Initial Inspection.* Prior to initial use, all new and repaired hooks shall be inspected to assure compliance with the provisions of **10-2.3.2.**

b. Inspection procedure for hooks shall be governed by the kind of equipment in which they are used. When such requirement for hooks are stated in standards for these specific equipments, they shall take precedence over the following. Otherwise there shall be two general classifications based upon intervals at which examination shall be performed. The classifications are herein designated "frequent" and "periodic" with intervals between examinations as defined below:

1. *Frequent Inspection*–Visual examinations by the operator or other designated personnel with records not required of items listed in **10-2.3.2**:

a. Normal service–Monthly
b. Heavy service–Weekly to Monthly
c. Severe service–Daily to Weekly
d. Special or infrequent service as authorized by qualified person before and after each occurrence with records on the operation.

2. *Periodic Inspection*–Visual inspections by appointed person making records of apparent external conditions to provide the basis for continuing evaluation as noted in **10-2.3.3**:

a. Normal service–Equipment in place–Yearly.
b. Heavy service–as in **10-2.3.1**.b.2a unless external conditions indicate that disassembly should be done to permit detailed inspection–Yearly.
c. Severe service–as in **10-2.3.1**.b.2b except that the detailed inspection may show the need for use of non-destructive type of testing–Quarterly.
d. Special or infrequent service as authorized by a qualified person–before the first such occurrence and as directed by the qualified person for any subsequent occurrences.

10-2.3.2 Frequent Inspection

Hooks in regular use should be examined for the following items as noted in **10-2.3.1**.b.1. (See **10-2.3.6**)

a. Distortion such as: bending, twisting, or increased throat opening.

b. Wear.

c. Cracks, severe nicks or gouges.

d. Hook attachment and securing means.

10-2.3.3 Periodic Inspection

Hooks in regular use should be inspected for the deficiencies listed in **10-2.3.2** as noted in **10-2.3.1**.b.2.

10-2.3.4 Hooks not in regular use

Hooks not in regular use should be inspected in accordance with **10-2.3.2** before being returned to service.

10-2.3.5 Performance Testing

No performance testing of hooks shall be required except as is necessary to conform to the requirements for the equipment of which they are a part.

10-2.3.6 Maintenance

a. Hooks having any of the following deficiencies shall be removed from service, unless a qualified person approves their continued limited use:

1. Crack(s)
2. Wear exceeding 10 percent (or as recommended by the manufacturer) of the original dimension.
3. A bend or twist exceeding 10 degrees from the plane of the unbent hook, or as recommended by the manufacturer.
4. Increase in throat opening exceeding 15 percent, or as recommended by the manufacturer.

b. Repair of nicks and gouges may be carried out by a designated person by grinding longitudinally following the contour of the hook, provided that no dimension is reduced more than 10 percent (or as recommended by the manufacturer) of its original value (A qualified person may authorize use if the reduced area is not critical).

c. All other repairs shall be performed by the manufacturer or other qualified person.

Section 10-2.4 Operating Practices

10-2.4.1 Personnel using miscellaneous hooks shall be instructed in the following practices:

a. Determine that the load or force required does not exceed the rated load of the hooks assembly, especially when any special conditions, such as choking or grabbing, are considered.

b. Shock loading shall be avoided.

c. A hook shall not be used in a manner other than that for which it was intended.

d. Hands and fingers shall be kept from between load and hook.

* * * NOTICE * * *

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MEDIA COULD BE IN THE FORM OF:
PHOTOS, CHARTS, DIAGRAMS, FILM, MAPS ETC.

ADDITIONAL MEDIA IS MAINTAINED WITH THE:
ORIGINAL HARD COPY REPORT

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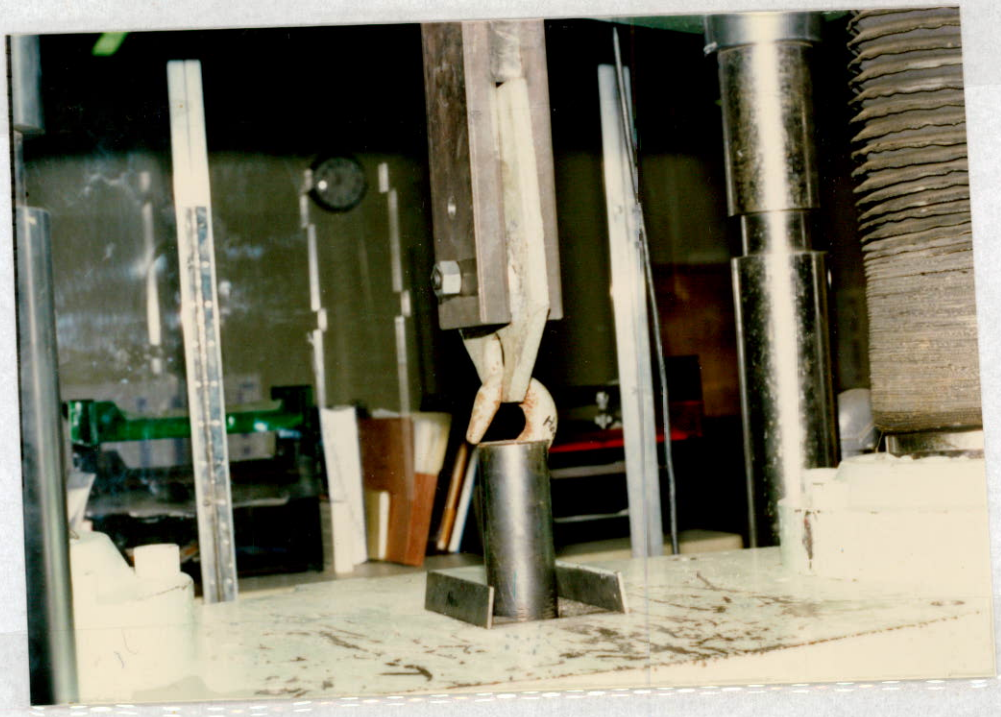
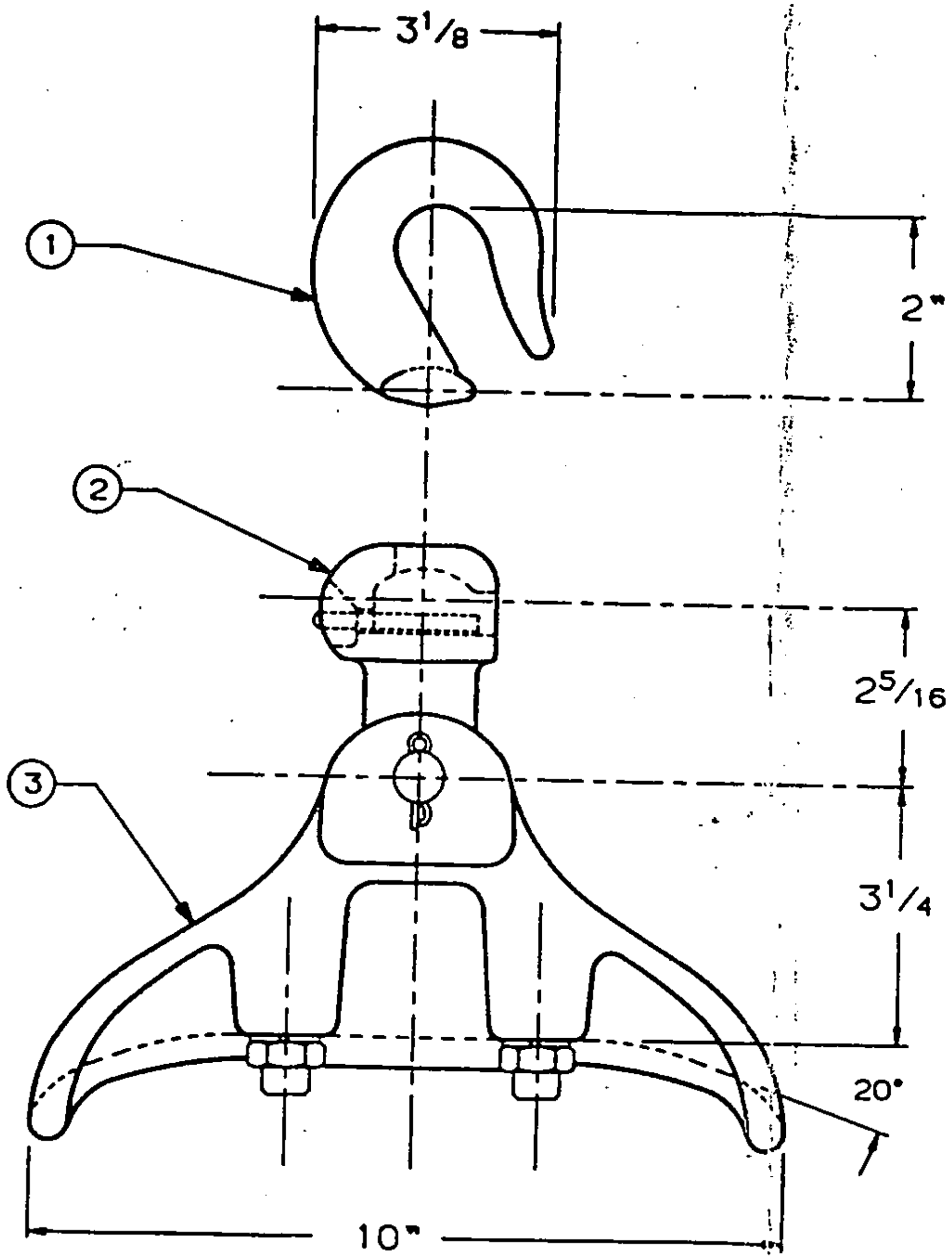
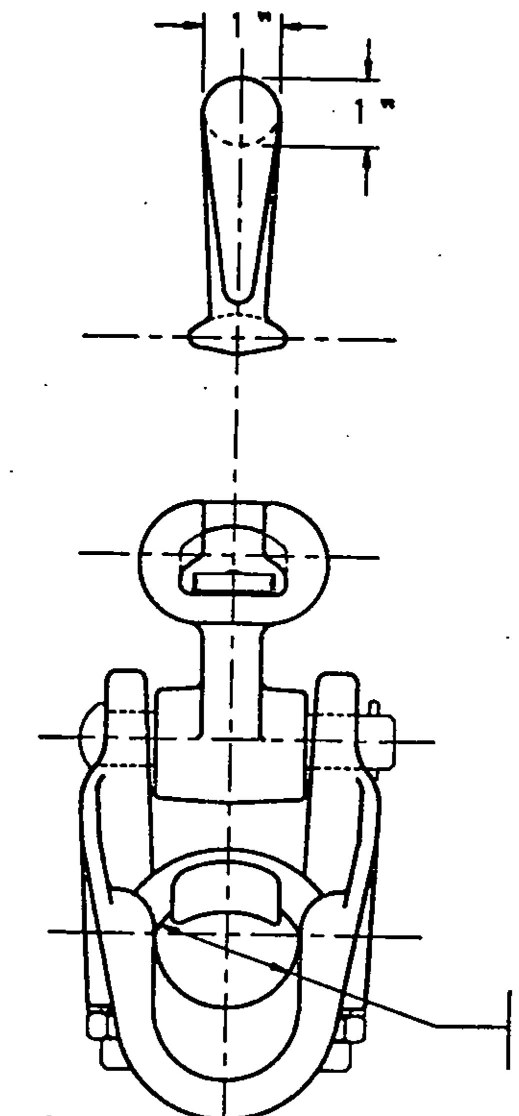


500-87.25

ITEM NO.	QTY.	LINDSEY PART NO.	DESCRIPTION	MAT'L	ASTM	WT. EA.
1	1	3310	30 KIP BALL HOOK	FS	A-576	
2	1	3361	30 KIP SOCKET EYE	DI	A-536	
3	1	1346	25 KIP SUSP. CLAMP	AL	B-26	





PACIFIC GAS AND ELECTRIC CO. REC'D ... ENGINEERING ... DESIGN

APPROVED FOR ... NOV 4 ... MICROFILMING

690157

GENERAL NOTES:

1. ALL FERROUS PARTS ARE HOT DIP GALVANIZED PER ASTM A-123.
2. ALL FERROUS FASTNERS ARE HOT DIP GALVANIZED PER ASTM A-153.
3. ALL BALL AND SOCKET FITTINGS TO FIT ANSI CLASS 52-3 AND 52-5.
4. ALL COTTER KEYS ARE HUMPBACK STAINLESS STEEL (TYPE 304).

NO.	DATE	BY	APP.	DESCRIPTION
B	10-23 86	KS	HC	ADDED NOTE 3 REVISED AND UPDATED
A	2-4 85	MC		3-1/4 WAS 3-1/8 3361 WAS 3365. 10" WAS 11"

REVISIONS

USED ON NUMBERS

DRAWING AND DESIGN PROPERTY OF LINDSEY MFG. CO. UNAUTHORIZED MANUFACTURE OR REPRODUCTION IN WHOLE OR PART PROHIBITED.

ULT. STRENGTH — 25,000 LBS. REQ. 18,000

INNOVATIONS IN TRANSMISSION AND DISTRIBUTION — LINDSEY MANUFACTURING COMPANY

TITLE: 44-115KV SINGLE STRING SUSPENSION

TOLERANCES UNLESS OTHERWISE NOTED	FRACTIONS	DECIMALS	ANGLES
CAST			
FORGE			
MACHINE			
FABRICATION			

WEIGHT: ASMB— RAW FIN.

MATERIAL: SEE CHART — FINISH: SEE NOTES

NOTE! DO NOT SCALE DRAWING. BREAK ALL SHARP EDGES

APP. HC 10-23-86 — CHK. — DRG. KCS 10-23-86

SCALE: NONE — NUMBER: TYPE SAA

LAST REVISION: NO. B DATE 10-23-86

DRAWING-NUMBER: R-3053

500-82.25

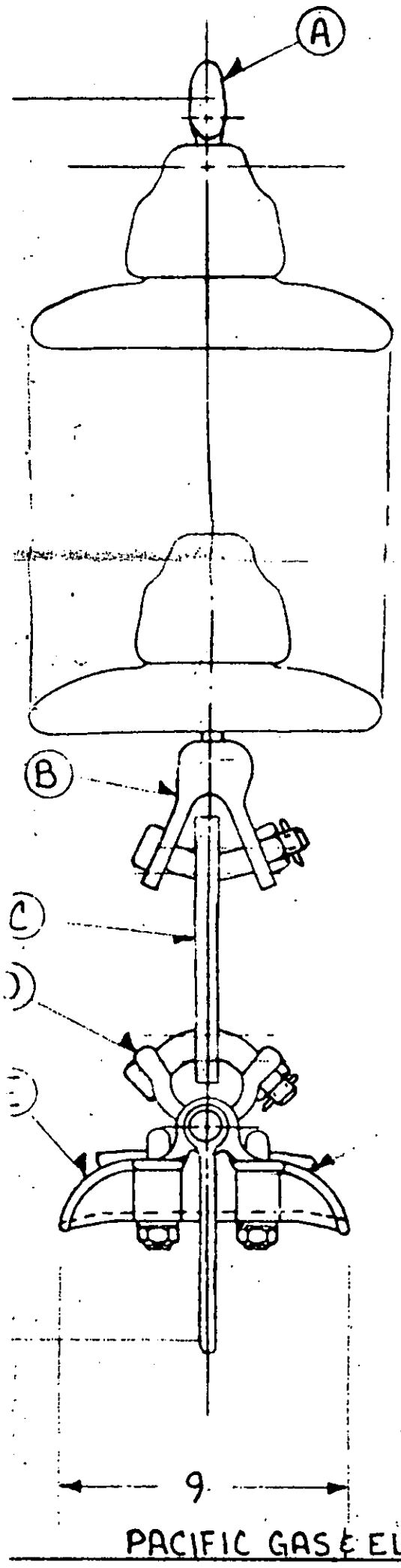
3001

LIST OF MATERIAL

DRAWING NUMBER 60282

ITEM	PART NO.	MATERIAL	DESCRIPTION
1 A	78420-2000	F.S.	HOOK
1 B	92802-2000	M.I.	SOCKET Y-CLEVIS
1 C	99844-4001	STL.	YOKE PLATE
2 D	93885-3003	M.I.	Y-CLEVIS EYE
2 E	87144-3006	ALUM.	SUSPENSION CLAMP
2 F	88017-2000	F.S.	CHAIN SHACKLE

SHIP UNASSEMBLED



ITEM	WEIGHT*	ULT. STR.*	A.S.T.M.
A	1.7 #	30,000 #	A-576
B	2.3 #	30,000 #	A-47
C	13.9 #	30,000 #	A-283
D	2.2 #	25,000 #	A-47
E	5.1 #	25,000 #	B-108
F	1.3 #	10,000 #	A-576

PACIFIC GAS AND ELECTRIC CO. REC'D FEB 1981 ENGINEERING RECORDS DESIGN - DRAFTING

TYPE 2SJ

- CLAMP SUITABLE FOR 1.00 TO 1.47 DIA. CONDUCTOR.

697677

APPROVED FOR FEB 5 - 1981 MICROFILMING

PACIFIC GAS & ELECTRIC

DATE	BY	DATE	BY
12-15-78	GB DRAFTSMAN		MFG. ENG.
12-18-78	MS CHECKER		TECH. DIRECTOR
12-18-78	MS CHIEF DRAFTSMAN		PATENT ATTORNEY
12-18-78	MS DEVELOP. ENG.		CHIEF ENG.

OHIO BRASS
MANSFIELD, OHIO

115 KV JUMPER ASSEMBLY TYPE 2SJ

	M & T SALES		4	
	VALVE SALES		83	
*	P. U. SALES			
	PURCHASING			
✓	PRODUCTION		✓	

DRAWING NO. 60282
FILE 30-C SCALE