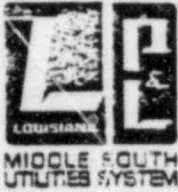


WATERFORD 3 SES
PLANT OPERATING MANUAL



LOUISIANA
POWER & LIGHT

POM VOLUME 10
POM SECTION 3

ME-3-310
REVISION + 2

CHANGE
1
42-
3-12-84

SURVEILLANCE PROCEDURE

~~FUNCTIONAL TEST~~ OF TIME DELAY RELAYS
CALIBRATION

LP&L W-3 RECORDS
FIELD CONTROLLED

MUST BE REVERIFIED
7 DAYS FROM CHECK OUT
DATE

PORC Meeting No. 84-12

Reviewed: [Signature]
PORC Chairman

Approved: [Signature]
Plant Manager-Nuclear

3-9-84
Approval Date

Effective Date

WATERFORD 3 SES
PLANT OPERATING MANUAL
CHANGE/REVISION/DELETION REQUEST

Procedure No. ME-3-310 Title CALIBRATION OF TIME DELAY RELAYS
Effective Date _____ (if different from approval date)

Complete A, B, or C

A. Change No. 1
B. Revision No. 2
C. Deletion N/A

REASON FOR CHANGE, REVISION, OR DELETION

CHANGE INCORRECT REVISION NUMBER FROM REVISION 1 TO REVISION 2
CHANGE TITLE OF PROCEDURE TO CALIBRATION OF TIME DELAY RELAYS

REQUIRED SIGNATURES

Originator [Signature] Date March 12 1984
Technical Review [Signature] Date 3-12-84

SAFETY EVALUATION

Does this change, revision, or deletion:	YES	NO
1. Change the facility as described in the FSAR?	—	<u>X</u>
2. Change the procedures as described in the FSAR?	—	<u>X</u>
3. Conduct tests/experiments not described in the FSAR?	—	<u>X</u>
4. Create a condition or conduct an operation which exceeds, or could result in exceeding, the limits in Technical Specifications?	—	<u>X</u>

If the answer to any of the above is yes, complete and attach a 10 CFR 50.59 Safety Evaluation checklist.

Safety Evaluation [Signature] Date 3-12-84
Group/Dep't. Head Review [Signature] Date 3-12-84

Temporary Approval* [Signature] Date 3-12-84 (NOS) ^{RES 3-12-84}
Temporary Approval* [Signature] Date 3-12-84 (NOS)

QC Review _____ Date _____
PORC Review _____ Date _____ Meeting No. _____
Plant Manager-Nuclear Approval _____ Date _____

*Temporary approval must be followed by Plant Manager-Nuclear approval within 14 days.

*Change 1
10-3-84*

TABLE OF CONTENTS

- 1.0 PURPOSE
- 2.0 REFERENCES
- 3.0 PREREQUISITES
- 4.0 PRECAUTIONS AND LIMITATIONS
- 5.0 INITIAL CONDITIONS
- 6.0 MATERIAL AND TEST EQUIPMENT
- 7.0 ACCEPTANCE CRITERIA
- 8.0 PROCEDURE
 - 8.1 Preparation
 - 8.2 Timing Test
 - 8.3 Restoration
- 9.0 SETPOINTS
- 10.0 ATTACHMENTS
 - 10.1 Functional Test of Time Delay Relays (Surveillance) Data Record Form (2 pages)
 - 10.2 Time Delay Relay Specifications (2 pages)
- 11.0 COMMITMENTS AND REFERENCES

LIST OF EFFECTIVE PAGES

Title	Revision
1-12	Revision 1
1-8, 9, 10	Change 1

*Change 1
10-3-84*

Change 1
Date 5/2/84

1.0 PURPOSE

1.1 This procedure provides instructions for performing a channel calibration of the Reactor Coolant Pump transfer trip relays in accordance with Technical Specification Table 3.8-1. This satisfies a portion of Technical Specification 4.8.4.1.a.1.a.

1.1.1 This procedure shall be performed at least once per 18 months on at least 10 percent of the Reactor Coolant Pump circuit breakers listed in Technical Specification Table 3.8-1.

1.2 This procedure provides instructions for performing a channel calibration of the 4.16 kV bus 3A3-S and 3B3-S undervoltage timing relays. This satisfies a portion of Technical Specification 4.3.2.1.

1.2.1 This procedure shall be performed at least once per 18 months on the timing relays in each 4.16 kV bus undervoltage channel.

1.3 This procedure provides instructions for performing a functional test of the CEDM cooling unit and the pressurizer heater transfer trip relays in accordance with Technical Specification Table 3.8-1. This satisfies a portion of Technical Specification 4.8.4.1.a.2.

1.3.1 This procedure shall be performed at least once per 18 months on at least 10 percent of the transfer trip relays on the CEDM cooling unit and the pressurizer heater breakers listed in Technical Specification Table 3.8-1.

1.4 All of the transfer trip relays pertaining to this procedure are listed in Attachment 10.2.

2.0 REFERENCES

2.1 Agastat Timing Relays 7000 Series, 457000854

ME-3-310 Rev 1

2.2 Waterford 3 FSAR, Chapter 16 Technical Specifications

2.2.1 4.8.1.1.1.b

2.2.2 4.8.1.1.2.a.4

2.2.3 4.8.4.1.a.1.a

2.2.4 4.8.4.1.a.2

2.2.5 4.3.2.1

2.3 UNT-5-002, Condition Identification and Work Authorization

2.4 UNT-5-003, Clearance Requests, Approval and Release

NOTE

The following references are listed with revision numbers as an aid to development of future procedure changes/revisions/reviews. The technician performing this procedure shall use the latest Controlled Copy reference revision available.

2.5 Control Wiring Diagrams, LOU-1564-B-424

2.5.1 Sheet E220, Rev. 1

2.5.2 Sheet E230, Rev. 1

2.5.3 Sheet E240, Rev. 1

2.5.4 Sheet E250, Rev. 1

2.5.5 Sheet E285, Rev. 6

2.5.6 Sheet E286, Rev. 6

2.5.7 Sheet E287, Rev. 7

2.5.8 Sheet E288, Rev. 6

Surveillance Procedure
Calibration
~~Functional Test~~ of Time Delay Relays

ME-3-310
Revision 4

Change 1
SAC 3-2-84

- 2.5.9 Sheet 289, Rev. 7
- 2.5.10 Sheet 290, Rev. 9
- 2.5.11 Sheet 1139, Rev. 6
- 2.5.12 Sheet 1140, Rev. 6
- 2.5.13 Sheet 1141, Rev. 6
- 2.5.14 Sheet 1142, Rev. 6
- 2.5.15 Sheet 2347S, Rev. 5
- 2.5.16 Sheet 2349S, Rev. 5
- 2.5.17 Sheet 2338, Rev. 3
- 2.5.18 Sheet 2388, Rev. 3

3.0 PREREQUISITES

- 3.1 The applicable Station Service Transformer must be deenergized when this procedure is performed on the transfer trip relays, if necessary.
- 3.2 The Shift Supervisor/Control Room Supervisor (SS/CRS) has granted permission to perform this procedure and signified by signing the appropriate space on the maintenance task card.
- 3.3 All measuring and test equipment (M&TE) used to perform this procedure shall be within its current calibration cycle, as evidenced by an affixed calibration sticker.

4.0 PRECAUTIONS AND LIMITATIONS

4.1 PRECAUTIONS

- 4.1.1 Ensure that the channel calibration to be performed will not inadvertently initiate any protective action, cause loss of control of a component or system, or prevent any other protective actions that may be required.

18
13
194

4.2 LIMITATIONS

- 4.2.1 Step completion shall be signified by initialing or entering data in the appropriate space on Attachment 10.1. If a procedure step does not apply to a particular component or equipment being tested, "N/A" shall be recorded in the appropriate data or signoff space.
- 4.2.2 If any discrepancies are encountered that cannot be resolved within the scope of this procedure, submit a CIWA in accordance with UNT-5-002 to initiate further corrective action. The CIWA number and an explanation shall be entered in the "Remarks" section of Attachment 10.1.
- 4.2.3 Record correctable deficiencies together with the remedial action taken in the "Remarks" section of Attachment 10.1 as a guide to trend analysis.
- 4.2.4 Reconnecting wires requires independent verification as to their proper restoration. The person making the disconnection shall enter the Wire Identification (ID) number (provide temporary labels if necessary) and its Termination ID in the space provided on Attachment 10.1 prior to disconnecting. Upon reconnection, the person performing the reconnection shall enter the Wire ID and Termination ID he reconnects to and provide his initials in the "Performed By" space. The person performing independent verification shall initial in the "Verified By" space provided.
- 4.2.5 If any "As Found" values do not meet the acceptance criteria, inform the Electrical Supervisor and the SS/CRS. The Electrical Supervisor shall be notified prior to correcting the out-of-tolerance conditions. Signify notification of the SS/CRS by entering initials, date and time in the space provided on Attachment 10.1.

Change 1
JPC 3/2/84

5.0 INITIAL CONDITIONS

The plant must be in operational mode 5 or 6 when this procedure is performed.

6.0 MATERIAL AND TEST EQUIPMENT

6.1 MATERIAL

6.1.1 Torque-Seal or equivalent position-marking compound

6.2 TEST EQUIPMENT.

6.2.1 Multi-Amp Model SR-76 or equivalent test equipment

6.2.2 Triplet Model 630 PLK or equivalent VOM

7.0 ACCEPTANCE CRITERIA

The "As Left" closing time for the normally open contacts is in the time ranges indicated on Attachment 10.2 (steps 8.2.3, 8.2.5).

8.0 PROCEDURE

8.1 PREPARATION

8.1.1 Ensure that all prerequisites have been completed.

8.1.2 Have Operations establish a safety clearance for the relay to be tested.

8.1.3 If necessary, lift wires/leads from the relay as required.

8.1.4 Connect a timing device to the relay so that it will start timing when voltage is applied to the relay coil and will stop timing when the relay's normally open (NO) contacts close.

8.1.5 Connect a switched 125 Vdc source (not energized) to the relay coil.

8.1.6 Record the relay UNID number and model number on Attachment 10.1.

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REV 3/2 84

8.1.7 Obtain the pickup time range from Attachment 10.2 and enter it in the "Tolerance" space in the timing test section of Attachment 10.1.

8.2 TIMING TEST

NOTE

If any "As Found" values do not meet the acceptance criteria, inform the SS/CRS of the out-of-tolerance values.

- 8.2.1 Ensure that the timing device is zeroed (reset).
- 8.2.2 Switch the 125 Vdc source on and apply voltage to the relay coil.
- 8.2.3 When the relay's NO contacts close, stopping the timing device, record the "As Found" relay delay time indicated on the timing device.
- 8.2.4 Using an ohmmeter, verify that all of the NO contacts are closed.
- 8.2.5 If the "As Found" delay time falls in the time range listed in the "Tolerance" space, record the "As Found" delay time in the "As Left" space and proceed to section 8.3.
- 8.2.6 If the "As Found" delay time does not fall in the time range listed in the "Tolerance" space, alternately adjust the relay time dial and cause the relay to pick up until the delay time falls in the time range listed in the "Tolerance" space on three consecutive tests. Record the delay time on the last test performed in the "As Left" column.
- 8.2.7 Replace any removed or broken Torque-Seal with fresh compound, being careful not to move the time dial in the process.

8.3 RESTORATION

- 8.3.1 Turn off all of the test equipment and disconnect from the relay.
- 8.3.2 Replace any lifted leads/wires.
- 8.3.3 Have Operations remove the safety clearance.
- 8.3.4 Inform the SS/CRS that the procedure is complete.

9.0 SETPOINTS

Timed NO contact closure as indicated on Attachment 10.2.

10.0 ATTACHMENTS

- 10.1 Functional Test of Time Delay Relays (Surveillance) Data Record Form
- 10.2 Time Delay Relay Specifications

11.0 COMMITMENTS AND REFERENCES

RT L3.46

~~FUNCTIONAL TEST~~ OF TIME DELAY RELAYS (SURVEILLANCE)
Calibration
DATA RECORD FORM

CHING
50-3-2-84

UNID NO: _____ SYSTEM: _____ CWD NO: _____

MODEL NO: _____ DATE: _____

DESCRIPTION: _____

PREPARATION

STEP NO.		INITIALS / DATE
8.1.1	Prerequisites complete.	____ / ____
8.1.2	Safety clearance established.	____ / ____

TIMING TEST

8.2.3 / 8.2.5	
"AS FOUND" _____ SEC.	"TOLERANCE" _____ SEC.
"AS LEFT" _____ SEC.	

RESTORATION

8.3.3	Safety clearance removed.	____ / ____
8.3.4	Informed SS/CRS the procedure is complete.	____ / ____

MEASURING AND TEST EQUIPMENT

M&TE NUMBER	DESCRIPTION	CAL. DUE DATE

REMARKS: _____

SS/CRS NOTIFIED OF ANY "AS FOUND" VALUES NOT MEETING THE ACCEPTANCE CRITERIA.

INITIALS / DATE / TIME
____ / ____ / ____

SS/CRS ON DUTY: _____

PERFORMED BY: _____

DATE/TIME: _____ / _____

REVIEWED BY: _____

DATE/TIME: _____ / _____

WATERFORD 3 SES
PLANT OPERATING MANUAL

CHANGE/REVISION/DELETION REQUEST

Procedure No. ME-3-310 Title FUNCTIONAL TEST OF TIME DELAY RELAY
Effective Date _____ (if different from approval date)

Complete A, B, or C

- A. Change No. N/A
B. Revision No. 21
C. Deletion NA

REASON FOR CHANGE, REVISION, OR DELETION

ADD REACTOR COOLANT PUMP TRANSFER TRIP RELAYS, MAKE THE PURPOSE STATEMENT MORE COMPREHENSIVE, ADD TOLERANCE TO ATTACHMENT 10.1 AND 10.2

REQUIRED SIGNATURES

Originator Dan Dill Date 11/17/83
Technical Review Mike Perrone Date 11-18-83

SAFETY EVALUATION

Does this change, revision, or deletion:	YES	NO
1. Change the facility as described in the FSAR?	—	<u>✓</u>
2. Change the procedures as described in the FSAR?	—	<u>✓</u>
3. Conduct tests/experiments not described in the FSAR?	—	<u>✓</u>
4. Create a condition or conduct an operation which exceeds, or could result in exceeding, the limits in Technical Specifications?	—	<u>✓</u>

If the answer to any of the above is yes, complete and attach a 10 CFR 50.59 Safety Evaluation checklist.

Safety Evaluation Mike Perrone Date 11-18-83
Group/Dep't. Head Review R.E. Spradley Date 1-7-84 / 1-7-84
Temporary Approval* _____ Date _____ (NOS)
Temporary Approval* _____ Date _____
QC Review L. L. Skinner Date 3-2-84
PORC Review D. Dill Date 3-2-84 Meeting No. 84-12
Plant Manager-Nuclear Approval N/A Date N/A

*Temporary approval must be followed by Plant Manager-Nuclear approval within 14 days.

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1.0 PURPOSE

2.0 REFERENCES

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4.0 PRECAUTIONS AND LIMITATIONS

5.0 INITIAL CONDITIONS

6.0 MATERIAL AND TEST EQUIPMENT

7.0 ACCEPTANCE CRITERIA

8.0 PROCEDURE

 8.1 Preparation

 8.2 Timing Test

 8.3 Restoration

9.0 SETPOINTS

10.0 ATTACHMENTS

 10.1 Functional Test of Time Delay Relays (Surveillance) Data
 Record Form (2 pages)

 10.2 Time Delay Relay Specifications (2 pages)

11.0 COMMITMENTS AND REFERENCES

LIST OF EFFECTIVE PAGES

Title	Revision 1
1-12	Revision 1

1.0 PURPOSE

1.1 This procedure provides instructions for performing a channel calibration of the Reactor Coolant Pump transfer trip relays in accordance with Technical Specification Table 3.8-1. This satisfies a portion of Technical Specification 4.8.4.1.a.1.a.

1.1.1 This procedure shall be performed at least once per 18 months on at least 10 percent of the Reactor Coolant Pump circuit breakers listed in Technical Specification Table 3.8-1.

1.2 This procedure provides instructions for performing a channel calibration of the 4.16 kV bus 3A3-S and 3B3-S undervoltage timing relays. This satisfies a portion of Technical Specification 4.3.2.1.

1.2.1 This procedure shall be performed at least once per 18 months on the timing relays in each 4.16 kV bus undervoltage channel.

1.3 This procedure provides instructions for performing a functional test of the CEDM cooling unit and the pressurizer-heater-transfer trip relays in accordance with Technical Specification Table 3.8-1. This satisfies a portion of Technical Specification 4.8.4.1.a.2.

1.3.1 This procedure shall be performed at least once per 18 months on at least 10 percent of the transfer trip relays on the CEDM cooling unit and the pressurizer heater breakers listed in Technical Specification Table 3.8-1.

1.4 All of the transfer trip relays pertaining to this procedure are listed in Attachment 10.2.

2.0 REFERENCES

2.1 Agastat Timing Relays 7000 Series, 457000854

2.2 Waterford 3 FSAR, Chapter 16 Technical Specifications

2.2.1 4.8.1.1.1.b

2.2.2 4.8.1.1.2.a.4

2.2.3 4.8.4.1.a.1.a

2.2.4 4.8.4.1.a.2

2.2.5 4.3.2.1

2.3 UNT-5-002, Condition Identification and Work Authorization

2.4 UNT-5-003, Clearance Requests, Approval and Release

NOTE

The following references are listed with revision numbers as an aid to development of future procedure changes/revisions/reviews. The technician performing this procedure shall use the latest Controlled Copy reference revision available.

2.5 Control Wiring Diagrams, LOU-1564-B-424

2.5.1 Sheet E220, Rev. 1

2.5.2 Sheet E230, Rev. 1

2.5.3 Sheet E240, Rev. 1

2.5.4 Sheet E250, Rev. 1

2.5.5 Sheet E285, Rev. 6

2.5.6 Sheet E286, Rev. 6

2.5.7 Sheet E287, Rev. 7

2.5.8 Sheet E288, Rev. 6

- 2.5.9 Sheet 289, Rev. 7
- 2.5.10 Sheet 290, Rev. 9
- 2.5.11 Sheet 1139, Rev. 6
- 2.5.12 Sheet 1140, Rev. 6
- 2.5.13 Sheet 1141, Rev. 6
- 2.5.14 Sheet 1142, Rev. 6
- 2.5.15 Sheet 2347S, Rev. 5
- 2.5.16 Sheet 2349S, Rev. 5
- 2.5.17 Sheet 2338, Rev. 3
- 2.5.18 Sheet 2388, Rev. 3

3.0 PREREQUISITES

- 3.1 The applicable Station Service Transformer must be deenergized when this procedure is performed on the transfer trip relays, if necessary.
- 3.2 The Shift Supervisor/Control Room Supervisor (SS/CRS) has granted permission to perform this procedure and signified by signing the appropriate space on the maintenance task card.
- 3.3 All measuring and test equipment (M&TE) used to perform this procedure shall be within its current calibration cycle, as evidenced by an affixed calibration sticker.

4.0 PRECAUTIONS AND LIMITATIONS

4.1 PRECAUTIONS

- 4.1.1 Ensure that the channel calibration to be performed will not inadvertently initiate any protective action, cause loss of control of a component or system, or prevent any other protective actions that may be required.

4.2 LIMITATIONS

- 4.2.1 Step completion shall be signified by initialing or entering data in the appropriate space on Attachment 10.1. If a procedure step does not apply to a particular component or equipment being tested, "N/A" shall be recorded in the appropriate data or signoff space.
- 4.2.2 If any discrepancies are encountered that cannot be resolved within the scope of this procedure, submit a CIWA in accordance with UNT-5-002 to initiate further corrective action. The CIWA number and an explanation shall be entered in the "Remarks" section of Attachment 10.1.
- 4.2.3 Record correctable deficiencies together with the remedial action taken in the "Remarks" section of Attachment 10.1 as a guide to trend analysis.
- 4.2.4 Reconnecting wires requires independent verification as to their proper restoration. The person making the disconnection shall enter the Wire Identification (ID) number (provide temporary labels if necessary) and its Termination ID in the space provided on Attachment 10.1 prior to disconnecting. Upon reconnection, the person performing the reconnection shall enter the Wire ID and Termination ID he reconnects to and provide his initials in the "Performed By" space. The person performing independent verification shall initial in the "Verified By" space provided.
- 4.2.5 If any "As Found" values do not meet the acceptance criteria, inform the Electrical Supervisor and the SS/CRS. The Electrical Supervisor shall be notified prior to correcting the out-of-tolerance conditions. Signify notification of the SS/CRS by entering initials, date and time in the space provided on Attachment 10.1.

5.0 INITIAL CONDITIONS

The plant must be in operational mode 5 or 6 when this procedure is performed.

6.0 MATERIAL AND TEST EQUIPMENT

6.1 MATERIAL

6.1.1 Torque-Seal or equivalent position-marking compound

6.2 TEST EQUIPMENT

6.2.1 Multi-Amp Model SR-76 or equivalent test equipment

6.2.2 Triplet Model 630 PLK or equivalent VOM

7.0 ACCEPTANCE CRITERIA

The "As Left" closing time for the normally open contacts is in the time ranges indicated on Attachment 10.2 (steps 8.2.3, 8.2.5).

8.0 PROCEDURE

8.1 PREPARATION

8.1.1 Ensure that all prerequisites have been completed.

8.1.2 Have Operations establish a safety clearance for the relay to be tested.

8.1.3 If necessary, lift wires/leads from the relay as required.

8.1.4 Connect a timing device to the relay so that it will start timing when voltage is applied to the relay coil and will stop timing when the relay's normally open (NO) contacts close.

8.1.5 Connect a switched 125 Vdc source (not energized) to the relay coil.

8.1.6 Record the relay UNID number and model number on Attachment 10.1.

8.1.7 Obtain the pickup time range from Attachment 10.2 and enter it in the "Tolerance" space in the timing test section of Attachment 10.1.

8.2 TIMING TEST

NOTE

If any "As Found" values do not meet the acceptance criteria, inform the SS/CRS of the out-of-tolerance values.

- 8.2.1 Ensure that the timing device is zeroed (reset).
- 8.2.2 Switch the 125 Vdc source on and apply voltage to the relay coil.
- 8.2.3 When the relay's NO contacts close, stopping the timing device, record the "As Found" relay delay time indicated on the timing device.
- 8.2.4 Using an ohmmeter, verify that all of the NO contacts are closed.
- 8.2.5 If the "As Found" delay time falls in the time range listed in the "Tolerance" space, record the "As Found" delay time in the "As Left" space and proceed to section 8.3.
- 8.2.6 If the "As Found" delay time does not fall in the time range listed in the "Tolerance" space, alternately adjust the relay time dial and cause the relay to pick up until the delay time falls in the time range listed in the "Tolerance" space on three consecutive tests. Record the delay time on the last test performed in the "As Left" column.
- 8.2.7 Replace any removed or broken Torque-Seal with fresh compound, being careful not to move the time dial in the process.

8.3 RESTORATION

- 8.3.1 Turn off all of the test equipment and disconnect from the relay.
- 8.3.2 Replace any lifted leads/wires.
- 8.3.3 Have Operations remove the safety clearance.
- 8.3.4 Inform the SS/CRS that the procedure is complete.

9.0 SETPOINTS

Timed NO contact closure as indicated on Attachment 10.2.

10.0 ATTACHMENTS

- 10.1 Functional Test of Time Delay Relays (Surveillance) Data Record Form
- 10.2 Time Delay Relay Specifications

11.0 COMMITMENTS AND REFERENCES

RT L3.46

FUNCTIONAL TEST OF TIME DELAY RELAYS (SURVEILLANCE)

DATA RECORD FORM

UNID NO:

SYSTEM:

CWD NO:

MODEL NO:

DATE:

DESCRIPTION:

PREPARATION

STEP NO.

INITIALS / DATE

8.1.1 Prerequisites complete.

8.1.2 Safety clearance established.

TIMING TEST

8.2.3 / 8.2.5

"AS FOUND" _____ SEC.

"TOLERANCE" _____ SEC.

"AS LEFT" _____ SEC.

RESTORATION

8.3.3 Safety clearance removed.

8.3.4 Informed SS/CRS the procedure is complete.

MEASURING AND TEST EQUIPMENT

M&TE NUMBER

DESCRIPTION

CAL. DUE DATE

REMARKS:

SS/CRS NOTIFIED OF ANY "AS FOUND" VALUES NOT MEETING THE ACCEPTANCE CRITERIA.

INITIALS / DATE / TIME

SS/CRS ON DUTY: _____

PERFORMED BY: _____

DATE/TIME: _____

REVIEWED BY: _____

DATE/TIME: _____

TIME DELAY RELAY SPECIFICATIONS

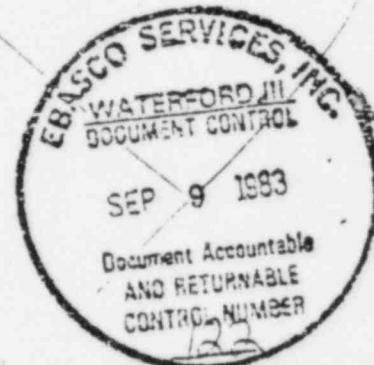
<u>UNID NUMBER</u>	<u>DESCRIPTION</u>	<u>SETTING</u>	<u>RANGE</u>
<u>RC-EREL-220D</u>	<u>REACTOR COOLANT PUMP 1A RELAY #2</u>	<u>4 SEC.</u>	<u>3.5 to 4.5 SEC.</u>
<u>RC-EREL-230D</u>	<u>REACTOR COOLANT PUMP 1B RELAY #2</u>	<u>4 SEC.</u>	<u>3.5 to 4.5 SEC.</u>
<u>RC-EREL-240D</u>	<u>REACTOR COOLANT PUMP 2A RELAY #2</u>	<u>4 SEC.</u>	<u>3.5 to 4.5 SEC.</u>
<u>RC-EREL-250D</u>	<u>REACTOR COOLANT PUMP 2B RELAY #2</u>	<u>4 SEC.</u>	<u>3.5 to 4.5 SEC.</u>
<u>CDC-EREL-1139-3S</u>	<u>CEDM COOLING UNIT 3A RELAY #2</u>	<u>1 SEC.</u>	<u>0.9 to 1.1 SEC.</u>
<u>CDC-EREL-1140-3S</u>	<u>CEDM COOLING UNIT 3A RELAY #2</u>	<u>1 SEC.</u>	<u>0.9 to 1.1 SEC.</u>
<u>CDC-EREL-1141-3S</u>	<u>CEDM COOLING UNIT 3A RELAY #2</u>	<u>1 SEC.</u>	<u>0.9 to 1.1 SEC.</u>
<u>CDC-EREL-1142-3S</u>	<u>CEDM COOLING UNIT 3A RELAY #2</u>	<u>1 SEC.</u>	<u>0.9 to 1.1 SEC.</u>
<u>RC-EREL-285-E</u>	<u>PRESSURIZER HEATER BACKUP BANK 1 RELAY 2</u>	<u>0.5 SEC.</u>	<u>0.4 to 0.6 SEC.</u>
<u>RC-EREL-286-E</u>	<u>PRESSURIZER HEATER BACKUP BANK 2 RELAY 2</u>	<u>0.5 SEC.</u>	<u>0.4 to 0.6 SEC.</u>
<u>RC-EREL-287-E</u>	<u>PRESSURIZER HEATER BACKUP BANK 3 RELAY 2</u>	<u>0.5 SEC.</u>	<u>0.4 to 0.6 SEC.</u>
<u>RC-EREL-288-E</u>	<u>PRESSURIZER HEATER BACKUP BANK 4 RELAY 2</u>	<u>0.5 SEC.</u>	<u>0.4 to 0.6 SEC.</u>
<u>RC-EREL-289-E</u>	<u>PRESSURIZER HEATER BACKUP BANK 5 RELAY 2</u>	<u>0.5 SEC.</u>	<u>0.4 to 0.6 SEC.</u>
<u>RC-EREL-290-E</u>	<u>PRESSURIZER HEATER BACKUP BANK 6 RELAY 2</u>	<u>0.5 SEC.</u>	<u>0.4 to 0.6 SEC.</u>

TIME DELAY RELAY SPECIFICATIONS

<u>4KV-EREL-2338K-S</u>	<u>3A3-S BUS UNDER- VOLTAGE 27-T1 RELAY</u>	<u>10 SEC.</u>	<u>9.0 to 11.0 SEC.</u>
<u>4KV-EREL-2338L-S</u>	<u>3A3-S BUS UNDER- VOLTAGE 27-T2 RELAY</u>	<u>10 SEC.</u>	<u>9.0 to 11.0 SEC.</u>
<u>4KV-EREL-2338M-S</u>	<u>3A3-S BUS UNDER- VOLTAGE 27-T3 RELAY</u>	<u>10 SEC.</u>	<u>9.0 to 11.0 SEC.</u>
<u>4KV-EREL-3B-12J-S</u>	<u>3B3-S BUS UNDER- VOLTAGE 27-T1 RELAY</u>	<u>10 SEC.</u>	<u>9.0 to 11.0 SEC.</u>
<u>4KV-EREL-3B-12K-S</u>	<u>3B3-S BUS UNDER- VOLTAGE 27-T2 RELAY</u>	<u>10 SEC.</u>	<u>9.0 to 11.0 SEC.</u>
<u>4KV-EREL-3B-12L-S</u>	<u>3B3-S BUS UNDER- VOLTAGE 27-T3 RELAY</u>	<u>10 SEC.</u>	<u>9.0 to 11.0 SEC.</u>

CARE AND MAINTENANCE INSTRUCTION

ITEM(S): Containment Fan Coolers
 QUANTITY: 4 Units
 PURCHASE ORDER: NY-403559
 SUB-PURCHASE ORDER: -----
 VENDOR: American Air Filter Company, Inc.
 MANUFACTURER: American Air Filter Company, Inc.
 SPECIFICATION: LOU 1564.745
 SAFETY CLASS: 2
 STORAGE LEVEL: B



*For your information
 5-21-84
 62*

A). BEFORE PLACING IN STORAGE

1. Inspect the general condition of the equipment to assure that it meets the degree of quality and workmanship required in the specification and contract.
2. Motor windings are to be meggered at time of placement in storage. Record resistance readings.
3. Assure all coil and pipe openings are plugged or capped.
4. Coils are to be stored dry. A small amount of glycol/water solution was left in coils by manufacturer to prevent rupture of coil tubes due to freezing of condensation.

B). HANDLING (ALL PHASES)

1. Refer to American Air Filter Instruction Manuals NESE 174-1 and NESE 325.
2. Hoist equipment using all 4 lifting eyes with sling spreaders to prevent side loading against housing and/or coils. Do not lift or pull coils by supply or return pipe connections.

FOIA-84-206
 K/5

CARE AND MAINTENANCE INSTRUCTION

C). AFTER PLACING IN WAREHOUSE STORAGE

1. At least monthly, inspect the general condition of the equipment to assure that it continues to meet the degree of quality and workmanship required in the specification and contract.
2. Manually rotate fan rotors a minimum of 3 turns, making sure a different fan blade is in the vertical position than before. Repeat this rotation at least every 3 months.
3. The fan motor bearings were lubricated at the factory with Chevron SRI No. 2 grease, and should need no additional greasing while in storage. R2
4. Connect motor space heaters and maintain throughout length of storage.
5. Immediately prior to removal from warehouse storage, megger motor windings and record resistance readings.

Note: The resistance reading must not have dropped more than 50% of the initial reading taken in section A step 2 of this CMI. If the drop is below 50% then the fan motors will have to be dried either electrically or mechanically before installation.

6. Deleted. R
7. At least monthly, inspect fins. Any bent fins should be straightened using a fin comb (6 fins to an inch).

D). AFTER MOVING TO IN-PLACE STORAGE

1. Prior to positioning unit, the sloped drain pan shown in section "A-A" of drawing 107D-1032697 is to be inspected to assure that the 34 1/4" - 20 x 3/4" long hex head screws per drain pan are snug. Also inspect the 8 3/8" - 16 x 1" long hex head capscrews per drain pan to ensure they are snug.
2. After unit is in place refer to page 15 of manufacturer's Instruction Manual NESE 325 for special securing instructions.
3. At least monthly, inspect the general condition of the equipment to assure that it continues to meet the degree of quality and workmanship required in the specification and contract.
4. Assure all coil and pipe openings remain capped or plugged.
5. Assure space heaters are connected and functioning.
6. Provide adequate protection from damage and deterioration as a result of activities and conditions in the vicinity.
7. Continue fan rotor rotation as per step 2 section C of this CMI.
8. Maintain fan motor bearings per step C.3, this CMI.

CARE AND MAINTENANCE INSTRUCTION

AFTER MOVING TO IN-PLACE STORAGE (Continued)

9. At time of removal from storage, fan motor bearings are to be purged to make sure that an ample supply of fresh grease (Mobilux E.P. No. 2 is acceptable) is in each bearing grease cavity. R1
10. Megger motors per CP-425, or other approved procedures. (Example - Contractor's approved construction procedures.) R2

E). OPERATION OF FAN COOLERS DURING CONSTRUCTION PHASE:

NOTE: All testing instruments must be calibrated through the LP&L Calibration Program.

1. PRIOR TO ENERGIZING MOTOR:

- a. Disconnect motor leads at lugs and megger leads at 500 test volts. Minimum acceptable value is 1 Megohm. If resistance is less than minimum value, dry motor per American Air Filter Instruction Manual, Ref. No. 2, this CMI. Reconnect motor leads upon completion.
- b. Megger all cables, permanent and/or temporary. Forward data to Ebasco S/U Coordinator.
- c. Check all terminal connections, assembly screws, bolts, and nuts for tightness.
- d. Purge existing Chevron SR-1 grease out of each motor bearing and fan pitch control mechanism, by hand-pumping in 3.0 cubic inches (minimum) of Mobilux EP-2 grease, or approved equal. There are two (2) external grease fittings for motor bearings and two (2) internal grease fittings for the pitch control mechanism on each unit.
- e. Check to be sure that fan blades are free to rotate and that the inlets to the coil banks are free and clear of debris. Check intakes for debris.
- f. Remove prefilter media in air handling units, and replace with American Air Filter No. AG-48 with UL +2 rating. R4
- g. Clean air handling units, and open drains to remove any moisture accumulated.
- h. Thirty (30) days prior to start-up, system will be walked down to check for debris in duct by Ebasco S/U coordinator and LP&L S/U engineer.
- i. Remove drain plug on motor and leave open for 10 minutes. Reinstall plug.
- j. Make control circuit checks.
- k. LP&L will perform breaker checks.

2. MOTOR-FAN START-UP CHECK

- a. Check rotor for direction of rotation. This should be counterclockwise when looking into the intake.
- b. When fan is up to speed, check the motor amperage on each phase for balance and correct motor load. All load data is stamped on nameplate. Information on load data must not be exceeded.

CAPE AND MAINTENANCE INSTRUCTION

OPERATION OF FAN COOLERS DURING CONSTRUCTION PHASE: (Continued)

2. c. Check bearing temperatures using a calibrated, portable, hand-held pyrometer.
- d. Vibration readings will be taken by LP&L.

3. DURING OPERATION OF FAN UNITS

- a. After first 100 hours of operation, hand-pump 3.0 cubic inches (minimum) of Mobilux EP-2 grease into motor bearings.
- b. At least every six (6) months, thereafter, hand-pump 3.0 cubic inches (minimum) of Mobilux EP-2 grease, or approved equal, into motor bearings. This can be done while motor is running (or not running).
- c. At least every six (6) months, disconnect motor windings at the lugs, and megger motor windings on 500V test position. De-energize input power before meggering. Megger at approximately the same temperature and humidity conditions. A wide variation from previous readings indicates deterioration at insulation. Shut down and investigate if problem exists. Reconnect windings and restore power upon completion.
- d. Inspect filters on a daily basis to determine the proper changing frequency. When filters are visibly dirty, pulling in, and restricting flow, change filters and establish a changing schedule at that time. Unit will be required to be shut down during this operation. R4
- e. Deleted. R4

F). PRIOR TO TRIAL OPERATION/CHECKOUT

1. Remove all pre-filter media, caps, plugs, and desiccants (if applicable). R3
2. Assure that fan inlet areas and coil banks are free of all debris.
3. Manually rotate fan blades to assure they are free to rotate.
4. Inspect units to assure they are clean and free of any condensation.
5. Megger motor windings to assure conformance to acceptability standards, reference CF-425. R2
6. Lubricate fan motor bearings per Owner's Lubrication Schedule. R2

G). REFERENCES

1. Deleted. R1
2. American Air Filter Instruction Manual NESE 325.
3. Deleted. R1
4. Joy Manufacturing Instruction FF 13310. R1

CARE AND MAINTENANCE INSTRUCTION

<u>REVISION</u>	<u>DATE</u>	<u>PREPARED BY</u>	<u>APPROVED BY</u>
0	06/18/78	D. Wakefield	W. C. Griggs
1	05/08/79	G. Banquer	W. C. Griggs
2	01/21/80	A. Verdoorn	W. C. Griggs
3	03/20/81	<i>A. Verdoorn</i> A. Verdoorn	<i>R. F. Vine</i> R. F. Vine
4	04/29/81	<i>J. Carpenter</i> J. Carpenter	<i>R. F. Vine</i> R. F. Vine

Supplement to Field Manual of Care and Maintenance Instructions.
Reference ASP-IV-19.

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE
NONCONFORMANCE REPORT

Distribution:
White - PQAE or Site QA Supervisor
Yellow - Organization receiving disposition
Pink - Initiator of NCR

REPORT NO. 103-5290

INSTRUCTIONS: (See back of form)

EBASCO
FIELD CODE: 1100.11.66 SUS# 43A

CLIENT OR PROJECT (2)		DRAWING NO./SPEC NO. (3)
FDSI/Waterford III		CHI 174 ASP IV 19
SUPPLIER, CONSTRUCTION QC OR CONTRACTOR (4)	P.O. NO. (5)	
Ebasco Forge Account		40355/9 EC 3/1/84
DESCRIPTION OF COMPONENT, PART OR SYSTEM (8)		
CHI 174 Containment Fan Coolers		

I. DESCRIPTION OF NONCONFORMANCE (7) (Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)

HVAC inspection/maintenance sheets indicate maintenance or inspection was performed on units AH-1 (2A-SA) and AH-1 (2B-SB) from August 1981 to July 1982. It appears no MR exists for this time period. This is in violation of ASP-IV-19.

ITEM NO: 0001

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (1)	TITLE/COMPANY	DATE (9)
D. Fastussen	S/U Engr./Ebasco	11/11/82

II. RECOMMENDED DISPOSITION (10) (Submit Sketch if Applicable)

See Attachment #1

REPORTABLE	YES	NO
1002P0055(8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
1002P0055(8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7-19-83		

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11)	TITLE/COMPANY	DATE (12)
James Cole	CHIEF	7-19-83

III. EVALUATION OF DISPOSITION BY EBASCO, REASON FOR DISPOSITION (13)

IV. CORRECTIVE ACTION (14) Required Not Required
The 7-19-83

V (15) <input type="checkbox"/> ENGINEERING	<input checked="" type="checkbox"/> QUALITY ASSURANCE	<input type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> OTHER
NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)
	James Cole James Cole		
DATE	DATE	DATE	DATE
	7-19-83		
<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED
<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION REQUIRED NOT REQUIRED (16)

(17) BY: KCOVERTON SIGNATURE: [Signature] TITLE: Lead QA Engineer/CPA DATE: 7-19-83

QUALITY ASSURANCE
NONCONFORMANCE REPORT

REPORT NO. 103-5090

White - PQAE or Site QA Supervisor
Yellow - Organization receiving ending disposition
Pink - Initiator of NCR

INSTRUCTIONS: (See back of form)

Emilia
TRENID CODE:

SUB# H3A

CLIENT OR PROJECT (2)	DRAWING NO./SPEC NO. (5)	
<u>1267 Waterford III</u>		
SUPPLIER, CONSTRUCTION CO OR CONTRACTOR (4)	P.O. NO. (5)	CMI 174 ASP IV 19
<u>Esasco Forge Account</u>	<u>403557</u>	<u>3/1/84</u>
DESCRIPTION OF COMPONENT, PART OR SYSTEM (6)		
<u>CMI 174 Containment Fan Coolers</u>		

I. DESCRIPTION OF NONCONFORMANCE (7) (Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)

HVAC inspection/maintenance sheets indicate maintenance or inspection was performed on units AH-1 (2A-5A) and AH-1 (3B-5B) from August 1981 to July 1982. It appears no M&R exists for this time period. This is in 3/1/11/82 violation of ASP-IV-19.

ITEM NO:

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (8)	TITLE/COMPANY	DATE (9)
<u>D. Rasmussen</u>	<u>S/U Engr./Esasco</u>	<u>11/11/82</u>

II. RECOMMENDED DISPOSITION (10) (Submit Sketch if Applicable)

REPORTABLE	YES	NO
DISPOSABLE	<input type="checkbox"/>	<input type="checkbox"/>
REMOVED	<input type="checkbox"/>	<input type="checkbox"/>
Reason for	Date	

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11)	TITLE/COMPANY	DATE (12)

III. EVALUATION OF DISPOSITION BY: EBASCO, REASON FOR DISPOSITION (13)

IV. CORRECTIVE ACTION (14) Required Not Required

<input checked="" type="checkbox"/> ENGINEERING	<input type="checkbox"/> QUALITY ASSURANCE	<input type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> OTHER
NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)
DATE	DATE	DATE	DATE
<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED
<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS

V. VERIFICATION OF DISPOSITION REQUIRED NOT REQUIRED (15)

(17) BY: _____ SIGNATURE _____ TITLE _____ DATE _____

Duplicate
Pink Copy

EBASCO SERVICES INCORPORATED - 7/14/83

QUALITY ASSURANCE

NONCONFORMANCE REPORT

Distribution:

- White - QA or Site QA Supervisor
- Yellow - Organization recommending disposition
- Pink - Initiator of NCR

REPORT NO. 103-5090

INSTRUCTIONS: (See back of form)

TREND CODE:

SUS# 43A

CLIENT OR PROJECT (2)

DRAWING NO./SPEC NO. (3)

TRIST Waterford III
SUPPLIER, CONSTRUCTION QC OR CONTRACTOR (4)

P.O. NO. (5)

QMI 174
ASP IV 19

Edisco Force Account
DESCRIPTION OF COMPONENT, PART OR SYSTEM (6)

40355/9
EC 3/1/84

QMI 174 Containment Fan Coolers

I. DESCRIPTION OF NONCONFORMANCE (7) (Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)

NRC inspection/maintenance sheets indicate maintenance or inspection was performed on units AH-1 (3A-6A) and AH-1 (3B-5B) from August 1981 to July 1982. It appears no NCR exists for this time period. This is in violation of ASP-IV-19.

ITEM NO:

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (8)

TITLE/COMPANY

DATE (9)

D. Rasmussen

S/U Engr./Ebasco

11/11/82

II. RECOMMENDED DISPOSITION (10) (Submit Sketch if Applicable)

SEE Attachment #1

REPORTABLE	YES	NO
100EFG0.53(4)	<input type="checkbox"/>	<input type="checkbox"/>
DATE	<input type="checkbox"/>	<input type="checkbox"/>

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11)

TITLE/COMPANY

DATE (12)

James Lee

ORE

7-19-83

III. EVALUATION OF DISPOSITION BY EBASCO, REASON FOR DISPOSITION (13)

SEE ATTACHMENT #1

IV. CORRECTIVE ACTION (14) Required Not Required

V. (15) <input type="checkbox"/> ENGINEERING	<input checked="" type="checkbox"/> QUALITY ASSURANCE	<input type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> OTHER LP&L 7-19-83
NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)
	James Lee		
DATE	DATE	DATE	DATE
	7-19-83		7-19-83
<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED
<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION REQUIRED NOT REQUIRED (16)

(17) BY: SIGNATURE TITLE DATE

EBASCO VENDOR QA OR QA ENGINEERING

174A AH-1-305B) R1-43
 174B AH-1-305A)
 174C AH-1-305A)
 174D AH-1-305A)
 174E AH-1-305B)

AH Attachment #1

182
 In-Place

MATERIAL MAINTENANCE RECORD - A

P.O.# 403559 MATERIAL DESCRIPTION Containment Fan Coolers
 CMI 174 LOCATION Per HVAC Maintenance Sheet MRR# ----- TAG# 174
 STORAGE LEVEL ----- DATE RECEIVED ----- DATE ISSUED -----

STEP #	REQUIRED MAINTENANCE	FREQUENCY
1.	Prior to positioning unit, assure that the 3/4" - 20 3/4" long hex head screws and the 8 3/8"-16 x 1" long hex head cap screws per sloped drain pan (Dwg 107D-1032697, Section "A-A"	PER HVAC MAINT. SH.
2.	After unit is in place, secure per page 15 of "Instruction Manual NESE325".	
3.	Check the general condition. Maintain plugs/caps on all coil/pipe openings.	
4.	Maintain operation of space heaters. Provide adequate protection from damage & deterioration.	
5.	Rotate fan rotors at least 3 turns. Stop 90° from starting point.	
6.	Before rotation, add small amount of Chevron SRI #2 grease or equal to rotor shaft bearings.	
REVIEWED & ACCEPTED		
7.	When removing from storage, purge old grease with new supply in each bearing cavity.	
OCT 6 1982		

NOTE Steps 1 and 2 to be done by the installer.

PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger; Pressure Gauges; Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	Q.C.
1,2,3,4 5,6	8-3-81	8-21-81	All steps complete per Aug. 1981 HVAC Maint. Sh. R. 1	QC	ave
1,2,3 4,5,6	9-3-81	9-21-81	All steps complete per Sept 1981 HVAC Maint Sh. R.1	QC	ave
1,2,3 4,5,6	10-3-81	10-19-81	All steps complete per sheet Oct. 1981 HVAC Sh. R1	QC	ave
1,2,3 4,5,6	11-3-81	11-25-81	All steps complete per HVAC Sheet dtd Nov. 1981 R.1	QC	ave
1,2,3 4,5,6	12-3-81	12-23-81	All steps complete per Dec. 1981 HVAC Maint. Sh. R.1.	QC	ave
3,4,5,6	1-3-82	2-9-82	All steps complete per JAN. 1982 HVAC MAINT. Sh. R1 AH-1(3A-3A) term Inf. AH-1(3B-3B) FORM TSCM 2	JR	ave
3,4,5,6	2-3-82	2-26-82	All steps complete per Feb. 1982 HVAC MAINT. Sh. R1.	JR	ave
3,4,5,6	3-3-82	3-25-82	All steps complete per MARCH 1982 HVAC SH. Rev. 1 Term: AH-1(3A-3A) AH-1(3B-3B)	JR	ave

Duplicate Original

7/14/83

QUALITY ASSURANCE
NONCONFORMANCE REPORT

DATE OF ISSUE
BY
APPROVED BY
TITLE

INSTRUCTIONS: (See back of form) **FORM QAB**

FORM 43A

CLIENT OR PROJECT (1)

LP&L/Waterford III

SUPPLIER, CONSTRUCTION GC OR CONTRACTOR (4)

Flasco Force Account

P.O. NO. (3)

40355/9 3/1/84

DRAWING NO./SPEC

CHI-174

AST-IV-19



DESCRIPTION OF COMPONENT, PART OR SYSTEM (8)

CHI 174 Containment Fan Coolers

I. DESCRIPTION OF NONCONFORMANCE (7) (Items Involved, Specification, Code or Standard to Which It Applies, Submit Sketch if Applicable)

In reference to the MWR, it appears no maintenance or inspection was performed on fan cooler units: AH-1 (3D-SB) from 7/17/78 to 7/31/79

AH-1 (3C-SA) from 8/11/78 to 7/31/79

AH-1 (3B-SB) from 3/13/79 to 7/31/79

RESPONSIBLE	YES	NO
APPROVED	<input type="checkbox"/>	<input checked="" type="checkbox"/>
RECEIVED BY	<input type="checkbox"/>	<input checked="" type="checkbox"/>

ITEM NO:

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (1)

Duane Radzusse

TITLE/COMPANY

S/U Engr./Ebasco

DATE (8)

11/11/82

II. RECOMMENDED DISPOSITION (10) (Submit Sketch if Applicable)

ESPA RECEIVED 28 JULY 1983 SEE ATTACHED

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11)

TITLE/COMPANY

AST. ENGR./EBASCO

DATE (12)

28 JULY 83

III. EVALUATION OF DISPOSITION BY EBASCO, REASON FOR DISPOSITION (13)

CONCUR WITH DISPOSITION. ABOVE UNITS ARE ACCEPTABLE

NO FURTHER CORRECTIVE ACTION REQUIRED

IV. CORRECTIVE ACTION (14) Required Not Required

7-29-83

V. (15) <input type="checkbox"/> ENGINEERING	<input checked="" type="checkbox"/> QUALITY ASSURANCE	<input checked="" type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> OTHER
NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)
DATE	DATE	DATE	DATE
<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED
<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input checked="" type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION REQUIRED

NOT REQUIRED 7-29-83

(17) BY _____ SIGNATURE _____ TITLE _____ DATE _____

Duplicate Original 7/14/83
Pink copy 7/27/83
EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE

Distributions:
White - PCAF or E-CR Reports
Yellow - Disposition recommending
Disposition
Pink - Inspector of NCR

REPORT NO. W3-5091 NONCONFORMANCE REPORT

INSTRUCTIONS: (See back of form) REPORT CODE: _____ SUS# _____

CLIENT OR PROJECT (2) _____ DRAWING NO./SPEC NO. (3)

LP&L/Waterford III
SUPPLIER, CONSTRUCTION GC OR CONTRACTOR (4) _____ P.O. NO. (5) _____
Ebasco Force Account 40355/4 3/1/84

CMI-174
ASP-IV-19

DESCRIPTION OF COMPONENT, PART OR SYSTEM (6)
CMI 174 Containment Fan Coolers

I. DESCRIPTION OF NONCONFORMANCE (7) (Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)

In reference to the NCR, it appears no maintenance or inspection was performed on fan cooler units: AH-1 (3D-SB) from 7/17/78 to 7/31/79

AH-1 (3C-SA) from 8/11/78 to 7/31/79

AH-1 (3B-SB) from 3/13/79 to 7/31/79

REPORTABLE	YES	NO
MODIFIED	<input type="checkbox"/>	<input type="checkbox"/>
INDEXED	<input type="checkbox"/>	<input type="checkbox"/>
Reviewed by:	Date	

ITEM NO:

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (8) _____ TITLE/COMPANY _____ DATE (9) 11/11/82
Duane Rasmussen S/U Engr./Ebasco

II. RECOMMENDED DISPOSITION (10) (Submit Sketch if Applicable)

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11) _____ TITLE/COMPANY _____ DATE (12) _____

III. EVALUATION OF DISPOSITION BY EBASCO, REASON FOR DISPOSITION (13)

IV. CORRECTIVE ACTION (14) Required Not Required

V. (15) <input type="checkbox"/> ENGINEERING	<input type="checkbox"/> QUALITY ASSURANCE	<input type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> OTHER
NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)
DATE	DATE	DATE	DATE
<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED
<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION REQUIRED NOT REQUIRED (16)

(17) BY _____ SIGNATURE _____ TITLE _____ DATE _____
EBASCO VENDOR CA QA ENGINEERING

EBASCO SERVICES INCORPORATED

EBASCO

DATE May 4, 1983 FILE REF
28 JULY 1983 FCC NCR-W3-5091

TO QAIRG CMI Coordinator

OFFICE LOCATION

FROM

EMD *[Signature]*

OFFICE LOCATION

NOTE: THIS DEFICIENCY REPORT DISPOSITION WILL ADEQUATELY RESPOND TO AND RESOLVE THE ISSUES RAISED IN NCR-W3-5091

SUBJECT Deficiency Report Disposition
QEM-0174-10 November 12, 1982
NY 403559 CMI #174
Containment Fan Coolers

Item #1. C.F.C. AH-1-(3CSA) was received 8-11-78 per MRR no. 805010 and issued to the field 8-21-78 per ROW no. 22369, (6 working days after receipt). Due to the "time lag" between warehouse receipt and notification of the EMD via a copy of the MRR, (approx. 3 to 5 days) the EMD had no way of knowing this equipment was in warehouse storage. Upon notification, the EMD initiated a maintenance worksheet and issued said worksheet to craft for completion. Craft personnel were unable to locate said C.F.C. due to it being issued to field, rendering the EMD powerless to perform it's required duties i.e. steps A.2 and C.5 of CMI no. 174.

(B)

Item #2. The MMR dated 7-13-78 thru 6-13-80 does indicate cooler maintenance. Step no. 1 of the MMR requires monthly inspections of the cooling units. This step is recorded as being completed from 7-13-78 thru 7-24-79 which is the date the last cooling unit was removed from the warehouse.

new

Item #3. Meggering of C.F.C. AH-1-(3ASA), AH-1-(3BSB) & AH-1-(3DSB) prior to removal from warehouse storage was inadvertently missed by EMD Personnel. Meggering of these units was accomplished in January, 1980 with all units recording a reading of infinity (∞). Accept as is.

(A)

OK - [Signature]

Item #4. An MMR for the period of 8-3-81 thru 8-3-82 is available and on file in QA vault. Copies of said MMR are also available at material QC and EMD maintenance history records.

[Signature]

Item #5. C.F.C. AH-1-(3ASA) and AH-1-(3BSB) were inadvertently removed from the Ebasco Maintenance Program in July 1982. These units were reinstated into the program in November 1982 with maintenance scheduled to begin in December 1982. An attempt was made in December to perform in-place maintenance, however LP&L was running the units at this time and upon further investigation it was found that SUS no. 43a-9 had been accepted by LP&L. All records on file for In-Place maintenance (9/79 - 7/82) and the LP&L "Test-Data" records for these units indicate them to be in an acceptable condition.

(C)

OK - [Signature]

Disposition acceptable

*QAIRG CMI Coordinator
Charles A. Whitchurch*

5/9/83

- Item #6. Incompleted worksheets is a problem of the past and is typical of prior practices. Since EMD training on the implementation of the new EMD Internal Instructions, present and future errors of this type will be prevented.
- Item #7. Voided.
- Item #8. Changes on the MMR-A form that were not initialed and dated is a problem of the past and is typical of prior practices. Since EMD training and the implementation of the new EMD Internal Instructions, present and future errors of this type will be prevented.
- Item #9. Megger ID no's and calibration due dates will be incorporated to the applicable MMR's per NCR no. W3-5089 and can be considered complete when said NCR is accepted.
- Item #10 MMR dated 7-3-79 thru 7-27-81 is the only In-Place MMR which was not labled In-Place. This card has since been corrected.
- Item #11 C.F.C.'s AH-1-(3ASA) AH-1-(3BSB), AH-1-(3CSA), AH-1-(3DSB) have not been removed from there "In-Place" locations.
- Item #11 Subsequent inspections render equipment acceptable. Accept as is. (May 11, 1983).

(Append) Motor purged before removal from warehouse. Since then all motors have been reworked and 2 motors were sent to manufacturer and returned to site. Lubrication only required on fan. No lubrication required on motors, except at time of removal from warehouse. - which no record exists. Equipment now tests out okay.



EBASCO SERVICES INCORPORATED
 QUALITY ASSURANCE
 NONCONFORMANCE REPORT

Distributions:
 White - PQAE or Site QA Supervisor
 Yellow - Organization recommending disposition
 Pink - Initiator of NCR



RT NO. (1) W3-5265

INSTRUCTIONS: (See back of form) Trend 1700.00.60 SUS 4.3

CLIENT OR PROJECT (2) Waterford SES Unit III

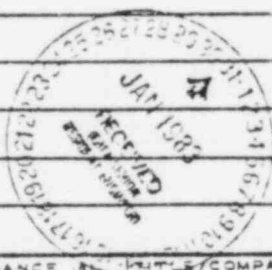
SUPPLIER, CONSTRUCTION QC OR CONTRACTOR (4) Ebasco Services P.O. NO. (5) W3-NY-17A

DESCRIPTION OF COMPONENT, PART OR MATERIAL (6) Axial flow fans Dwg. SMG-855-2
SMG-854-3

LOGBOOK MAY 1983 11 ENTRY

I. DESCRIPTION OF NONCONFORMANCE (7) (Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)

Ref. attached DN E-2074 for nonconformance description.



REPORTABLE	YES	NO
TOC/FBI/ISS/ID	<input type="checkbox"/>	<input checked="" type="checkbox"/>
RECEIVED	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Items: 4

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (8) L. W. Jagger TITLE/COMPANY PQAS Ebasco DATE (9) 11/29/82

II. RECOMMENDED DISPOSITION (10) (Submit Sketch if Applicable)

~~Perform all maintenance steps required in the CMI. Document any deficiencies found. Initiate a new maintenance and starting with the date the above maintenance is performed. Note on the card the error made by the E.M.D.~~

E.M.D records indicate equipment to be in an acceptable condition prior to being inadvertently removed from the CMI program. These units were found to meet LP&L standards and was accepted by LP&L 11/18/82. With an acceptable copy of LP&L preoperative test-recommend accept as is.

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11) Donald W. [Signature] TITLE/COMPANY K. Bruce Heat EMD Super DATE (12) 1-13-83

III. EVALUATION OF DISPOSITION BY EBASCO, REASON FOR DISPOSITION (13)

Above disposition is not acceptable.
 See Att #2 for details.
 (Based on new info provided see Att #4 for revised ESSE evaluation of disposition)

IV. CORRECTIVE ACTION (14) Required Not Required

Documentation errors causing this condition to occur is a problem of the past. Training of EMD personnel has taken place and will prevent recurrence. See attached R. Garfano 5/18/83

<input checked="" type="checkbox"/> ENGINEERING	<input type="checkbox"/> QUALITY ASSURANCE	<input checked="" type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> OTHER
NAME (SIGNATURE) <u>[Signature]</u>	NAME (SIGNATURE) <u>[Signature]</u>	NAME (SIGNATURE) <u>[Signature]</u>	NAME (SIGNATURE)
DATE <u>3/8/83</u>	DATE <u>5/13/83</u>	DATE <u>2-5-83</u>	DATE
<input checked="" type="checkbox"/> ACCEPTED <input checked="" type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED
<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION

REQUIRED NOT REQUIRED (16)

(17) BY F. Clawson SIGNATURE [Signature] TITLE OAE DATE 5/19/83

D. N. Number H-2074

Date of Report 11/19/82



WATERFORD STEAM ELECTRIC STATION
1982 - 1165 MW INSTALLATION UNIT NO. 3
DISCREPANCY NOTICE

REQ# N/A

REQ# N/A

REQ# N/A

Item Description S2(3A) & S2(3B) Axial Flow Fans, AHL(3A-SA), AHL(3B-SB) SUS 43A

Location +21 RCB & -4 RCB System 43A

P. O. / Contract No. W3-NY-17A Dwg./Spec. No. SMG-854-3, 855-2, 854-2

1. Discrepancy Description: See attached sheet.

Q. C. Inspector A. Crooks *Anthony Crooks* 11-19-82

Q. C. Supervisor G. Bourgeois *G. Bourgeois*

2. Recommended Disposition: Route to OA for review. NCR recommended.

Provided By E. Falcon *E. Falcon* Date 11/19/82

3. NCR No. W3-5265 Q. A. Site Supervisor [Signature] Date 12/8/82

for J. Gutierrez

4. Disposition: _____

Sr. Resident Engineer _____ Date _____

Referred To: _____

5. Corrective Action Taken: _____

Organization: _____ Signature _____ Date _____

6. Reinspection remarks: _____

Accept _____ Reject _____ Q.C. Inspector _____ Date _____

ATTACHMENT # 1

DN H-2074

AH1 (3A-SA) DWG. SMG-855-2

AH1 (3A-SA) DWG. SMG-855-2

~~B~~ ~~B~~

Discrepancy Description: During CMI inspection it was found that the units mentioned above were inadvertently removed from the Ebasco CMI Program for the months of June, July, August, September, October and November.

Also, S2(3A) and S2(3B) axial flow fans on dwg. SMG-854-3 were inadvertently removed from Ebasco CMI Program for the months of August, September, October and November. This is in violation of CMI Procedures.

Anthony Crooks 11-19-82

A. CROOKS

QC Inspector

11/19/82

MFT

ESSE Evaluation of Recommended Disposition

In our attempt to evaluate the recommended disposition of this NCR, the following was noticed:

- 1) Referenced discrepancy notice #R-2074 does not specifically identify which Care and Maintenance Instruction (CMI) is involved. Also, the specific year of when the inspection was removed from the CMI program is missing. This is important realizing that SUS 43A consists of 43A-1 and 43A-2 and that each have different released dates.
- 2) Description of component (Box 6, NCR Form) erroneously relate Axial Flow Fans with CMI 146.

Based on the above, QA to furnish needed/proper information to ESSE for further evaluation.

by: A. Bishara 3/8/83
A. Bishara, Lead HVAC ESSE Engineer



TO *N. J. Kurris* AT *QA Site Supervisor*
 SUBJECT *NCR W3-5265 (DN-H-2074)* DATE *3/21/83*

Per Amin Bichara's request for additional information (Attachment #2) applicable CMI's for the units in question are: CMI-174 for AH-1(3A-SA) & AH-1(3B-SB) and CMI-164 for S2(3A) & S2(3B). These units were dropped from the CMI program during 1982.

If any additional information is required, please, contact me.

PLEASE REPLY TO

SIGNED *Larry Bourgeois*

REC'D
 MAR 22 1983
RECEIVED QA

DATE _____ SIGNED _____

ATTACHMENT #4
NCR W3-5265

May 9, 1983

ESSE EVALUATION OF DISPOSITION

The recommended disposition does not specifically address the nonconforming condition. By requiring preoperative test reports as justification for equipment condition is an inaccurate method of disposing the nonconformance. However, by successfully completing pre-requisite testing of this system, has establish conclusively that the equipment has not been impaired by the negligence of CMI inspection. Per LP&L Test Director, Mr. C. Cudworth, prerequisite testing procedure no. SFG-43A-001 was successfully completed on 12/21/82.

To assure the nonreoccurrence of this incident, personnel responsible for implementing the subject CMI inspection/documentation show evidence of retaining per applicable procedures.

A. Bishara 5/10/83.
Lead HVAC Engineer - A. Bishara



Interoffice Correspondence

TO L. Jager

DATE April 4, 1983 FILE NO. W3-NCR-15106
W3-15101

OFFICE LOCATION QA Site Supervisor

FROM Don Stephens

OFFICE LOCATION EMD Supervisor

SUBJECT EMD Internal Instructions

1. EMD signature added to attachment #2. Q.A. to add signature to additional corrective action suggested per interoffice correspondence 3/23/83 to provide traceability of documentation.
2. Listed below are the individuals working within the Equipment Maintenance Department. Their signature signifies they have read the new Maintenance Department Internal Instructions and have received instruction on implementing the proper procedures for conducting EMD task efficiently, effectively and accurately.

Linda Francis
 Shirley Barrios
 Glen Champion
 John Galczynski
 Richard Schwarer

3. Attachment #2 is a copy of "Equipment Maintenance Internal Instructions." This satisfies Q.A. reoccurrence prevention criteria.

DS/ek



EBASCO SERVICES INCORPORATED
 MANPOWER PLANNING AND DEVELOPMENT
 PROGRAM PARTICIPANT ROSTER

PROGRAM CODE: N/A
 PROGRAM TITLE: Leasing and Maintaining of Permanent Plant Items (ASP-IV-19) + Internal Instructional Programs
 LOCATION: Waterford 3
 EQUIPMENT MAINTENANCE DPT.
 TRAINED BY: [Signature]
 DATE: 2-17-85



PARTICIPANT NAME (LAST, FIRST, MIDDLE)	PAYROLL NUMBER	DEPARTMENT	JOB TITLE	SIGNATURE
JANDA FRANCIS	977747 320 (Badge #) 470348	EMD	Secretary	[Signature]
MURLEY BARRIOS	5310 (Badge) 471563	EMD	Material Engineer	[Signature]
LEN CHAMPION	5624 (Badge) 976-765	EMD	Eng. Asst	[Signature]
JOHN GALCZYNSKI	5400 (Badge)	EMD	ASSISTANT ENGINEER	[Signature]
EDWARD SCHWARER	477-787 5085 (Badge)	EMD	Eng. Asst	[Signature]

INSTRUCTIONS: Please forward WHITE copy to Manpower Planning and Development, Elasco Services Incorporated
 ; New York, NY 10006. Retain YELLOW copy for records.

177
1063

EQUIPMENT MAINTENANCE DEPARTMENT INTERNAL INSTRUCTIONS

EFFECTIVE: 17 February 1983

These new instructions, distinct and separate, must not be associated with any or all similar past practices.

The purpose of these instructions is to furnish adequate means for documenting and tracking all permanent plant material and equipment in the Ebasco warehouse and certain In-Place storage items.

Ebasco warehouse shall transmit to the E.M.D. all MRR's, ROW's, RTW's, RMR's, Change of Locations and Record of Shipment Received. Upon receipt, these documents shall be recorded in the Warehouse Documents Received Log (WDRL).

MATERIAL RECEIVED REPORT (MRR) - EMD personnel shall: assign (by reference to the P.O. or Sub-P.O. number) the applicable CMI number to the MRR; record the MRR number on the appropriate Material Maintenance Record (MMR) and active worksheets. The MRR must be filed under the applicable CMI number in the MRR file.

REQUEST ON WAREHOUSE (ROW) - EMD personnel shall: assign the applicable CMI number to the ROW; record the ROW number and date onto the appropriate MRR; highlight (w/green marker) on the MRR those items removed from the warehouse; line through the former location of these items on the MRR and the appropriate active worksheets. Line through the former location on the relevant MMR, initial and date. Note, the green highlighting indicates these items were removed from the warehouse. When all items on an MRR have been green lined, the MRR number shall be lined through, initialed and dated (using black ink) on the appropriate MMR; then, file the ROW with the MRR. When all MRR's associated with a CMI have been green lined, the pertinent MMR shall be closed out after the last ROW number and date is recorded, in the "COMMENTS COLUMN" on the MMR. Then, the MMR is sent to the QA Records Vault, via warehouse QC, with the appropriate worksheets attached. A transmittal form must be used to transmit MMR documents to the warehouse QC. A copy of all documents must be made and kept in the CMI folder.

CHANGE OF LOCATION (C/L) - EMD personnel shall: assign the applicable CMI number to the C/L; record the change of location on the appropriate active worksheets and MRR, then line through the former location. The former location on the MMR shall be lined thru, initialed and dated. The C/L must be filed with the appropriate MRR.



ATT. 2083

RECORD OF SHIPMENT RECEIVED (ROSR) - EMD personnel shall highlight (w/blue marker) N.Y. purchase order to indicate permanent plant equipment has been received. The applicable CMI number shall be written beside the N.Y. purchase order number. Then, the ROSR report must be filed in the Record of Shipment Received Book.

RETURN TO WAREHOUSE (RTW) - EMD personnel shall: assign the applicable CMI number to the RTW; record the RTW number, date and location onto the corresponding MRR. The new warehouse locations shall be recorded on the relevant active worksheets and MMR. Then, the RTW must be filed with the appropriate MRR.

RETURN MATERIAL REPORT (RMR) - EMD personnel shall: assign the applicable CMI number to the RMR; record the RMR number and date onto the appropriate MRR. Those items removed from the warehouse shall be: highlighted (w/green marker) on the MRR; then, line thru the former location of these items on the MRR and the appropriate active worksheets. The former location on the MMR shall be lined thru, initialed and dated. Then, the RMR must be filed with the pertinent MRR.

EMD Worksheets - EMD worksheets shall be issued monthly for each active CMI to the EMD inspecting personnel. These worksheets shall be issued prior to the month the inspections are due to be performed. The worksheet shall contain information identical to the top half of the corresponding MMR, while the bottom half of this worksheet shall remain blank, except where the current due date shall be entered. Other exceptions are:

- (1) Where meggering is required, blank spaces shall be labeled: "TAG#", "MEGGER#", "CAL. DATE", "DUE DATE", "SERIAL#" and "RANGE".
- (2) Where QC's presence is necessary, a space shall be labeled: "QC"(for signature).

In the column labeled "STEP NO.", the inspecting personnel must record which steps of the required maintenance were performed. The date inspection was completed shall be entered in the column labeled: "DATE COMPLETED".

When applicable, the megger value, pressure, humidity, etc. shall be entered in the column labeled: "COMMENTS". When the item being inspected is not the same as the one indicated in the material description then this item must be identified on the worksheet in the column labeled: "COMMENTS".

The inspector, after completing the inspection, shall record his initials in the column labeled: "S/U GEN CRAFT SUPERVISOR". If QC presence is required, the QC person must initial his name in the column labeled: "QC", indicating that he witnessed the inspection. After the worksheet data has been recorded on the MMR, then the MMR must also be signed by QC.



Upon completion of each worksheet, all recorded information shall be transcribed from the worksheet to the pertinent MMR. A copy of the worksheets shall be retained and the original attached to the MMR upon transmitting the completed MMR to the QA record vault (via QC warehouse).

An EMD Monthly CMI Logsheet shall be kept to reflect the status of the active CMI's for that period. Each active CMI shall be listed numerically on the monthly logsheet. Safety and seismic related CMI's must be listed first, separately and numerically. Similarly, all other CMI's must be listed next, numerically and separate. Any CMI's added during this monthly time period must be listed separately.

Upon completion of active worksheets by inspecting personnel, relevant data shall be copied from the worksheet to the logsheet. When the worksheet indicates that the inspection was completed, the CMI number on the monthly logsheet must be highlighted (w/blue marker). If the worksheet indicates the inspection was not completed, the CMI number on the logsheet must be circled (in black ink). However, if a CMI has been closed out, the CMI number in the logbook must be highlighted (w/yellow marker). Thus, a CMI number in the logbook neither highlighted nor circled indicates that this particular worksheet has not been returned.

When QC signs a worksheet it is also required that QC sign the relevant MMR. When QC signs the MMR, a check mark (in black ink) must be made in the logbook beside the corresponding CMI number on the monthly log.

Different items listed under the same CMI number, which have individual MMR's, must be identified to indicate the difference.

For IN-PLACE CMI's, the words "IN-PLACE" must be written beside the CMI number on the monthly logsheet.

A Yearly CMI Logbook shall be kept to reflect the status of all CMI's, listing them in numerical order. It shall be noted by placing an "S" beside the CMI number where an item is safety or seismic related. Across from the CMI number and in the column below the applicable month, this block must be highlighted (w/blue marker) when the inspection has been completed. If no inspection has been made, then the block shall remain blank. When the CMI has been closed, this block shall be highlighted (w/yellow marker). In the column beside the CMI number, it is optional to write whether the item has been issued or the CMI is open or closed.

MATERIAL MAINTENANCE RECORD (MMR) - MMR's must be kept locked in a fireproof file cabinet. MMR's shall be filed numerically and separated safety from nonsafety. All MMR's relate to warehouse storage unless "IN-PLACE" is written on the front in the upper right hand corner. The blanks on the front, top half of the MMR must be filled using: P.O. number with sub P.O. number if applicable, material description, CMI number, location, MRR number, storage level and date received. Also, each step of the required maintenance shall be numbered and listed.

Always use black ink when writing on the MMR. When making a correction; line thru, initial and date. When making a late entry, add L.E. All blanks shall be filled in except where not applicable, and then they shall be marked N/A.

E.M.D.. Supv.



LOUISIANA POWER & LIGHT COMPANY
 WATERFORD STEAM ELECTRIC STATION
 1983 - 1165 MW INSTALLATION - UNIT NO. 3

PLANT EQUIPMENT CONSTRUCTION
 MAINTENANCE RECORDS STATUS

CMI DESCRIPTION

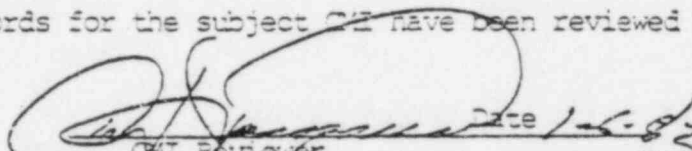

Containment Fan Coolers

CMI No. 174Purchase Order No.
NY 403559

FINAL

ERASCO STARTUP REVIEW

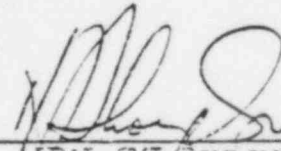
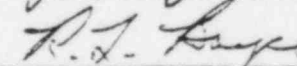
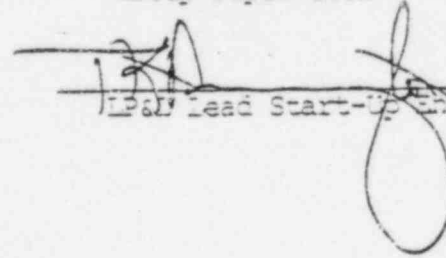
The pertinent construction maintenance records for the subject CMI have been reviewed and accepted with exceptions as noted.


 CMI Reviewer
Date 1-12-83

 ERASCO Startup Supv.
Date 1-13-83
1-13-83

1-13-83

LP&L ACCEPTANCE

This CMI Records Review is acceptable.


 LP&L CMI Reviewer
Date 1-14-83

 LP&L Release & Turnover
 Group Supervisor
Date 1-14-83

 LP&L Lead Start-Up Engineer
Date 1/17/83

(11)

CMI TASK FORCE REVIEW

CMI #174 SUMMARY

Items: Containment Fan Coolers

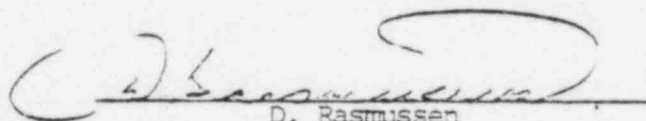
Quantity: Four Units

Purchase Order: NY-403559

Date Review Was Completed: 10-8-82

The review of CMI #174 was conducted to confirm the integrity of both warehouse and in-place maintenance/inspection records.

Attached is a list of equipment by tag number, the appropriate material receiving report numbers indicating dates received, ROW number, and the date equipment was issued to the field. Also included in this package are copies of the material maintenance records indicating completion of maintenance or inspection activities from the time equipment was received on site until it was released to LP&L. There are eleven deficiencies noted on form QAI 9.2. as a result of the engineering and QA review. Three NCR's have been generated. Copies in package.


D. Rasmussen
11-10-82

CMI TASK FORCE REVIEW

CMI #174 SUMMARY

Items: Containment Fan Coolers

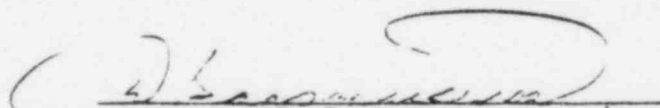
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D. Rasmussen
11-10-82

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE
NONCONFORMANCE REPORT

Distribution:
White - POAE or Site QA Supervisor
Yellow - Organization recommending disposition
Pink - Initiator of NCR

REPORT NO. W3-4777

SUS# 43A-9

INSTRUCTIONS: (See back of form) TREND CODE: 1200.00.60

CLIENT OR PROJECT (2) <u>Waterford 3</u>		DRAWING NO./SPEC NO. (3) <u>QMI - 174</u> <u>ASP-IV-19</u> <u>ANSI 45.2.2</u>
SUPPLIER, CONSTRUCTION QC OR CONTRACTOR (4) <u>Ebasco Force Account</u>	P.O. NO. (5) <u>403559</u>	
DESCRIPTION OF COMPONENT, PART OR SYSTEM (6) <u>In Place Maint. - QMI 174-Containment Fan Coolers</u>		

I. DESCRIPTION OF NONCONFORMANCE (7) (Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)

No in-place storage maintenance records from 3/13/79 thru 7/13/79 for the containment fan coolers.

REPORT MADE	BY	DATE
INDEXED		
FILED		
MAINTAINED BY <u>[Signature]</u> DATE <u>12/15/82</u>		

Item: 4001

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (8) <u>Cheryl Ann Tiller / Cheryl Ann Tiller</u>	TITLE/COMPANY <u>QMI Reviewer/Ebasco</u>	DATE (9) <u>10/15/82</u>
---	---	-----------------------------

II. RECOMMENDED DISPOSITION (10) (Submit Sketch if Applicable)

Maintenance records which exist, document that the equipment is in satisfactory condition. Accept as is, no corrective action is required.

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11) <u>M. R. Strawbridge</u>	TITLE/COMPANY <u>Asst. Const. Supt./EBASCO</u>	DATE (12) <u>12/6/82</u>
--	---	-----------------------------

III. EVALUATION OF DISPOSITION BY EBASCO, REASON FOR DISPOSITION (13)
CONCUR WITH RECOMMENDED DISPOSITION

IV. CORRECTIVE ACTION (14) Required Not Required

V. (15) <input type="checkbox"/> ENGINEERING	<input checked="" type="checkbox"/> QUALITY ASSURANCE	<input checked="" type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> OTHER
NAME (SIGNATURE) <u>[Signature]</u>	NAME (SIGNATURE) <u>[Signature]</u>	NAME (SIGNATURE)	NAME (SIGNATURE)
DATE <u>12/26/82</u>	DATE <u>12/22/82</u>	DATE	DATE
<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED
<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION REQUIRED NOT REQUIRED (16)

CONSTRUCTION INSTALLATION RECORDS REVIEW & STATUSING

Transmittal No. _____
Sheet 1 of 1
Prepared By: C. WITZBURGH

CM1-174

SUS No. _____
Activity Contract No. 403559

Transmitted herewith are the listings of reviewed documents for Contract No. 403559 Activity Contract No. 403559

Reference Requirement	Doc. Title Form No.	No. of Sheets	Review Status		Comments
			ACC	REJ	
	MATERIAL MAINTENANCE REPORT - A	3	A		See Deficiency Report
	CM1 - CARE AND MAINTENANCE INSTRUCTION	5	✓		
	HVAC MAINTENANCE REPORT, RECORD	34	A		See Deficiency Report
	QUALITY ASSURANCE RECORDS TRANSMITTAL	3	✓		

Reviewed By: Cdw
Date: 1/12/82

Please acknowledge receipt and return a copy to sender.

Remarks:

ACKNOWLEDGEMENT:

Date:

341 3.2

EBASCO SERVICES
QUALITY ASSURANCE ENGINEERING
CONSTRUCTION-INSTALLATION RECORDS
DEFICIENCY REPORT

REVIEW NO. 1

CMI-174

Sheet 1 of 6

QEM-0174-10

SUS No. _____ Date of Report 11-12-82

Client or Project Waccamox III Contract P.O. PO.# 203559 Reviewer C.W. WHITCHURCH
Activity IN-PROCESS REVIEW CONTAINMENT SAN COOLERS

Completeness
Accuracy
Legibility

Document Number or Identification	Reason for Restriction
<u>Page 1 of 6</u>	
<input checked="" type="checkbox"/> <u>CMI # 174</u>	<u>ONE REQUIRES MOTOR WINDINGS</u>
<u>ITEM 1.</u>	<u>TO BE MEASURED AT TIME OF</u>
	<u>DISPLACEMENT IN STORAGE CONTAINER</u>
	<u>PER TO THIS REQUIREMENT, FOR</u>
	<u>MOTOR FOR AH-1 (3C-5A) WAS</u>
	<u>NOT MEASURED AT THIS TIME.</u>
	<u>REFERENCE IS MADE TO THE</u>
	<u>REFERENCE NUMBER 7003736 TO THE</u>
	<u>CAW 5/12/83</u>
<input checked="" type="checkbox"/> <u>ITEM 2.</u>	<u>IN REFERENCE TO THE WORK IT</u>
	<u>REQUIRES NO MAINTENANCE OR</u>
	<u>INSPECTION WAS PERFORMED</u>
	<u>ON SAN COOLER UNITS:</u>
	<u>AH-1 (3D-5B) FROM 7-17-79 TO 7-31-79,</u>
	<u>AH-1 (3C-5A) FROM 8-14-79 TO 7-31-79</u>
	<u>AH-1 (3B-5B) FROM 3-17-79 TO 7-31-79</u>
	<u>(CAW) 5/12/83</u>

Verification of Corrective Action _____

EBASCO SERVICES
QUALITY ASSURANCE ENGINEERING
CONSTRUCTION-INSTALLATION RECORDS
DEFICIENCY REPORT

REVIEW NO. 1

CM1-174

Sheet 2 of 6

REM-0174-10

SUS No. Date of Report: 11-12-82

Client or Project: Waterford III Contract No.: PO. 403559 Reviewer: CWHITCHURCH
Activity: IN-PROCESS REVIEW CONTAINMENT TEN Pools etc.

Completeness
Accuracy
Legibility

Document Number or Identification	Reason for Rejection
X ITEM 3.	CMR requires that the meggered immediately prior to removal from storage. Sample is not shown this was accomplished on the following SRN meters: AH-1 (30-38), AH-1 (38-52), AH-1 (38-52). CAW 5/12/83
X ITEM 4.	Hydr inspection / maintenance sheets indicate maintenance or inspection did not occur on units AH-1 (30-38) and AH-1 (38-52) from Aug. 1981 to July 1982. It appears no maintenance was performed during this time period. This is in violation of ASP-IV-19. CAW 5/12/83

Verification of Corrective Action

Reviewer Date

QAI 2.2

EBASCO SERVICES
QUALITY ASSURANCE ENGINEERING
CONSTRUCTION-INSTALLATION RECORDS
DEFICIENCY REPORT

REVIEW NO. 1

CMI-174

Sheet 3 of 6

QEM-0174-10

SUS No. _____ Date of Report: 11-12-82

Client or Project: Waverford III Contract No.: P.O. # 403559 Reviewer: C.W. WHITCHURCH
Activity: IN-PROCESS REVIEW CONTAINMENT 401 COLLEGE

Compliance
Accuracy
Legibility

Document Number or Identification	Reason for Rejection
<u>X</u> <u>ITEM 5.</u>	<u>PAR 3 OF 6</u>
	<u>401 WASTE ALL (30-50) AND 401 (30-50) ARE SCOPE TO 501-11-11-82.</u>
	<u>W.A.A. (COW 5/12/83)</u>
	<u>THE SYSTEM STATUS REPORT INDICATES THESE 12 HOURS WERE RELEASED FROM 11/11/82 TO 11/12/82. TO DATE THIS SYSTEM HAS NOT BEEN FORMALLY ACCEPTED BY L.P.C. ACCORDING TO 401-11-19, P.P.R. 6.7.4, EBASCO IS RESPONSIBLE FOR MAINTAINING EQUIPMENT UNTIL FORMAL ACCEPTANCE. IT APPEARS THIS EQUIPMENT HAS NOT BEEN MAINTAINED SINCE JULY 1982. REFER TO 401-11-11-82. (COW 5/12/83)</u>

Verification of Corrective Action _____

Reviewer _____ Date _____

EBASCO SERVICES

QUALITY ASSURANCE ENGINEERING
CONSTRUCTION-INSTALLATION RECORDS
DEFICIENCY REPORT

241 9.2

REVIEW NO. 1

CMI-174

Sheet 4 of 6

QEM-0174-10

SUS No. _____ Date of Report 11-12-82

Client or Project Waccamux III Contract No. PO #403559 Reviewer CW
C. WHITCHURH
Activity IN-PROCESS REVIEW CONTAINMENT HIGH COOLERS

Completeness
Accuracy
Legibility

Document Number or Identification	Reason for Rejection
<u>X</u> ITEM 6.	<u>pg. 4 of 6</u> <u>HYCO maintenance / inspection sheet states "airside items completed." This work was completed from Sept. 1979 to Sept. 1980, but discontinued from Oct. 1980 thru July 1982</u>
ITEM 7.	<u>Set tip work was noted in reports. (CW 11/12/82)</u>
<u>X</u> ITEM 8.	<u>work for work performed per HYCO maintenance sheet is missing initials and dates for changes made in June 1980, and June 1981 (CW 5/12/83)</u>

Verification of Corrective Action _____

EBASCO SERVICES

QAI 3.2

QUALITY ASSURANCE ENGINEERING
CONSTRUCTION-INSTALLATION RECORDS
DEFICIENCY REPORT

REVIEW NO. 1

CM1-174

Sheet 5 of 6

QEM-0174-10

SUS No.

Date of Report
11-12-82

Client or Project
Waterford III

Contract No.
PO # 403559

Reviewer
C. WHITCHURCH

Activity
IN-PROCESS REVIEW CONTAINMENT MAN PODERS

Completeness
Accuracy
Legibility

Document Number or Identification	Reason for Rejection
<u>ITEM 9.</u>	<u>FORM DOES NOT INDICATE ID NUMBER OR ACTIVATION DATE DATE AS PER REQUIREMENTS OF CP-425.</u>
<u>ITEM 10.</u>	<u>PER PROCEDURE (1982-11-19) PAR 5.4.5, MANU'S APPLYING TO IN-PIPE STORAGE SHALL BE LABELED "IN-PIPE STORAGE." CONTRARY TO THIS REQUIREMENT NONE OF THE 19 MANU'S INDICATE IN-PIPE STORAGE ON THEM.</u>

PCW 5/12/83

PCW 5/12/83

Verification of Corrective Action

Reviewer

Date

Accept

Reject

EBASCO SERVICES

241 3.2

QUALITY ASSURANCE ENGINEERING
CONSTRUCTION-INSTALLATION RECORDS
DEFICIENCY REPORT

REVIEW NO. 1

CMI-174

Sheet 6 of 6

QEM-0174-10

SJS No.	Date of Report 11-12-82
Client or Project Wanamond III	Contract P.O. NO. 403559
Reviewer C. WHITCHURCH	Activity IN-PROCESS REVIEW CONTAINMENT DUN COOLERS

Compliance
Accuracy
Legibility

Document Number or Identification	Reason for Retraction
X ITEM 11	<p>P. 6 OF 6</p> <p>AND REQUIRES WORK TO BE BEING TO BE PERFORMED AT TIME OF REPROVAL ^{TO 11-82} IN PLACE STORAGE TO MAKE SURE AN AMPLE SUPPLY OF FRESH GREASE IS IN EACH BEARING HOUSING - NEVERLY DO NOT INDICATE THAT AS EVER BEING MAINTAINED.</p> <p>DEFICIENCIES 1-11</p> <p>ALL THE ABOVE DEFICIENCIES HAVE BEEN DISPOSITIONED ACCEPTABLE QA/RG, CMI COORDINATOR Charles A. Whitehurst 5/12/83</p>

Verification of Corrective Action

Reviewer	Date
----------	------

Account

Revised

EBASCO SERVICES INCORPORATED

EBASCO

DATE May 4, 1983

FILE REF

TO QAIRG CMI Coordinator

OFFICE LOCATION

FROM EMD *[Signature]*

OFFICE LOCATION

SUBJECT Deficiency Report Disposition
QEM-0174-10 November 12, 1982
NY 403559 CMI #174 *[Signature]*
Containment Fan Coolers

Item #1. C.F.C. AH-1-(3CSA) was received 8-11-78 per MRR no. 805010 and issued to the field 8-21-78 per ROW no. 22369, (6 working days after receipt). Due to the "time lag" between warehouse receipt and notification of the EMD via a copy of the MRR, (approx. 3 to 5 days) the EMD had no way of knowing this equipment was in warehouse storage. Upon notification, the EMD initiated a maintenance worksheet and issued said worksheet to craft for completion. Craft personnel were unable to locate said C.F.C. due to it being issued to field, rendering the EMD powerless to perform it's required duties i.e. steps A.2 and C.5 of CMI no. 174.

Item #2. *[Signature]* The MMR dated 7-13-78 thru 6-13-80 does indicate cooler maintenance. Step no. 1 of the MMR requires monthly inspections of the cooling units. This step is recorded as being completed from 7-13-78 thru 7-24-79 which is the date the last cooling unit was removed from the warehouse.

Item #3. Meggering of C.F.C. AH-1-(3ASA), AH-1-(3BSB) & AH-1-(3DSB) prior to removal from warehouse storage was inadvertently missed by EMD Personnel. Meggering of these units was accomplished in January, 1980 with all units recording a reading of infinity (∞). Accept as is. *[Signature]*

Item #4. *[Signature]* An MMR for the period of 8-3-81 thru 8-3-82 is available and on file in QA vault. Copies of said MMR are also available at material QC and EMD maintenance history records.

Item #5. C.F.C. AH-1-(3ASA) and AH-1-(3BSB) were inadvertently removed from the Ebasco Maintenance Program in July 1982. These units were reinstated into the program in November 1982 with maintenance scheduled to begin in December 1982. An attempt was made in December to perform In-Place maintenance, however LP&L was running the units at this time and upon further investigation it was found that SUS no. 43a-9 had been accepted by LP&L. All records on file for In-Place maintenance (9/79 - 7/82) and the LP&L "Test-Data" records for these units indicate them to be in an acceptable condition. *[Signature]*

Disposition acceptable
QAIRG CMI Coordinator
Charles A. Whitechurch
5/9/83

DATE May 4, 1983

FILE REF.

TO QAIRG CMI Coordinator

OFFICE LOCATION

FROM

EMD *[Signature]*

OFFICE LOCATION

SUBJECT Deficiency Report Disposition
 QEM-0174-10 November 12, 1982
 NY 403559 CMI #174 *[Signature]*
 Containment Fan Coolers

Item #1. C.F.C. AH-1-(3CSA) was received 8-11-78 per MRR no. 805010 and issued to the field 8-21-78 per ROW no. 22369, (6 working days after receipt). Due to the "time lag" between warehouse receipt and notification of the EMD via a copy of the MRR, (approx. 3 to 5 days) the EMD had no way of knowing this equipment was in warehouse storage. Upon notification, the EMD initiated a maintenance worksheet and issued said worksheet to craft for completion. Craft personnel were unable to locate said C.F.C. due to it being issued to field, rendering the EMD powerless to perform it's required duties i.e. steps A.2 and C.5 of CMI no. 174.

ok
 Item #2. The MMR dated 7-13-78 thru 6-13-80 does indicate cooler maintenance. Step no. 1 of the MMR requires monthly inspections of the cooling units. This step is recorded as being completed from 7-13-78 thru 7-24-79 which is the date the last cooling unit was removed from the warehouse.

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ok
 Item #4. An MMR for the period of 8-3-81 thru 8-3-82 is available and on file in QA vault. Copies of said MMR are also available at material QC and EMD maintenance history records.

Item #5. C.F.C. AH-1-(3ASA) and AH-1-(3BSB) were inadvertently removed from the Ebasco Maintenance Program in July 1982. These units were reinstated into the program in November 1982 with maintenance scheduled to begin in December 1982. An attempt was made in December to perform In-Place maintenance, however LP&L was running the units at this time and upon further investigation it was found that SUS no. 43a-9... been accepted by LP&L. All records on file for In-Place maintenance (79 - 7/82) and the LP&L "Test-Data" records for these units indicate them to be in an acceptable condition. *ok*

Disposition acceptable
 QAIRG CMI Coordinator
 Charles A. Whitechurch
 5/9/83

- Item #6. Incompleted worksheets is a problem of the past and is typical of prior practices. Since EMD training on the implementation of the new EMD Internal Instructions, present and future errors of this type will be prevented.
- Item #7. Voided.
- Item #8. Changes on the MMR-A form that were not initialed and dated is a problem of the past and is typical of prior practices. Since EMD training and the implementation of the new EMD Internal Instructions, present and future errors of this type will be prevented.
- Item #9. Megger ID no's and calibration due dates will be incorporated to the applicable MMR's per NCR no. W3-5089 and can be considered complete when said NCR is accepted.
- Item #10 MMR dated 7-3-79 thru 7-27-81 is the only In-Place MMR which was not labled In-Place. This card has since been corrected.
- Item #11 C.F.C.'s AH-1-(3ASA) AH-1-(3BSB), AH-1-(3CSA), AH-1-(3DSB) have not been removed from there "In-Place" locations.
- Item #11 Subsequent inspections render equipment acceptable. Accept as is. (May 11, 1983).

(Append) Motor purged before removal from warehouse. Since then all motors have been reworked and 2 motors were sent to manufacturer and returned to site. Lubrication only required on fan. No lubrication required on motors, except at time of removal from warehouse - which no record exists. Equipment now tests out okay.

DS:RS/lsf

CONSTRUCTION INSTALLATION RECORDS REVIEW

To: Quality Assurance Manufacturing Records Supervisor

From: Quality Assurance Installation Records Group

Date: 3-3-84

Defined Area/SUB No. _____

199C

PACKAGE I.D. No. CME 174

Sheet 1 of 1

Prepared By: J. BIRDELOANE

Activity QA Review of Ebasco CMI Program

Transmitted herewith are the completed documents for Contract P.O. 403559

REFERENCE REQUISITION	DOCUMENT TITLE FORM NO.	NO OF SHEETS	REVIEW		COMMENTS
			ACC	A	
CARE AND MAINTENANCE INSTRUMENT # 174	MATERIAL MAINTENANCE RECORD - 19	1	✓		In-Place (Card dated 12-19-82 and 1-19-83. M.L. 3/2/84

Reviewed By: [Signature]

Date: 3-3-84

* Reference known open items: ICH, OH, etc. that do not effect review and acceptance.

REMARKS:

NOC. 00.00

Distribution:
 White - PGAE or Site QA Supervisor
 Yellow - Organization recommending disposition
 Pink - Initiator of NCR

REPORT NO. (11) W3-5089

INSTRUCTIONS: (See back of form) TREND CODE: 150-001 SUS# 43A-1

CLIENT OR PROJECT (2) WATER FORD III DRAWING NO./SPEC NO. (3) CP-174
 SUPPLIER, CONSTRUCTION QC OR CONTRACTOR (4) EBASCO FORCE MAJOR P.C. NO. (5) 40355X CP-425
 DESCRIPTION OF COMPONENT, PART OR SYSTEM (8) CONTAINMENT FAN COOLER

I. DESCRIPTION OF NONCONFORMANCE (7) (Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)

PER REQUIREMENTS OF CP-425 THE I.D. NUMBER AND CALIBRATION DUE DATE MUST BE RECORDED TO MAINTAIN TRACEABILITY TO MEGGER UNITS USED. MMEP 400 CP-174 DOES NOT HAVE MEGGER NUMBER OR CALIBRATION DUE DATE RECORDED.

ITEM NO: 001

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (9) DUANE BRUNNER TITLE/COMPANY SLIPING ENGINEER DATE (6) 11-11-82

II. RECOMMENDED DISPOSITION (10) (Submit Sketch if Applicable)

Transfer megger I.D. numbers and calibration due dates to the applicable material maintenance records using the H.V.A.C. monthly maintenance worksheets and the material Q.C. test equipment calibration log as supporting documentation.
 Initial and date all entries on the material maintenance records.

REPORTABLE	YES	NO
150CF/150L50(4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Y8CF821	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Reviewed by: <u>[Signature]</u>	Date: <u>11/12/82</u>	

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11) M.R. Strawbridge TITLE/COMPANY Asst. Const. Supt./EBASCO DATE (12) 12/3/82

III. EVALUATION OF DISPOSITION BY EBASCO, REASON FOR DISPOSITION (13)

CONCUR WITH RECOMMENDED DISPOSITION

IV. CORRECTIVE ACTION (14) Required Not Required

RECOMMENDED DISPOSITION ABOVE ITEMS CONCUR DISAGREE ATTACH ALL QC INSPECTION REPORT SHEETS WORK TEST LOG, CALIBRATION LOG AND DATE AND SIGNATURES ATTACH THIS NCR See Attachments

V. (15) <input type="checkbox"/> ENGINEERING	<input checked="" type="checkbox"/> QUALITY ASSURANCE	<input checked="" type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> OTHER
NAME (SIGNATURE): <u>[Signature]</u>	NAME (SIGNATURE): <u>[Signature]</u>	NAME (SIGNATURE): <u>[Signature]</u>	NAME (SIGNATURE):
DATE: <u>12-6-82</u>	DATE: <u>12/14/82</u>	DATE:	DATE:
<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED
<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input checked="" type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION REQUIRED NOT REQUIRED (16)

(17) BY QAE SIGNATURE James C. R. Jamuloe TITLE QAE DATE 5-4-83

NONCONFORMANCE REPORT

REPORT NO. 11

113-5089

Distribution:

- White - QA/E or Site QA Supervisor
- Yellow - Organization recommending disposition
- Pink - Initiator (if not QA)

INSTRUCTIONS: See back of form

TREND CODE: ~~7-9-81~~ SUB: 47A/1

CLIENT OR PROJECT #1

Waterford II

DRAWING NO./SPEC NO.

SUPPLIER, CONSTRUCTION QC OR CONTRACTOR #4

EBASCO FORCE PRODUCT 40257

CP-42



COMPONENT, PART OR SYSTEM #3

CONCRETE HAN RODS

I. DESCRIPTION OF NONCONFORMANCE

(Items Involved, Specification, Code or Standard to Which Items Subject. Submit Sketch if Applicable)

DEP REQUIREMENTS OF 10-405 THE TD. NUMBER AND CALIBRATION DUE DATE MUST BE RECORDED TO MAINTAIN TRACEABILITY TO MESSOR UNIT USED. MAKE UP UNIT 174 DOES NOT HAVE MESSOR NUMBER OR CALIBRATION DUE DATE RECORDED.

ITEM NO: 001

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE #1

TITLE/COMPANY

DATE #1

John P. ...

II. RECOMMENDED DISPOSITION

(Submit Sketch if Applicable)

Transfer mesger I.D. numbers and calibration due dates to the applicable material maintenance records using the H.V.A.C. monthly maintenance worksheets and the material Q.C. test equipment calibration log as supporting documentation. Initial and date all entries on the material maintenance records.

REPORTABLE	YES	NO
100P721	<input type="checkbox"/>	<input checked="" type="checkbox"/>
100P721	<input type="checkbox"/>	<input checked="" type="checkbox"/>

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION #11

TITLE/COMPANY

DATE #11

M.R. Strawbridge / M. R. Strawbridge / Asst. Const. Supt./EBASCO / 12/3/82

III. EVALUATION OF DISPOSITION BY EBASCO, REASON FOR DISPOSITION

CONCUR WITH RECOMMENDED DISPOSITION

IV. CORRECTIVE ACTION

Required Not Required

RECOMMENDED DISPOSITION ABOVE. ATTACH ALL QC INSPECTION REPORT SHEETS WORK TESTS, CALIBRATION AND DATE AND SIGNATURES ATTACH THIS NCR

VI(1) <input type="checkbox"/> ENGINEERING	<input type="checkbox"/> QUALITY ASSURANCE	<input checked="" type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> OTHER
NAME SIGNATURE: [Signature]	NAME SIGNATURE: [Signature]	NAME SIGNATURE: [Signature]	NAME SIGNATURE:
DATE: 11-29-82	DATE: 12-6-82	DATE: 12/14/82	DATE:
<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED
<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input checked="" type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION

REQUIRED NOT REQUIRED

(17) BY: EBASCO VENDOR QA OR QA ENGINEERING SIGNATURE TITLE DATE

Attachment to NCR-W3 5089

EBFA CMI group has updated their documentation cards on CMI 174 to reflect the megger & calibration due date on the equipment used to do insulation testing on AH1-A, B, C, & D.

Attached are copies of the CMI #174 work sheets dated 1-22-82, 7-22-80, & 1-22-80. Also, ^{attached} are copies of the calibration sheets on meggers QC 1.3.0 & 1.3.6 showing the ^{meggers} used on the CMI were in calibration.

J. O. Danell
EBFA 5-2-83



Pg. 1 of 1

Tracor Sciences & Systems

Tracor, Inc.
8500 Tracor Lane
Austin, Texas 78721
Telephone 512-928-2500

PRODUCT ASSURANCE

CALIBRATION RECORD


SECTION A

1. ITEM CALIBRATED <u>Major Mesger</u>	8. CALIBRATION PROCEDURE USED <u>GIDEP 116-2413</u>
2. ACTIVITY REQUESTING CALIBRATION <u>Ebasco Services Inc.</u>	9. DATE OF LAST CALIBRATION <u>unknown</u>
3. INVENTORY NUMBER <u>QC 1.3.0 #</u>	10. RESUBMISSION DATE <u>10-17-80</u>
4. MANUFACTURER <u>Biddle</u>	11. REASON FOR PERFORMING CALIBRATION <input type="checkbox"/> CERTIFICATION <input checked="" type="checkbox"/> CALIBRATION (PERIODIC) <input type="checkbox"/> CROSSCHECK <input type="checkbox"/> OPERATIONAL FAILURE <input type="checkbox"/> FUNCTIONAL TEST
5. MODEL NUMBER <u>21159</u>	
6. SERIAL NUMBER <u>25749</u>	
7. INVOICE NO. <u>471-031-00-50</u>	

SECTION B

1. CALIBRATED BY <u>[Signature]</u>	6. DID ITEM SHOW EVIDENCE OF <input type="checkbox"/> SEVERE ENVIRONMENT <input type="checkbox"/> PHYSICAL MISHANDLING <input type="checkbox"/> AGE AND LONG SERVICE <input type="checkbox"/> OVERLOAD <input checked="" type="checkbox"/> NONE OF THE ABOVE	9. ITEM RETURNED <input type="checkbox"/> LACK OF PARTS <input type="checkbox"/> NOT REPAIRABLE
2. TEST DATE <u>10-17-79</u>	7. REPAIR REQUIRED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	10. ADJUSTMENTS MAJOR ADJUSTMENT REQUIRED (UNIT OUT OF TOLERANCE) <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
3. NUMBER OF MONTHS SINCE LAST CALIBRATION <u>-</u>		8. PARTS REQUIRED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
4. AMBIENT TEMP. <u>74°</u>	5. HUMIDITY <u>55%</u>	MINOR ADJ. (UNIT IN TOLERANCE) <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO

LIST OF EQUIPMENT USED IN THIS CALIBRATION SECTION C

MPGR.	MODEL NO.	SERIAL NO.	ASSET NO.	MPGR.	MODEL NO.	SERIAL NO.	ASSET NO.
Dana	5400	3063A	52084				
Dana	031	11675	48000				
REVIEWED & ACCEPTED QUALITY CONTROL NOV 6 1979							
<u>[Signature]</u>							
							

LIMITATIONS See Calibration data on reverse side

The item listed under Section A has been calibrated and certified under the condition listed in Section B using Tracor Reference Standard(s) listed in Section C and traceable to the National Bureau of Standards thru the following Test Number(s) & Date(s):

Test Number	Date	Test Number	Date
<u>521-101-78</u>	<u>1 March 1978</u>	_____	_____
<u>215932</u>	<u>10 Jan. 1977</u>	_____	_____

REMARKS:

pg 1 of 1



REVIEWED & ACCEPTED
 QUALITY CONTROL CALIBRATION RECORD OF
 100V 6MEGGER INSULATION TESTER

R. J. [Signature]

I. NO. ER4500
 # PC 1.3.6

MANUFACTURER: <i>Riddle</i>	MODEL NO. <i>21359</i>	RANGE <i>1000 Mac Ohms</i>	ACCURACY UNITS See Tolerance Column
--------------------------------	---------------------------	-------------------------------	--

DESIRED			AS FOUND		AS LEFT	
INPUT OHMS	OUTPUT OHMS	TOLERANCE OHMS	OUTPUT OHMS	ERROR UNITS	OUTPUT OHMS	ERROR UNITS
100	100	± 10	100	0	100	0
500	500	± 25	525	25	500	0
5K	5K	± 250	5.5K	0.5K	5.1K	100
20K	20K	± 2K	21K	1K	20K	0
1M	0.5M	± .05M	0.5M	0	0.55M	0.05M
1M	1M	± .1M	0.9M	0.1M	.95M	.05M
1M	2M	± .2M	1.5M	0.2M	1.4M	.1M
1M	5M	± .5M	4.9M	0.1M	5M	0
10M	5M	± .5M	4.9M	0.1M	4.9M	.1M
10M	10M	± 1M	9M	1M	10M	0
10M	20M	± 1M	19M	1M	20M	0
10M	50M	± 5M	49M	1M	52M	2M
100M	50M	± 5M	49M	1M	50M	0
100M	100M	± 5M	95M	5M	100M	0
100M	200M	± 20M	200M	0	215M	15M
100M	500M	± 50M	500M	0	500M	0
1000M	500M	± 50M	500M	0	500M	0
1000M	1000M	± 200M	1000M	0	1000M	0

DISCHARGE RESISTANCE	TOLERANCE OHMS	OUTPUT OHMS	ERROR UNITS	OUTPUT OHMS	ERROR UNITS
112K Ohms	± 1.12K	112.3K	0.3K	112.3K	0.3K

OUTPUT VOLTAGE	TOLERANCE VOLTS	OUTPUT VOLTS	ERROR UNITS	OUTPUT VOLTS	ERROR UNITS
1000 Volts	+50, -0	1005	5	1005	5
500 Volts	+50, -0	500	0	500	0
250 Volts	+25, -0	255	5	255	5
100 Volts	+10, -0	100	0	100	0

pg. 1 of 2

UNIT	R	LOCATION	CIRCLE	PLANT
1A-1(SA-SA) ✓	1740	RCB - 21-E	1 2 3 4 5 6 7 8 9 10	1740
1A-1(SB-SB) ✓	1740	RCB - 4-E	1 2 3 4 5 6 7 8 9 10	1740

ALL WORK MUST BE COMPLETED BY

1-29-82





WATERFORD STEAM ELECTRIC STATION
1982 - 1165 MW INSTALLATION - UNIT NO 3

QUALITY CONTROL
STORAGE INSPECTION OF ITEMS REPORT

Legend:
A=acceptable
U=unacceptable
N/A=not applicable

ITEM: AH 1(3A-SA) CONTAINMENT FAN DATE: 1-22-82

PO # NY403559 VENDOR AMERICAN AIR FILTER

SUBCONTRACTOR PO # N/A MANUFACTURER N/A

C.M.I. NO: 174 FREQUENCY OF INSPECTION: monthly REPORT NO: 028

CHECKLIST

VERIFY THAT ENVIRONMENTAL CONDITIONS IN THE STORAGE AREA SATISFY STORAGE LEVEL REQUIREMENTS

VERIFY THAT ITEM IS READILY ACCESSIBLE FOR INSPECTION OR MAINTENANCE

VERIFY THAT IDENTIFICATION AND MARKING IS INTACT AND LEGIBLE

VERIFY THAT PROTECTIVE COVERS AND SEALS ARE IN PLACE

VERIFY THAT COATINGS AND PRESERVATIVES ARE STILL EFFECTIVE

VERIFY THAT DESICCANTS ARE STILL EFFECTIVE

VERIFY SUFFICIENT GAS BLANKET PRESSURE

VERIFY THAT NO PHYSICAL DAMAGE HAS OCCURED TO ITEM

VERIFY THAT ITEM IS CLEAN

VERIFY THAT SPACE HEATERS ARE ENERGIZED

VERIFY THAT STORAGE RACKS ARE PROPERLY SUPPORTING ITEM

VERIFY THAT NO ITEMS ARE THREATENING THE INTEGRITY OF THIS ITEM

VERIFY THAT ACCEPTABLE I. R. TEST HAS BEEN PERFORMED AND DOCUMENTED

VERIFY THAT SHAFT ROTATION HAS BEEN PERFORMED AND DOCUMENTED

A U N/A

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OTHER: RCB + 21 - E

COMMENTS: THIS UNIT IS TERMINATED
SEE DN - 4-1562



RUSTED INSTRUMENT TAPS → ENCLOSED

MCC # 3A-317-S CUMPT # 2M QC INSPECTOR Anthony Corbin

MEGGER ID # 1.3.6

MEGGER CAL DUE DATE 3.5.82

Form No. WQC-1-? (2-24-78)

MEGGER VALUE - ∞

2333



WATERFORD STEAM ELECTRIC STATION
1982 - 1165 MW INSTALLATION - UNIT NO 3

Legend:
A=acceptable
U=unacceptable
N/A=not applicable

QUALITY CONTROL
STORAGE INSPECTION OF ITEMS REPORT

ITEM: AH1 (3B-SB) CONTAINMENT FAN COM/DATE: 1-22-82

PO # NY403559 VENDOR AMERICAN AIR FILTER

SUBCONTRACTOR PO # N/A MANUFACTURER N/A

C.M.I. NO: 174 FREQUENCY OF INSPECTION: monthly REPORT NO: 029

CHECKLIST

- VERIFY THAT ENVIRONMENTAL CONDITIONS IN THE STORAGE AREA SATISFY STORAGE LEVEL REQUIREMENTS
- VERIFY THAT ITEM IS READILY ACCESSIBLE FOR INSPECTION OR MAINTENANCE
- VERIFY THAT IDENTIFICATION AND MARKING IS INTACT AND LEGIBLE
- VERIFY THAT PROTECTIVE COVERS AND SEALS ARE IN PLACE
- VERIFY THAT COATINGS AND PRESERVATIVES ARE STILL EFFECTIVE
- VERIFY THAT DESICCANTS ARE STILL EFFECTIVE
- VERIFY SUFFICIENT GAS BLANKET PRESSURE
- VERIFY THAT NO PHYSICAL DAMAGE HAS OCCURED TO ITEM
- VERIFY THAT ITEM IS CLEAN
- VERIFY THAT SPACE HEATERS ARE ENERGIZED
- VERIFY THAT STORAGE RACKS ARE PROPERLY SUPPORTING ITEM
- VERIFY THAT NO ITEMS ARE THREATENING THE INTEGRITY OF THIS ITEM
- VERIFY THAT ACCEPTABLE I. R. TEST HAS BEEN PERFORMED AND DOCUMENTED
- VERIFY THAT SHAFT ROTATION HAS BEEN PERFORMED AND DOCUMENTED

A U N/A

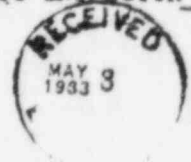
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OTHER: RCB-4

COMMENTS: TWO INSTRUMENTS ON REAR OF UNIT
ARE RUSTED AND NOT TEMP. ~~NOT~~ ²²³² BLANKED
OFF. SEE DN - H 1606 - CLOSED

3B-317-S COMPT # 3M.
MEGGER ID # 1.3.6
MEGGER CAL DUE DATE - 3.5.82
Form No. WQC-1-2 (2-24-78)
MEGGER VALUE 750 MΩ

QC INSPECTOR Anthony Corder



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1749	1749	1749
1750	1750	1750

* All work must be completed by
JULY 31, 1980.



1980 - YEAR OF INSPECTION - 1983

STORAGE INSPECTION OF ITEMS

DATE: 7-23-80

ITEM: AH-1 (3A-SA) CONTAINMENT FAN COOLER
P/N: NY403559 MANUFACTURER: AMERICAN AIR FILTER CO INC
SERIAL NO: N/A
C.V. NO: 174 FREQUENCY OF INSPECTION: MONTHLY REPORT NO: 010

- VERIFY THAT ENVIRONMENTAL CONDITIONS IN THE STORAGE AREA SUFFICIENTLY STORAGE
- VERIFY THAT ITEM IS READILY ACCESSIBLE FOR INSPECTION OR MAINTENANCE
- VERIFY THAT IDENTIFICATION AND MARKING IS CLEAR AND LEGIBLE
- VERIFY THAT PROTECTIVE COVERS AND SEALS ARE IN PLACE
- VERIFY THAT COATINGS AND PRESERVATIVES ARE STILL EFFECTIVE
- VERIFY THAT DESICCANTS ARE STILL EFFECTIVE
- VERIFY SUFFICIENT GAS BLANKET PRESSURE
- VERIFY THAT NO PHYSICAL DAMAGE HAS OCCURRED TO ITEM
- VERIFY THAT ITEM IS CLEAN
- VERIFY THAT CRACK REPAIRS ARE EVIDENT
- VERIFY THAT STORAGE PALLETS ARE PROPERLY SUPPORTING ITEM
- VERIFY THAT NO ITEMS ARE IMPAIRING THE INTEGRITY OF THIS ITEM
- VERIFY THAT ACCEPTABLE T. R. TEST HAS BEEN PERFORMED AND DOCUMENTED
- VERIFY THAT SEALT ROTATION HAS BEEN PERFORMED AND DOCUMENTED

	A	T	S/A
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CODE: RCB + 21 - E

REMARKS:



QC INSPECTOR: Anthony Cooke

QUALITY CONTROL
STORAGE INSPECTION OF TANKS REPORT

DATE: _____
TIME: _____
BY: _____
N/A

ITEM: AH-1 (3B-SB) CONTAINMENT FAN COOLER DATE: 7.22.80
P.O. #: NH403559 VENDOR: AMERICAN AIR FILTER CO INC
SUBCONTRACTOR NO: N/A MANUFACTURER: N/A
C.M. NO: 174 FREQUENCY OF INSPECTION: MONTHLY REPORT NO: 011

- VERIFY THAT ENVIRONMENTAL CONDITIONS IN THE STORAGE AREA Satisfy STORAGE AREA REQUIREMENTS
- VERIFY THAT ITEM IS READILY ACCESSIBLE FOR INSPECTION OR MAINTENANCE
- VERIFY THAT IDENTIFICATION AND MARKING IS CLEAR AND LEGIBLE
- VERIFY THAT PROTECTIVE COVERS AND SEALS ARE IN PLACE
- VERIFY THAT COATINGS AND PRESERVATIVES ARE STILL EFFECTIVE
- VERIFY THAT DESICCANTS ARE STILL EFFECTIVE
- VERIFY SUFFICIENT GAS BLANKET PRESSURE
- VERIFY THAT NO PHYSICAL DAMAGE HAS OCCURRED TO ITEM
- VERIFY THAT ITEM IS CLEAN
- VERIFY THAT SPACE HEATERS ARE INSTALLED
- VERIFY THAT STORAGE PAGES ARE PROPERLY SUPPORTING ITEM
- VERIFY THAT NO ITEMS ARE OBSTRUCTING THE INSPECTION OF THIS ITEM
- VERIFY THAT ACCEPTABLE I. R. TEST HAS BEEN PERFORMED AND DOCUMENTED
- VERIFY THAT SEALT ROTATION HAS BEEN PERFORMED AND DOCUMENTED

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GROUP: RCB-4-E

COMMENTS: _____



QC INSPECTOR Anthony Cronin

1980 - 1983

STORAGE INSPECTION OF THESE ITEMS

DATE: 7-22-83

ITEM: AH-1(3C-SA) CONTAINMENT FAN COOLER DATE: 7-22-83
 P/N: N4403559 MANUFACTURER: AMERICAN AIR FILTER CO INC
 SUBCONTRACTOR P/N: N/A MANUFACTURER: AMERICAN AIR FILTER CO INC
 QTY: 170 FREQUENCY OF INSPECTION: MONTHLY REPORT NO: 011

- VERIFY THAT ENVIRONMENTAL CONDITIONS IN THE STORAGE AREA SUFFICIENT STORAGE
- VERIFY THAT ITEM IS READILY ACCESSIBLE FOR INSPECTION OR MAINTENANCE
- VERIFY THAT IDENTIFICATION AND MARKING IS CLEAR AND LEGIBLE
- VERIFY THAT PROTECTIVE COVERS AND SEALS ARE IN PLACE
- VERIFY THAT COATINGS AND PRESERVATIVES ARE STILL EFFECTIVE
- VERIFY THAT DESICCANTS ARE STILL EFFECTIVE
- VERIFY SUFFICIENT GAS BLANKET PRESSURE
- VERIFY THAT NO PHYSICAL DAMAGE HAS OCCURRED TO THEM
- VERIFY THAT ITEM IS CLEAN
- VERIFY THAT SPACE HEATERS ARE INSTALLED
- VERIFY THAT STORAGE RACKS ARE PROPERLY SUPPORTING THEM
- VERIFY THAT NO ITEMS ARE COMPROMISING THE INTEGRITY OF THIS ITEM
- VERIFY THAT ACCEPTABLE T. 2. TEST HAS BEEN PERFORMED AND DOCUMENTED
- VERIFY THAT SHAFT ROTATION HAS BEEN PERFORMED AND DOCUMENTED

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ORDER: RCB+21-D

COMMENTS: _____



QC INSPECTOR: Anthony Cooper

UNITED STATES DEPARTMENT OF ENERGY
1980 - 1985 IS INSPECTION - USE NO 1

STORAGE DEPARTMENT OF ITEMS REPORT

APPROPRIATE
APPROPRIATE
N/A

ITEM: AH-1 (3D-SB) CONTAINMENT FAN COOLER DATE: 7-22-80

PO#: NV 403559 VENDOR: AMERICAN AIR FILTER CO INC

CONTRACTOR PO #: N/A MANUFACTURER: N/A

C.Y. NO: 174 FREQUENCY OF INSPECTION: MONTHLY REPORT NO: 011

COMMENTS

- VERIFY THAT ENVIRONMENTAL CONDITIONS IN THE STORAGE AREA Satisfy STORAGE AREA REQUIREMENTS
- VERIFY THAT ITEM IS READILY ACCESSIBLE FOR INSPECTION OR MAINTENANCE
- VERIFY THAT VENTILATION AND HEATING IS ON AND WORKING
- VERIFY THAT PROTECTIVE COVERS AND SEALS ARE IN PLACE
- VERIFY THAT CONTROLS AND INSTRUMENTS ARE STILL OPERATIVE
- VERIFY THAT DESIGNATED ARE STILL IDENTIFIED
- VERIFY SUFFICIENT GAS blanket pressure
- VERIFY THAT NO PHYSICAL DAMAGE HAS OCCURRED TO ITEM
- VERIFY THAT ITEM IS CLEAN
- VERIFY THAT SPACE HEATERS ARE OPERATING
- VERIFY THAT STORAGE RACKS ARE PROPERLY SUPPORTING ITEM
- VERIFY THAT NO ITEMS ARE OBSTRUCTING THE INTEGRITY OF THIS ITEM
- VERIFY THAT ACCEPTABLE I. R. TEST HAS BEEN PERFORMED AND DOCUMENTED
- VERIFY THAT SEAL ROTATION HAS BEEN PERFORMED AND DOCUMENTED

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CODE: RCB-4-D

COMMENTS: _____



QC INSPECTOR Anthony Cooker

ITEM 5 REQUIRMENTS HAVE BEEN MODIFIED
MONITOR PROGRESS. SCHEDULE AT
LEAST 2 DAYS IN ADVANCE.

★ - ALL WORK MUST BE COMPLETED BY NOV 30
JAN 31, 1980



UNITED STATES DEPARTMENT OF THE ARMY
1980 - 1000 1000 1000 1000 1000 1000

QUALITY CONTROL
STORAGE DEPARTMENT OF THE ARMY

DATE: _____
INITIALS: _____
TIME: _____
BY: _____

AH-1 (3A-SA) CONTAINMENT FAN CONTROL - 1-22-80
403559 AMERICAN AIR FILTER CO INC
N/A N/A
174 MONTHLY 004

- 1. THE UNIT IS OPERATIONAL AND THE STORAGE AREA IS CLEAN AND FREE OF DEBRIS
- 2. THE UNIT IS PROPERLY MAINTAINED AND THE FILTERS ARE CHANGED AS REQUIRED
- 3. THE UNIT IS PROPERLY MAINTAINED AND THE FILTERS ARE CHANGED AS REQUIRED
- 4. THE UNIT IS PROPERLY MAINTAINED AND THE FILTERS ARE CHANGED AS REQUIRED
- 5. THE UNIT IS PROPERLY MAINTAINED AND THE FILTERS ARE CHANGED AS REQUIRED
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- 12. THE UNIT IS PROPERLY MAINTAINED AND THE FILTERS ARE CHANGED AS REQUIRED
- 13. THE UNIT IS PROPERLY MAINTAINED AND THE FILTERS ARE CHANGED AS REQUIRED
- 14. THE UNIT IS PROPERLY MAINTAINED AND THE FILTERS ARE CHANGED AS REQUIRED
- 15. THE UNIT IS PROPERLY MAINTAINED AND THE FILTERS ARE CHANGED AS REQUIRED

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RCB + 21 - E



CC BY: Anthony Crocker

A-1-30 SF 45388

UNITED STATES DEPARTMENT OF JUSTICE
FEDERAL BUREAU OF INVESTIGATION

Form:
Investigative
Administrative
Financial

QUALITY CONTROL
STORAGE DEPARTMENT OF WORK CENTER

AH-1 (3B-SB) CONTAINMENT ENCLOSURE 1-22-80

403559 AMERICAN AIR FILTER COMPANY

N/A MANUFACTURE N/A

NO: 174 FREQUENCY OF INSPECTION: MONTHLY FORM NO: 005

A 2 3/4

- 1. ARE ALL ENVIRONMENTAL CONDITIONS IN THE STORAGE AREA SAFELY STORED
- 2. ARE ALL CONTAINERS PROPERLY LABELED AND IDENTIFIED
- 3. ARE ALL CONTAINERS PROPERLY STORED AND IDENTIFIED
- 4. ARE ALL CONTAINERS PROPERLY STORED AND IDENTIFIED
- 5. ARE ALL CONTAINERS PROPERLY STORED AND IDENTIFIED
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- 17. ARE ALL CONTAINERS PROPERLY STORED AND IDENTIFIED
- 18. ARE ALL CONTAINERS PROPERLY STORED AND IDENTIFIED
- 19. ARE ALL CONTAINERS PROPERLY STORED AND IDENTIFIED
- 20. ARE ALL CONTAINERS PROPERLY STORED AND IDENTIFIED

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RCB-U-E



CC DIRECTOR Anthony Cooker

STORAGE AND CONTAINMENT SYSTEMS
1980 - 1985 OF CONTAINMENT - UNIT NO 1
STORAGE SYSTEM
STORAGE SYSTEMS OF UNIT NO 1

STATUS:
APPROVED
TEMPORARILY
STANDARD APPROVAL

10.2.80

A4-1(3C-SA) CONTAINMENT FAN CODE: 1.2.2.80

U63559 AMERICAN AIR FILTER CO INC

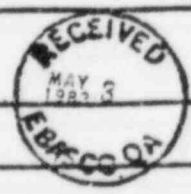
N/A N/A

174 MONTHLY 005

- 1. THE SYSTEM IS DESCRIBED AS BEING A STORAGE AND CONTAINMENT SYSTEM
- 2. THE SYSTEM IS DESCRIBED AS BEING A STORAGE AND CONTAINMENT SYSTEM
- 3. THE SYSTEM IS DESCRIBED AS BEING A STORAGE AND CONTAINMENT SYSTEM
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- 18. THE SYSTEM IS DESCRIBED AS BEING A STORAGE AND CONTAINMENT SYSTEM
- 19. THE SYSTEM IS DESCRIBED AS BEING A STORAGE AND CONTAINMENT SYSTEM
- 20. THE SYSTEM IS DESCRIBED AS BEING A STORAGE AND CONTAINMENT SYSTEM

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ACB +21 -D



Anthony Cooks

FEDERAL BUREAU OF INVESTIGATION
1940 - 1945
STORAGE DEPARTMENT OF THE ARMY

ADDRESS:
APPROVED:
TRANSMITTED:
DATE RECEIVED:

AH-1(30-SB) CONTAINMENT FAN COOLER 1-22-80

403559 AMERICAN AIR FILTER CO INC

N/A

N/A

174

Monthly

005

- 1. THE CONTAINER IS IN GOOD CONDITION AND IS PROPERLY MAINTAINED
- 2. THE CONTAINER IS PROPERLY VENTILATED AND IS PROTECTED FROM WEATHERING
- 3. THE CONTAINER IS PROPERLY SEALED TO PREVENT LEAKAGE OF AIR
- 4. THE CONTAINER IS PROPERLY STORED AND IS NOT IN CONTACT WITH OTHER CONTAINERS
- 5. THE CONTAINER IS PROPERLY MAINTAINED AND IS NOT DAMAGED
- 6. THE CONTAINER IS PROPERLY MAINTAINED AND IS NOT DAMAGED
- 7. THE CONTAINER IS PROPERLY MAINTAINED AND IS NOT DAMAGED
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- 15. THE CONTAINER IS PROPERLY MAINTAINED AND IS NOT DAMAGED

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RCB-4-D



Anthony Cooker

742 - AH130-53-4RCB
 743 - AH130-5A-21RCB
 744 - AH13-3B-53-4RCB
 1746 AH13(307A)

MATERIAL MAINTENANCE RECORD — A

P.O.# 403559 MATERIAL DESCRIPTION Containment Fan Coolers
 CMI 174 LOCATION PER HVAC MAINTENANCE SHEET FOR CMI 174 MRR# — TAG# 174
 STORAGE LEVEL — DATE RECEIVED — DATE ISSUED —

STEP #	REQUIRED MAINTENANCE	FREQUENCY
1).	Prior to positioning unit, assure that the 3/4" - 20x3/4" long hex head screws and the 3/8" - 16 x 1" long hex head cap screws per sloped drain pan (Dwg 107D-1032697, Section "A=A")	
2).	After unit is in place, secure per page 15 of "Instruction Manual NESE325".	
3).	Check the general condition. Maintain plugs/caps on all coil/pipe openings.	13th mth.
4).	Maintain operation of space heaters. Provide adequate protection from damage and deterioration.	13th mth.
5).	Rotate fan rotors at least 3 turns. Stop 90° from starting point.	Ev. 3 mth.
6).	Before rotation, add small amount of Gulf Precision #2 ^{Chevron SRI # 2} grease or equal to rotor shaft bearings.	Ev. 3 mth.
7).	When removing from storage, purge old grease with new supply in each bearing cavity.	

PER HVAC MAINT SHEET

1.70
Ev. 3 mth.
Ev. 3 mth.
Upon removal from stg.

NOTE: Steps 1 and 2 to be done by the installer.

PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Meggor, Pressure Gauges; Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	Q.C.
3,4,5,6	7-3-79	7-31-79	ITEMS MAINTAINED	MH	Acc
3,4,5,6	8-3-79	8-30-79	REVIEWED & ACCEPTED QUALITY CONTROL ITEMS MAINTAINED	MH	Acc
3,4,5,6	9-3-79	9-30-79	ALL STEPS COMPLETE PER AUG 20 1981 HVAC MAINT. SHEET FOR CMI 174.	JRB 10-9-79	Acc
NOTE: AS OF SEPT, 1979, MAINTENANCE PERFORMED ON ALL PER HVAC MAINTENANCE SHEET FOR CMI 174. COMPLETION OF SHEET WILL COVER ALL ABOVE CMI STEPS WHERE APPLICABLE EACH MONTH.					
1,2,3,4,5,6	10-3-79	10-30-79	ALL STEPS COMPLETE PER OCT, 1979 HVAC MAINT. SHEET, REV C FOR CMI 174.	DB	Acc
1,2,3,4,5,6	11-3-79	11-22-79	ALL STEPS COMPLETE PER NOV, 1979 HVAC MAINT. SHEET, R.O FOR CMI 174	J.C.	Acc
1,2,3,4,5,6	12-3-79	12-31-79	ALL STEPS COMPLETE PER DEC, 1979 HVAC MAINT. SHEET, R.O FOR CMI 174.	J.C.	Acc
2,3,4,5,6	1-3-80	1-3-80	ALL STEPS COMPLETE PER JAN, 1980 HVAC MAINT. SH. R.O FOR CMI 174. meggor used 130	J.C.	Acc

TAG # _____ DESCRIPTION _____ LOCATION _____

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger, Pressure Gauges, Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	G.C.
1,2,3,4,5,6	2-3-80	2-13-80	ALL STEPS COMPLETE PER FEB MAINT. SH. R0 FOR CMI 174.	JL	ave
1,2,3,4,5,6	3-3-80	3-26-80	All steps complete per March 1980 R.1 Maint. sh. for CMI 174.	JL	ave
1,2,3,4,5,6	4-3-80	4-21-80	All steps complete per April 1980 R.2 Maint. sh. for CMI 174.	JL	ave
1,2,3,4,5,6	5-3-80	5-30-80	All steps complete per May 1980 Maint. sh. R.2 for CMI 174.	JL	ave
1,2,3,4,5,6	6-3-80	6-20-80	All steps complete per June, 1980 Maint. sh. R.1 for CMI 174.	JL	ave
1,2,3,4,5,6	7-3-80	7-15-80	All steps complete per July 1980 Maint. sh. R.1 for CMI 174. <small>megger used 1-3-0 cul. dev. 10/12/80 R 51183</small>	JL	ave
1,2,3,4,5,6	7-3-80	8-30-80	All steps complete per Aug 1980 Maint. sh. R1 for CMI 174.	JL	ave
1,2,3,4,5,6	9-3-80	9-30-80	All steps complete per Sept 1980 Maint. sh. R.1 for CMI #174.	JL	ave
1,2,3,4,5,6	10-3-80	10-30-80	All steps complete per Oct 1980 Maint. sh. R1 for CMI 174. See attached sheet for problems.	JL	ave
1,2,3,4,5,6	11-3-80	11-21-80	All steps complete per Nov 1980 Maint. sh. R1 for CMI 174.	JL	ave
1,2,3,4,5,6	12-3-80	12-23-80	All steps complete per December 1980 HVAC Maint. sh. R.1	JL	ave
1,2,3,4,5,6	1-3-81	1-19-81	All steps complete per Jan. 1981 HVAC Maint. sh. R.1	JL	ave
1,2,3,4,5,6	2-3-81	2-24-81	All steps complete per Feb. 1981 R1 HVAC Maint. sh.	JL	ave
1,2,3,4,5,6	3-3-81	3-26-81	All steps complete per March 1981 R1 HVAC maintenance sheet.	JL	ave
1,2,3,4,5,6	4-3-81	4-17-81	All steps complete per April 1981 HVAC Maint. sh. R.1.	JL	ave
1,2,3,4,5,6	5-3-81	5-27-81	All steps complete per May 1981 HVAC Maint. sh. R.1	JL	ave
1,2,3,4,5,6	6-3-81	6-24-81	All steps complete per June 1981 HVAC Maint. sh. R.1	JL	ave
1,2,3,4,5,6	7-3-81	7-27-81	All steps complete per July 1981 HVAC Maint. sh. R.1. AH-1(SC-SA) AH-1(3D-SB) Released.	JL	ave

MATERIAL MAINTENANCE RECORD - A

P.O. # 403559 MATERIAL DESCRIPTION CONTAINMENT FAN COOLERS
 CMI 174 LOCATION 2B 4/50 2/B 9-1-78 20/4-2-9/35 7/33 MRR # 803920 TAG # 174A, B, C, D
 STORAGE LEVEL B DATE RECEIVED 7-3-78 DATE ISSUED NOT ISSUED, CARD IS FULL.

STEP #	REQUIRED MAINTENANCE	FREQUENCY
	<u>174A-TAG AH-13D-SB ; 174B-TAG AH-13C-SA ;</u>	
	<u>174C-TAG AH-13A SA MRR 805640 9-1-78</u>	
	<u>174D-TAG AH-13B SB MRR 805642 9-1-78</u>	
	<u>① CHECK GENERAL CONDITION, ^{deleted upon} SPACE HEATERS & FOR BENT FINE</u>	<u>13TH MONTHLY</u>
<u>STEP 2</u>	<u>② ROTATE FAN ROTORS 3 TURNS & ADD ^{add 2.2479} SPACE ATTITUDE OF GLE PRESSION #2</u>	<u>12-13-78, 3-3-79, 4-13-79, 7-13-79</u>
<u>STEP 3</u>	<u>③ CHECK DESICCANT - MAINTAIN AS REQ'D.</u>	<u>13TH MONTHLY</u>

PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger, Pressure Gauges; Humidity Cards; etc.)	EQUIPMENT MAN	Q.C.
<u>UPON RECEIPT</u>		<u>7-17-78</u>	<u>MOTOR MEGGERED @ > 500 mΩ</u>		
<u>13</u>	<u>7-13-78</u>	<u>7-20-78</u>	<u>HOUSING ISSUED PER ROW 21448</u>	<u>MH</u>	<u>NA</u>
<u>-</u>	<u>-</u>	<u>8-11-78</u>	<u>COOLER HOUSE ASSEMBLY (174B) AH-13C-SA REVENED ON MRR 805010. ITEM WAS PLACED IN SITE LOCATION UPON RECEIPT.</u>	<u>MH</u>	<u>NA</u>
<u>13</u>	<u>9-13-78</u>	<u>9-12-78</u>	<u>174C,D MEGGERED @ 750 mΩ</u>		
<u>13</u>	<u>10-13-78</u>	<u>10-12-78</u>	<u>ITEMS MAINTAINED</u>		
<u>13</u>	<u>11-13-78</u>	<u>11-9-78</u>	<u>ITEMS MAINTAINED</u>		
<u>123</u>	<u>12-13-78</u>	<u>12-8-78</u>	<u>ITEMS MAINTAINED</u>		
<u>13</u>	<u>1-13-79</u>	<u>1-11-79</u>	<u>ITEMS MAINTAINED</u>		

REVIEWED & ACCEPTED
QUALITY CONTROL
MH
JUN 10 1980
R. J. [Signature]

T.G.# _____ DESCRIPTION _____ LOCATION _____

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger, Pressure Gauges, Humidity Cards, etc.)	EQUIPMENT MAN	Q.C.
1,3	2-13-79	2-12-79	ITEMS MAINTAINED 174D ISSUED ON ROW 29731.	MH	NA
1,3	3-13-79	3-13-79	ITEMS MAINTAINED	MH	NA
1,3	4-13-79	4-12-79	ITEMS MAINTAINED	MH	NA
1,3	5-13-79	5-10-79	ITEMS MAINTAINED	MH	NA
1,2,3	6-13-79	6-11-79	ITEMS MAINTAINED 174C ISSUED ON ROW 32845.	MH	NA
-	-	7/24/79	Only accessories in warehouse	MH	NA
1	7-13-79	7-25-79	ITEMS MAINTAINED	MH	NA
1	8-13-79	8-17-79	ITEMS MAINTAINED	MH	NA
1	9-13-79	9-27-79	ITEMS MAINTAINED	MH	NA
1	10-13-79	10-26-79	ITEMS MAINTAINED	J.C.	NA
1	11-13-79	11-29-79	ITEMS MAINTAINED	J.C.	NA
1	12-13-79	12-14-79	ITEMS MAINTAINED	J.C.	NA
1	1-13-80	1-11-80	ITEMS MAINTAINED	J.C.	NA
1	2-13-80	2-11-80	ITEMS MAINTAINED	J.C.	NA
1	3-13-80	3-13-80	ITEMS MAINTAINED	J.C.	NA
1	4-13-80	4-10-80	ITEMS MAINTAINED	J.C.	NA
1	5-13-80	5-16-80	ITEMS MAINTAINED	J.C.	NA
1	6-13-80	6-9-80	ITEMS MAINTAINED	J.C.	NA

MATERIAL MAINTENANCE RECORD — A

P.O.# NY 403559 MATERIAL DESCRIPTION Containment Fan Coolers
 CMI 174 LOCATION 2B 446 1/2 T/33 MRR# 803980 TAG# 174
 STORAGE LEVEL B DATE RECEIVED 7/3/78 DATE ISSUED 4/6/82

STEP #	REQUIRED MAINTENANCE	FREQUENCY
1.	Check general condition	13th Monthly
REVIEWED & ACCEPTED QUALITY CONTROL FR 8 1982 <i>R. J. Biondolillo</i>		

PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger, Pressure Gauges; Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	Q.C.
1	7-13-80	7-8-80	Maintenance Complete	JL	NA
1	8-13-80	8-21-80	Maintenance Complete	JL	NA
1	9-13-80	9-4-80	Maintenance Complete	JL	NA
1	10-13-80	10-3-80	Maintenance Complete	JL	NA
1	11-13-80	11-10-80	Maintenance Complete	JL	NA
1	12-13-80	12-9-80	Maintenance Complete	JL	NA
1	1-13-81	1-26-81	Maintenance Complete	JL	NA
1	2-13-81	2-9-81	Maintenance Complete	JL	NA

TAG # _____ DESCRIPTION _____ LOCATION _____

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger, Pressure Gauges, Humidity Cards, etc.)	S/U GEN. CRAFT SUPERVISOR	Q.C.
1	3-13-81	3-10-81	Maintenance Complete	JL	N/A
1	4-13-81	4-20-81	maintenance Complete	JL	N/A
1	5-13-81	5-8-81	Maintenance Complete	JL	NA
1	6-13-81	6-12-81	Maintenance Complete	JL	NA
1	7-13-81	7-24-81	Maintenance Complete	JL	N/A
1	8-13-81	8-18-81	maintenance Complete	JL	N/A
1	9-13-81	9-8-81	Maintenance Complete	JL	NA
1	10-13-81	10-29-81	Maintenance Complete	JL	N/A
1	11-13-81	11-13-81	Maintenance Complete	JL	N/A
1	12-13-81	12-8-81	Maintenance Complete	JL	N/A
1	1-13-82	1-15-82	MAINTENANCE Complete	JR	NA
1	2-15-82	2-6-82	MAINTENANCE Complete	JR	NA
1	3-15-82	3-15-82	MAINTENANCE Complete Issued per Ken Becker	JR	NA
1	4-15-82	4-6-82	EMD.	JR	NA

174A AH-1(305B) R1-43
 174B AH-1(325A) R1-43
 174C AH-1(385A) R1-43
 174D AH-1(385B) R1-43

In-Place

MATERIAL MAINTENANCE RECORD - A

P.O.# 403559 MATERIAL DESCRIPTION Containment Fan Coolers
 CMI 174 LOCATION Per HVAC Maintenance Sheet MRR# ----- TAG# 174
 STORAGE LEVEL ----- DATE RECEIVED ----- DATE ISSUED -----

STEP #	REQUIRED MAINTENANCE	FREQUENCY
1.	Prior to positioning unit, assure that the 3 1/2" - 20 3/4" long hex head screws and the 8 3/8"-16 x 1" long hex head cap screws per sloped drain pan (Dwg 107D-1032697, Section "A-A")	PER HVAC MAINT. SH.
2.	After unit is in place, secure per page 15 of "Instruction Manual NESE325".	
3.	Check the general condition. Maintain plugs/caps on all coil/pipe openings.	
4.	Maintain operation of space heaters. Provide adequate protection from damage & deterioration	
5.	Rotate fan rotors at least 3 turns. Stop 90° from starting point.	
6.	Before rotation, add small amount of Chevron SRI #2 grease or equal to rotor shaft bearings.	
REVIEWED & ACCEPTED		
7.	When removing from storage, purge old grease with new supply in each bearing cavity.	
OCT 6 1982		
NOTE Steps 1 and 2 to be done by the installer.		

PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger; Pressure Gauges; Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	Q.C.
1,2,3,4 5,6	8-3-81	8-21-81	All steps complete per Aug. 1981 HVAC Maint. Sh. R. 1	QC	ave
1,2,3 4,5,6	9-3-81	9-21-81	All steps complete per Sept 1981 HVAC Maint Sh. R. 1	QC	ave
1,2,3 4,5,6	10-3-81	10-19-81	All steps complete per sheet Oct. 1981 HVAC Sh. R. 1	QC	ave
1,2,3 4,5,6	11-3-81	11-25-81	All steps complete per HVAC Sheet dtd Nov. 1981 R. 1	QC	ave
1,2,3 4,5,6	12-3-81	12-23-81	All steps complete per Dec. 1981 HVAC Maint. Sh. R. 1.	QC	ave
2,3,4,5,6	1-3-82	2-9-82	All steps complete per Jan 1982 HVAC MAINT sh. R. 1 AH-1(3A-3A) term Int. AH-1(3A-5B)	JR	ave
2,3,4,5,6	2-3-82	2-26-82	All steps complete per Feb. 1982 HVAC MAINT. sh. R. 1.	JR	ave
1,2,3,4,5,6	3-3-82	3-25-82	All steps complete per MARCH 1982 HVAC SH. REV. 1 Term: AH-1(3A-3A) AH-1(3B-5B)	JR	ave

MATERIAL MAINTENANCE RECORD — A

P.O.# 403559 MATERIAL DESCRIPTION CONTAINMENT FAN COOLERS
 CMI 174 LOCATION See HVAC Maint Sh. Rev. 1 MRR# _____ TAG# 174
 STORAGE LEVEL B DATE RECEIVED --- DATE ISSUED Issued 11/18/82

STEP #	REQUIRED MAINTENANCE	FREQUENCY
1.	Inspect general condition of equipment.	
2.	motor windings are to be meggered at time of placement in storage.	
3.	Coils are to be stored dry. Assure coil and pipe openings are plugged or capped.	
4.	MANUALLY rotate fan rotors a minimum of 3 turns, making sure a different fan blade is in the vertical position than before.	
5.	At least every 3 mos. Add a small amount of lubricant (Gulf Precision #2 or equivalent) to rotor shaft bearings.	
NOTE: See bottom of card		

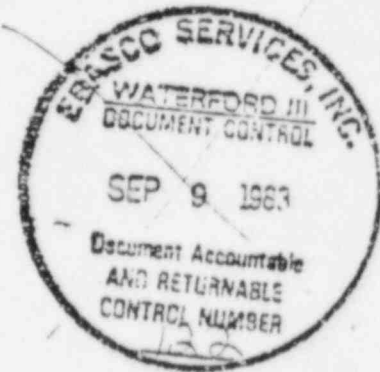
PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger, Pressure Gauges; Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	G.C.
1, 2, 3, 4, 5	12-19-82	12-21-82	MAINT. COMPLETE PER HVAC MAINT SH. REV. 1 FOLLOWING MOTORS: AH-1(3A-3A), AH-1(3B-3B) MOTORS ARE FOR RUNNING.	AR	
1, 2, 3, 4, 5	1-19-83	1-14-83	MOTORS AH-1(3A-3A), AH-1(3B-3B), RELEASED PER SUS 43A-9 ACCEPTED BY LPL ON 11/18/82.	AR	

The AH-1(3A) and (3B) units were inadvertently removed from the maintenance program in July of 1982. Maintenance on these units will be reinstated beginning in December 1982, with all maintenance steps being performed. RS 11-17-82

CARE AND MAINTENANCE INSTRUCTION

ITEM(S): Axial Flow Fans
 QUANTITY: 8
 PURCHASE ORDER: NY-403548
 SUB-PURCHASE ORDER: -----
 VENDOR: RA Dunkan and Associates
 MANUFACTURER: Joy Manufacturing Co.
 SPECIFICATION: LOU 1564.748L
 SAFETY CLASS: 3, NNS
 STORAGE LEVEL: B



*For your information
 9-21-84
 J.S.*

A). BEFORE PLACING IN STORAGE

1. Inspect the general condition of the equipment to assure that it meets the degree of quality and workmanship required in the specification and contract.

B). HANDLING (ALL PHASES)

1. Per ASP-IV-22. R1
2. Assure that no stress is put on motor during handling.
3. Deleted R2
4. Use a sling around large fan casings, or install eye bolts in the flanges for lifting smaller fan units. Severe impacts could distort the casing or possibly damage the bearings. R1

C). AFTER PLACING IN WAREHOUSE STORAGE

1. At least monthly, inspect the general condition of the equipment to assure that it continues to meet the degree of quality and workmanship required in the specification and contract.
2. Energize heaters on motors so equipped.
3. At least every 6 months following receipt of equipment, add a fresh supply of Gulfcrowne EP #2 grease, or equal, purging a small amount of the old grease from each grease cavity in controllable pitch mechanisms and fan shaft bearings. Before greasing controllable pitch rotor bearings, move the adjusting lever toward the fan rotor as much as possible, or to the highest blade angle. R2

FOIA-84-206
 K/6

CARE AND MAINTENANCE INSTRUCTION

C). AFTER PLACING IN WAREHOUSE STORAGE (cont'd.)

4. Grease drains should be fully operable while in storage. These grease drain plugs can be removed and attached to the motor until reinserted. R2
5. Deleted. R3
6. At least monthly, rotate motor shafts at least several revolutions. Assure that shafts turn freely. Stop rotation approximately 90° beyond the starting reference. R2
7. Assure that fan rotors are not subjected to impact during storage.
8. Place and maintain dust covers over fan units.
9. Megger motors per CP-425.

D). AFTER MOVING TO IN-PLACE STORAGE

1. Maintain per steps C.1, C.2, C.3, and C.7_of warehouse storage. R5
2. Megger motors per CP-425 or other approved procedures. (Example: Contractor's approved construction procedures).
3. Provide adequate protection from damage and deterioration as a result of activities and conditions in the vicinity.
4. Delete. R4
5. Assure that grease drain plugs are in place and secure.
6. At least every 3 months, rotors must be rotated at least several revolutions. If rotor does not rotate due to air circulation through ductwork, stop rotor 90° beyond starting reference when manually rotating shaft. On those units which have rotors observed turning due to air circulation, documentation of this rotation at least every 3 months is acceptable. No stopping reference point is needed. R4

E). RESTORATION PRIOR TO TRIAL OPERATION/CHECKOUT

1. Completely purge bearings of old grease, resupplying with a fresh supply of grease, per Owner's Lubrication schedule. Assure that fan blade bearings have an adequate supply of Lubriplate #530AA, or equal. R2
2. Open grease and condensation drain outlets to remove leakage and moisture (if any) respectively. Reinsert and secure plugs when finished.
3. Remove dust covers. R2
4. Screens, guards, and other protective devices shall be in place.
5. Assure that all shafts turn freely, and that all material/tools etc. have been removed from duct or area in front of fan intake. R2

CARE AND MAINTENANCE INSTRUCTIONF). REFERENCES

- | | |
|---|----|
| 1. Deleted. | R2 |
| 2. Joy Mfg. Co., Series 1000/2000 Axivane Fan Operator's Handbook,
Emdrac No. 5817-3527. | R2 |
| 3. Deleted. | R2 |

<u>REVISION</u>	<u>DATE</u>	<u>PREPARED BY</u>	<u>APPROVED BY</u>
0	08-11-77	G. L. Banquer	B. D. Fowler
1	10-12-78	A. Rome	W. C. Griggs
2	05-10-79	<i>A. Verdoorn</i> A. Verdoorn <i>AV</i>	<i>W.C. Griggs</i> W. C. Griggs
3	07-05-79	<i>A. Verdoorn</i> A. Verdoorn <i>AV</i>	<i>W.C. Griggs</i> W. C. Griggs
4	10-04-79	<i>G. Banquer</i> G. Banquer	<i>W.C. Griggs</i> W. C. Griggs
5	04-01-80	<i>G. Banquer</i> G. Banquer	<i>W.C. Griggs</i> W. C. Griggs

Supplement to Field Manual of Care and Maintenance Instructions.
Reference ASP-IV-19.

LOGBOOK
FEB 19 1983

EBASCO SERVICES INCORPORATED
QUALITY ASSURANCE
NONCONFORMANCE REPORT

Distribution:
White - PQAE or Site QA Supervisor
Yellow - Organization recommending disposition
Pink - Initiator of NCR

LOGBOOK
MAR 14 1983

RT NO. 11) W3-5265

INSTRUCTIONS: (See back of form) Trend 1700.00.60 SUS 4

CLIENT OR PROJECT 2) Waterford SES Unit III

SUPPLIER, CONSTRUCTION GC OR CONTRACTOR 3) Ebasco Services

DESCRIPTION OF COMPONENT, PART OR ASSEMBLY 4) Axial flow fans

P.O. NO. 15) W3-NY-17A

Dwg. SMC-855-2
SMC-854-3

LOGBOOK
MAY 1983 11

I. DESCRIPTION OF NONCONFORMANCE 11) (Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)

Ref. attached DN H-2074 for nonconformance description.

LOGBOOK
JAN 1983

REPORTABLE	YES	NO
TUCP-780-5512	<input type="checkbox"/>	<input type="checkbox"/>
TUCP-581	<input type="checkbox"/>	<input type="checkbox"/>
Prepared by	[Signature]	

Items: 4

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE 12) L. V. Jagger

TITLE/COMPANY 13) PQAS Ebasco

DATE 14) 11/29/82

II. RECOMMENDED DISPOSITION 110) (Submit Sketch if Applicable)

~~Perforate all maintenance straps required in the CMI. Document any deficiencies found. Initiate a new maintenance and starting with the date the above maintenance is performed. Note on the card the error made by the E.M.D.~~

EAK
1-12-83

EMD records indicate equipment to be in an acceptable condition prior to being inadvertently removed from the CMI program. These units were found to meet LP&L standards and was accepted by LP&L 11/18/82. With an acceptable copy of LP&L preoperative test-recommend accept as is.

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION 111) [Signature]

TITLE/COMPANY 112) EMD Supri

DATE 113) 1-13-83

III. EVALUATION OF DISPOSITION BY EBASCO, REASON FOR DISPOSITION 114)

Above disposition is not acceptable.
See Att #2 for details.
(Based on news info provided see Att #4 for revised ESSE evaluation of disposition)

IV. CORRECTIVE ACTION 115) Required Not Required

Documentation errors causing this condition to occur is a problem of the past. Thinking of EMD personnel has taken place and will prevent recurrence. See attached [Signature] 5/10/83

<input checked="" type="checkbox"/> ENGINEERING	<input type="checkbox"/> QUALITY ASSURANCE	<input checked="" type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> OTHER
NAME (SIGNATURE) [Signature]	NAME (SIGNATURE) [Signature]	NAME (SIGNATURE) [Signature]	NAME (SIGNATURE)
DATE 3/8/83	DATE 5/6/83	DATE 2-5-83	DATE
<input checked="" type="checkbox"/> ACCEPTED	<input checked="" type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED	<input type="checkbox"/> REJECTED
<input checked="" type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION 116) REQUIRED NOT REQUIRED

117) BY [Signature] SIGNATURE [Signature] TITLE OAE DATE 5/10/83

D. N. Number H-2074

Date of Report 11/19/82



WATERFORD STEAM ELECTRIC STATION
1982 - 1165 MW INSTALLATION UNIT NO. 3
DISCREPANCY NOTICE

MFR# N/A

MFR# N/A

MFR# N/A

Item Description S2(3A) & S2(3B) Axial Flow Fans, AHL(3A-SA), AHL(3B-SB) SUS 43A

Location -21 RC3 & -4 RC3 System 43A

P. O. / Contract No. WJ-NY-17A Dwg./Spec. No. SMG-854-3, 855-2, 854-2

1. Discrepancy Description: See attached sheet.

11.19.82

Q. C. Inspector A. Crooks *Anthony Crooks*

Q. C. Supervisor G. Bourgeois *G. Bourgeois*

2. Recommended Disposition: Route to QA for review. NCR recommended.

Provided By E. Falcon *E. Falcon* Date 11/19/82

3. WJ No. WJ-5265 Q. A. Site Supervisor [Signature] Date 12/9/82

4. Disposition: for J. Gutierrez

Sr. Resident Engineer _____ Date _____

Referred To: _____

5. Corrective Action Taken: _____

Organization: _____ Signature _____ Date _____

6. Reinspection remarks: _____

Accept _____ Reject _____ Q.C. Inspector _____ Date _____

ATTACHMENT # 1

DN E-2074

AHL (3A-SA) DWG. SMG-855-2

AHL (3A-SX) DWG. SMG-855-2
D S

Discrepancy Description: During CMI inspection it was found that the units mentioned above were inadvertently removed from the Ebasco CMI Program for the months of June, July, August, September, October and November.

Also, S2(3A) and S2(3B) axial flow fans on dwg. SMG-854-3 were inadvertently removed from Ebasco CMI Program for the months of August, September, October and November. This is in violation of CMI Procedures.

Anthony Crooks 11-19-82
A. CROOKS
QC Inspector
11/19/82

AFT

ESSE Evaluation of Recommended Disposition

In our attempt to evaluate the recommended disposition of this NCR, the following was noticed:

- 1) Referenced discrepancy notice #H-207# does not specifically identify which Care and Maintenance Instruction (CMI) is involved. Also, the specific year of when the inspection was removed from the CMI program is missing. This is important realizing that SUS 43A consists of #3A-1 and #3A-2 and that each have different released dates.
- 2) Description of component (Box 6, NCR Form) erroneously relate Axial Flow Fans with CMI 146.

Based on the above, QA to furnish needed/proper information to ESSE for further evaluation.

by: A. Bishara 3/8/83
A. Bishara, Lead HVAC ESSE Engineer



TO: H. J. Kurnia AT: OA Site Supervisor
SUBJECT: NCR W3-5265 (DN-H-2074) DATE: 3/21/83

Per Amin Bichara's request for additional information (Attachment #2) applicable CMI's for the units in question are: CMI-174 for AH-1(3A-SA) & AH-1(3B-SB) and CMI-164 for S2(3A) & S2(3B). These units were dropped from the CMI program during 1982.

If any additional information is required, please, contact me.

SIGNED

Larry Bourgeois



DATE

SIGNED

May 9, 1983

ESSE EVALUATION OF DISPOSITION

The recommended disposition does not specifically address the nonconforming condition. By requiring preoperative test reports as justification for equipment condition is an inaccurate method of disposing the nonconformance. However, by successfully completing pre-requisite testing of this system, has establish conclusively that the equipment has not been impaired by the negligence of CMI inspection. Per LP&L Test Director, Mr. C. Cudworth, prerequisite testing procedure no. SFG-43A-001 was successfully completed on 12/21/82.

To assure the nonreoccurrence of this incident, personnel responsible for implementing the subject CMI inspection/documentation show evidence of retaining per applicable procedures.

A. Bishara 5/10/83.
Lead HVAC Engineer - A. Bishara



Interoffice Correspondence

DATE April 4, 1983 FILE # WJ-NCR-15106
 WJ-15101

TO L. Jager OFFICE LOCATION CA Site Supervisor

FROM Don Stephens OFFICE LOCATION EMD Supervisor

SUBJECT EMD Internal Instructions

1. EMD signature added to attachment #2. Q.A. to add signature to additional corrective action suggested per interoffice correspondence 3/23/83 to provide traceability of documentation.
2. Listed below are the individuals working within the Equipment Maintenance Department. Their signature signifies they have read the new Maintenance Department Internal Instructions and have received instruction on implementing the proper procedures for conducting EMD task efficiently, effectively and accurately.

Linda Francis
 Shirley Barrios
 Glen Champion
 John Galczynski
 Richard Schwarer

3. Attachment #2 is a copy of "Equipment Maintenance Internal Instructions." This satisfies Q.A. reoccurrence prevention criteria.

DS/ek



EBASCO SERVICES INCORPORATED
MANPOWER PLANNING AND DEVELOPMENT
PROGRAM PARTICIPANT ROSTER

PROGRAM TITLE	PARTICIPANT NAME (LAST, FIRST, INITIAL)	PAYROLL NUMBER	DEPARTMENT	JOB TITLE	SIGNATURE	DATE
Training of Personnel (NSP-IV-19) Equipment Maintenance Dept. Leaving and Maintaining of Personnel (NSP-IV-19) + Technical Instructions	N/A					2-17-85
	Waterford 3	971941	EMD	Secretary	<i>Richard J. Loria</i>	
	WADA FRANCIS	3206 (Agent) 970378	EMD	Material Engineer	<i>Airley M. Barrios</i>	
	AIRLEY BARRIOS	5310 (Badge) 471863	EMD	Eng. Asst	<i>Alan Champion</i>	
	LEN CHAMPION	5624 (Badge) 976-765	EMD	ASSISTANT ENGINEER	<i>John G. Galszynski</i>	
JOHN GALCZYNSKI	5400 (Badge)	EMD	Eng. Asst	<i>Richard J. Loria</i>		
GUARD SCITWARER	977-787 5085 (Badge)	EMD				



REMARKS: Please forward WHITE copy to Manpower Planning and Development, Ebasco Services Incorporated
New York, NY 10006. Retain YELLOW copy for records.

1053

EQUIPMENT MAINTENANCE DEPARTMENT INTERNAL INSTRUCTIONS

EFFECTIVE: 17 February 1983

These new instructions, distinct and separate, must not be associated with any or all similar past practices.

The purpose of these instructions is to furnish adequate means for documenting and tracking all permanent plant material and equipment in the Ebasco warehouse and certain In-Place storage items.

Ebasco warehouse shall transmit to the E.M.D. all MPR's, ROW's, RTW's, RMR's, Change of Locations and Record of Shipment Received. Upon receipt, these documents shall be recorded in the Warehouse Documents Received Log (WDRL).

MATERIAL RECEIVED REPORT (MRR) - EMD personnel shall: assign (by reference to the P.O. or Sub-P.O. number) the applicable CMI number to the MRR; record the MRR number on the appropriate Material Maintenance Record (MMR) and active worksheets. The MRR must be filed under the applicable CMI number in the MRR file.

REQUEST ON WAREHOUSE (ROW) - EMD personnel shall: assign the applicable CMI number to the ROW; record the ROW number and date onto the appropriate MRR; highlight (w/green marker) on the MRR those items removed from the warehouse; line through the former location of these items on the MRR and the appropriate active worksheets. Line through the former location on the relevant MMR, initial and date. Note, the green highlighting indicates these items were removed from the warehouse. When all items on an MRR have been green lined, the MRR number shall be lined through, initialed and dated (using black ink) on the appropriate MMR; then, file the ROW with the MRR. When all MRR's associated with a CMI have been green lined, the pertinent MMR shall be closed out after the last ROW number and date is recorded, in the "COMMENTS COLUMN" on the MMR. Then, the MMR is sent to the QA Records Vault, via warehouse QC, with the appropriate worksheets attached. A transmittal form must be used to transmit MMR documents to the warehouse QC. A copy of all documents must be made and kept in the CMI folder.

CHANGE OF LOCATION (C/L) - EMD personnel shall: assign the applicable CMI number to the C/L; record the change of location on the appropriate active worksheets and MRR, then line through the former location. The former location on the MMR shall be lined thru, initialed and dated. The C/L must be filed with the appropriate MRR.



111
2013

RECORD OF SHIPMENT RECEIVED (ROSR) - EMD personnel shall highlight (w/blue marker) N.Y. purchase order to indicate permanent plant equipment has been received. The applicable CMI number shall be written beside the N.Y. purchase order number. Then, the ROSR report must be filed in the Record of Shipment Received Book.

RETURN TO WAREHOUSE (RTW) - EMD personnel shall: assign the applicable CMI number to the RTW; record the RTW number, date and location onto the corresponding MRR. The new warehouse locations shall be recorded on the relevant active worksheets and MMR. Then, the RTW must be filed with the appropriate MRR.

RETURN MATERIAL REPORT (RMR) - EMD personnel shall: assign the applicable CMI number to the RMR; record the RMR number and date onto the appropriate MRR. Those items removed from the warehouse shall be: highlighted (w/green marker) on the MRR; then, line thru the former location of these items on the MRR and the appropriate active worksheets. The former location on the MMR shall be lined thru, initialed and dated. Then, the RMR must be filed with the pertinent MRR.

EMD Worksheets - EMD worksheets shall be issued monthly for each active CMI to the EMD inspecting personnel. These worksheets shall be issued prior to the month the inspections are due to be performed. The worksheet shall contain information identical to the top half of the corresponding MMR, while the bottom half of this worksheet shall remain blank, except where the current due date shall be entered. Other exceptions are:

- (1) Where meggering is required, blank spaces shall be labeled: "TAG#", "MEGGER#", "CAL. DATE", "DUE DATE", "SERIAL#" and "RANGE".
- (2) Where QC's presence is necessary, a space shall be labeled: "QC"(for signature).

In the column labeled "STEP NO.", the inspecting personnel must record which steps of the required maintenance were performed. The date inspection was completed shall be entered in the column labeled: "DATE COMPLETED".

When applicable, the megger value, pressure, humidity, etc. shall be entered in the column labeled: "COMMENTS". When the item being inspected is not the same as the one indicated in the material description then this item must be identified on the worksheet in the column labeled: "COMMENTS".

The inspector, after completing the inspection, shall record his initials in the column labeled: "S/U GEN CRAFT SUPERVISOR". If QC presence is required, the QC person must initial his name in the column labeled: "QC", indicating that he witnessed the inspection. After the worksheet data has been recorded on the MMR, then the MMR must also be signed by QC.



Upon completion of each worksheet, all recorded information shall be transcribed from the worksheet to the pertinent MMR. A copy of the worksheets shall be retained and the original attached to the MMR upon transmitting the completed MMR to the QA record vault (via QC warehouse).

An EOD Monthly CMI Logsheet shall be kept to reflect the status of the active CMI's for that period. Each active CMI shall be listed numerically on the monthly logsheet. Safety and seismic related CMI's must be listed first, separately and numerically. Similarly, all other CMI's must be listed next, numerically and separate. Any CMI's added during this monthly time period must be listed separately.

Upon completion of active worksheets by inspecting personnel, relevant data shall be copied from the worksheet to the logsheet. When the worksheet indicates that the inspection was completed, the CMI number on the monthly logsheet must be highlighted (w/blue marker). If the worksheet indicates the inspection was not completed, the CMI number on the logsheet must be circled (in black ink). However, if a CMI has been closed out, the CMI number in the logbook must be highlighted (w/yellow marker). Thus, a CMI number in the logbook neither highlighted nor circled indicates that this particular worksheet has not been returned.

When QC signs a worksheet it is also required that QC sign the relevant MMR. When QC signs the MMR, a check mark (in black ink) must be made in the logbook beside the corresponding CMI number on the monthly log.

Different items listed under the same CMI number, which have individual MMR's, must be identified to indicate the difference.

For IN-PLACE CMI's, the words "IN-PLACE" must be written beside the CMI number on the monthly logsheet.

A Yearly CMI Logbook shall be kept to reflect the status of all CMI's, listing them in numerical order. It shall be noted by placing an "S" beside the CMI number where an item is safety or seismic related. Across from the CMI number and in the column below the applicable month, this block must be highlighted (w/blue marker) when the inspection has been completed. If no inspection has been made, then the block shall remain blank. When the CMI has been closed, this block shall be highlighted (w/yellow marker). In the column beside the CMI number, it is optional to write whether the item has been issued or the CMI is open or closed.

MATERIAL MAINTENANCE RECORD (MMR) - MMR's must be kept locked in a fireproof file cabinet. MMR's shall be filed numerically and separated safety from nonsafety. All MMR's relate to warehouse storage unless "IN-PLACE" is written on the front in the upper right hand corner. The blanks on the front, top half of the MMR must be filled using: P.O. number with sub P.O. number if applicable, material description, CMI number, location, MRR number, storage level and date received. Also, each step of the required maintenance shall be numbered and listed.

Always use black ink when writing on the MMR. When making a correction; line thru, initial and date. When making a late entry, add L.E. All blanks shall be filled in except where not applicable, and then they shall be marked N/A.

E.M.D.. Supv.



LOUISIANA POWER & LIGHT COMPANY
 WATERFORD STEAM ELECTRIC STATION
 1983 - 1165 MW INSTALLATION - UNIT NO. 3

PLANT EQUIPMENT CONSTRUCTION
 MAINTENANCE RECORDS STATUS

CMI DESCRIPTION

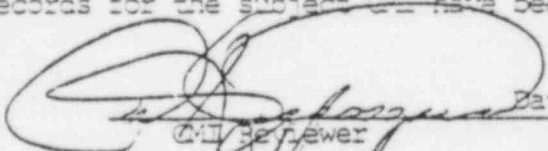
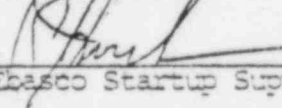
Axial Flow Fans

CMI No. 164Purchase Order No.
NY 403548

(Final Review)

EBASCO STARTUP REVIEW


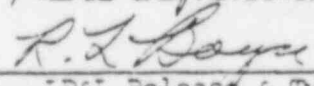
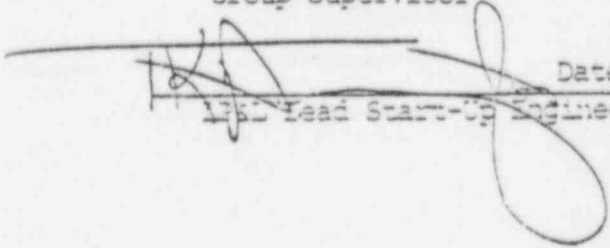
The pertinent construction maintenance records for the subject CMI have been reviewed and accepted with exceptions as noted.


 CMI Reviewer
Date 1-6-83

 Ebasco Startup Supv.

Date

LP&L ACCEPTANCE

This CMI Records Review is acceptable.


 LP&L CMI Reviewer
Date 1-10-83

 LP&L Release & Turnover
 Group Supervisor
Date 1-10-83

 LP&L Lead Start-Up Engineer
Date 1/10/83

DATE May 4, 1983

FILE REF

TO QAIRG CMI Coordinator

OFFICE LOCATION

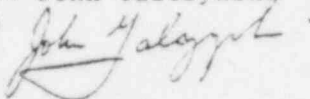
FROM

EMD



OFFICE LOCATION

SUBJECT Deficiency Report Disposition
QEM-0164-18 May 4, 1983
NY 403548, CMI-164 John Galczynski
(Axial Flow Fans)



1. Past errors (i.e. no. initial and date) have been corrected by training EMD personnel to provide tracability of documentation. Accept as is.
2. Use of felt tip pens have been replaced and stopped. EMD personnel are now aware of these restrictions. Accept as is.
3. EMD personnel are now fully instructed to initial and date all changes to documentation. Accept as is.
4. See item 3 response.
5. See item 3 response.
6. See item 2 response.
7. Simply human error. Accept as is.
8. See item 3 response.
9. See item 3 response.
10. EMD Force Account Personnel have been instructed in proper procedures for revising documentation. Accept as is.
11. See item 10 response.
12. See item 10 response.
13. See item 10 response.
14. See item 10 response.
15. See item 10 response.
16. Human error. Accept as is.
17. Reference NCR for EMD response.
18. Maintenance record change as requested.

EBASCO SERVICES

QUALITY ASSURANCE ENGINEERING
CONSTRUCTION-INSTALLATION RECORDS
DEFICIENCY REPORT

REVIEW NO. 1

241 3.2

Sheet 1 of 2

QEM-0164-18

STS No. 10 Date of Report 11/12/82

Client or Project: Waterford Contract No.: 403548 Reviewer: C. Whit Church
Activity: IN-PROCESS REVIEW AXIAL FLOW FANS

Compliance
Accuracy
Legibility

Document Number or Identification	Reason for Rejection
cmi #164	① name on sheet dated received 8/2/77 location not initialed & dated. Caw 5/13/83
X	② Felt tip pen or felt marker used throughout Caw 5/13/83
X	③ Step #1 one item marked out without initial and date. Caw 5/13/83
X	④ Date completed changed without initial and date 8/11/77. Caw 5/13/83
X	⑤ Date due 6/1/79 marked out without initial and date. Caw 5/13/83
X	⑥ name with date issued 4/30/82 miss use of felt marker. Caw 5/13/83
X	⑦ step #6 has no initial Caw 5/13/83
X	⑧ name with date received 2/20/79 Caw 5/13/83 Step #2 3 and date due marked out without initial and date (6/1/79)
X	⑨ name date 10/11/79 due with 10/30/79 Caw 5/13/83 templ has no initial or date changed.

Verification of Corrective Action _____

Reviewer _____ Date _____

Accord Exact

EBASCO SERVICES

241 3.2

QUALITY ASSURANCE ENGINEERING
CONSTRUCTION-INSTALLATION RECORDS
DEFICIENCY REPORT

REVIEW NO. 1

Sheet 2 of 3 *EW*
5/11/83

REM-0164-18

SUS No. Date of Report *EW*
5/12/83

Client or Project Wassford Contract No. 2/4/82 Reviewer *EW*
Whitchurch

Activity IN-PROCESS REVIEW

Compliance
Accuracy
Legibility

Document Number or Identification	Reason for Rejection
X CMI #16+	(2) HVAC maintenance Report Oct. 1980 was #16 item crossed out without initial and date. <i>EW</i> 5/12/83
X	(4) HVAC maintenance Report Oct. 1980 has note crossed out without initial and date. <i>EW</i> 5/13/83
X	(3) HVAC maintenance Report Jan. 1980 items crossed out without initial and date. <i>EW</i> 5/13/83
X	(3) HVAC maintenance Report Oct. 1979 items crossed out without initial and date. <i>EW</i> 5/13/83
X	(14) MMR date due 11/14/80 item crossed out in comments without initial and date same with 10/14/80. <i>EW</i> 5/13/83
X	(5) MMR date 12/14/82 crossed out without initial and date. <i>EW</i> 5/13/83
X	(10) Location of motor that was meggered 5/13/83 on #173 is not noted. MMR # 403544

Verification of Corrective Action _____

Accept Reject

Reviewer _____ Date _____

EDASCO SERVICES

QUALITY ASSURANCE ENGINEERING
CONSTRUCTION-INSTALLATION RECORDS
DEFICIENCY REPORT

DAI 1.1

REVIEW NO. 1

Draw 2 of 3 ^{CAW} 7/14/82

QEM-0164-18

STS No.

Date of Report 11/12/82 ^{CAW} 11/12/82

Project Name
XXXXXXXXXX

Contract No. CAW 12/16/82

Inspector C. Whitchurch

Activity IN-PROCESS REVIEW

Compliance
Accuracy
Acceptance

Document Number
or Identification

Reason for Defect on

X CMI #164 (7) Axial Flow Fan E 28 (3B-5B) Tag #164F was issued to the field for installation on ROW #26942 on 12-18-79. Inplace maintenance documentation does not begin until 7/31/82 ^{CAW} leaving a maintenance record gap of over 4 months. NER was written ~~to~~ to document the missing maint. record. ^{CAW} 5/13/83

X (10) On sheet 3.4 this is an Inplace maintenance record. It is not stated on maintenance record ^{CAW} THE WEEDS (IN-PLACE) IS NOT NOTED AT TOP OF MAIR AS REQUIRED. ^{CAW} 5/13/83

Verification of Corrective Action DISPOSITION ACCEPTABLE, CAIRG CMI COORDINATOR, Charles A. Whitchurch, 5/13/83

Accred

Effect

Reviewer

Date

REPORT NO. WS-5092

Distribution:
 White - PQAE or Site QA Supervisor
 Yellow - Organization recommending disposition
 Pink - Initiator of NCR

INSTRUCTIONS: (See back of form) TREND CODE: 1700.00.60

SUS# 1/12

CLIENT OR PROJECT (2) <u>LP&L/Waterford 3</u>	DRAWING NO./SPEC NO. (3) <u>CMI 164 ASP-IV-19 ANSI 45.2.2</u>
SUPPLIER, CONSTRUCTION QC OR CONTRACTOR (4) <u>Ebasco Maintenance Department</u>	P.O. NO. (5) <u>403548</u>
DESCRIPTION OF COMPONENT, PART OR SYSTEM (6) <u>Inplace Maint. Record-CMI 164 Axial Flow Fans</u>	

I. DESCRIPTION OF NONCONFORMANCE (7) (Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)

Axial Flow Fan E-28 (3B-5B) Tag #164F was issued to the field for installation on Row 26948 on 12/18/78. Inplace maintenance documentation does not begin until 7/31/79, leaving a maintenance record gap of over 7 months.

ITEM NO: 0001

REPORTABLE	YES	NO
100P#58.0648	<input type="checkbox"/>	<input checked="" type="checkbox"/>
100P#21	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Reviewed by: <u>[Signature]</u>	Date: <u>11/11/82</u>	

NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (8) <u>Cheryl Ann Tiller Cheryl Ann Tiller</u>	TITLE/COMPANY <u>CMI Reviewer/Ebasco</u>	DATE (9) <u>11/11/82</u>
---	---	-----------------------------

II. RECOMMENDED DISPOSITION (10) (Submit Sketch if Applicable)

Records cannot be located for the listed time period. All records on file, for CMI #164 indicate the equipment to be in an acceptable condition. Recommended disposition is "accept as is".

NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11) <u>M. R. Strawbridge</u>	TITLE/COMPANY <u>Asst. Const. Supt./EBASCO</u>	DATE (12) <u>11/22/82</u>
--	---	------------------------------

III. EVALUATION OF DISPOSITION BY EBASCO, REASON FOR DISPOSITION (13)

ACCEPT RECOMMENDED DISPOSITION. NO FURTHER ACTION REQUIRED. CMI-8-82

IV. CORRECTIVE ACTION (14) Required Not Required

V. <input checked="" type="checkbox"/> ENGINEERING	<input checked="" type="checkbox"/> QUALITY ASSURANCE	<input checked="" type="checkbox"/> CONSTRUCTION	<input type="checkbox"/> OTHER
NAME (SIGNATURE) <u>C. O'Brien</u>	NAME (SIGNATURE) <u>[Signature]</u>	NAME (SIGNATURE)	NAME (SIGNATURE)
DATE <u>12-8-82</u>	DATE <u>12-13-82</u>	DATE	DATE
<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input checked="" type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED	<input type="checkbox"/> ACCEPTED <input type="checkbox"/> REJECTED
<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS	<input type="checkbox"/> ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION REQUIRED NOT REQUIRED (15)

CMI TASK FORCE REVIEW

CMI #164 SUMMARY

Items: Axial Flow Fans

Quantity: 8

Purchase Order: 403548

Data Review Was Completed: 11-5-82

COPY

The review of CMI #164 was conducted to confirm the integrity of both warehouse and in-place maintenance and inspection records.

Attached is a list of equipment by tag number, the appropriate Manual Receiving Report numbers and received dates, ROW number, and the date equipment was issued to the field. Also included in this package are copies of the Material Maintenance Records from time of receipt to release of the equipment to LP&L, and deficiency reports generated from the results of the Engineering and QA review. Eighteen deficiencies have been documented. All deficiencies noted are software related.

Cheryl Tiller

11-8-82

de
Cheryl Tiller

MATERIAL MAINTENANCE RECORD - A

P.O.# 403548 MATERIAL DESCRIPTION AXIAL FLOW FANS
 CMI 164 LOCATION See Above MRR# 901437 TAG# E, J, K, L, M, N
 STORAGE LEVEL B DATE RECEIVED 2/20/79 DATE ISSUED _____

STEP #	REQUIRED MAINTENANCE	FREQUENCY
	164I - 3/4 SF40413-20HP; 164J - 3/4 SF40415-20HP; 164K - 3/4 SF40417-20HP 164L - 3/4 SF40416-20HP; 164M - 3/4 SF40414-20HP; 164N - 3/4 SF40418-20HP	
1.	MEGGER PER CP-425 - E, J, K, L, M, N	3/1/79; 7/1/79
2.	ROTATE MOTOR SHAFTS 3/4 TURNS	1ST MONTHLY
3.	CHECK GENERAL CONDITION, HEATERS & DUST COVERS	1ST MONTHLY

PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger, Pressure Gauges; Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	Q.C.
UPON RECEIPT 1, 2, 3	3/1/79	3-19-79	J, J, K, L MEGGERED @ 7500 m.l. ITEMS MAINTAINED	MH	R.B
2, 3	4-1-79	4-19-79	164M+N RECEIVED ON MRR 902352 & MEGGERED @ 7500 m.l. USING MEGGER #21-35 ITEMS MAINTAINED	MH	R.B
2, 3	5-1-79	5-22-79	ITEMS MAINTAINED	MH	R.B
2, 3	6-1-79	6-5-79	new card has been made due to new revisions per R2 of CMI 164	MH	
REVIEWED & ACCEPTED QUALITY CONTROL					
JUN 5 1979					
R. J. Diandolitto					

WATERFORD STEAM ELECTRIC STATION
1980-1165 MW INSTALLATION-UNIT NO. 3
QUALITY CONTROL

MEMO TO FILE WQC-1-2:

Date: 4-8-80

The following equipment has been issued to the installing contractor and is no longer in the Ebasco CMI Program:

Item Description Axial Flow Fan
Vendor R. A. Dunstan & Associates
Mfr. Jay Manufacturing Co.
PO No. NJ-403548
CMI No. 164

QC Inspector: Jackie Matherne

MATERIAL MAINTENANCE RECORD - A

P.O.# 403548 MATERIAL DESCRIPTION Axial Flow Fans
 CMI 164 LOCATION 28 S. ... MRR# Various TAG# C, G, H, I, J, K, L, M, N
 STORAGE LEVEL B DATE RECEIVED 10/9/79 DATE ISSUED 1-3-80

STEP #	REQUIRED MAINTENANCE	FREQUENCY
		REVIEWED AND ACCEPTED QUALITY CONTROL
1.	Check general condition, heaters, & dust covers	1st monthly APR 9 1980
2.	Rotate motor shafts 3/4 turns	1st monthly
3.	Assure fan rotors are not subjected to impact	1st monthly
4.	Add fresh supply of Gulfarom-2 grease (see step 4.3 of CMI for instructions)	Every 6 months 12-79 12-80
5.	Remove condensation drain plugs, allow moisture to drain, then replace	Every 6 months 12-79
	Step 5 deleted per R3 of CMI	
6.	Megger per CP-425	1st monthly
		Every 6 months 7/79 11/80 7/80

See completed maint records for maint prior to 6-1-79

PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger; Pressure Gauges; Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	Q.C.
1,2,3,4,5,6	6-1-79	6-25-79	These Axial Flow Fans have condensation drain plugs which do not have to be removed. They have holes in them to permit maint. Complete constant draining.	MH	N/A
		7-6-79	164C, G, H, I, J, K, L, M, N meggered at 7500 mΩ using Gulf's megger #6-002	MH	N/A
1,2,3,5,6	7-1-79	7-30-79	164C issued on 820 32974. 7-24-79. maint. Complete	MH	N/A
1,2,3,5,6	8-1-79	8-27-79	164G+H meggered at >500 mΩ using Gulf's megger #6-001.	MH	N/A
		9-24-79	164G+H meggered at 7500 mΩ using Gulf's megger #6-001	MH	N/A
1,2,3,5,6	9-1-79	9-26-79	maint. Complete	MH	N/A
1,2,3,6	10-1-79	10-31-79	motors meggered at >500 mΩ using Gulf's megger #6-001.	J.C.	N/A
1,2,3,6	11-1-79	11-30-79	Maint. Complete	BAH	N/A
		12-16-79	Motors meggered at >500 mΩ using Ebasco's megger #130	J.C.	N/A
1,2,3,6	12-1-79	12-5-79	MAINT. COMPLETE	J.C.	N/A
1,2,3,4,6	1-1-80	1-2-80	Motors meggered at >500 mΩ using Ebasco's Meg. #130-164 & meg. ground (TI-TS)	J.C.	N/A

MATERIAL MAINTENANCE RECORD - A

P.O.# 403548 MATERIAL DESCRIPTION AXIAL FLOW FANS
 CME 164 LOCATION WHEELER See Above MRR# 703540 TAG# 164A, B, C, D, E, F, G, H
 STORAGE LEVEL B DATE RECEIVED 3/2/77 DATE ISSUED _____

STEP #	REQUIRED MAINTENANCE	FREQUENCY
	ITEMS MAINTAINED: <u>164A-5HP SN 21115, 164B-5HP SN 21117, 164C-5HP SN 5XP882387A1-TO, 164D-40HP SN 1009, 164E-15HP SN 104F, 164F-100HP SN 21119, 164G-75H.P., 164H.</u>	
	ENERGIZE SPACE HEATERS (PROVIDED ON MOTORS 75HP AND ABOVE SN'S 21113, 21114, 21119)	UPON RECEIPT
	MEGGER PER CP 425 @ 500 TEST VOLTS (164A, 164B - LESS THAN 50HP)	" "
1.	MEGGER MOTORS @ 500 TEST VOLTS PER CP 425 <u>164A, 164B, 164C, 164D, 164E</u>	EVER 6 MO ^{12/1/78} 9/1/77, 11/1/78, 7/1/79, 11/1/79
	NOTE: MOTORS OILING LUBRICATED. NO OILING REQ'D 282/15/77	
2.	ROTATE MOTOR SHAFTS SEVERAL TURNS (STOP 90° FROM START)	1ST MONTHLY
3.	INSPECT GENERAL CONDITION, HEATERS (WHERE APPLICABLE), COVERS	1ST MONTHLY
4.	MEGGER MOTOR @ 500 TEST VOLTS PER CP. 425 (164C) <u>(164A & 164G) (164H)</u>	1ST MONTHLY

PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger, Pressure Gauges; Humidity Cards; etc.)	EQUIPMENT MAN	Q.C.
1, 2, 3	—	8/11/77	UPON RECEIPT MAINTENANCE COMPLETE Motors Meggered @ 500 M.V. ITEMS MAINTAINED	JB	NA
1, 2, 3	9/1/77	9/1/77	ALL ITEMS MAINTAINED Motors Meggered @ 500 M.V.	JB	NA
2, 3	10/1/77	10/4/77	ALL ITEMS MAINTAINED		NA
2, 3	11/1/77	11/1/77	ALL ITEMS MAINTAINED	JB	WA
2, 3	12/1/77	12/1/77	Motors Meggered @ 71000 M.V. ALL ITEMS MAINTAINED	R. J. Diandallo JB	WA
1, 2, 3	1/1/78	1/31/78	ALL ITEMS MAINTAINED	MH	NA
1	1/1/78	1/31/78	MOTORS MEGGERED @ 71000 M.V. 164C MEGGERED @ 7500 M.V.	MH	NA
4, 2, 3	2/1/78	2/14/78	ALL ITEMS MAINTAINED	MH	NA

TAG # _____ DESCRIPTION _____ LOCATION _____

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger, Pressure Gauges; Humidity Cards; etc.)	EQUIPMENT MAN	Q.C.
2,3,4	3/1/78	3/27/78	164C, D, E, F MEGGERED @ 7500 M.L. ALL ITEMS MAINTAINED	MH	
2,3,4	4/1/78	4/7/78	ALL ITEMS MAINTAINED	MH	
2,3,4	5/1/78	5-17-78	164L-F MEGGERED @ 7500 M.L.		
2,3,4	5/1/78	5-22-78	ALL ITEMS MAINTAINED	MH	
4					
MH 5-24-78	5-24-78	5-24-78	164G MEGGERED @ 7500 M.L.	MH	
		6-19-78	ALL ITEMS MAINTAINED		
2,3,4	6-1-78	6-15-78	164C, E, G, MEGGERED @ 7500 M.L. MOTORS MEGGERED @ 7500 M.L.	MH	
1,2,3,4	7-1-78	7-26-78	ALL ITEMS MAINTAINED	MH	
		8-15-78	MOTORS MEGGERED @ 7500 M.L.		
2,3,4	8-1-78	8-25-78	ALL ITEMS MAINTAINED	MH	
		9-29-78	MOTORS MEGGERED @ 750 M.L.		
2,3,4	9-1-78	9-19-78	MH RECEIVED ON MAR 908140 + MEGGERED @ 7500 M.L. ALL ITEMS MAINTAINED	MH	
			MOTORS MEGGERED @ 750 M.L.		
2,3,4	10-1-78	10-20-78	ALL ITEMS MAINTAINED	MH	10-2
			MOTORS MEGGERED @ 750 M.L.		R.B.
2,3,4	11-1-78	11-29-78	ALL ITEMS MAINTAINED	MH	11-29-
			MOTORS MEGGERED @ 7500 M.L.		R.B.
2,3,4	12-1-78	12-18-78	164F ISSUED PER ROW 26948 ALL ITEMS MAINTAINED	MH	12-22
			MOTORS MEGGERED @ 7500 M.L.		R.B.
1,2,3,4	1-1-79	1-19-79	ALL ITEMS MAINTAINED	MH	
			MOTORS MEGGERED @ 7500 M.L.		
2,3,4	2-1-79	2-15-79	ALL ITEMS MAINTAINED	MH	
			C, G, H MEGGERED @ 750 M.L.		
2,3,4	3-1-79	3-19-79	ALL ITEMS MAINTAINED	MH	
			164D & E ISSUED ON ROW 30255		
2,3,4	4-1-79	4-17-79	MOTORS MEGGERED @ 750 M.L. USING MEGGER AC 1.35	MH	
		4-19-79	ALL ITEMS MAINTAINED		
			164A + B ISSUED ON ROWS 30804 + 30804		
2,3,4	5-1-79	5-22-79	164 C, G, H MEGGERED @ 7500 M.L. USING MEGGER AC 1.3, 4. ALL ITEMS MAINTAINED	MH	
			new card has been made, due to many revisions on 12 of CME 164		
2,3,4	6-1-79	6-5-79		MH	

1) - # E6(B) - E6(B) - 40 units
 2) - # S1(B) - 40 units
 3) - # E28(BB-SB) - 46 RAB (J6A)

MATERIAL MAINTENANCE RECORD - A

P.O.# 403543 MATERIAL DESCRIPTION Axial Flow Fans
 CMI 164 LOCATION Per Hvac Maint. Sheet for CMI 157 MRR# — TAG# 164
 STORAGE LEVEL — DATE RECEIVED — DATE ISSUED —

STEP #	REQUIRED MAINTENANCE	FREQUENCY
1.	Check the general condition & dust covers. Energize & maintain heaters on motors; use temporary heat source on motors w/o permanent heaters. Provide protection from damage and deterioration.	14th Monthly
2.	Megger motors per CP-425.	A, B, D, E. 6/19 12/19 CF-MTRJ
3.	Drain moisture at condensation drain plug (low point)	Every 6 mths. 7-79 - 1-80
4.	Rotate motor shafts 3 1/4 turns.	14th Monthly 1-80, 4-80, 7-80, 10-80
5.	Add fresh Gulfcrown EP2 to controllable pitch mech. & fan shaft bearings (purge small amount of old grease)	Every 6 mths. 7-79 - 1-80 10-79
NOTE: Before greasing pitch rotor bearings, move adjusting lever toward fan rotor as much as possible (High. blade angle) Assure drain plugs are in-place.		

PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger, Pressure Gauges, Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	Q.C.
1, 2, 3, 4, 5	7-14-79	7-31-79	104A, B, D, E, F meggered at >500 mΩ using Gulf's megger #6001 cal. due 2-21-80 maintenance completed	MH	ave
1, 2, 4	8-14-79	8-30-79	164 C, F meggered at >500 mΩ using Gulf's megger #6001. maintenance completed	MH	ave
1, 2, 3, 4, 5	9-14-79	9-28-79	ALL STEPS COMPLETE PER SEPT 1979 HVAC MAINT. SHEET FOR CMI 157, REV 0 ITEMS MEGGERED @ >500 MΩ GULF'S MEGGER #6001	JB 10-6-79	ave
NOTE: AS OF SEPT, 1979, MAINT PERFORMED SHALL BE PER HVAC MAINT. SHEET FOR CMI 164. COMPLETION OF SHEET WILL COVER ALL ABOVE CMI STEPS WHERE APPLICABLE EACH MONTH.					
1, 2, 3, 4, 5	10-14-79	10-30-79	ALL STEPS COMPLETE PER OCT, 1979 HVAC MAINT SHEET, REV 0 FOR CMI 164 ITEMS MEGGERED @ >500 MΩ	JB	ave
1, 2, 3, 4, 5	11-14-79	11-22-79	ALL STEPS COMPLETE PER NOV., 1979 HVAC MAINT. SHEET REV. 1 FOR CMI 164 E28(BB-SB) meggered I.N.F. E29(BA-SA) meggered I.N.F.	J.C.	ave
1, 2, 3, 4, 5	12-14-79	12-31-79	ALL STEPS COMPLETE PER DEC. 1979 HVAC MAINT. SHEET REV. 1 FOR CMI 164 164 ALL MOTORS MEG'D I.N.F.	J.C.	ave
1, 2, 3, 4, 5	1-14-80	1-14-80	ALL STEPS COMPLETE PER JAN 1980 HVAC MAINT. SH. RI. FOR CMI 164. ALL MOTORS MEG'D I.N.F.	J.C.	ave

TAG #	DESCRIPTION	LOCATION			
STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger, Pressure Gauges, Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	G.C.
2,3,4,5	2-14-80	2-13-80	All steps complete per HVAC Maint Sh. for Feb. R1 All motors meggered infinity.	JL	ave
2,3,4,5	3-14-80	3-26-80	All steps complete per March 1980 maint. sh. Revision 2. All motors meggered Infinity.	JL	ave
2,3,4,5	4-14-80	4-21-80	All steps complete per April 1980 maint. Sh. R2. All motors meggered Infinity.	JL	ave
2,3,4,5	5-14-80	5-30-80	All steps complete per May 1980 maint. Sh. R2. All motors meggered Infinity.	JL	ave
2,3,4,5	6-14-80	6-20-80	All steps complete per June 1980 maint. Sh. R.2. All motors meggered Infinity.	JL	ave
2,3,4,5	7-14-80	7-15-80	All steps complete per July 1980 Maint. Sh. R3 - S10(3) Terminated. All other motors meggered inf.	JL	ave
2,3,4,5	8-14-80	8-20-80	All steps complete per Aug. 1980 R4 Maint. Sheet. E28(3A-5A) meggered. Ent - S10(3) is terminated. Ref. memo to M Galczynski ESU #80-1669 dated 8-11-80. - DN #0987 written on both S2(3A) and S2(3B) -	JL	ave
-	-	-	E28(3B-5B) cannot be rotated, EMU checking.	JL	ave
2,3,4,5	9-14-80	9-30-80	All steps complete per Sept. 1980 maint. sh. R4. E28(3A-5A) & E28(3B-5B) meggered inf. S10(3) is terminated.	JL	ave
2,3,4,5	10-14-80	10-20-80	All steps complete per Oct. 1980 Maint. Sh. R4 E28(3A-5A) & E28(3B-5B) meggered inf. S10(3) is terminated. See attached sheet for problems.	JL	ave
2,3,4,5	11-14-80	11-21-80	All steps complete per Nov. 1980 Maint. Sh. R4 E28(3A-5A) & E28(3B-5B) meggered inf. S10(3) is Terminated.	JL	ave
2,3,4,5	12-14-80	12-23-80	DN-14-0987 problems solved for S2(3A), S2(3B) - E28(3B-5B) - OK-rotated.	JL	ave
2,3,4,5	12-14-80	12-23-80	All steps complete per December 1980 HVAC maint sh. R4 - S10(3) Term. All other motors meggered infinity.	JL	ave
1,2,3,4,5	1-14-81	1-19-81	All steps complete per Jan. 1981 HVAC maint. sh. R.4. Terminated are - E4(3), E10(3), S10(3).	JL	ave
1,2,3,4,5	2-14-81	2-24-81	All steps complete per Feb. 1981 HVAC maint. sh. R4. Terminated are - E4(3), E10(3), S10(3).	JL	ave
1,2,3,4,5	3-14-81	3-26-81	All steps complete per March 1981 HVAC Maint. Sh. R4. E4(3), E10(3), S10(3) are Terminated.	JL	ave
1,2,3,4,5	4-14-81	4-17-81	All steps complete per April 1981 HVAC Maint. Sh. R.4. E4(3), E10(3), S10(3) Term. Megger #1. S.G. used. meggered inf.	JL	ave

MATERIAL MAINTENANCE RECORD - A

In-Place

P.O.# 403548 MATERIAL DESCRIPTION Radial Flow Fans
 CMI 164 LOCATION Per HVAC Maint. Sh. for MFR# --- TAG# 164
 CMI #157
 STORAGE LEVEL ----- DATE RECEIVED ----- DATE ISSUED -----

STEP #	REQUIRED MAINTENANCE	FREQUENCY
1.	Check the general condition and dust covers. Energize & maintain heaters on motors; use temporary heat source on motor w/o permanent heaters. Provide protection from damage and deterioration.	14th Monthly
2.	Megger motors per CP-425.	
3.	Drain moisture at condensation drain plug (low point)	6 months
4.	Rotate motor shafts 3/4 turns.	7/81, 10/81, 1/82, 4/82, 7/82, 1
5.	Add fresh Gulf Crown EP2 to controllable pitch mech. fan shaft bearings (purge small amount of old grease) (NOTE: Before greasing pitch rotor bearings, move adjusting lever toward fan rotor as much as possible (High blade angle) Assure drain plugs are in-place)	6 months REVIEWED & ACCEPTED QUALITY CONTROL OCT 18 1982 <i>[Signature]</i>

PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger; Pressure Gauges; Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	Q.C.
1, 2, 3, 4, 5	5-14-81	5-27-81	All steps complete per May 1981 HVAC Maint. Sh. R.4. Term. are E4(3), E10(3) S10(3) . Megger #1.3.6 used	JC	ave
1, 2, 3, 4, 5	6-14-81	6-24-81	All steps complete per June, 1981 HVAC maint sh. R.4. E4(3), E10(3), S10(3) are terminated. E28(3B-SB), E28(3A-SA) meggered inf. using megger # FFM T&E 98-05-506 FFM SN 1292	JC	ave
2, 3, 4, 5	7-14-81	7-27-81	All steps complete per July 1981 HVAC maint. sh. R.4. Terminated are - E4(3), E10(3), E28(3A-SA), S10(3), E53(3A), E53(3B), E54(3A), E54(3B), E55(3A), E55(3B). All other motors meggered 7500 mA using Epascos #1.3.6	JC	ave
2, 3, 4, 5	8-14-81	8-21-81	All steps complete per Aug. 1981 HVAC Maint sh. R.4. Terminated are E4(3), E10(3), E28(3A-SA), S10(3), E53(3A), E53(3B), E54(3A), E54(3B), E55(3A), E55(3B). All other motors meggered >500 mA using Epascos #1.3.6	JC	ave
1, 2, 3, 4, 5	9-14-81	9-21-81	All steps complete per HVAC maint sh. R.4 Sept. 1981. Terminated are: E4(3), E10(3), E28(3A-SA), S10(3), E53(3A), E53(3B).		

TAG # _____ DESCRIPTION _____ LOCATION _____

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger; Pressure Gauges; Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	Q.C.
1,2,3 4,5	9-14-81	9-21-81	E54(3A) E54(3B) E55(3A) E55(3B) All other motors meggered >1000 mΩ using Ebasco megger #1.3.6	JC	ave
1,2,3 4,5	10-14-81	10-19-81	All steps complete per Oct 1981 HVAC Maint. Sh. R.4. Terminated are: E4(3), E28(3B-SB), E28(3A-SA). The following have been released to LP&L: E6(3), E10(3), S10(3), E53(3A) E53(3B) E54(3A), E54(3B), E55(3A) E55(3B)	LB	ave
1,2,3 4,5	10-19-81 11-14-81			JC	ave
1,2,3 4,5	11-14-81	11-25-81	All steps complete per Nov. 1981 HVAC Maint. Sh. R.4. Terminated are: E28(3B-SB) E28(3A-SA) , E4(3) has been Released to LP&L	LB	ave
				JC	ave
1,2,3,4 5	12-14-81	12-23-81	All steps complete per Dec. 1981 HVAC Sh. R.4 Terminated are E29(3B-SB) E28(3A-SA)	JC	ave
2,3,4,5	1-14-82	2-9-82	All steps complete per JAN. 1982 HVAC Sh. R.4 terminated. Are E28(3B-SB), Eng. comp. released, E28(3A-SA) Eng. comp. released. S2(3A) 30 mΩ Elect. Eng waiting for response, S2(3B) Elect. Eng waiting for response.	LB	ave
2,3,4,5	2-14-82	2-26-82	All steps complete per Feb 1982 HVAC Sh. R.4 Following: S2(3A) 1000 mΩ, T2-250mΩ S2(3B) T2-500mΩ, T3-250mΩ	LB	ave
1	3-14-82	3-25-82	All steps complete per March 1982 HVAC Maint. Sh. Rev. 4	HR	ave
1,4	4-14-82	4-22-82	All steps complete per April 1982 HVAC MAINT. Sh. Rev. 4 S2(3A) S2(3B)	HR	LB-a
1,2	5-14-82	5-31-82	All steps complete per MAY 1982 HVAC MAINT. Sh. Rev. 4 Terminated: S2(3A), S2(3B)	HR	LB-a
1,2	6-14-82	6-30-82	All steps complete per June 1982 per HVAC MAINT. Sh. Rev. 4. Term: S2(3A), S2(3B)	HR	ave
1,2	7-14-82	7-31-82	All steps complete per July 1982 HVAC MAINT. Sh. Rev. 4. Released to LP&L: S2(3A), S2(3B)	HR	ave

MATERIAL MAINTENANCE RECORD - A

P.O.# 403548 MATERIAL DESCRIPTION AXIAL FLOW FANS
 CM# 164 LOCATION SEE HVAC MAINT. JN. Rev. 4 MFR# N/A TAG# 164
 STORAGE LEVEL B DATE RECEIVED N/A DATE ISSUED Released 11/18/82

STEP #	REQUIRED MAINTENANCE	FREQUENCY
1.	Monthly inspect general condition of the equipment.	
2.	Energize and maintain space heaters.	
3.	megger per CP-425.	
4.	Rotate motor shafts 3/4 turns.	
5.	Lubricate with Gulf Precision #2 grease as required.	
<p>NOTE: The 5-2 units were inadvertently removed from the maintenance program in July 1982. Maintenance on these units will be reinstated beginning in December 1982 with all maintenance steps outlined in this CM# being performed ¹¹⁻¹¹⁻⁸²</p>		

PERFORM THE REQUIRED MAINTENANCE ON ABOVE MATERIAL ON THE DATE INDICATED BELOW. RECORD COMMENTS AS APPLICABLE AND ENTER NOTATION EQUIPMENT MATERIAL MAINTENANCE RECORD. COMPLETE ALL ATTACHMENTS AS REQUIRED AND RETURN TO THE EQUIPMENT MAN.

STEP NO.	DATE DUE	DATE COMPLETED	COMMENTS (Megger; Pressure Gauges; Humidity Cards; etc.)	S/U GEN. CRAFT SUPERVISOR	Q.C.
1, 2, 3, 4, 5	12-19-82	12-21-82	All steps completed per HVAC MAINT JN. Rev. 4. Motors megged per CP-425 (meg. 1.5 G CAL Date 12-7-82). Due date 12-19-82. SA(3A) 200 mV A, D, C; SA(3B) 300 mV A, D, C.	AR	
1, 2, 3, 4, 5	1-19-83	1-14-83	Motors SA(3A), SA(3B) released per SUS 43A-9 accepted by LPFL ON 11/18/82	AR	

AN ADVISORY CONCERNING A TECHNICAL DEVELOPMENT RELATED TO THE APPLICATION OR OPERATION OF NUCLEAR PLANT EQUIPMENT SUPPLIED BY COMBUSTION ENGINEERING.

January 14, 1981

Limatorque Valve Operator

Key Stock

Introduction: The purpose of this Infobulletin is to ensure that plants using Limatorque SMB (or SB) 3, 4 & 5 motor operators are aware of the correct key stock to be used during valve maintenance. Use of incorrect key stock at one utility resulted in the failure of a safety-related valve to operate during surveillance testing.

Discussion: During surveillance testing of motor operated valves at a BWR a Limatorque SMB-4 operator failed to operate. Investigation by the utility revealed the key which positions the motor pinion gear on the motor shaft sheared as a result of incorrect keystock.

The material specified by Limatorque for the key is SAE #140 alloy steel hardened to 280/320 Brinell "B"; however, the key stock used by the utility during a previous repair was key stock of a lower hardness. Limatorque has confirmed that the motor pinion gear key on their SMB (or SB) - 3, 4 & 5 operators require the use of the harder key stock.

Recommendation: Utilities should ensure that repair procedures incorporate the proper key stock material recommended by Limatorque for SMB (or SB) 3, 4 & 5 motor operators.

Applicability: Limatorque SMB 3 & 4 operators are known to have been supplied to Palisades, Ft. Calhoun, Maine Yankee, Palo Verde 1, 2 & 3, WPPSS 3 & 5, Yellow Creek 1 & 2. Other utilities should review this information for possible applicability.

THE INFORMATION CONTAINED IN THIS ENGINEERING INFOBULLETIN IS PROVIDED BY CE UNDER THE TERMS OF THE NUCLEAR STEAM SUPPLY SYSTEM CONTRACT FOR THE APPLICABLE PLANT AS A SERVICE TO YOUR ORGANIZATION AS A RESULT AND SINCE OPERATION OF YOUR PLANT IS COMPLETELY WITHIN YOUR CONTROL AND RESPONSIBILITY, AND INVOLVES MANY FACTORS NOT WITHIN CE'S KNOWLEDGE, THIS INFORMATION MAY BE UTILIZED ONLY WITH THE UNDERSTANDING THAT CE MAKES NO WARRANTIES OR REPRESENTATIONS EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, WITH RESPECT TO THE ACCURACY, COMPLETENESS OR USEFULNESS OF THE INFORMATION CONTAINED IN THIS BULLETIN, AND THAT CE DISCLAIMS AND YOU ASSUME ALL LIABILITY, IN NEGLIGENCE OR OTHERWISE, AS A RESULT OF YOUR USE OF THIS INFORMATION.

AVAILABILITY DATA PROGRAM INFOBULLETIN



LOUISIANA
POWER & LIGHT / INTER-OFFICE CORRESPONDENCE

November 18, 1983

FILE COPY

W3P83-3838
Q-3-A20.03.13

TO: File

FROM: D. W. Herrin

SUBJECT: IE Circular 79-04
Loose Locking Nut on Limitorque Valve Operators

REFERENCES: 1. LW3-823-80 from R. K. Stampley to D. L. Aswell,
dated 8/13/80
2. W3M83-0924 from R. P. Barkhurst to F. J. Drummond,
dated 11/15/83

IE Circular 79-04 was issued by the NRC on March 16, 1979 and concerned loose locking nuts on Type SMB and SMC Limitorque valve operators. If this locking nut is not secure, it can loosen and allow the stem nut to move axially to the point that the splines are disengaged; resulting in a loss of drive to the valve stem.

IE Circular 79-04 recommended that all licensees survey all installed Limitorque Operator Types SMB-000 through SMB-5 and Type SMC to determine that the locking nut is secure and verify that assembly and maintenance instructions contain directions for securing the locking nut either by staking, per the vendor's recommendation, or another acceptable manner.

By Reference 1, Ebasco stated that all installed Limitorque Type SMB-000 through SMB-5 and SMC valve operator stem nuts at Waterford 3 have been verified to be staked.

LP&L Mechanical Maintenance procedure MM-6-002 "Valve Operator Repair" states, in part, "This procedure is intended to provide the overall instructions for the repair activity with the specific how-to instructions to be provided by the procedures referenced in Section 2.0 and the components technical documents, such as, vendor manuals, instructions, drawings and Bulletins". Additionally, the vendor manual for Limitorque type SMB and SMC valve operators (457000468) has been reviewed and verified to address the staking of locking nuts for each type of operator.

FOIA-84-206
K18

Page 2
W3P83-3838
File
November 18, 1983

Based on the above information, no further action is required and this memo is complete-to-file for IE Circular 79-04.

Dennis W. Herrin

D. W. Herrin

DWH/cb

cc: R. S. Leddick, R. P. Barkhurst, F. J. Drummond, K. W. Cook, T. F. Gerrets,
D. E. Dobson, Central Records, Nuclear Records, Licensing Library

LOG NO. 134-023

January 12, 1984

LW3-55-84

Files: 1-I-8

No Response Required

FILE COPY

Mr D E Dobson, Project Manager
Louisiana Power & Light Company
P O Box B
Killona, LA 70066

RE: WATERFORD SES UNIT NO. 3,
ADP INFOBULLETIN 83-12
LIMITORQUE OPERATORS TYPE SB AND SBD

Dear Mr Dobson:

The subject infobulletin identifies the failures of Limitorque Cast Iron Spring Compensation Housings. These housings are mounted on Type SB & SBD motor operators which are used where high speed actuation is required.

There are no SB or SBD operators being used on this project. No further action regarding this matter is therefore required.

Very truly yours,

J P EVERS
Manager of Mechanical Engineering

John Horvath

By: R C Rossi

RC

GG:lw *RR*

Attachment: ADP Infobulletin 83-12

cc: Central Records/W3 (2)
Nuclear Records GO (2)
MSS Nuclear Activities
R S Leddick

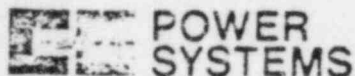
FOIA-84-206

K/9

C-E Power Systems
Combustion Engineering Inc
1000 Prospect Hill Road
Windsor, Connecticut 06095

Tel 203/688-1911
Telex 99297

Attachment to LW3-55-84



RECEIVED

DEC 12 1983

R. E. DIVINE

Louisiana Power and Light Company
Ebasco Services Incorporated, Agent
Two World Trade Center
80th Floor
New York, New York 10048

December 8, 1983

C-CE-8904

Attention: Mr. R. J. Milhiser

Subject: NY 403402 - CE Contract 9270
Louisiana Power and Light Company
Waterford Steam Electric Station - Unit No. 3
ADP Infobulletin Number 83-12

Attachment: (1) ADP Infobulletin 83-12, "Failure of Limitorque Cast Iron
Spring Compensator Housings", October 10, 1983

Gentlemen:

Attachment (1) describes failures of the cast iron spring compensator housings of certain Limitorque valve operators. The Infobulletin emphasizes potential personnel hazards associated with these failures, a matter not specifically addressed in the Infobulletin references which LP&L may already have reviewed.

TVA filed a 10CFR50.55(e) report on this subject as a result of failures noted at Watts Bar-1.

This bulletin is forwarded for information. Please confirm receipt of this bulletin, using the attached form.

Very truly yours,

J. W. Veirs
Project Manager

JWV:GDH:HBM/cmb
Attachment

cc: R. J. Milhiser (0+1)
R. Marshall (2w/encl)
J. M. Brooks
Nuclear Records (3w/encl)
F. J. Drummond
M. I. Meyer
T. F. Gerrets
N. S. Carns (encl)
D. E. Dobson
R. F. Burski (encl)

R. P. Barkhurst
Central Records (encl)
R. S. Leddick (encl)
T. Rucci
C. J. Decareaux
J. F. Fager (encl)
S. A. Telle (encl)
F. J. McQuiston
P. J. Hauser
E. S. Hornsby

AN ADVISORY CONCERNING A TECHNICAL DEVELOPMENT RELATED TO THE APPLICATION OR OPERATION OF NUCLEAR PLANT EQUIPMENT SUPPLIED BY COMBUSTION ENGINEERING.

October 10, 1983

FAILURE OF LIMITORQUE CAST IRON SPRING
COMPENSATOR HOUSINGS

References:

1. INPO Significant Event Report 45-83, "Limitorque Motor Operator Housing Failures", June 30, 1983.
2. "Valve Operator Damaged", Nuclear Power Experience, PWR-2, Vol. XVI, C, page 405, March, 1982.

Introduction: The cast iron spring compensator housings of some Limitorque valve operators have failed when the valves have been operated to the closed position. The housings reportedly could not support the spring tension.

Discussion: Reference 1 described the cracking and failure of the cast iron spring compensator housings of Limitorque SB-00 and SBD-00 operators at one unit. The reference stated that the failures prevented remote operation of the valves and could also have affected their manual operation. Potential causes were identified as possible valve overtightening, housing casting material deficiencies, structural design deficiencies or a combination of these. Limitorque, the valve supplier, and the affected utility are pursuing corrective action.

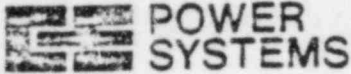
Reference 2 described the failure of a Limitorque SB-00 operator at another unit. A portion of the spring compensator housing of a power operated relief block valve was found lying on top of the pressurizer. The reference noted that an attempt to close the valve in its as-found condition would have ejected operator internals from the opening left by the failed spring compensator housing, and the valve would have remained in the open position.

In addition to the matters discussed in References 1 and 2, C-E believes that failure of these spring compensator housings could constitute a personnel hazard which utilities may wish to address. C-E is not aware of any other failures of cast iron spring compensator housings in Limitorque SB-series operators.

Recommendations: Utilities may wish to review Limitorque SB-00 and SBD-00 valve operators to determine whether cast iron or ductile iron spring compensator housings are installed. If cast iron housings are installed, the housings should be inspected for potential cracks. Utilities should also be aware of the potential personnel hazard if such cast iron housings were to fail during valve operation.

Applicability: C-E has supplied valves with SB-00 operators for St. Lucie-2. Limitorque SB-0,-1,-3 valve operators have been supplied for Palo Verde-1,-2 and -3.

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LOG NO. 184-1572
100

FILE COPY

March 26, 1984

C-CE-9071

Louisiana Power and Light Company
Ebasco Services Incorporated, Agent
Two World Trade Center
80th Floor
New York, New York 10048

Attention: Mr. R. J. Milhiser

Subject: NY 403402 - CE Contract 9270
Louisiana Power and Light Company
Waterford Steam Electric Station - Unit No. 3
ADP Infobulletin Number 84-03

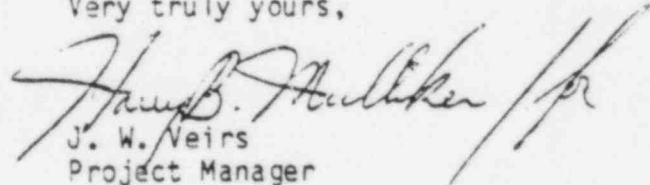
Attachment: (1) ADP infobulletin No. 84-03, "Terminal Block Connector
Errors, March 19, 1984"

Gentlemen:

Attachment (1) describes instrumentation errors that may be generated when terminal block connectors are exposed to accident conditions inside containment. The Infobulletin recommends that utilities consider an examination of errors and uncertainties associated with terminal blocks used in safety-related applications.

This bulletin is forwarded for information. Please confirm receipt of this bulletin, using the attached form.

Very truly yours,


J. W. Veirs
Project Manager

JWV:GDH:HBM/cmb
Attachment

cc: R. J. Milhiser (0+1)
R. Marshall (3w/att.)
J. M. Brooks
Nuclear Records (2w/att.)
F. J. Drummond (att.)
T. F. Gerrits
N. S. Carns (att.)
D. E. Dobson
R. F. Burski (att.)

R. P. Barkhurst (att.)
Central Records (att.)
R. S. Leddick
J. F. Fager (att.)
S. A. Toelle (att.)
F. J. McQuiston
P. J. Hauser
E. S. Hornsby

FOIA-84-206
K/10

AN ADVISORY CONCERNING A TECHNICAL DEVELOPMENT RELATED TO THE APPLICATION OR OPERATION OF NUCLEAR PLANT EQUIPMENT SUPPLIED BY COMBUSTION ENGINEERING.

March 19, 1984

TERMINAL BLOCK CONNECTOR ERRORS

Introduction: Combustion Engineering, Inc. has recently become aware of data indicating, for certain types of containment measurement channel terminations, that signal errors may be generated when the termination is exposed to a test environment designed to envelope accident conditions inside containment.

Discussion: C-E performs engineering analyses to determine setpoints for the Plant Protection System. These setpoints include allowances for measurement errors and uncertainties of the equipment within the measurement channel.

Certain portions of the equipment within these measurement channels are not provided by C-E. This equipment includes portions of the cabling and terminations which connect the process transducer to the signal processing electronics. These cables and connections are provided by the customer's architect engineer, agent or constructor.

For plants prior to Palo Verde, C-E assumed that signal errors associated with architect-engineer-furnished cables and terminations were negligible in comparison with the signal errors associated with the remainder of the equipment in the instrument loop. Based on data available at the time, a one-percent allowance was included in the Palo Verde setpoint analyses for this effect.

Results of a Sandia National Laboratories study of terminal block errors were summarized in the October 31, 1983 issue of Inside NRC. The Sandia study indicated that under accident conditions moisture films settled on the terminal blocks and changed their resistance, resulting in large errors on low-resistance instrumentation circuits. The error was noted to be inversely related to the circuit resistance, with higher circuit resistances having lower errors. While C-E cannot confirm the magnitude of the terminal block errors reported by Inside NRC, the existence of non-zero errors potentially conflicts with the values assumed in the setpoint calculations.

Recommendations: Utilities may wish to consider an examination of the errors and uncertainties during accident conditions associated with terminal block connectors used in various safety-related applications inside containment. Based on these errors and uncertainties, the acceptability of existing Plant Protection System setpoints and the Accident Monitoring Instrumentation should be reconfirmed.

Applicability: All C-E NSSS plants that utilize terminal block connectors in safety-related applications.

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ADP INFOBULLETIN FEEDBACK REPORT

Utilities are requested to confirm the receipt of the subject Infobulletin by completing this report and returning it to C-E.

ADP Infobulletin # 84-03 Dated 3/19/84 Plant Name _____
Subject Terminal Block Connector Errors
Returned by: _____ Date: _____
Title: _____

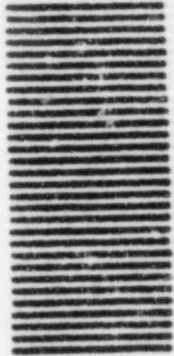
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ATT: RELIABILITY SYSTEMS 9485-2408

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44-10 184-1573
GO

FILE COPY

Louisiana Power and Light Company
142 Delaronde Street
New Orleans, Louisiana 70174

March 26, 1984

C-CE-9073

Attention: Mr. R. P. Barkhurst

Subject: Availability Data Program: Bulletins 84-01 and 84-02

Attachments: (1) ADP Infobulletin 84-01, "Safety Injection Isolation Valve Operability", March 6, 1984.
(2) ADP Infobulletin 84-02, "Loss of Charging Capacity Caused by Volume Control Tank Reference Leg Dryout", March 6, 1984.

Gentlemen:

ADP Infobulletin 84-01, attached, describes a problem with the operation of the high pressure safety injection isolation valves against differential pressure that was discovered during hot functional testing at a C-E NSSS unit. The specific hardware problems affecting the subject valves are limited to System 80 units, which does not include LP&L. However, the overall concern regarding the need to routinely verify the ability of these valves to function against the most severe differential pressure is applicable to all C-E NSSS units. C-E therefore, recommends in this bulletin that all utilities that own a C-E NSSS test the ability of these valves to open against differential pressure. This testing could be conveniently performed as part of the refueling evolution during the time period that the fueling pool is being filled.

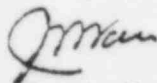
Infobulletin 84-02, attached, describes a problem involving the loss of charging capacity at two C-E NSSS units caused, by dryout of the common reference leg for the volume control tank (VCT) level instruments. In both cases, the VCT was drained sufficiently for the charging pumps to become vapor bound. In one case, the operating charging pump sustained a cracked block. The affected utilities routed separate instrument lines, including reference legs, for each instrument and initiated procedural changes to ensure the reference legs were "topped-off" on a regular basis. This infobulletin recommends that utilities determine if this problem affects their units and consider implementing similar corrective measure, if applicable.

FOIA-84-206
K/11

We would appreciate receiving acknowledgment of receipt of these ADP's. Self-addressed, postage-paid, forms are attached for your convenience.

If there are questions or other discussions, please let us know.

Very truly yours,



J. W. Veirs
Project Manager

JWV:WSC/cmb
Attachments

cc: R. J. Milhiser (2w/att.)
R. Marshall (3w/att.)
J. M. Brooks
Nuclear Records (2w/att.)
F. J. Drummond
T. F. Gerrets
N. S. Carns (att.)
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Central Records (att.)
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AN ADVISORY CONCERNING A TECHNICAL DEVELOPMENT RELATED TO THE APPLICATION OR OPERATION OF NUCLEAR PLANT EQUIPMENT SUPPLIED BY COMBUSTION ENGINEERING.

March 6, 1984

SAFETY INJECTION ISOLATION VALVE OPERABILITY

Introduction: The High Pressure Safety Injection (HPSI) system is designed to mitigate the effects of a loss of coolant accident. Malperformance of the system during accident conditions could potentially impact the ability of the HPSI system to perform its design function. This Infobulletin discusses a problem recently noted during hot functional testing at a C-E NSSS which had the potential to impact the performance of the HPSI system.

Discussion: HPSI header isolation valves are required to open, against full pump discharge pressure, to permit HPSI initiation in the event of a LOCA. When attempting to open the subject valves (2 inch Borg Warner) during an integrated HPSI system test performed as part of the precore hot functional testing, it was discovered that with the HPSI pumps operating the valves would only open a small portion of the full range of travel (wherein the torque trip was bypassed) but would subsequently trip on high torque without opening further. Although it was subsequently demonstrated that the motor had sufficient torque to open the valve if the torque limiting feature was bypassed, the valve yoke unscrewed from the body, permitting the valve operator to rotate until stopped by tension on the electrical power cable. Even if the electrical cable has sufficient strength to stop rotation of the valve operator, the loose yoke could cause binding of the valve or stem.

Upon investigation, it was determined that the torque requirements were greater than the valve operator spring pack was normally designed to produce. However, the valve operator assembly was designed for and did withstand all operations including application of motor stall torque, with the exception that the threaded body to bonnet connection loosened.

Corrective Actions:

The following steps were taken to correct these problems:

- The opening torque switch light was bypassed using a separate switch rotor in lieu of the open limit switch rotor.
- Although the valve vendor maintains that proper torquing of the retaining nut will prevent yoke rotation, the affected utility elected to tack weld the valve yoke to the body in two places as an added precaution.

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March 6, 1984

Recommendations: The problems described in this Infobulletin are specific to the subject valve application. However, C-E believes that other mechanisms such as mechanical interferences and/or inadvertent changes or drift in torque switch setpoints might occur which could interfere with proper operation of the valve over the life of the plant. For this reason, C-E recommends that utilities confirm that their surveillance testing verifies the ability of the safety injection valves to open against the most severe pressure differential. Such surveillance testing could be performed as part of the refueling evolution during the time period that the fueling pool is being filled.

Applicability: The testing recommendation is applicable to all C-E NSSS units.

ADP INFOBULLETIN FEEDBACK REPORT

Utilities are requested to confirm the receipt of the subject Infobulletin by completing this report and returning it to C-E.

ADP Infobulletin # 84-01 Dated 3/6/84 Plant Name _____
Subject Safety Injection Isolation Valve Operability
Returned by: _____ Date: _____
Title: _____

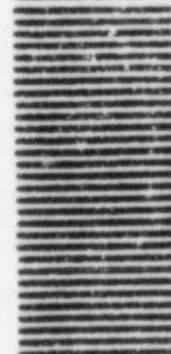
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AN ADVISORY CONCERNING A TECHNICAL DEVELOPMENT RELATED TO THE APPLICATION OR OPERATION OF NUCLEAR PLANT EQUIPMENT SUPPLIED BY COMBUSTION ENGINEERING. March 6, 1984

LOSS OF CHARGING CAPACITY CAUSED BY VOLUME CONTROL TANK REFERENCE LEG DRYOUT

Introduction: While in hot standby during recovery from a reactor trip, the three inservice positive displacement charging pumps at a C-E NSSS unit stopped circulating coolant to the reactor coolant system because the volume control tank (VCT) was pumped dry. The VCT was empty although its two liquid level sensors each indicated an acceptable liquid inventory and, hence, an apparently acceptable inflow/outflow balance from the VCT.

Discussion: During recovery from the reactor trip, and just before the loss of charging flow, the pressurizer level had been restored to above the heater cutoff level by operating all three charging pumps. The primary system had stabilized at normal temperature and pressure when plant personnel noticed that pressurizer level was no longer continuing to increase. A complete loss of charging flow was confirmed by checking the flowmeter in the common discharge header of the charging pumps. The charging pump casing vent valves were opened, and gas came out instead of liquid, indicating the charging system had lost its prime. The operators subsequently confirmed that the VCT was empty.

Both VCT liquid level sensors were erroneously indicating an acceptable level of liquid within the VCT. The false level indication was caused by an empty reference leg that was shared by both liquid level sensors. The reference leg was found to be leaktight and the cause of the empty reference leg is not known. During the loss of charging flow, there was no significant decrease in pressurizer level. The pumps were restored to operation by repeated venting after refilling the VCT.

The liquid level sensors at the affected unit were differential pressure transducers manufactured by Fisher & Porter Co. Both sensors shared common high and low level penetration taps in the VCT. These two instruments also shared the same instrument sensing lines with the common connecting point being in close proximity to the point of connection to the instruments. With a common reference leg, if some degree of liquid level in the reference leg is lost, there is no induced disagreement between sensors, and an undetectable offset exists between

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March 6, 1984

the indicated tank level and true tank level. In the event discussed in this bulletin, the offset was sufficient to indicate an acceptable VCT level when, in fact, the VCT was empty.

The NRC-AEOD staff studied this event and concluded that the consequences of this event were minor because the charging system was not safety-related at the affected unit. However, the AEOD concluded that it was conceivable that this event could be repeated at other C-E plants similar in design to the affected unit, but which had taken credit for charging pump injection in their LOCA analysis.

A similar event had previously occurred at another C-E NSSS unit. During subsequent operation, it was discovered that the inservice charging pump had sustained a cylinder crack attributed to "stagnation and subsequent shock loading". The cylinder block was replaced.

Corrective Action: Corrective actions implemented by the affected utilities included replacing the Fisher & Porter pressure transducers (which are no longer available) with Rosemount Model 1153 Series D transmitters. Separate instrument lines, including separate reference legs for each instrument, were routed as close as possible to the takeoff (root) valves. In addition, the maintenance procedures were modified to indicate that each instrument reference leg must now be filled prior to the monthly calibration. One of the utilities is also reportedly considering the installation of an accumulator for the reference legs.

Recommendations: Utilities with common reference legs for the VCT level instruments should monitor the VCT level instrument reference leg water level over several calibration periods to determine if this problem affects their unit. If presence of this problem is confirmed, affected utilities may wish to consider implementing corrective actions similar to those adopted at the affected unit in order to preclude this problem.

Applicability: All C-E NSSS units with common reference legs for the VCT level instrumentation.

ADP INFOBULLETIN FEEDBACK REPORT

Utilities are requested to confirm the receipt of the subject infobulletin by completing this report and returning it to C-E.

ADP Infobulletin # 84-02 Dated 3/6/84 Plant Name _____
Subject Loss of Charging Caused by VCT Reference Leg Dryout
Returned by: _____ Date: _____
Title: _____

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LOUISIANA
POWER & LIGHT / INTER-OFFICE CORRESPONDENCE

January 10, 1983

W3P83-0105
Q-3-R15.02
3-R16
3-A1.05.02

M E M O R A N D U M

TO: R. P. Barkhurst

FROM: F. J. Drummond

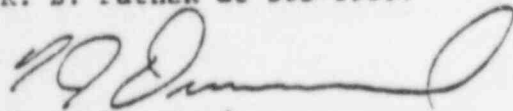
SUBJECT: Waterford SES Unit No. 3
Availability Data Program Info Bulletin
81-02 Supplement 1
Reactor Trip Switchgear Circuit Breaker
Testing and Preventive Maintenance

REFERENCE: IE Bulletin 79-09
G.E. AK-2 Circuit Breaker Failure

Attached is the subject ADP Info Bulletin 81-02 that points out the procedure for testing the under voltage and shunt trip circuits. Incorporation of this procedure will yield a higher confidence in the operation of the shunt and under voltage trip circuits.

As per the reference IE Bulletin, Combustion Engineering had determined that G.E. AK-2 circuit breakers are installed in the Reactor Trip Circuit Switchgear (2C75) at Waterford 3. Therefore, the attached information is being forwarded to you for your plant staff's information and for any corrective action that may be necessary.

If we can be of any assistance in this matter, please do not hesitate to call R. B. Pathak at 363-8906.



F. J. Drummond

FJD/RBP/bgu

Attachment

FOIA-84-206
K/12 --

AN ADVISORY CONCERNING A TECHNICAL DEVELOPMENT RELATED TO THE APPLICATION OR OPERATION OF NUCLEAR PLANT EQUIPMENT SUPPLIED BY COMBUSTION ENGINEERING.

November 5, 1981

REACTOR TRIP SWITCHGEAR CIRCUIT BREAKER
TESTING AND PREVENTIVE MAINTENANCE

Introduction: While conducting ground isolation checks on its 125V dc system, the utility discovered that one reactor trip switchgear (RTSG) circuit breaker undervoltage (UV) device failed to trip and two others operated sluggishly. The UV devices on the remaining RTSG breakers operated satisfactorily. Existing surveillance procedures would not have identified the malfunctioning UV devices.

Discussion: AEP Infobulletin 81-02 made recommendations to improve the reliability of RTSG circuit breakers having UV and shunt trip devices. The NRC subsequently issued Inspection and Enforcement Circular 81-12, "Inadequate Periodic Test Procedure of PWR Protection System", which recommended that normal surveillance testing include independent tests of the UV and shunt trip devices including "...position verification to ensure that the breaker actually trips". The test guidelines below permit independently testing the UV and shunt trip devices and include tripping the RTSG circuit breakers. If performed at refueling intervals as defined in the technical specifications, these tests will not cause significant additional cycling of the breakers. C-E is informing the NRC's Office of Inspection and Enforcement that these guidelines and the associated test interval have been transmitted to utilities having a C-E NSSS.

Recommendation: The following guidelines were prepared based on Unit Electric Control, Inc. Drawing No. 8170-2-81.1. Each utility should refer to its plant-specific as-built drawing for the Reactor Trip Switchgear when preparing its detailed test procedure.

Prerequisites

1. The plant should be in a condition allowing the RTSG circuit breakers to be racked out.

Procedure

1. Rack the circuit breaker out to the "test" position. (This will render the remote closure switches inoperable and will enter a test trip switch in the shunt trip circuit.)
2. Shut the breaker.
3. Depress the "Test-Trip" pushbutton and observe that the breaker opens. If the breaker fails to open, troubleshoot and repair the breaker in accordance with applicable station procedures and retest the breaker. (This tests the shunt trip device only.)
4. Shut the breaker.
5. Remove the trip circuit control power fuses and observe that the breaker opens. If the breaker fails to open, troubleshoot and repair the breaker in accordance with applicable station procedures and retest the breaker. (This tests the UV trip device only.)
6. Test all remaining RTSG circuit breakers in the same manner.
7. Return all RTSG circuit breakers to the appropriate non-test condition.

Applicability: All plants having a C-E designed NSSS.

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AVAILABILITY DATA PROGRAM INFOBULLETIN



LOUISIANA
POWER & LIGHT / INTER-OFFICE CORRESPONDENCE

January 10, 1983

W3P83-0105
Q-3-R15.02
3-R16
3-A1.05.02

M E M O R A N D U M

TO: R. P. Barkhurst

FROM: F. J. Drummond

SUBJECT: Waterford SES Unit No. 3
Availability Data Program Info Bulletin
81-02 Supplement 1
Reactor Trip Switchgear Circuit Breaker
Testing and Preventive Maintenance

REFERENCE: IE Bulletin 79-09
G.E. AK-2 Circuit Breaker Failure

Attached is the subject ADP Info Bulletin 81-02 that points out the procedure for testing the under voltage and shunt trip circuits. Incorporation of this procedure will yield a higher confidence in the operation of the shunt and under voltage trip circuits.

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F. J. Drummond

FJD/RBP/bgu

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FOIA-84-206
K/12

AN ADVISORY CONCERNING A TECHNICAL DEVELOPMENT RELATED TO THE APPLICATION OR OPERATION OF NUCLEAR PLANT EQUIPMENT SUPPLIED BY COMBUSTION ENGINEERING.

November 5, 1981

REACTOR TRIP SWITCHGEAR CIRCUIT BREAKER
TESTING AND PREVENTIVE MAINTENANCE

Introduction: While conducting ground isolation checks on its 125V dc system, the utility discovered that one reactor trip switchgear (RTSG) circuit breaker undervoltage (UV) device failed to trip and two others operated sluggishly. The UV devices on the remaining RTSG breakers operated satisfactorily. Existing surveillance procedures would not have identified the malfunctioning UV devices.

Discussion: ADP Infobulletin 81-02 made recommendations to improve the reliability of RTSG circuit breakers having UV and shunt trip devices. The NRC subsequently issued Inspection and Enforcement Circular 81-12, "Inadequate Periodic Test Procedure of PWR Protection System", which recommended that normal surveillance testing include independent tests of the UV and shunt trip devices including "...position verification to ensure that the breaker actually trips". The test guidelines below permit independently testing the UV and shunt trip devices and include tripping the RTSG circuit breakers. If performed at refueling intervals as defined in the technical specifications, these tests will not cause significant additional cycling of the breakers. C-E is informing the NRC's Office of Inspection and Enforcement that these guidelines and the associated test interval have been transmitted to utilities having a C-E NSSS.

Recommendation: The following guidelines were prepared based on Unit Electric Control, Inc. Drawing No. 8170-2-81.1. Each utility should refer to its plant-specific as-built drawing for the Reactor Trip Switchgear when preparing its detailed test procedure.

Prerequisites

1. The plant should be in a condition allowing the RTSG circuit breakers to be racked out.

Procedure

1. Rack the circuit breaker out to the "test" position. (This will render the remote closure switches inoperable and will enter a test trip switch in the shunt trip circuit.)
2. Shut the breaker.
3. Depress the "Test-Trip" pushbutton and observe that the breaker opens. If the breaker fails to open, troubleshoot and repair the breaker in accordance with applicable station procedures and retest the breaker. (This tests the shunt trip device only.)
4. Shut the breaker.
5. Remove the trip circuit control power fuses and observe that the breaker opens. If the breaker fails to open, troubleshoot and repair the breaker in accordance with applicable station procedures and retest the breaker. (This tests the UV trip device only.)
6. Test all remaining RTSG circuit breakers in the same manner.
7. Return all RTSG circuit breakers to the appropriate non-test condition.

Applicability: All plants having a C-E designed NSSS.

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March 14, 1984

LW3-394-84

File: 1-1-P

No response required

10010.184-1563
NC

Mr D E Dobson, Project Manager
Louisiana Power & Light Company
P O Box B
Killona, Louisiana 70066

FILE COPY

Attention: R Naylor

RE: WATERFORD SES UNIT NO. 3
CE ADP INFOBULLETIN 82-11
TARGET ROCK SOLENOID VALVE FAILURE

Ref: C-CE-8093 dated November 15, 1982

Dear Mr Dobson:

Attached for your information and records is a copy of the referenced CE letter which submitted the subject bulletin. This bulletin describes failures of Target Rock Model 77L-001 and 77L-003 line service solenoid valves during environmental qualification testing in accordance with the requirements of NUREG-0588.

CE advises that they have not furnished this model valves to Waterford 3. We also wish to confirm that the Target Rock valves furnished on Ebasco Purchase Order NY-403674 are of a different model than those described in CE's bulletin, for which qualification documentation has already been included in our response to NUREG-0588. Therefore, CE ADP Infobulletin 82-11 does not apply to Waterford 3.

If you have any questions please let us know.

Very truly yours,

J P Evers
Manager of Mechanical Engineering

John Howarth
By: R C Rossi
for

IVS:pp
Attachment

cc: Central Records W3 (2)
Nuclear Records GO (2)
MSS Nuclear Activities
R S Leddick

FOIA-84-206
K/14



Louisiana Power and Light Company
Ebasco Services Incorporated, Agent
Two World Trade Center
80th Floor
New York, New York 10048

November 15, 1982

C-CE-8093

Attention: Mr. R. K. Stampley

Subject: N/ 403402 - CE Contract 9270
Louisiana Power and Light Company
Waterford Steam Electric Station - Unit No. 3
ADP Infobulletin 82-11, Target Rock Solenoid Valve Failure
During Testing

Gentlemen:

C-E Infobulletin 82-11, attached, discusses failures observed in Target Rock solenoid actuated valves during qualification testing. C-E reported these anomalies to the NRC under 10CFR21. C-E provided no valves of this type to Waterford-3.

Very truly yours,

A handwritten signature in cursive script, appearing to read "J. W. Veirs".

J. W. Veirs
Project Manager

JWV:VAP/cmb
Enclosure

cc: R. K. Stampley (0+1)	P. V. Prasankumar
R. L. Hymes (encl)	Central Records (encl)
R. J. Milhiser (3w/encl)	L. V. Maurin (encl)
J. M. Brooks	G. B. Rogers
Power Prod. Dept. (3w/encl)	C. J. Decareaux
F. J. Drummond	J. F. Fager
M. I. Meyer	S. A. Toelle (encl)
T. F. Gerrets	L. B. Shackford
D. B. Lester	P. J. Hauser
T. K. Armington	W. K. Combs

AVAILABILITY DATA PROGRAM INFOBULLETIN

AN ADVISORY CONCERNING A TECHNICAL DEVELOPMENT RELATED TO THE APPLICATION OR OPERATION OF NUCLEAR PLANT EQUIPMENT SUPPLIED BY COMBUSTION ENGINEERING. November 9, 1982

TARGET ROCK SOLENOID VALVE
FAILURE DURING QUALIFICATION TESTING

Introduction: This bulletin is to advise utilities of anomalies observed during qualification testing of Target Rock solenoid actuated valves performed by Combustion Engineering. C-E has reported this information to the NRC under 10CFR21.

Discussion: C-E was requested by a utility customer to perform qualification testing of certain Target Rock solenoid valves to upgrade them to the requirements of NUREG-0588. For the qualification program two Target Rock model 77L-001 one-inch valves and two Target Rock model 77L-003 two-inch valves were received by C-E, and one of each model valve was subsequently tested. The major components of the program involved irradiation exposure to an accumulated 60 megarads, thermal aging at 250°F for 635 hours, mechanical cycling, vibrational aging to represent normal service, seismic testing, and finally testing in a simulated LOCA environment. Similar valves had been previously qualified by Target Rock for irradiation, aging and seismic vibration under IEEE-323-1974 (IEEE Trial-use Standard, General Guide for Qualifying Class 1 Electrical Equipment) and IEEE-344-1975 (IEEE Guide for Seismic Qualification of Class 1 Electrical Equipment).

During the NUREG-0588 qualification testing at C-E, a number of anomalies were identified in these valves. The testing was finally discontinued when both test valves failed to function for different reasons during the seismic tests. The anomalies and failures noted during testing included incorrect valve assembly as received, missing parts as received, failure of valve position indicator limit switches during testing, failure of a valve to open on demand as a result of solenoid lead shorting from vibration induced wear, and failure of a valve to fully close when de-energized due to a seat malfunction.

In appraising the safety significance of the observed problems, C-E has considered the vibratory damage of the solenoid as a common mode of failure which, in a seismic event, could potentially disable several redundant valves at one time. Although the model 77L-001 valve failed due to a displaced seat in the seismic test, evidence of solenoid lead wire damage was noted, ostensibly for the same reasons as those that led to the electrical shorting of the model 77L-003 valve solenoid. C-E believes that assurance of operability of some of these valves is very important in the System 80 design since they play a vital role in achieving cold shutdown during events involving extended loss of off-site power.

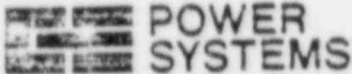
Recommendation: C-E recommends that utilities consider a review of safety related systems which incorporate Target Rock solenoid valves and that, if necessary, such valves be inspected on a schedule consistent with plant operations to verify their consistency with the manufacturers drawings. Utilities should also consider increasing the frequency of surveillance testing of Target Rock solenoid valves installed in safety systems until appropriate corrective actions are evaluated. C-E, in consultation with Target Rock, is evaluating potential modifications to models 77L-001 and 77L-003 valves.

Applicability: Target Rock model 77L-001 and 77L-003 solenoid valves have been supplied by C-E for use in the safety injection tank vent system and the pressurizer auxiliary spray system at Palo Verde Units 1, 2 and 3. Other model Target Rock solenoid valves have been supplied by C-E for use in a number of safety and non-safety applications in various plants

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C-E Power Systems
Combustion Engineering, Inc.
1000 Prospect Hill Road
Windsor, Connecticut 06095

Te 203/688-1911
Telex 89297



LOG NO. 184-1970
RTO

Louisiana Power and Light Company
Ebasco Services Incorporated, Agent
Two World Trade Center
80th Floor
New York, New York 10048

FILE COPY

March 26, 1984

C-CE-9072

Attention: Mr. R. J. Milhiser

Subject: NY 403402 - CE Contract 9270
Louisiana Power and Light Company
Waterford Steam Electric Station - Unit No. 3
ADP Infobulletin Number 84-04

Attachment: (1) ADP Infobulletin No. 84-04, "Pressurizer Spray Nozzle and Spray Piping Thermal Fatigue, March 20, 1984"

Reference: (a) C-CE-7785, July 7, 1982

Gentlemen:

Attachment (1) re-emphasizes the potential for thermal fatigue of the pressurizer spray nozzle and pressurizer spray piping. The information therein supplements Infobulletin 82-06, transmitted by reference (a).

This bulletin is forwarded for information. Please confirm receipt of this bulletin, using the attached form.

Very truly yours,

J. W. Veirs
J. W. Veirs
Project Manager

JWV:GDH:HBM/cmb
Attachment

cc: R. J. Milhiser (0+1)
R. Marshall (3w/att.)
J. M. Brooks
Nuclear Records (2w/att.)
F. J. Drummond (att.)
T. F. Gerrets
N. S. Carns (att.)
D. E. Dobson
R. F. Burski (att.)

R. P. Barkhurst (att.)
Central Records (att.)
R. S. Leddick
J. F. Fager (att.)
S. A. Toelle (att.)
F. J. McQuiston
P. J. Hauser
E. S. Hornsby

FOIA-84-206
K/15

AN ADVISORY CONCERNING A TECHNICAL DEVELOPMENT RELATED TO THE APPLICATION OR OPERATION OF NUCLEAR PLANT EQUIPMENT SUPPLIED BY COMBUSTION ENGINEERING.

March 20, 1984

PRESSURIZER SPRAY NOZZLE AND SPRAY PIPING

THERMAL FATIGUE

Reference: Infobulletin 82-06, "Potential Thermal Fatigue of Pressurizer Spray Nozzles and Auxiliary Spray Piping", June 18, 1982.

Introduction: The purpose of this Infobulletin is to remind utilities of the potential for thermal fatigue of the pressurizer spray nozzle and pressurizer spray piping and to update them on appropriate steps to be taken to minimize thermal fatigue. The information herein supplements Infobulletin J2-06.

Discussion: When the pressurizer main spray system was designed, it was intended that, when the main spray valves were closed, the main spray bypass valves would pass sufficient flow to completely fill the spray line and minimize the temperature difference between the spray line fluid and the pressurizer spray nozzle. However, this requires the line to be well insulated and sufficient bypass flow. Test data has indicated that sufficient bypass flow to keep the spray piping full may not be available when less than four reactor coolant pumps (RCPs) are operating, resulting in a stratified or no flow condition.

When stratified flow occurs, steam partially fills the pipe in the uppermost section of nonvertical runs while relatively cool liquid flows along the bottom, thereby causing a diametral temperature gradient in the piping. During the no flow condition, water in the spray nozzle area and in a portion of the the spray piping drains, allowing this region to fill with steam. If this latter condition is maintained, the standing water column in the spray piping will become cooled by heat losses to containment. When spray (either main or auxiliary) is subsequently reinitiated under either the stratified or no flow condition, the relatively cold water will contact the hot surfaces of the piping and nozzle. The resulting thermal transients experienced by the piping and nozzle may be more severe than the transients for which these components were designed.

C-E is currently performing an evaluation of pressurizer spray system thermal fatigue. It will include an analysis to determine the potential severity of thermal fatigue usage on both the pressurizer spray nozzle and piping. This evaluation is expected to be completed during the second quarter of 1984.

Recommendations: Utilities should confirm that plant procedures minimize cyclic use of the pressurizer spray system with less than four RCPs operating. During plant cooldown, this can be accomplished by throttling spray flow to maintain a full flow condition and a constant depressurization rate rather than reducing pressure in steps. This will help ensure that the spray line is

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March 20, 1984

always full of water and the thermal transients are within the assumed ranges. Verification of continuous full pipe bypass flow should also be considered. In addition, consideration should be given to establishing a program to record the spray fluid to pressurizer delta-T and the associated number of spray cycles whenever spray is actuated and less than four RCPs are operating or when the spray fluid to pressurizer delta-T exceeds 200°F. In determining the spray fluid to pressurizer delta-T, a correction factor may be required to account for sprayline RTD location because the RTD temperature reading may not always reflect the lowest fluid temperature in the spray system piping. The previously defined delta-T of 120°F reflected an assumed generic correction factor of 80°F. A spray cycle is defined as any initiation and termination of main or auxiliary spray flow through the pressurizer spray nozzle.

Establishment of a nondestructive examination program for the pressurizer spray nozzle, spray piping and the auxiliary sprayline "Tee" connection should also be considered as a means of providing added assurance of system integrity. Utilities may wish to consider performing such an examination during the next outage of sufficient length and possibly on a regularly scheduled basis thereafter, depending upon the results of the initial examination, the results of C-E's study, and the cyclic usage of the spray system.

Applicability: This Infobulletin is applicable to all operating plants with a C-E NSSS design.

ADP INFOBULLETIN FEEDBACK REPORT

Utilities are requested to confirm the receipt of the subject Infobulletin by completing this report and returning it to C-E.

ADP Infobulletin # 84-04 Dated 3/21/84 Plant Name _____

Subject Pressurizer Spray Nozzle and Spray Piping Thermal Fatigue

Returned by: _____ Date: _____

Title: _____

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K/16



CENTRIFUGAL FANS Ventilating / Industrial

SERVICE MANUAL

SECTION I

This manual has been prepared to help you keep your "Buffalo" fans and blowers operating efficiently with minimum expense for repairs or replacement.

An assembly drawing, containing all pertinent data and dimensions, is prepared for the specific equipment furnished on your order.

You will also find it helpful to have a "Buffalo" catalog pertaining to the particular types of fans which you are using. These may be obtained through your nearest "Buffalo" representative or by writing direct to Buffalo.

The contents of this manual cover our standard line of centrifugal fans only. For instructions and recommendations on engineered equipment for special requirements, contact your local Buffalo representative or the main plant in Buffalo.

In certain cases, especially where large fans are involved, it is advisable to have an experienced erector supervise installation of the equipment. Buffalo service men are available by arrangement through any Buffalo ~~Field~~ ^{EBASales office} office.

RECEIVED

JAN 1 - 1979

BUFFALO FORGE CO. / Buffalo, N. Y.

INFORMATION ONLY

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DOCUMENT CONTROL DEPT.
WATERFORD 3 FIELD

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SHIPPING and RECEIVING

BUFFALO STANDARD TERMS OF SALE

F.O.B. factory Buffalo, N. Y. with freight allowed or not allowed as stated in the proposal. It is, therefore, to the interest of the buyer to carefully inspect all shipments before they are accepted from the carrier. Upon delivery, be sure that all items listed on the bill have been received. (Partial shipments are often made.)

Even though all equipment is carefully inspected and prepared for shipment at the factory, rough handling enroute may cause damage to fan and drive parts.

Any shortage, breakage or damage noticed at time of delivery should be indicated on the carrier's freight bill and signed by the driver or carrier's representative. Damage, noticed after delivery, should be reported to the carrier at once. Request their inspection of the shipment and fill out a concealed damage inspection report.

HANDLING INFORMATION ONLY

UNITS SHIPPED COMPLETELY ASSEMBLED

Where slings are used, they should be placed under the motor or bearing base.

Holes are usually punched in the tops of fan housing side sheet bracing to facilitate lifting with a hook and chain.

On arrangement 3 fans with bearings on the housing, slings may be placed under end of bearing — NOT UNDER THE SHAFT. Protect the oil cups, oil sight gauges or grease fittings.

UNITS SHIPPED KNOCKED-DOWN

Parts of fans shipped knocked down also require special care. In handling the shaft or wheel and shaft assembly with a hoist or crane, rope slings should be placed around the shaft near the wheel position. NEVER place slings on the ground shaft surfaces where bearings or wheel are to be mounted.

Oil bearing surfaces of the shaft and cover with heavy paper, burlap or canvas. Chain or wire slings should be well padded where they contact wheel and shaft. Small marks on bearing surfaces and thrust collars should be removed with fine emery cloth or a stone and carefully cleaned.

Where a single hoist is used, a "spreader" will keep the sling from binding against the sides of the wheel.

When fan wheel is received separate from shaft, timber can be placed through the hub for lifting (care must be taken not to damage finished bore of the wheel). A rope sling may also be used. It is passed through the blades and around the hub.

Special coverings and coatings such as rubber,

phenolic enamels, etc. require extreme care as they are easily damaged. Even a small chip will break the continuity of the coating and destroy its protective value . . . touch up prior to erection.

Fan wheels are factory-balanced to provide smooth vibration-free operation. To prevent unbalance or damage, follow these basic rules:

1. Never lift wheel by blades or flanges.
2. Never roll wheels.
3. Never rest entire wheel weight on the housing side plates. Block up shaft to prevent this.
4. Never set wheel down so that wheel supports the shaft; use wood supports under shaft to support wheel by the shaft. Bent shafts cause unbalance.
5. Never lift double width, double inlet housing by putting timber or sling through inlets. To lift, use skid under housing or sling around housing or through holes provided in side sheet bracing.

STORAGE

Store in a dry, protected area being sure fan shaft, bearings and wheel are protected against dust and corrosion.

If necessary to store outdoors or within a building under construction, special care must be taken to prevent moisture, corrosion, dirt or dust accumulation. Coat the shaft with grease or rust preventive compound. Cover and seal bearings to prevent entrance of contaminants. If stored outdoors for

STORAGE (Continued)

any length of time, cover completely with a tarp or heavy waterproof paper. Block wheels to prevent rotation. Do not allow material of any kind to be piled on top of a fan housing or bearing base and never allow walking on housing or shaft.

Where large disassembled units are stored outdoors, block the shaft on supports sufficiently above ground level to avoid snow cover or submergence under surface water.

Bearing Protection:

Each fan equipped with **Fafnir RAK, RSAO, Link Belt P2-300, B-22400 & SKF SYR** pillow blocks has been test run at the factory. These bearings are prelubricated and should not require any additional grease for startup. However, if unit is not to be put into service immediately, it is advisable to add lubricant so as to expel any air voids in the bearing reservoir which may ultimately collect condensation or moisture. The excess lubricant which is then expelled at startup through the seals should not be replaced. This purging action will permit cooler operation and the remaining grease will be adequate to properly lubricate the bearing. During the inactive period, the bearings should be protected from the elements by a plastic film securely attached.

Units equipped with **Fafnir SAOL** bearings are also generally test run at the factory. These bearings are lubricated with the recommended amount of grease and are ready for operation. If the fan unit is not to be put into immediate service, the bearing end cap should be removed and, using a clean instrument (fingers will do), the interior surfaces of the casting and the exterior surfaces of the bearing should be coated with grease. It is not recommended that the housing cavities be completely packed. During the inactive period, the bearings should be protected from the elements by a plastic film securely attached.

Link Belt 6800 series bearings may be factory or field mounted depending upon fan design and size. If factory mounted, they may or may not have been test run, again depending upon unit size. When factory mounted, the bearings have been lubricated with the correct amount of grease to permit immediate operation upon erection.

When field mounted, it should be noted that the bearing was shipped with a preservative only and the bearing must be lubricated before operating. If the fan is not to be put into immediate service upon installation, the pillow block and bearing should be hand packed full of grease being sure that no moisture or dirt particles are entrapped during this procedure. The bearing should then be tagged that

it contains too much lubricant for normal operation and covered with a plastic film. When readying the equipment for operation, the bearing cap is to be removed and all lubricant swabbed out with a clean instrument and clean rags. After inspection of the bearings, fresh lubricant should be applied in the specified quantity. Complete greasing is assured if the grease is worked in one side of the bearing until grease appears on the opposite side. Pack the housing reservoir with grease to a height approximately even with the bottom of the shaft.

SKF SAF 22500 series bearings may be factory or field mounted depending upon fan design and size. If factory mounted they may or may not have been test run, again depending upon unit size. When factory mounted, the bearings have been lubricated with the correct amount of grease to permit immediate operation upon erection. When field mounted, it should be noted that the bearing was shipped with a preservative only and the bearing must be lubricated before operating. If the fan is not to be put into immediate service upon installation and the bearing has been factory mounted, the bearing cap is to be removed and the grease removed from the housing and bearing by cleaning out by hand as far as possible and then washing down the bearing and housing with a spray of white kerosene. After the bearing and housing have been washed down with white kerosene to remove as much of the grease as possible in the bearing, the bearing and housing should be blown out with air and dried with clean rags and the bearing and housing sprayed with Houghton Rust Veto 342 or equal. After replacing the pillow block cap, the entire assembly should be carefully wrapped with a plastic film. A tag must then be attached stating that lubricant of the proper amount must be added by the prescribed procedure before start-up. See paragraph above for LB6800 bearings for lubricant amount.

For field mounted bearings, the bearing has not been run, and therefore there is no grease in the pillow block. In this case, the bearing and the inside of the housing should be sprayed with Houghton Rust Veto 342 or equal and when the pillow block cap is replaced, the pillow block housing should be wrapped in plastic and tagged as above. The slushing compound should be left on the bearing. Before startup, the proper amount of grease must be applied as stated above.

Precaution:

Extreme care must be taken at all times to insure against the entrapment of foreign particles when working with bearings. Bearings with side or top caps removed should not be left unprotected or unattended at any time.

FOUNDATIONS

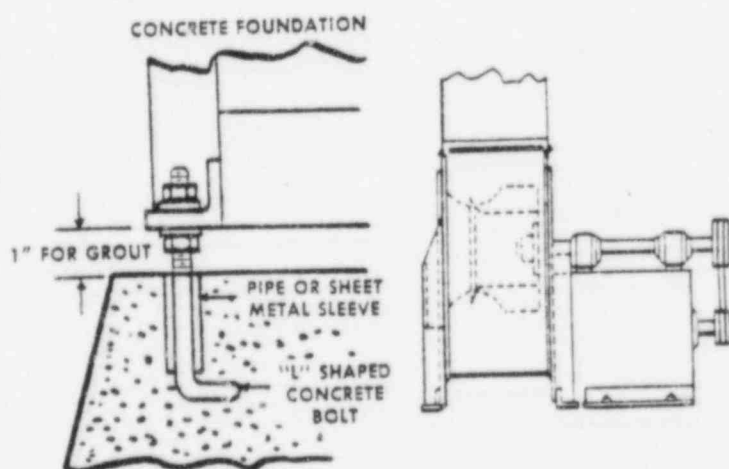
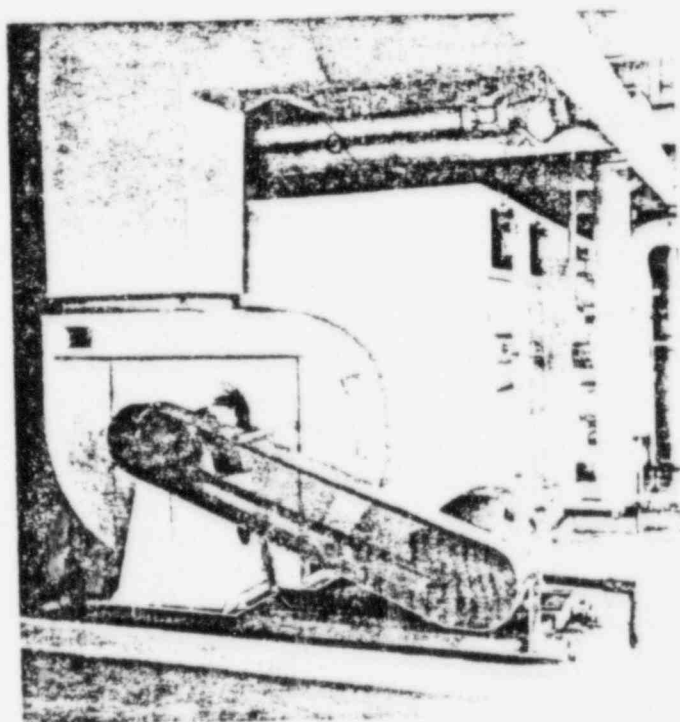
A rigid, level foundation is a must for every fan. It assures permanent alignment of fan and driving equipment and freedom from excessive vibration, minimizing maintenance costs. The sub-foundation (soil, stone, rock, etc.) should be firm enough to prevent uneven settlement of the structure. Foundation bolt locations are found on the assembly drawing.

POURED CONCRETE FOUNDATIONS RECOMMENDED

Poured concrete under the fan and all drive components is the best fan foundation. A generally accepted rule of thumb is that the weight of concrete foundation be at least three (3) times the total weight of the equipment it will support. This weight acts as an inertia block to stabilize the foundation. Where the ground is soft, the foundation should be flared or the footing course increased in size to resist settling. The top should extend at least 6 inches outside the outline of the fan base and should be beveled on the edges to prevent chipping.

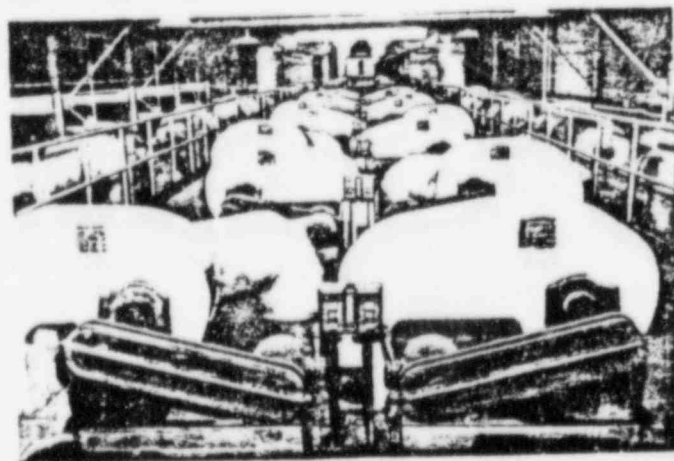
Anchor bolts in concrete should be L or T-shaped. They should be placed in pipe or sheet metal sleeves approximately 2" larger in diameter than the anchor bolts to allow for adjustment in bolt location after the concrete has set. In estimating the length of bolts, allow for the thickness of nut and washers, thickness of fan base, extra threads for draw down and approximately 1" for grout.

INFORMATION ONLY



EQUIPMENT MOUNTED FANS

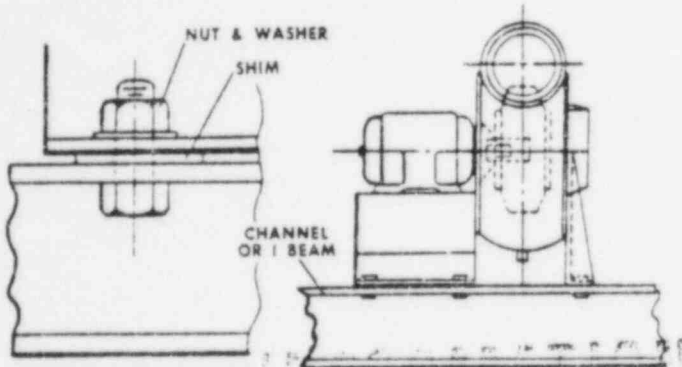
If the fan is mounted on equipment having parts which cause vibration, it is very important that the fan support is rigid enough to prevent such vibration being carried to the fan. The resonant frequency of the support should avoid the fan running speed by at least 20%. It may be advisable to use vibration isolators under the fan.



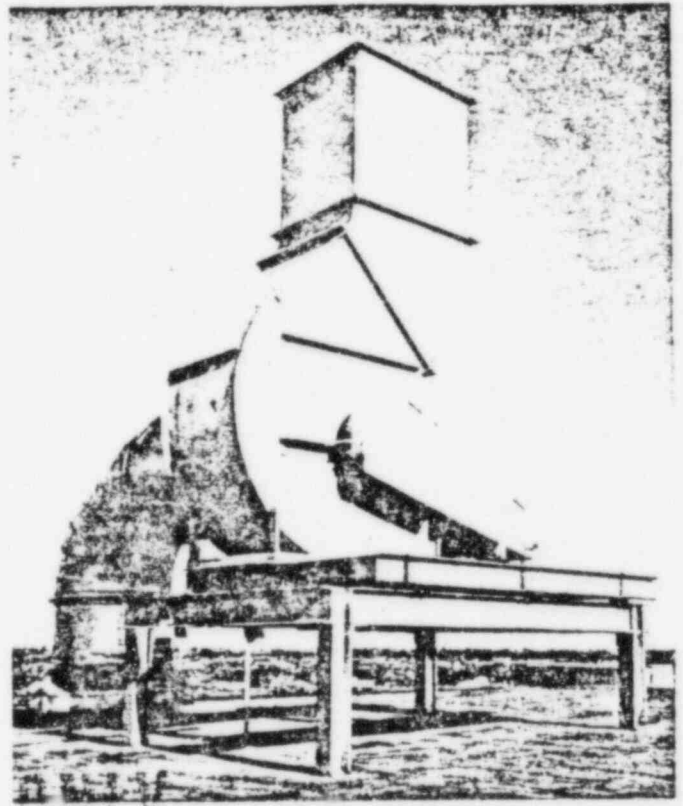
STRUCTURAL STEEL FOUNDATION

When a structural steel foundation is necessary, it should be sufficiently rigid to assure permanent alignment. It must be designed to carry, with minimum deflection, the weight of the equipment plus the loads imposed by centrifugal forces set up by the rotating elements. We recommend welded, riveted, or suitably locked structural bolted construction to best resist vibration.

Fans installed above ground level should be located near to or above a rigid wall or heavy column. An overhead platform or support must be rigidly constructed, level and sturdily braced in all directions.



ASSEMBLY AND INSTALLATION



Fans and blowers are shipped:

1. Completely assembled
2. Partially knocked-down
3. Completely knocked-down.

Knocked-down fans are disassembled and the parts match-marked for easy field assembly. When installing units allow ample space for removal of wheel, lubrication of bearings, adjustment of motor base and inspection or servicing of complete unit.

UNITS SHIPPED COMPLETELY ASSEMBLED.

Arr. 1, 2, 3, 4, 7, 8, 9, 10.

1. Remove skids and any protective coverings over bearings or housing.
2. Move fan to its rigid foundation. If vibration isolator pads or a vibration base is required, place the pads or base over the anchor bolts in the foundation. Line up foundation holes in fan base angles with anchor bolts and lower fan (be careful not to strip threads). Level unit with spirit level by shimming where necessary. Tighten nuts on all anchor bolts.
3. The fan is now ready to be connected into the system. See the OPERATION SECTION.

UNITS SHIPPED PARTIALLY KNOCKED-DOWN — Arr. 1, 2, 3, 7, 8, 9, 10.

Fans and blowers shipped partially knocked-down may have parts shipped as follows:

1. Fan section with housing, wheel, bearings and shaft assembled.
2. If split housing fan — top half removed.

3. Motor, coupling or V-belt drive separate.
4. Outlet damper, butterfly valve, screens, etc. separate.

To assemble:

1. Remove skids and any protective coverings over bearings or housing.
2. Move fan to its rigid foundation. If vibration isolator pads or a vibration base is required, place the pads or base over the anchor bolts in the foundation. Line up foundation holes in fan base angles with anchor bolts and lower fan, being careful not to strip threads. Level housing with spirit level by shimming where necessary. Tighten nuts on all anchor bolts.
3. If motor is not mounted, place motor in position on its base, align, shim where necessary and bolt down. See MOTOR SECTION.
4. If coupling has to be mounted, assemble half couplings on their shafts and align according to the COUPLING SECTION.
5. If fan is V-belt driven and drive is not mounted, assemble sheaves on their shafts and line up V-belts with proper tension. See V-BELT DRIVE SECTION.
6. If housing is split with top half removed, lower top half housing into position over bottom half housing being careful not to damage wheel or scratch shaft. Then bolt two halves together.
7. If outlet damper, butterfly valve, coupling guard or inlet screen is required, bolt these in position on the fan.
8. The fan is now ready to be connected into the system. See the OPERATION SECTION. If a belt guard is required, it can be mounted after system has been balanced.

ASSEMBLY AND INSTALLATION (Cont.)

PARTIALLY KNOCKED-DOWN FANS — Arrangement 4

Partially knocked-down fans for direct drive with the wheel overhung on the motor shaft are shipped with:

1. Motor separate
2. Wheel shipped separate or inside the fan housing

To assemble:

1. Refer to assembly drawing or parts list of fan which shows arrangement of parts.
2. Remove skids and any protective coverings on housing.
3. Move fan to its rigid foundation. If vibration isolator pads or a vibration base is required, place the pads or base over the anchor bolts in the foundation.

4A. With types BL, BL-Aerofoil, cast iron LL, MW, AW, OW, Volume, R and CB fans:

- a. Line up foundation holes in fan base angles with anchor bolts and lower fan, being careful not to strip threads. Hand tighten nuts on anchor bolts.
- b. Remove inlet bell, inlet stand and/or inlet side plate by removing bolts holding them to the housing.
- c. Remove wheel from housing or from its crate if shipped separately. Continue with Step 5.

4B. With types E and RE Fans:

- a. Line up foundation holes in motor base angles with anchor bolts and lower fan, being careful not to strip threads. Hand tighten nuts on the anchor bolts.
- b. Remove inlet side of housing (including inlet bell) by removing bolts holding it to drive side of housing.
- c. Remove wheel from housing or from its crate if shipped separately. Continue with Step 5.

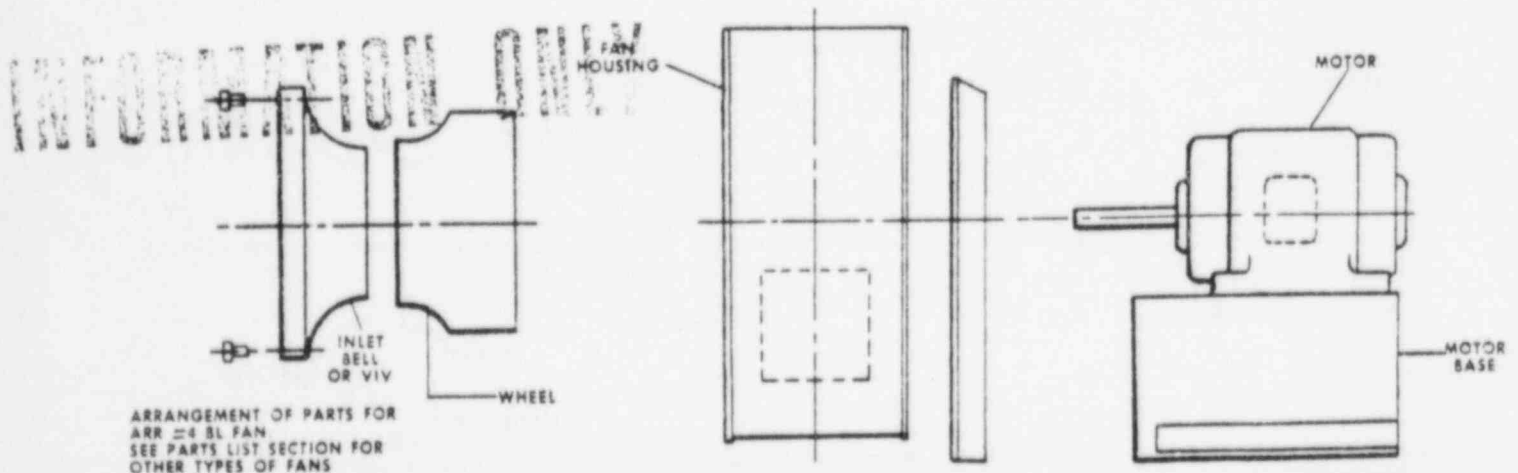
4C. With Baby Vent Sets:

- a. Place housing with inlet collar on floor.
- b. Remove motor base and drive side stand, if not already separate when received.
- c. Place wheel into housing through drive side opening, keeping wheel hub toward you.

d. Replace motor base and drive side stand and bolt to fan housing.

e. Stand fan up, being careful not to damage loose wheel. Line up foundation holes in motor base angles with anchor bolts and lower fan being careful not to strip threads. Level unit with spirit level by shimming where necessary. Tighten nuts on all anchor bolts.

5. Now mount motor on its base so that the motor shaft is centered in the fan housing shaft hole and extends far enough into the housing to mount the wheel. Hand tighten motor base bolts.
6. Clean the bore of the wheel hub with suitable solvent. Lubricate the bore with white lead and oil for easy entrance of the motor shaft.
7. Set screws in wheel hub should be turned out to prevent scratching of the motor shaft.
8. Clean off any protective coating on the motor shaft.
9. Slide wheel on motor shaft. Insert key into hub and shaft making sure key extends beyond setscrew hole in the hub. If key is tight in the keyway, file it to fit. Tighten setscrew over keyway only. The second setscrew leading rotation will be tightened after final alignment.
10. Replace inlet bell, inlet stand, inlet sideplate or inlet side of fan housing. Use a sealer between the two mating surfaces on high pressure Type R, CB, E and RE fans.
11. Level fan housing on foundation with spirit level by shimming where necessary. Tighten nuts on all anchor bolts.
12. Adjust wheel on motor shaft to give proper fit between wheel and fan housing. Re-shim the motor if wheel is high or low in fan housing. See ALIGNMENT SECTION.
13. When alignment is achieved and wheel does not strike housing, tighten nuts on motor base bolts, second set screw leading the key in direction of rotation and set screw over keyway.
14. If outlet damper, inlet screen, shaft seal or butterfly valve (on Types R and CB fans) is required, bolt these in position on the fan.
15. The fan is now ready to be connected into the system. See the OPERATION SECTION.



COMPLETELY KNOCKED-DOWN FANS — Arrangement 1, 3, 7, 8, 9.

1. Remove all parts from their crates or skids. Refer to assembly drawing or parts list.
2. If vibration isolator pads or a vibration base is required, place the pads or base over the anchor bolts in the foundation.

3A. Housings — Bolted Scroll Construction.

- a. Lay suitable length of 4 x 6 timber on floor. Using holes in fan bracing for crane hooks, lay the **drive side** of the fan housing (lower half only on horizontally split housing) on the timber with inside housing facing up.
- b. Bolt scroll sheet to scroll angle on the inside of fan housing. The scroll sheet has to be bent around outline of housing. Align match marks.
- c. Bolt **inlet side** of fan housing (lower half only on horizontally split housing) to scroll sheet.
- d. Carefully raise this housing assembly and continue with Step 3B.
- e. The upper half housing of a horizontally split fan is assembled like its lower half.

3B. Housings — Horizontal and/or Vertical Split

- a. Raise lower half of housing and line up foundation holes in fan base angles with anchor bolts. Lower housing over anchor bolts being careful not to strip threads. Level with spirit level by shimming where necessary. Tighten nuts on all anchor bolts.
- b. Bolt vertically split sections together.

3C. Housings — Completely Assembled

- a. Raise housing into position and line up foundation holes in fan base angles with anchor bolts. Lower housing over anchor bolts being careful not to strip threads. Level housing with spirit level by shimming where necessary. Tighten nuts on all anchor bolts.
- 4A. If Arrangement 1, 7, 8 and 9 fans are shipped with bearing or motor base separate, move bases into position on the foundation. Shim where necessary to level and tighten nuts on anchor bolts.
- 4B. If Arrangement 1, 3, 7, 8 and 9 fans have separate bearing pedestals and soleplates, place them in position on the foundation. The "held" bearing pedestal should be set level at the correct elevation.
- 4C. Standard Arrangement 3 and 7 fans have bearing supports on the fan bracing or in the inlet collar.

5. Shaft and Wheel

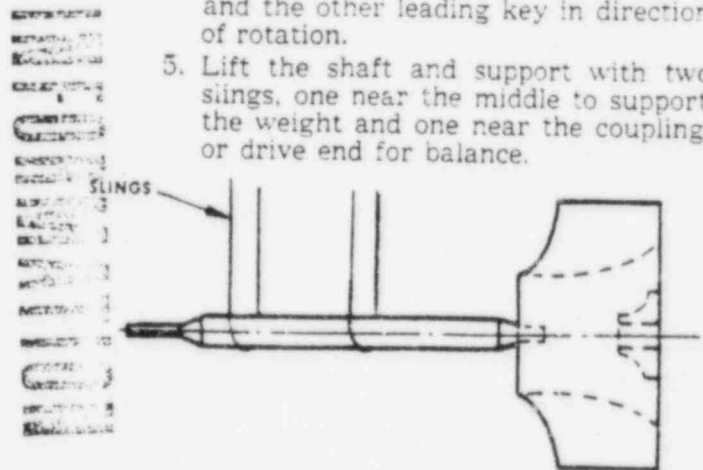
a. When received assembled:

1. Remove protective coating with solvent on bearing areas of shaft and coat with clean oil. **DO NOT TOUCH CLEAN BEARING AREAS OF SHAFT WITH BARE HAND** as perspiration can easily cause discoloration, oxidation and pitting.

b. When received disassembled:

1. Remove protective coating on shaft.

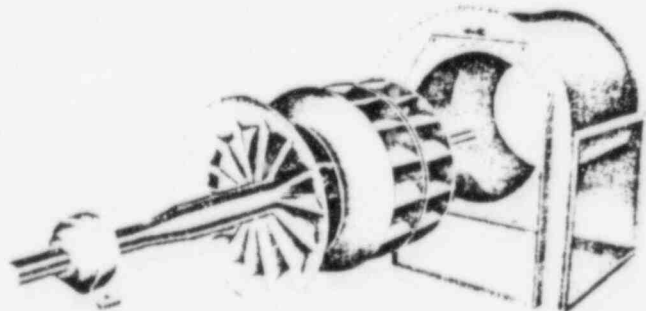
2. Remove key or keys from the shaft.
3. Carefully clean inside of wheel hub with solvent and lubricate bore with white lead and oil for ease of shaft entrance.
4. Be sure set screws in wheel hub are turned out to prevent scratching shaft. If three set screw holes appear in the hub, use only **TWO** — one over the key and the other leading key in direction of rotation.
5. Lift the shaft and support with two slings, one near the middle to support the weight and one near the coupling or drive end for balance.



6. The inlet bells or variable inlet vanes (VIV) are sometimes mounted with the wheel.

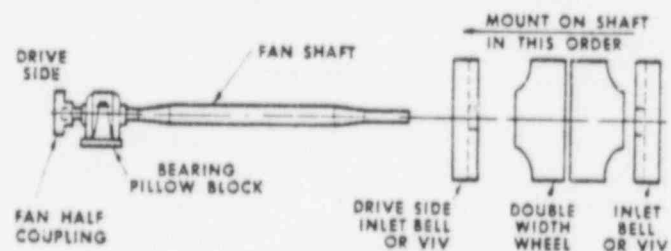
a. Fan Housing Not Split

Inlet bells or VIV should be mounted on the shaft **AFTER** wheel and shaft are placed in the fan housing.



b. Fan Housing Split, Coupling and Adjacent Bearing Shipped Mounted On Shaft. Double Inlet Only.

Before mounting wheel on shaft, the drive side inlet bell or VIV must be slipped over shaft into place. Use rags or paper on shaft for VIV to rest on. This will prevent scratches. Mount wheel or wheels as described in Step 7. Slip remaining VIV or inlet bell into place on the shaft.



c. Fan Housing Split, No Coupling or Bearings Mounted

After wheel is mounted on the shaft as

ASSEMBLY AND INSTALLATION (Cont.)

described in Step 7, the inlet bells or VIV's should be positioned on the shaft. Protect the shaft from scratches.

7. Slide the shaft into the wheel. **MAKE SURE ROTATION ARROW** painted, stamped or fastened on the fan housing **CORRESPONDS TO ARROW PAINTED ON WHEEL**. Slide inlet bells or VIV's into position as described in Step 6. The rotation arrow on the inlet bell or VIV must correspond with the mark on the fan housing and wheel. Motor overloading may result if the vanes in the inlet bell or VIV cause the air to whirl **against** wheel rotation.
8. The various Buffalo centrifugal wheel designs on Pg. 9 show wheel rotation. If there is the slightest doubt about correct rotation, please contact the nearest Buffalo representative or the factory.
9. Type BL and BL-Aerofoil double width fans have two single wheels placed back to back on the shaft. After the first wheel is in position, slide the second wheel onto the shaft.
10. Tap key into keyway. Do not push the gibhead key flush with the hub. Tighten set screw over key with only enough pressure to hold wheel in position while placing shaft in bearings.
11. Wheel and Shaft Into Split Fan Housing

- a. Fan with Sleeve bearings — Arr. 1, 8, 9 and Arr. 3 & 7 with independent pedestals.

1. Bolt and hand tighten lower halves of bearing housing on its support. Place lower half liners in housing.
2. Lower wheel and shaft into housing. If thrust collars are machined on shaft, be careful not to damage liner. It might help to lower shaft to just above bearings, lift bearing liner up around shaft and lower into bearing housing.
3. Install oil rings, upper liner and top half of bearing housings (keeps bearing clean).
4. If gasketing is supplied, tie all joint gaskets in place on lower fan housing.
5. Lower upper fan housing into place and bolt up. Bolt inlet bells or VIV's, which are loose on the shaft, to fan housing.
6. Adjust wheels and inlet bells for correct alignment. Shim bearing housings, if necessary, and align sleeve bearings. (See ALIGNMENT SECTION and BEARING SECTION.)
7. After final alignment is attained, nuts on all bolts and set screws should be tightened. Tighten set screw in wheel hub over key first and then set screw leading key in direction of rotation.
8. The bearing housing can be doweled to its base if desired. (Buffalo Forge does not supply dowel pins.)

- b. Sleeve Bearings on Fan Housing—Arr. 3 & 7.

1. Lower wheel and shaft into fan housing. Bolt lower half of both inlet bells or VIV's to fan housing. Wood blocks can be placed under the shaft to help support it while bolting inlet bells or VIV's.

2. Now bolt and hand tighten lower halves of bearing housing on its support. Place lower half liners in housing.

3. Continue Steps 11a-2 - 11a-8.

- c. Fan With Split Pillow Block Anti-Friction Bearings.

The procedure is similar to Step 11a except the balls and races or rollers and races are put on the shaft **BEFORE** lowering wheel and shaft into position.

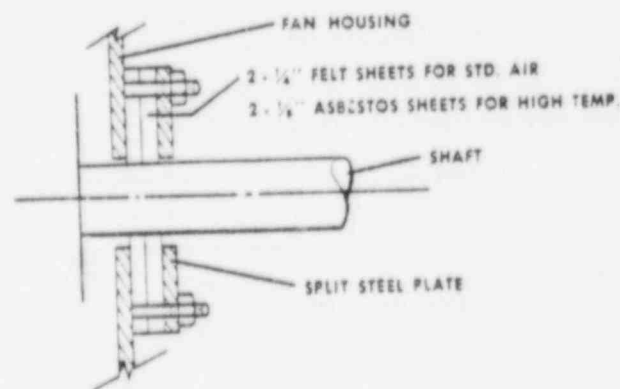
- d. Fan With Solid Pillow Block Anti-Friction Bearings.

The procedure is similar to Step 11a except the complete pillow block is assembled on the shaft **BEFORE** lowering wheel and shaft into position.

12. Wheel and Shaft Into Fan Housing — **NOT SPLIT**

- a. Place wheel and shaft into fan housing through the fan inlet.
- b. Place inlet bells or VIV's in position over the shaft and bolt to housing.
- c. Mount bearings on their supports, align inlet bell or VIV with wheel, align bearings, shim pillow blocks where necessary and tighten nuts on all bolts. (SEE BEARING SECTION AND ALIGNMENT SECTION.)
- d. Tighten set screw in wheel hub over key after final alignment and then tighten set screw leading key in direction of rotation.

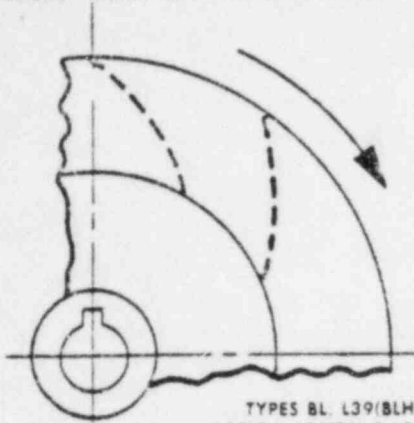
If a **shaft seal** is required, bolt assembly to fan housing. Make sure asbestos or felt seal seats itself around the shaft to prevent air leakage.



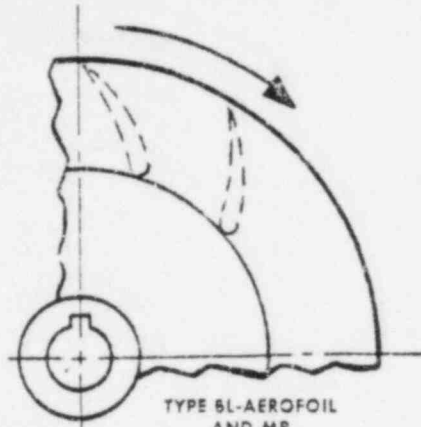
14. If fan has VIV's, assemble main control shaft and mechanism per assembly drawing. Check operating movement. (See VARIABLE INLET VANE SECTION.)
15. If outlet damper or inlet screens are required, bolt these in position to fan housing.
16. Mount motor on its base and connect to V-belt drive or couple to fan shaft. Mount coupling guard if required. (See MOTOR SECTION, V-BELT DRIVE SECTION and COUPLING SECTION.)
17. The fan is now ready to be connected into the system. (See the OPERATION SECTION.) If a belt guard is required, this can be fastened to fan after system has been balanced.

Arrows Indicate Proper Direction of Rotation

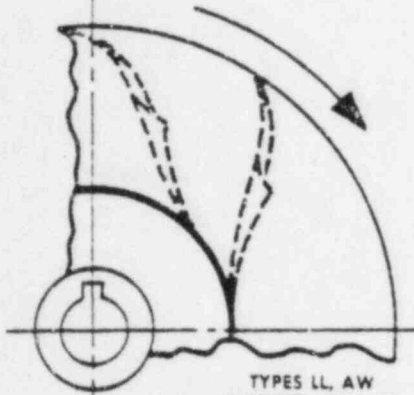
WHEEL DESIGNS AND ROTATIONS



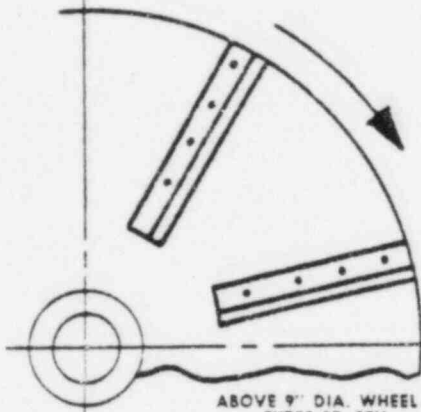
TYPES BL, L39(BLH),
L33(CL), L25(DL) & L21(EL)



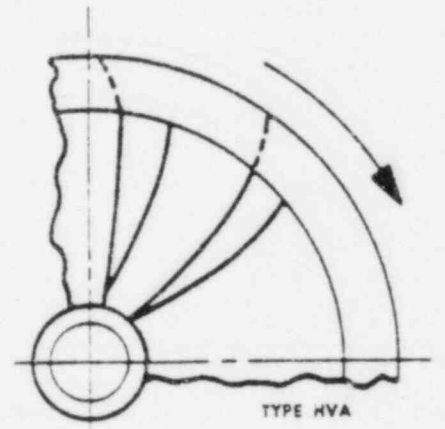
TYPE BL-AEROFOIL
AND MP



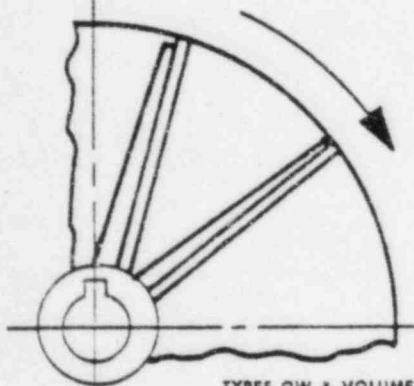
TYPES LL, AW
& REITED VENT SET
WITH LL WHEEL



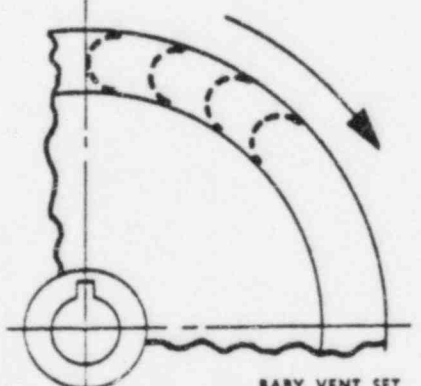
ABOVE 9" DIA. WHEEL -
TYPES 2E, 3E,
3E & 4E
CONE WHEEL



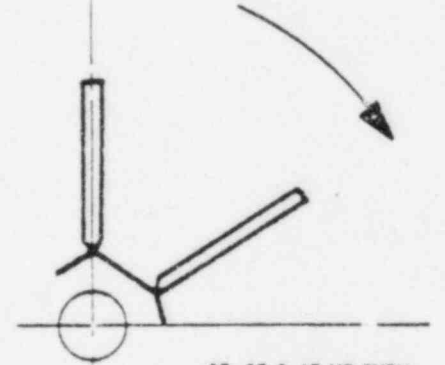
TYPE HVA



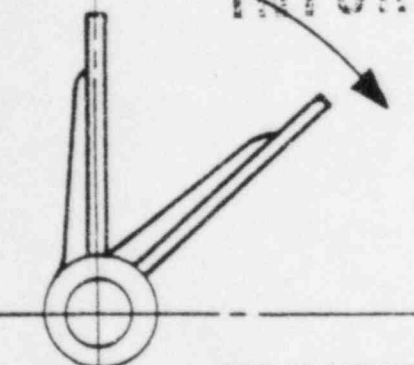
TYPES OW & VOLUME
OPEN & CONE WHEELS



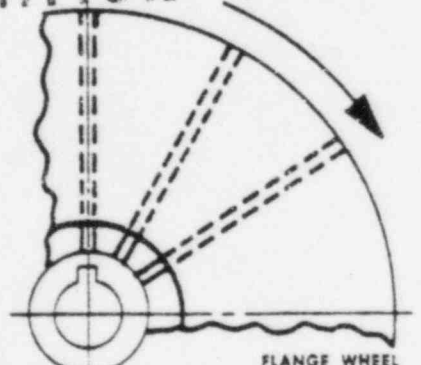
BABY VENT SET
& TYPE FC



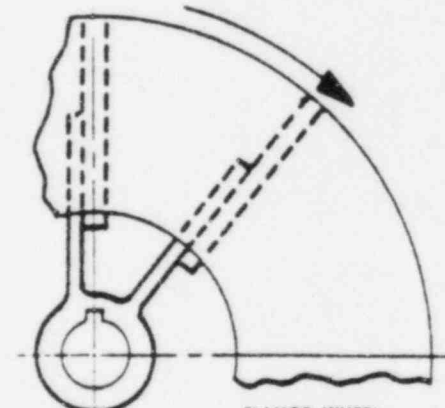
2E, 3E & 4E UP THRU
9" DIA.
PADDLE (BLAST) WHEEL



TYPES 2RE & VOLUME
PADDLE (BLAST) WHEEL



FLANGE WHEEL
TYPES CB, R,
MW, VOLUME,
4 1/2 E, 5E, 6E, 7E, 8E



FLANGE WHEEL
TYPES 3RE,
4RE & 7E

ALIGNMENT

UNITS SHIPPED COMPLETELY ASSEMBLED

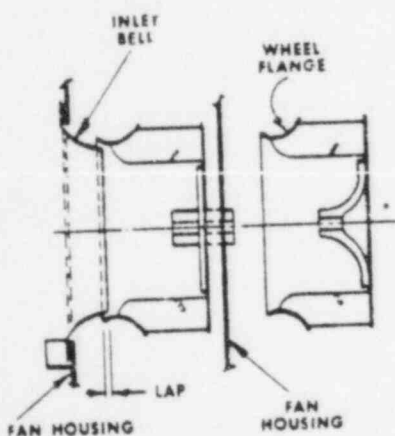
1. Level the fan housing on the foundation by shimming where necessary. Use a spirit level on the shaft or on a horizontal portion of the housing (base angle). Tighten nuts on all anchor bolts.
2. If fan is received with motor mounted, check tightness of motor hold down bolts. Also check coupling or V-belt drive alignment. (Refer to COUPLING SECTION or V-BELT DRIVE SECTION)
3. Spin wheel slowly by hand to see if fan wheel clears the fan inlets. It may be necessary to loosen wheel hub set screws and shift the wheel on the shaft to locate the wheel prop-

erly with the inlets. In most cases, the lip of the inlet bell or inlet cone should be even with or extend into the wheel inlet slightly. The proper wheel - inlet bell fits for 70°F air are shown below. A fan for high temperature application requires compensation. See Page 12.

4. If the fan is on a concrete foundation, you are now ready to pour the grout. Anchor bolts should be tight. After grout hardens, recheck for final level and alignment of all components.

If fan is on a steel foundation, you are ready for operation.

INLET BELL - WHEEL FITS

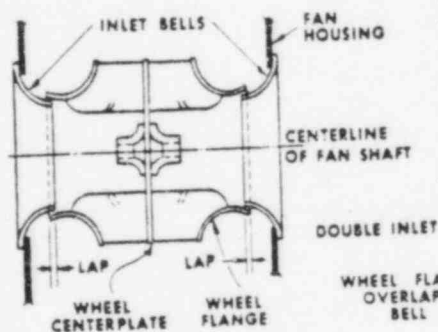
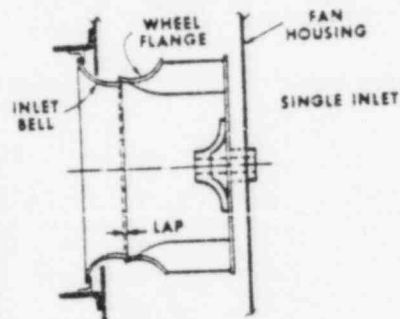


SIZE	LAP INCHES
245	1/4
270	1/4
300	1/4
330	1/4
365	1/4
400	1/4
445	1/4
490	1/4
540	1/4
600	1/4
660	1/4
730	1/4
805	1/4
890	1/4
980	1/4
1085	1/4
1200	3/8
1320	3/8
1460	3/8
1615	3/8
1780	3/8
1965	3/8
2175	3/8

TYPE BL & BL-AEROFOIL BELTED VENT SET WITH BL WHEEL

SKETCH SHOWS SINGLE INLET TYPE BL FANS. FOR DOUBLE INLET FANS (2 SINGLE WHEELS BACK-TO-BACK) SET BOTH WHEELS TO GIVE THIS LAP.

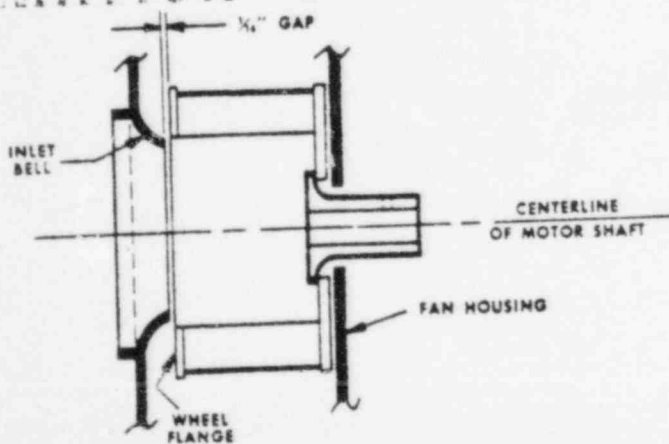
TYPE L39(BLH), L33(CL), L25(DL), L21(EL) - Single & Double Inlet



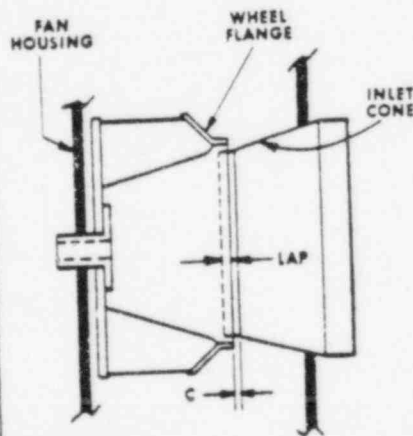
L39 (BLH) SIZE	L33 (CL) SIZE	L25 (DL) SIZE	L21 (EL) SIZE	LAP IN.
365	400	445	490	1/4
400	445	490	540	1/4
445	490	540	600	1/4
490	540	600	660	1/4
540	600	660	730	1/4
600	660	730	805	1/4
660	730	805	890	1/4
730	805	890	980	1/4
805	890	980	1085	1/4
890	980	1085	1200	3/8
980	1085	1200	1320	3/8
1085	1200	1320	1460	3/8
1200	1320	1460	1615	3/8
1320	1460	1615	1780	3/8
1460	1615	1780	1965	1/2
1615	1780	1965	2175	1/2
1780	1965	2175	-	3/4
1965	2175	-	-	3/4
2175	-	-	-	3/4

WHEEL FLANGES SHOULD OVERLAP EACH INLET BELL EQUALLY.

BABY VENT SETS

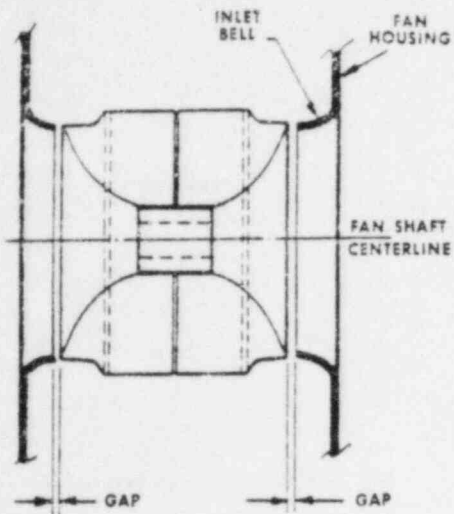


BELTED VENT SETS & CAST IRON WITH LL WHEEL



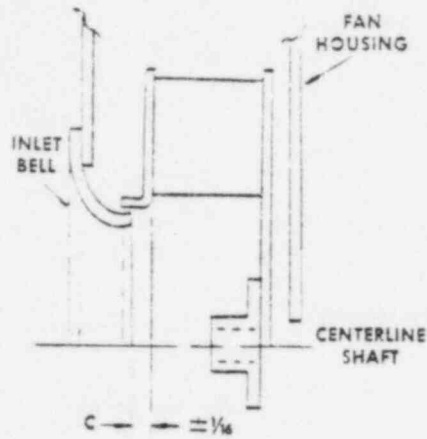
LL SIZE	BVS SIZE	C IN.	LAP IN.
175	175	3/8	1
200	200	3/8	1
225	225	3/8	1
250	250	3/8	0
275	275	3/8	0
300	300	3/8	0
325	325	3/8	0
375	375	3/8	0
400	400	3/8	0
450	450	3/8	0
500	500	1/2	1/4
550	550	1/2	1/4
600	600	1/2	1/4

TYPE HVA



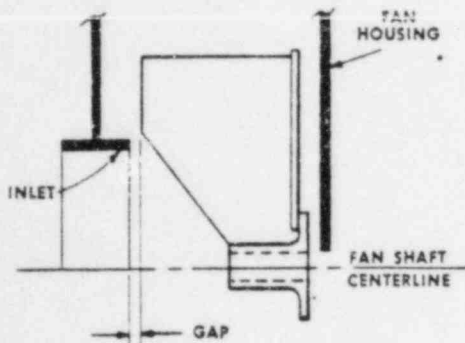
HVA SIZE	GAP INCHES
121	3/4
122	3/4
123	3/4
151	1/2
152	1/2
153	1/2
181	1/2
182	1/2

MP WHEEL
BELTED VENT SET
WITH MP WHEEL



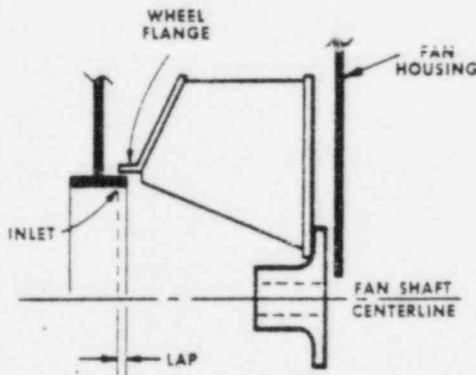
MP	C INCHES
400	1 1/2
445	1 1/2
490	1 1/2
540	1 1/2

TYPE OW - OPEN WHEEL



FAN SIZE	GAP INCHES
17	3/8
21	3/8
25	3/8
30	3/8
35	3/8
40	3/8
45	3/8
50	7/8
55	3/4
60	1 1/4
70	1 1/4
80	3/4
90	1 3/4
100	1
110	1 1/4
120	1 3/4

TYPE MW & AW
STEEL ONLY



FAN SIZE	LAP INCHES
17	1/8
21	3/8
25	3/8
30	3/4
35	3/8
40	3/8
45	3/8
50	3/4
55	3/8
60	1/2
70	3/8
80	3/4
90	3/4
100	1 1/4
110	1 1/4
120	1

For other standard Buffalo fans, the wheel position is indicated below:

FAN TYPE	WHEEL TYPE	CORRECT WHEEL POSITION
SMALL E & RE	PADDLE	} ADJACENT TO FAN INLET WITH A MINIMUM OF RUNNING CLEARANCE
VEH	PADDLE	
VOLUME	FLANGE	
VOLUME	CONE	
VOLUME	PADDLE	
E	FLANGE & CONE	
RE	FLANGE & CONE	
CB & R	LAP VARIES WITH SIZE AND TEMPERATURE. CHECK DRAWING FOR EACH INDIVIDUAL ORDER.	

MOTORS

After motor has been mounted, aligned and bolted down, wire to power supply through a disconnect switch, short-circuit protection and suitable magnetic starter with overload protection. ALL MOTORS should be connected as shown on nameplate. Install all wiring and fusing in accordance with the National Electric Code and local requirements.

Be sure power supply (voltage, frequency and current carrying capacity of wires) is in accord with the motor nameplate.

All a-c induction motors will perform satisfactorily with a 10% variation in voltage, a 5% variation in frequency or a combined voltage-frequency variation of 10%. For motors rated 208 - 220 volts, the above limits apply only to the 220 volt rating. To select control for 208 - 220 volt motors, use same amps for either 208 or 220 volts.

If grease plugs are inaccessible, motor end frames may be rotated 90° or 180° to afford better access. The main frame may be turned end-for-end to shift conduit box to the opposite side. The conduit box may be rotated to one of four 90° positions.

Most motors are received with bearings lubricated and require no relubrication for some time depending on operating conditions. **HOWEVER - ALWAYS CHECK TO BE SURE MOTOR BEARINGS ARE LUBRICATED BEFORE START-UP.** (See Maintenance Section on Motor Bearings.)

TO REVERSE DIRECTION OF ROTATION

A. Single Phase Motors

1. Shaded Pole rotation cannot be reversed unless motor is constructed so that the shading coil on half of stator pole can be shifted to other half of stator pole.
2. Split Phase interchange connections to supply of either main or auxiliary winding.
3. Capacitor all types of capacitor motors are reversed in rotation by interchanging connections to supply of either main or auxiliary winding.
4. Repulsion remove plate on motor end bracket and turn bracket (holding brushes) in direction **opposite** to direction of existing rotation.

B. Two Phase Motors - interchange line leads.

C. Three Phase Motors - interchange any two line leads.

Normal operation of motors results in temperature rises according to motor insulation. The total motor operating temperature includes ambient temperature plus motor temperature rise. The motor rise includes nameplate temperature rise, service factor allowance and hot-spot allowance.

INSULATION CLASS	MAXIMUM TOTAL OPERATING TEMPERATURE	
	° CENTIGRADE	° FAHRENHEIT
A	105	221
B	130	266
F	155	311
H	180	356

The motor nameplate indicates type of insulation. As the hot-spot allowance is not measurable, the maximum total operating temperature must be reduced. Class A insulation is then suitable for total measurable temperature of 90°C (194°F) on open motors, 95°C (203°F) on enclosed motors. Class B insulation is suitable for total temperature of 110°C (230°F) on open motors, 115°C (239°F) on enclosed motors. If the motor feels hot, measure its temperature - thermometer against stator windings or by resistance measurement.

Various motor troubles can be caused by:

1. low or high voltage.
2. overload - high temperature - drawing too much current.
3. armature unbalance - vibration and noise.
4. worn bearings - armature rubs against stator.
5. too much or not enough lubricant in bearings.
6. commutator brushes on d-c motor worn or not seated under proper tension.
7. loose hold down bolts - vibration and noise.
8. dirt in windings - high temperature.
9. low insulation resistance due to moisture - check resistance with a megohm meter ("Megger") or similar instrument employing a 500 volt d-c potential. Resistance should read at least 1 megohm. If it is less, remove motor from service, clean and dry windings. A high grade insulation varnish should be applied to the windings before putting back in service.

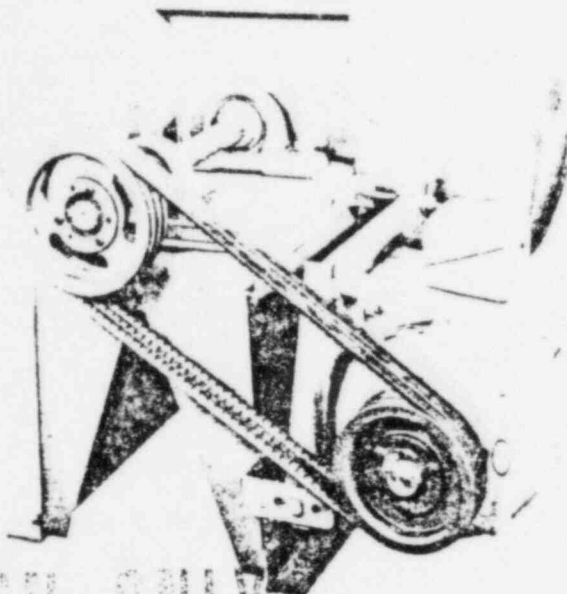
USEFUL MOTOR FORMULAS

SINGLE PHASE A-C	THREE PHASE A-C	DIRECT CURRENT
$HP = \frac{WATTS}{746} = \frac{KW}{.746}$	$HP = \frac{WATTS}{746} = \frac{KW}{.746}$	$HP = \frac{WATTS}{746} = \frac{KW}{.746}$
$MOTOR HP INPUT = \frac{E \times I \times PF}{746}$	$MOTOR HP INPUT = \frac{E \times I \times PF \times 1.732}{746}$	$MOTOR HP INPUT = \frac{E \times I}{746}$
$MOTOR HP OUTPUT = \frac{E \times I \times PF \times ME}{746}$	$MOTOR HP OUTPUT = \frac{E \times I \times PF \times 1.732 \times ME}{746}$	$MOTOR HP OUTPUT = \frac{E \times I \times ME}{746}$
$FAN BHP INPUT = \frac{E \times I \times PF \times ME \times DE}{746}$	$FAN BHP INPUT = \frac{E \times I \times PF \times 1.732 \times ME \times DE}{746}$	$FAN BHP INPUT = \frac{E \times I \times ME \times DE}{746}$

E = VOLTS · I = AMPS · PF = POWER FACTOR (80 - 85%)
ME = MECHANICAL EFFICIENCY (85 - 90%) · DE = DRIVE EFFICIENCY: DIRECT DRIVE 100%; V-BELT DRIVE 95%

FAN BRAKE HORSEPOWER CAN BE FIGURED BY A POWER READING OF FAN MOTOR WITH A VOLT-AMP METER. CALCULATE THE APPROXIMATE BRAKE HORSEPOWER, USING THESE EQUATIONS:

1. CORRECTED FULL-LOAD AMPS = $\frac{NAMEPLATE FULL-LOAD AMPS \times NAMEPLATE VOLTS}{FIELD VOLTAGE RATING}$
2. APPROX. FAN BHP = $NAMEPLATE HP \times \frac{(MOTOR OPERATING AMPS - MOTOR NO-LOAD AMPS \times 0.5)}{(CORRECTED FULL-LOAD AMPS - MOTOR NO-LOAD AMPS \times 0.5)}$



V-BELT DRIVES

Fans shipped completely assembled have had V-belt drive aligned at Buffalo Forge. Alignment should be checked before operation.

1. Be sure sheaves are locked in position.
2. Key should be seated firmly in keyway.
3. Place straight edge or taut cord across faces of driving and driven sheaves to check alignment. The motor and fan shafts must be parallel; with V-belts at right angles to the shafts.
4. Start the fan. Check for proper rotation. Run fan at full speed. A slight bow should appear on slack side. Adjust belt tension by adjusting motor on its sliding base. All belts must have slack on one side.
5. If belts squeal at start-up, they are too loose and should be tightened.
6. When belts have had time to seat in the sheave grooves, then readjust belt tension.

V-belt drive assembly can be mounted as follows:

1. Clean motor and fan shafts. Be sure they are free from corrosive material. Clean bore of sheaves and coat with white lead or heavy oil for ease of shaft entry. Remove oil, grease, rust or burrs from sheaves.
2. Place fan sheave on fan shaft and motor sheave on its shaft. **DO NOT POUND SHEAVES ON** as this may damage bearings. Tighten sheaves in place.
3. Move motor on slide base so belts can be placed in grooves of both sheaves without

forcing. Do not roll belts or use a tool to force belts over the grooves.

4. Align fan and motor shafts so they are parallel. The belts should be at right angles to the shafts. A straight edge or taut cord placed across faces of sheaves will aid in alignment.
5. Tighten belts by sliding motor in its base. Correct tension gives the best drive efficiency. Excessive tension causes undue bearing pressure.
6. Start the fan and run it at full speed. Adjust belt tension until only a slight bow appears on the slack side of the belts. If slippage occurs, a squeal will be heard at start-up. Eliminate this squeal by tightening up the belts.
7. Give belts a few days running time to become seated in sheave grooves — then readjust belt tension.

If the shafts become scratched or marked, carefully remove sharp edges and high spots such as burrs with fine emery cloth or a honing stone. Avoid getting emery dust in the bearings.

Do not apply any belt dressing unless it is recommended by the drive manufacturer. V-belts are designed for frictional contact between the grooves and sides of the belts. Dressing will reduce this friction.

Minimum belt center distances are available on request.

Belt tension on an adjustable pitch drive is obtained by moving the motor — **not by changing the pitch diameter** of the adjustable sheave.

BEARINGS -- Assembly Instructions

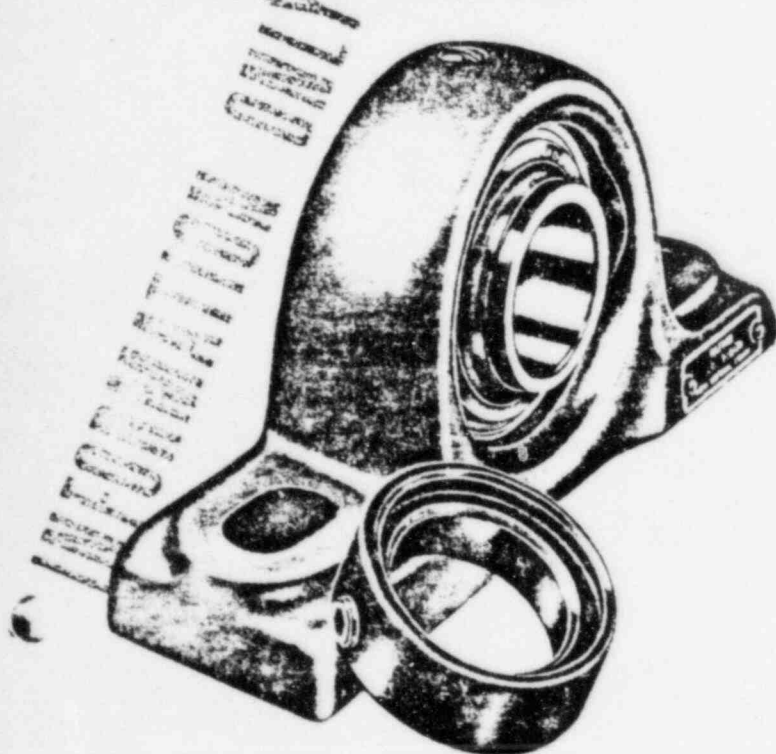
These general instructions cover standard types of anti-friction and sleeve bearings furnished with Buffalo Forge equipment. Detailed information on specific bearings supplied with the fan are found in the shipping envelope or can be obtained from the bearing manufacturer.

1. Bearings should be inspected and thoroughly cleaned if necessary. If a bearing is disassembled, mark its parts in relation to one another to avoid error in reassembly. Do not mix its parts with those of other bearings.

ANTI-FRICTION BEARINGS

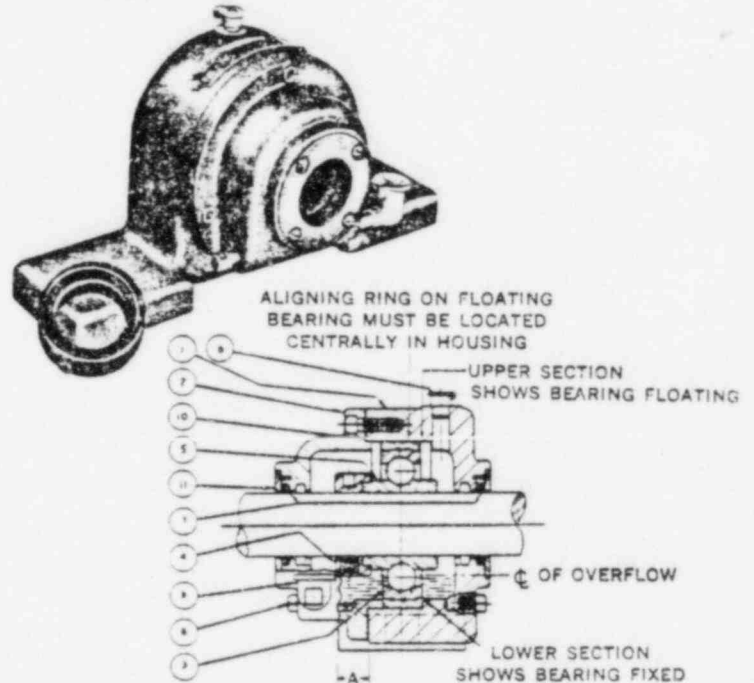
FAFNIR LAK, RAK, LAO, RSAO AND SAO -- fixed type ball bearing pillow blocks.

- a. This type of bearing is always shipped assembled and ready for installation.
- b. Slip each bearing pillow block and locking collar into position on the shaft. The locking collars will face each other on Arr. 1, 8, 9 and 10 and face away from each other on Arr. 2, 3 and 7.
- c. Bolt pillow blocks in position on their mounting surfaces after shimming and aligning. They should be mounted so fan wheel and shaft clear the fan housing.
- d. Slide locking collar against end of inner ring. Turn collar in direction of shaft rotation until it grips shaft and inner ring. Tighten collar with a drift pin. Tighten set screw or screws in collar.
- e. Types LAK, RAK, LAO and LSAO are pre-lubricated and need no grease. Type SAO needs grease lubrication before startup. (See MAINTENANCE SECTION - LUBRICATION.)
- f. To dismantle, reverse this procedure. **Be sure** to remove burr on shaft caused by set screw **BEFORE** removing pillow block from shaft. A honing stone will remove burr.



2. Determine type of pillow block and location of fixed bearing.
3. Check all nameplates on fan for special instructions.
4. Mount bearings in position on the shaft in accordance with the particular type of bearing furnished. (See following paragraphs.)
5. The shaft should be clean and free from burrs and other irregularities. Be sure bearing is not to be seated on worn flat sections.

FAFNIR SAOL -- fixed and floating type ball bearing pillow blocks.



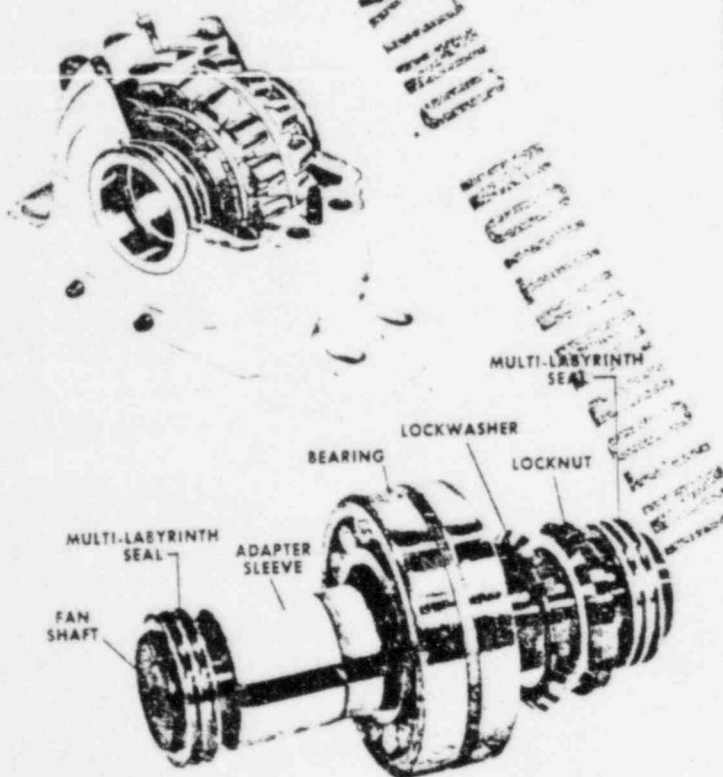
- a. These pillow blocks are shipped with bearings mounted in the housings but with locking collars separate.
- b. Remove end cover 2, gasket 10, plates 11 with packings 7. Be careful not to damage gasket and packings.
- c. Slide pillow block housing 1 with bearing 3 and one plate 11 onto shaft. Position bearing on shaft making sure cam end of inner ring 5 points out.
- d. In order to position floating bearing in its housing, measure collar projection "A" on fixed unit and duplicate it on floating unit. Since "A" is the same on both pillow blocks, the floating bearing will automatically be positioned in the center of the floating space.
- e. Bolt pillow blocks securely in position on their mounting surfaces after shimming and aligning. The outside diameter of shaft and housing bore should clear equally all around. Pillow blocks should be mounted so fan wheel and shaft does not strike any part of fan housing.
- f. Slide locking collar 4 into position against bearing inner ring 5. Turn collar in direction of shaft rotation until it grips shaft and inner

ring. Tighten collar with a drift pin. Tighten set screw in collar.

- g. Replace gasket 10, end cover 2, packing 7 and plate 11 on end cover. Bolt on end cover.
- h. Draw up screws holding plates just enough to hold packing rings snugly in place.
- i. Then fill with oil in top cup 6 until overflow cup 9 is full. Fill only when fan is not running.
- j. The SAOL type can be converted to grease lubrication. See Fafnir instructions when doing this.
- k. To disassemble, reverse this procedure. **BE SURE** to remove burr on shaft caused by the set screw **BEFORE** removing pillow block from the shaft. A honing stone will remove the burr.

LINK-BELT P-LB — fixed and floating type spherical roller bearing split pillow blocks.

- a. The bearing is dipped in a preservative coating at Link-Belt and does not have to be removed as it is compatible with grease and oil.
- b. Set lower half of split housing in position on its mounting surface. If an oil cup is used be sure it is assembled in pillow block.



- c. Apply white lead, thinned with oil, on outside diameter and threads of tapered sleeve and face of locknut (helps in tightening adapter).
- d. Assemble multi-labyrinth seal ring (if used) adapter sleeve, roller bearing, lockwasher, locknut and second seal loosely and slip onto shaft.
- e. Hand tighten locknut onto adapter sleeve as tightly as possible.
- f. Insert feeler gauges between outer ring and the unloaded roller on both sides of bearing until snug fit is obtained. Record this figure.

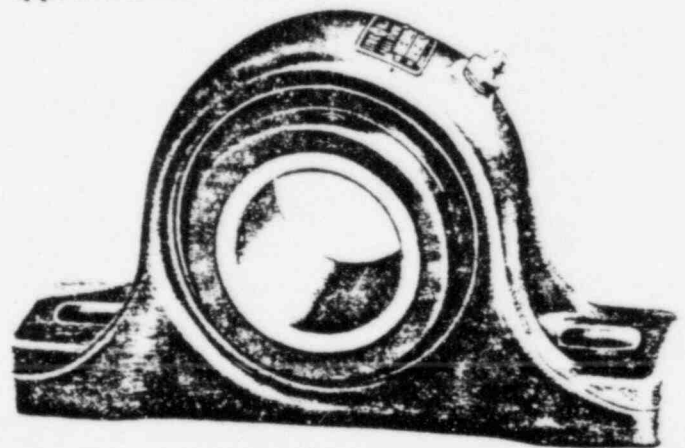
- g. Lower shaft with bearing and adapter assemblies into lower half of pillow block housings. Be sure multi-labyrinth seals are aligned with seal grooves. Bolt lower housing to bearing mounting surface after shimming and aligning. Pillow blocks should be mounted so fan wheel and shaft do not strike any part of fan housing.
- h. Position floating bearing centrally in lower housing. For a fixed bearing, position bearing for insertion of "C" spacer which is inserted on locknut side (keep bearing flush with opposite side of housing).
- i. Tighten locknut with a spanner wrench until snug. Place soft steel or brass bar against locknut and strike bar several times with a hammer. Distribute blows around locknut by rotating shaft. These blows drive inner ring farther up on adapter sleeve and release pressure on threads. Use spanner wrench to further tighten locknut. Repeat this procedure until desired amount of clearance has been removed from bearing.

BEARING CLEARANCE REDUCTION FROM READING STEP f.

Pillow block series number	Bearing Number	Reduction of Clearance	
		Minimum	Maximum
Inches			
6823 thru 6828	22209LBK 22210LBK	.0010	.0015
6829 thru 6844	22211LBK 22215LBK	.0010	.0020
6845 thru 6868	22217LBK 22224LBK	.0015	.0025
6869 thru 6892	22220LBK 22232LBK	.0020	.0030
6893 thru 68104	22234LBK 22236LBK	.0025	.0035
68105 thru 68116	22238LBK 22240LBK	.0025	.0040
68117 thru 66168	22244LBK 23056LBK	.0030	.0050
6923 thru 6928	22309LBK 22310LBK	.0010	.0015
6929 thru 6944	22311LBK 22316LBK	.0010	.0020
6945 thru 6968	22317LBK 22324LBK	.0015	.0025
6969 thru 6992	22326LBK 22332LBK	.0020	.0030

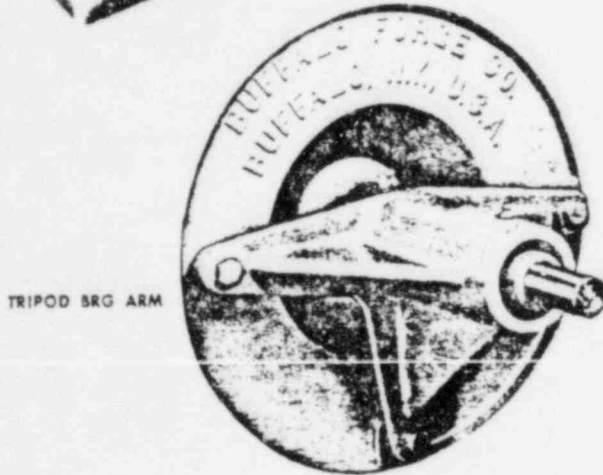
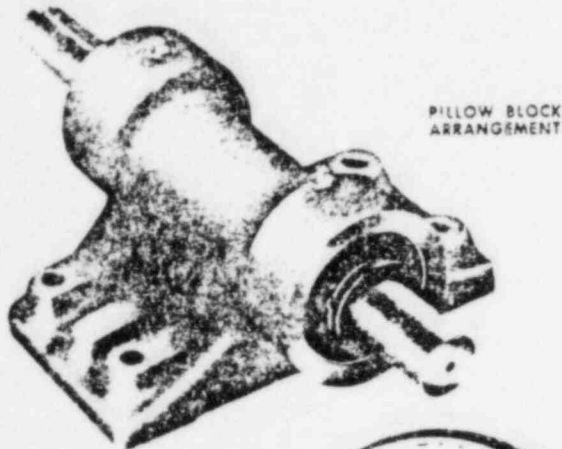
- j. Secure locknut by bending lockwasher tang into locknut slot.
- k. Insert "C" spacer in fixed bearing base on locknut side.
- l. Lubricate bearings with grease or oil. (See MAINTENANCE SECTION - LUBRICATION.)
- m. Replace top half of pillow block (cap). Make sure races are not cocked in housing before tightening cap bolts.

LINK-BELT — P-2-300 fixed type ball and P-B 22400 roller bearing one piece pillow block. The mounting procedure is similar to FAFNIR type RAK and LSAO.

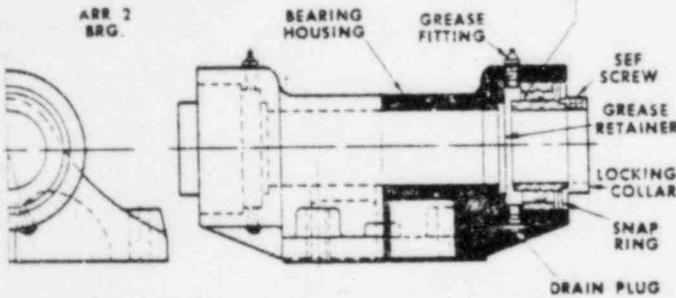


BEARINGS — Assembly Instructions

ARRANGEMENT 2 BEARINGS



Fafnir MUO-A BALL BRG
1/4" SIZE USES MU-A BRG



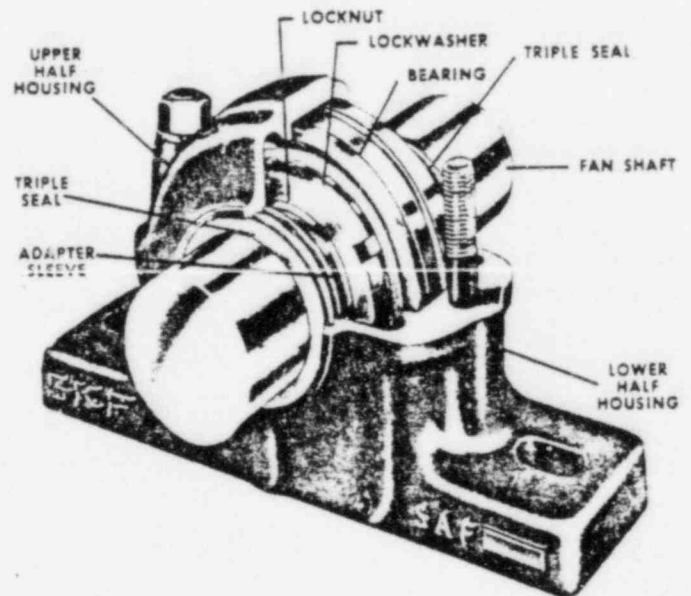
Both the pillow block arrangement and the tripod bearing arm use prelubricated Fafnir wide inner ring bearings held in a Buffalo housing by a snap ring and collar. Each bearing in the bearing arm has a lubrication and relief fitting. Be sure to remove relief fitting plug before lubricating. To disassemble:

1. Loosen set screw in collars.
2. Remove collar by rotating in direction opposite rotation. Remove burr caused by set screw. A honing stone will remove burr.

3. Remove snap ring with screw driver.
4. Take bearing assembly out of housing. This assembly was originally pressed into housing and removing it might require you to take the whole pillow block or tripod arm off the fan shaft.
5. Reverse this procedure to assemble.

TYPICAL ROLLER BEARING

SKF - SAF Series 22500 or 22600 — fixed and floating spherical roller bearing pillow blocks.



The adapter mounting procedure is similar to the LINK BELT roller bearing procedure.

BEARING CLEARANCE REDUCTION

FOR SHAFT DIAMETER OVER	INCLUDING	REDUCTION IN INTERNAL CLEARANCE
1 1/4"	2 1/4"	.001"
2 1/4"	3 1/4"	.0015"
3 1/4"	4 1/4"	.002"
4 1/4"	5"	.0025"
5"	6 1/4"	.003"
6 1/4"	7 1/4"	.0035"
7 1/4"	8 1/4"	.004"

The above SKF pillow blocks are all of the adapter mounting type. Sometimes the cylindrical bore mounted bearing which does not use an adapter is furnished. In this case, threads are cut on the shaft to take the locknut. Refer to the specific mounting instructions of the manufacturer.

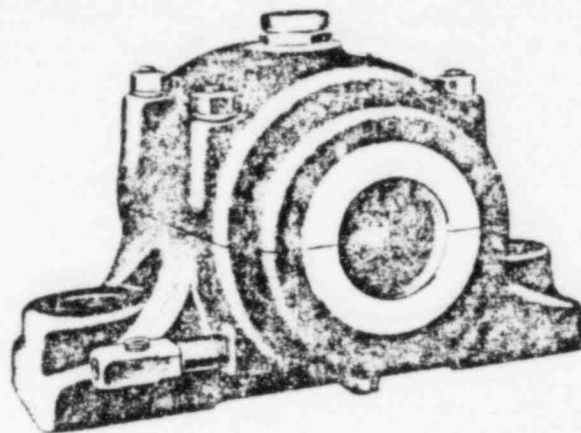
INDUSTRIAL MOUNTING ONLY

DODGE SLEEVE BEARINGS

Ring oil sleeve bearings may be ambient air cooled below certain restrictions of ambient conditions, speed, loading and temperature of air being handled. Above these limits water cooling is required. A circulating oil system is used above ring oiling speeds.

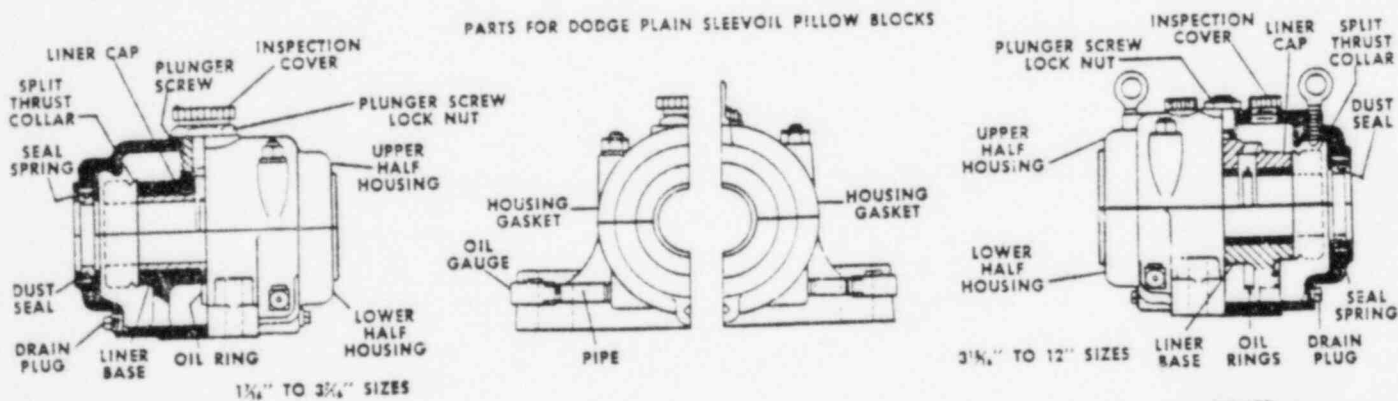
To Assemble a Dodge Plain Sleeveoil Pillow Block:

1. Set lower half of split housing in position on its mounting surface. The oil gauge and pipe should be inserted in housing.
2. Place liner base in lower housing and oil surface.
3. Lower fan shaft onto liner and bolt lower half housing to bearing mounting surface after shimming and aligning. Pillow blocks should be mounted so fan wheel and shaft do not strike any part of fan housing. A slight clearance is required between each side of liner and shaft. Clearance should be equal on the two sides and uniform along length of liner.
4. Install oil rings making sure screws are secure in joints. Rings must be free to rotate on fan shaft. Sizes 1-7/16" to 3-7/16" have one ring. Sizes 3-15/16" to 12" have two rings.
5. Thrust collars, in fixed unit, should now be installed. Remove clamp screws and make sure cracked joint is clean. Place one half on shaft with flinger groove next to liner base. Rotate it around shaft as far as possible and place other half in position. Bring halves together at joint and insert clamp screws. Check face to make sure there is no offset at joint, tap halves together and tighten clamp screws. Repeat



above for opposite end of fixed bearing. ASSEMBLE TWO COLLARS on one BEARING only. Other bearing is floating type. Tap collars up to face of lower liner allowing a total running clearance of .005" to .015". On 1-7/16" to 3-7/16" sizes only, liner cap is shorter than lower housing and thrust collars should be set to liner base.

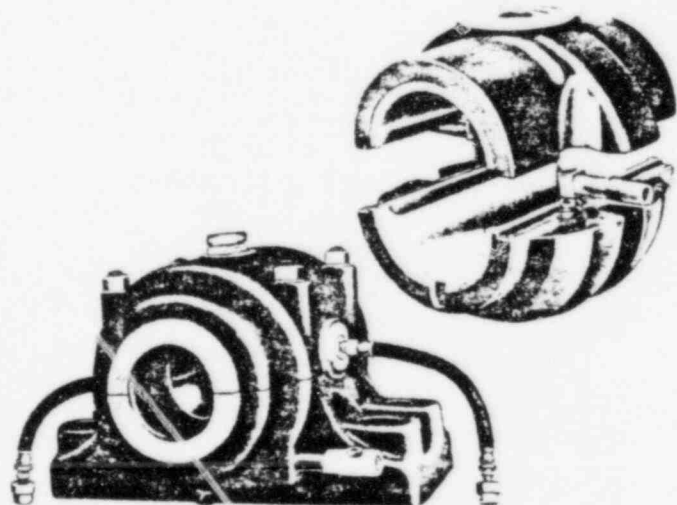
6. Unhook seal spring ends. Thread dust seal and spring around shaft and into groove at end of lower housing. Hook ends of spring together. Oil liner cap bearing surface and place cap on fan shaft. Oil rings must be free.
8. Loosen plunger screw on upper half housing (cap) and place cap on housing studs, being careful not to damage dust seals. Tighten stud nuts and turn plunger screw down snugly. Tighten plunger screw lock nut. Fill with oil to top of red circle in oil gauge. (See LUBRICATION SECTION.)



To assemble a Dodge Water Cooled Sleeveoil Pillow Block, follow the above steps and also install grommet and grommet washer. **ALWAYS USE FLEXIBLE HOSE CONNECTIONS** — keeps bearing self-aligning. Buffalo Forge does not supply flexible hose. A valve should be placed in the drain return line to regulate water flow. Bearing is thus kept full of water in case water valve accidentally gets shut off. Let water discharge to an open funnel for visual inspection.

Regulate flow of water to max. 100°F drain temperature. Too cold a jacket temperature is likely to cause condensation inside the bearing casing with resultant water in the oil reservoir.

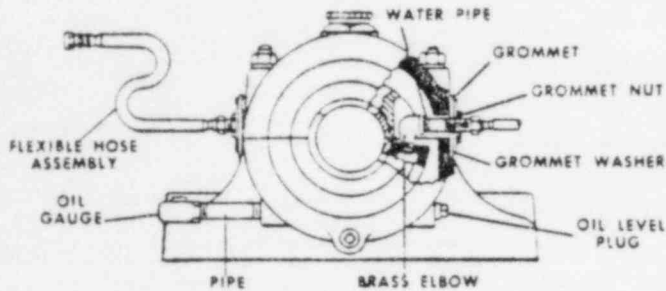
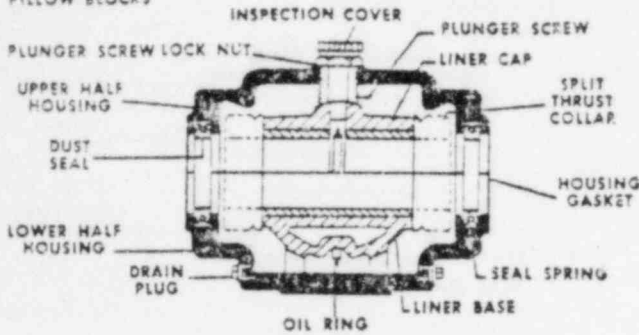
In cases where bearings are subjected to freezing temperatures, compressed air should be available to blow water out of sleeve jackets during shut down.



BEARINGS — Assembly instructions

Dodge Water Cooled Pillow Block (Cont.)

PARTS FOR 1 1/4" TO 3 1/4" DODGE WATER COOLED SLEEVOIL PILLOW BLOCKS



Auxiliary seals can be fitted to one or both ends of the pillow block. These seals consist of split semi-steel plates bolted to the outer housing and fitted with an extra standard seal.

For higher than normal thrust loads, bronze thrust plates are used with the thrust collars. These are bolted to the liner ends and fit up against thrust collars with running clearances as indicated for thrust collars of Lubrication of Sleeve Bearing Section.

Arrangement 2 Sleeve Bearing:

These fan arrangements use a Dodge bronze bushed fan and blower pillow block as shown.

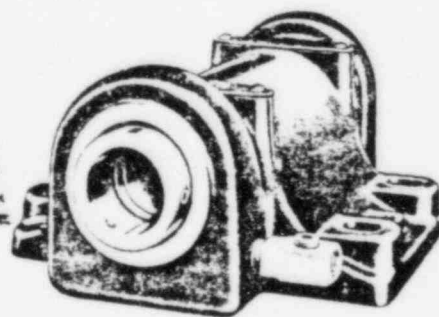
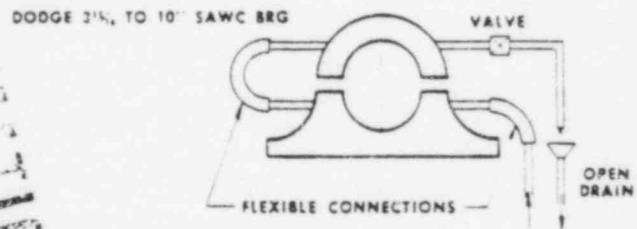
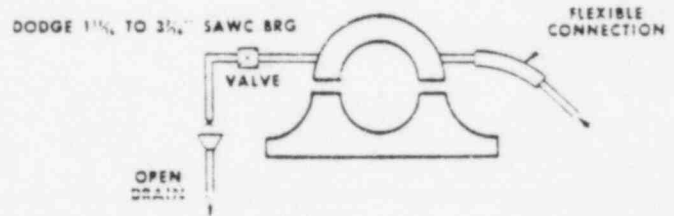
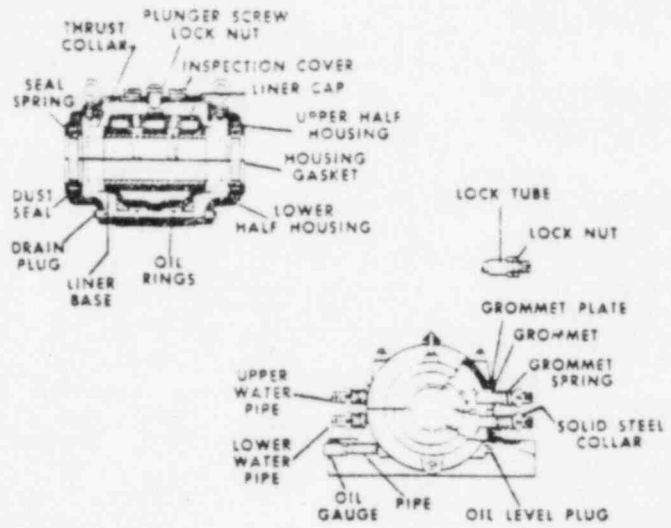
Pillow blocks are fitted with two bronze bushings and T section oil rings. Steel thrust collars can be adjusted from the outside.

These are shipped assembled with Arr. 2 fans. The oil level must be checked before start-up. Add oil only through oil gauge — NOT through inspection openings.

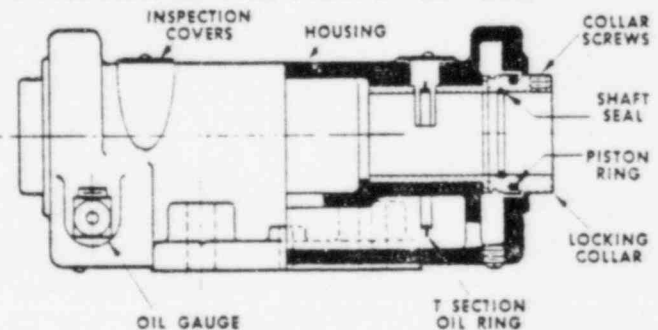
To disassemble an Arr. 2 sleeve bearing pillow block:

1. Loosen wheel hub set screws and remove set screw burrs on the fan shaft by honing. Put blocks under wheel.
2. Remove bolts holding pillow block to fan housing.
3. Remove shaft and pillow block from wheel.
4. Loosen set screws in pillow block locking collars and remove collars. Remove set screw burr on shaft by honing.
5. Slide complete pillow block off shaft.
6. The bronze bushing can then be pressed out of the pillow block.

PARTS FOR 3 1/4" TO 10" DODGE WATER COOLED SLEEVOIL PILLOW BLOCKS



PARTS FOR DODGE ARR. 2 SLEEVE BEARING PILLOW BLOCK



ADDITIONAL INFORMATION ONLY

FLEXIBLE COUPLINGS

A fan shipped assembled with coupling mounted has the coupling aligned. Handling during shipment could throw it out of alignment. Check coupling alignment before starting fan.

COUPLING LUBRICATION

Check LUBRICANT BEFORE STARTUP. The coupling should be oiled or greased the same as other power equipment. For type and amount of lubrication, follow manufacturer's recommendations. (See MAINTENANCE SECTION on COUPLINGS).

MOUNTING

If either coupling half has not been previously mounted on its shaft, the following procedure can be used: (refer to specific instructions found in shipping envelope):

1. Place coupling covers or sleeves over shaft ends.
2. Insert keys.
3. Install hubs on shaft with faces flush with shaft ends. If they do not go on by light tapping with a soft lead hammer, heat in water or oil and position on shafts.
4. Set motor at its magnetic center, if marked on shaft; otherwise find it (see AXIAL MOVEMENT below). With motor rotor on its magnetic center, locate motor on its base with coupling faces at proper axial clearance. Necessary clearance between faces of hubs is shown on the fan assembly drawing or on the coupling manufacturer's instruction sheet.

AXIAL MOVEMENT

If the driver is a sleeve bearing motor, its magnetic center must be found before aligning the coupling halves to prevent the motor half from moving up against fan half coupling. To find the axial movement of the motor shaft:

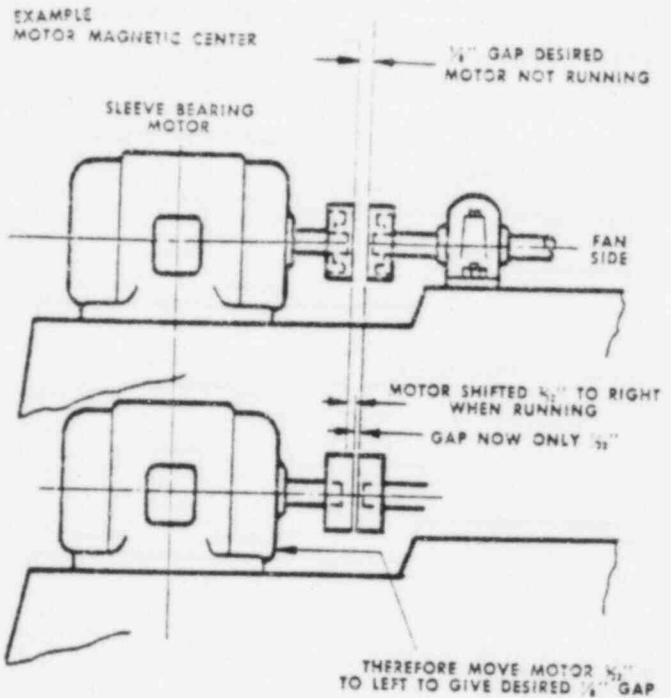
1. Run motor and notice how far shaft moves.
2. Or, push the shaft as far as it will go into the motor housing and mark a line on the shaft at the housing. Then pull the shaft out as far as it will go and scribe a line. Half the distance between the two scribed marks locates the sleeve bearing motor's magnetic center.

If motor axial movement becomes a problem, a limited end float coupling can be used to limit this movement and keep motor near its magnetic center.

A ball bearing motor has its thrust bearing to prevent movement.

COUPLING ALIGNMENT -

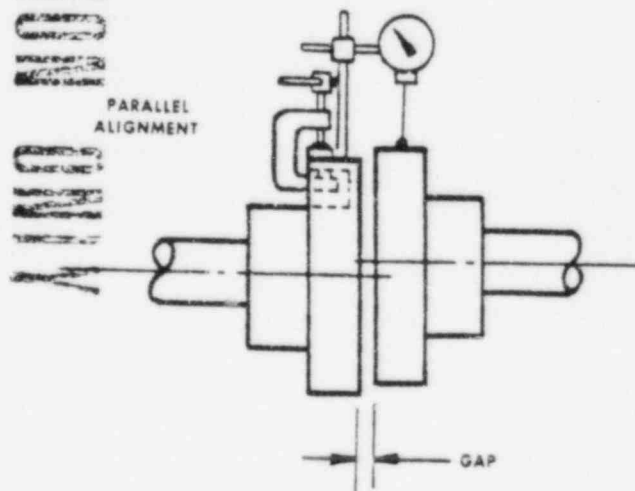
Coupling alignment can be done by two methods. (1) With a dial indicator or (2) with a steel straight edge and feeler gage. The dial indicator method is preferred even with a flexible coupling. Increased accuracy is obtained and the quantitative readings make it possible to determine exactly what shim adjustments are required. Because the



position of the fan half of the coupling is determined when the fan shaft and bearings are aligned, any necessary adjustment will usually have to be made by moving the driver. When in correct alignment the faces of the coupling should be parallel and hubs concentric.

Dial Indicator Method

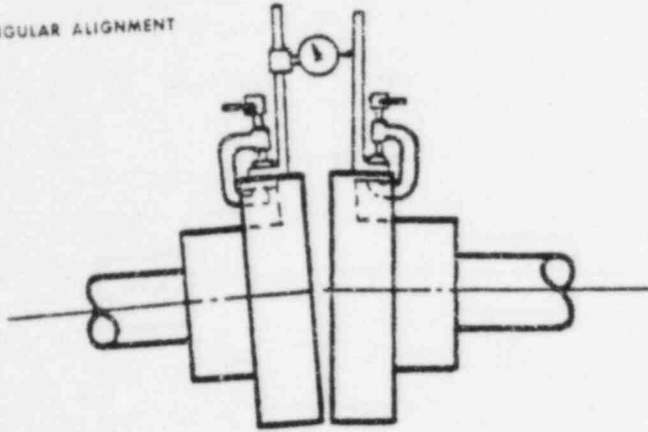
1. Parallel alignment. Fasten indicator bracket on one hub with dial button contacting alignment surface of opposite hub. Rotate shaft on which indicator is attached and take readings at four points: top, each side and bottom. Difference between the two side radial readings indicates motor must be shifted sideways. Difference between top and bottom readings indicates motor must be raised or lowered by adding or removing the same thickness of shims under all four feet. Amount of correction in each case is one half the difference between the two readings.



FLEXIBLE COUPLINGS

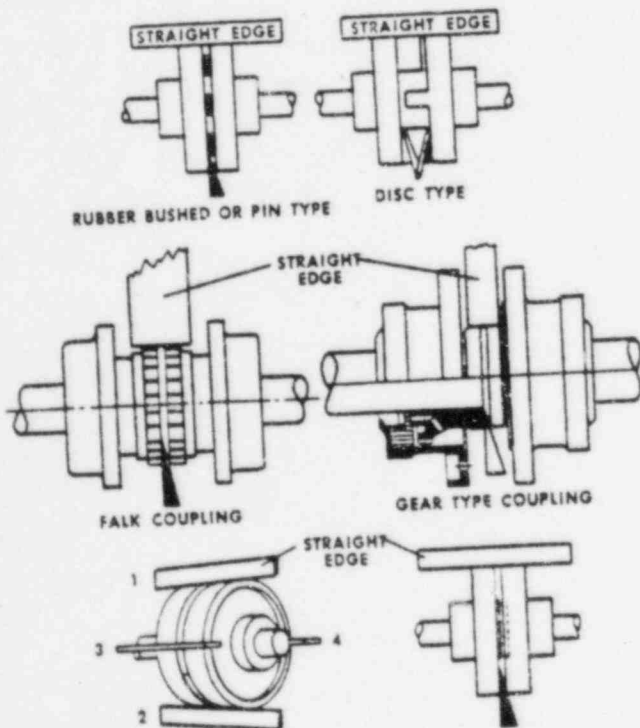
2. Angular alignment. Fasten the indicator brackets on the hubs. Rotate both shafts in unison so the four readings are taken between the same two points on the hubs. Adjust motor position until the same reading is obtained all around coupling. This equalizes the clearance or gap between the hub faces.

ANGULAR ALIGNMENT



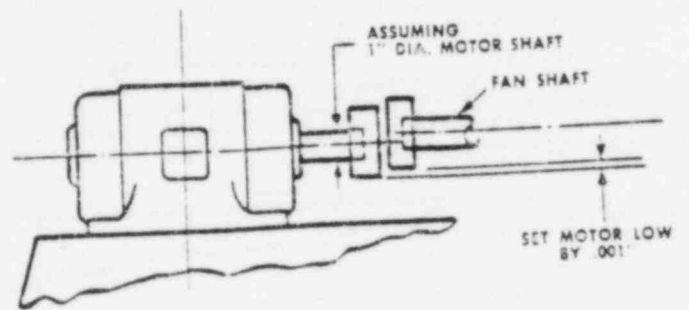
Straight Edge and Feeler Gage Method.

1. Parallel alignment. Place a straight edge across the coupling hubs. Raise or lower the motor by shimming until the straight edge lies true at top and bottom positions on the hubs. Placing the straight edge on each side of the hubs will align them in the horizontal position. Shift the motor sideways to adjust horizontally.
2. Angular alignment. The clearance between the hub faces can be equalized at four points with a steel wedge of feeler gage.



ALIGNING VARIOUS TYPES OF COUPLINGS
CHECK ALL TYPES AT FOUR POSITIONS 90° APART AS SHOWN

THERMAL EXPANSION



1. Turbines are usually set low by .001" per inch of turbine height from mounting feet to centerline of turbine shaft. This allows for expansion.
2. In cases where large motors are used, the half coupling should be set low by a few thousandths. When the driver heats up under operating conditions it will expand and bring the coupling in line. A reasonable figure must be assumed at the initial line up. A rule of thumb is .001" for each inch of motor shaft diameter and no more than 4 thousandths.
1" shaft dia. — set motor low by .001"
2" shaft dia. — set motor low by .002"
3. After fan and driver have been operating and thermal expansion is complete, recheck coupling alignment and correct if necessary.

VARIABLE INLET VANES—VIV's

Variable inlet vanes regulate fan capacity through moveable vanes in the fan inlet. A linkage joins all vanes together causing them to operate in unison when moving the control lever.

The VIV is completely assembled in the inlet bell and adjusted for proper operation at the factory. When the VIV is installed at the job site, it is ready for operation. Make sure vanes will spin air or gas in the same direction as wheel rotates.

Operate the control lever to make certain the vanes move easily from open to closed positions. This should be done **BEFORE** any inlet ductwork or inlet boxes are attached to the fan which will make the VIV inaccessible.

VIV's operated manually have a wing nut which locks the control lever in position on the quadrant. Automatic operation is accomplished by connecting a suitable control device to the VIV control lever. Double inlet fans include a connection shaft for operation of both inlets with one lever.

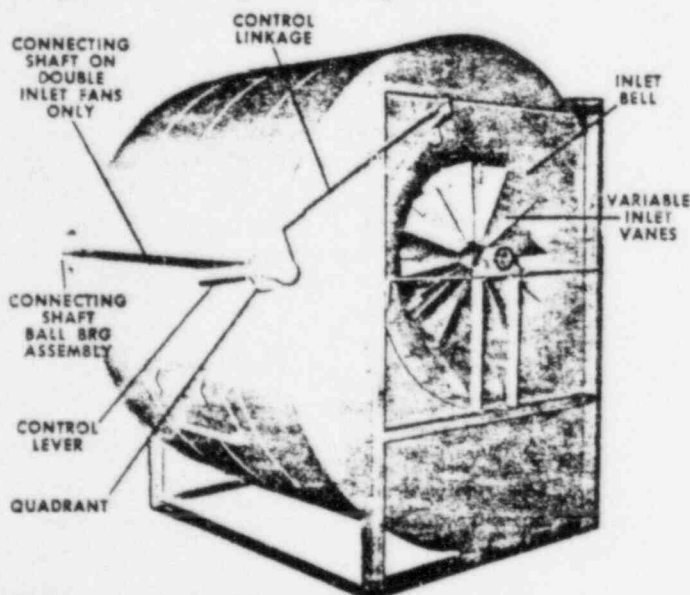
On some fans, in order to limit the horsepower, a stop is used to control the maximum open position. Do not remove this stop.

DESIGN 5 — Vanes are cantilevered with the operating mechanism inside the fan. They are easily serviced by removing the inlet bell which includes the VIV assembly. Each vane shaft is supported by two oilite bushings separated by a steel sleeve. The area between the steel sleeve and vane shaft is packed with graphite grease to prevent shaft from seizing. The vanes should be opened and closed frequently to give this grease a chance to function — especially in dusty atmospheres.

Units good up to 150°F operating temperature and 12" water gauge pressure.

DESIGN 6 & 6A — Same construction as Design 5 except they use prelubricated ball bearings instead of the oilite bushings and steel sleeve. The Design 6A VIV has the operating mechanism inside the fan completely shrouded in a dust tight cover.

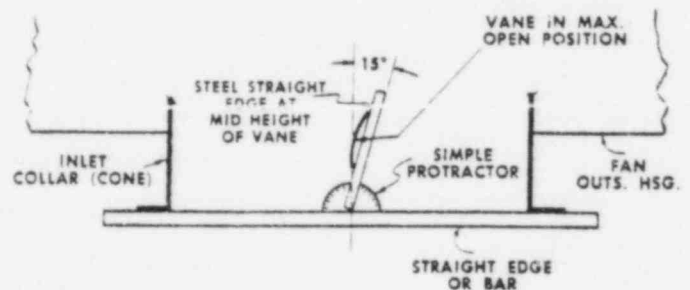
Bearings for Design 5, 6 & 6A variable inlet vanes are prelubricated prior to shipment.



MEASURING MAX. VIV OPEN POSITION

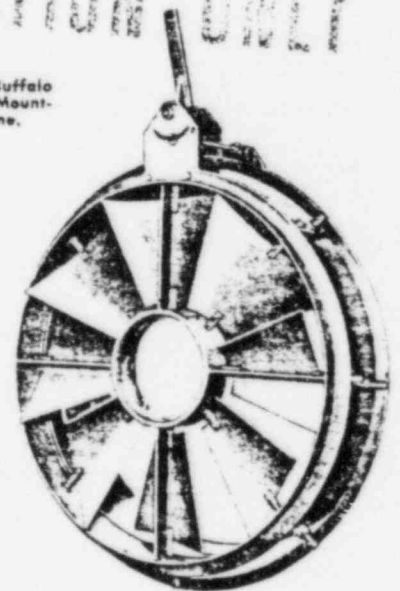
1. Loosen wing nut locking control lever to quadrant.
2. Lay straight edge or long bar across inlet.
3. At right angles to this bar, extend another straight edge into the vanes and lay it across one vane's two edges. Any vane in the inlet can be used.
4. Measure angle between edge of straight edge and fan shaft center line.
5. Sketch shows a counter-clockwise fan. For a clockwise rotating fan the 15° will be to the left of the center line instead of the right.
6. The maximum open position of the vanes must be 75° from a closed position to prevent rammimg. Stops are placed on the vanes at the factory to prevent more than a 75° open position.

NOTE: BL-Aerofoil vanes open 90° (Straight edge across vane edges will be parallel to fan shaft).



FOR INFORMATION ONLY

Ventilating Type Buffalo Variable Inlet Vane Mounted in Separate Frame.

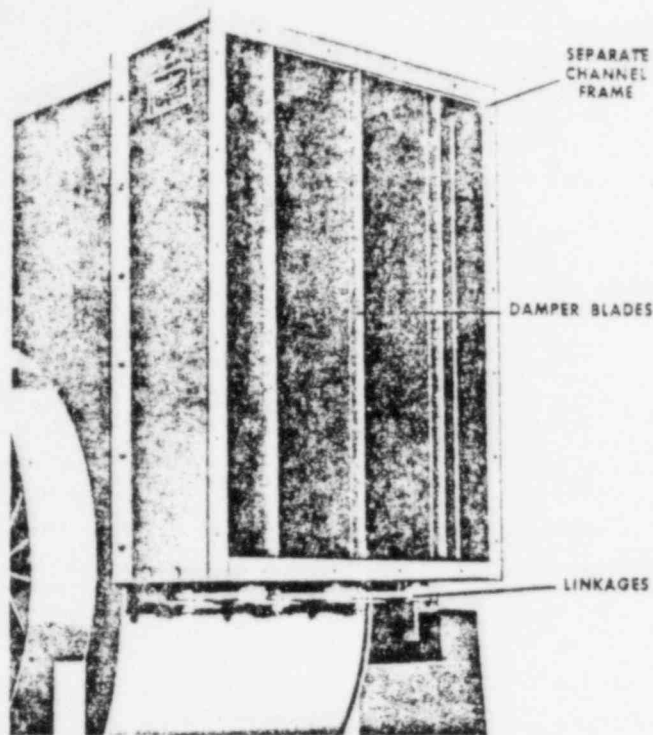


Type "HV" VIV

The center ring support with the operating mechanism completely out of the air stream allows easy servicing of parts.

The vane shafts rotate in NICE ball bearings which are designed to run dry. **DO NOT LUBRICATE BEARINGS.** The vane lever assembly should be greased occasionally through its Alemite grease fitting.

OUTLET DAMPERS



Dampers are furnished in separate channel section either structural or fabricated. It is best to close the damper when installing to prevent damage to the damper blades.

The damper blades and linkages are pre-set to give a tight fit between blades when the damper is closed. Check the damper operation to make sure all the blades operate without binding.

Dampers operated manually have a wing nut which locks the control lever in position on the quadrant. Automatic operation can be accomplished by connecting a suitable control device to the control lever of the damper.

DESIGN 4 — uses NICE series 500 ball bearings (or equal) on the blade shafts and a fabricated steel frame. This design good up to 200°F operating temperature and 6-3/4" water gauge pressure. The blades will open or close in opposite direction to the adjacent blade — Paraflow type.

DESIGN 5 — same as Design 4 except in heavier construction. Good up to 200°F operating temperature and 12" water gauge pressure.

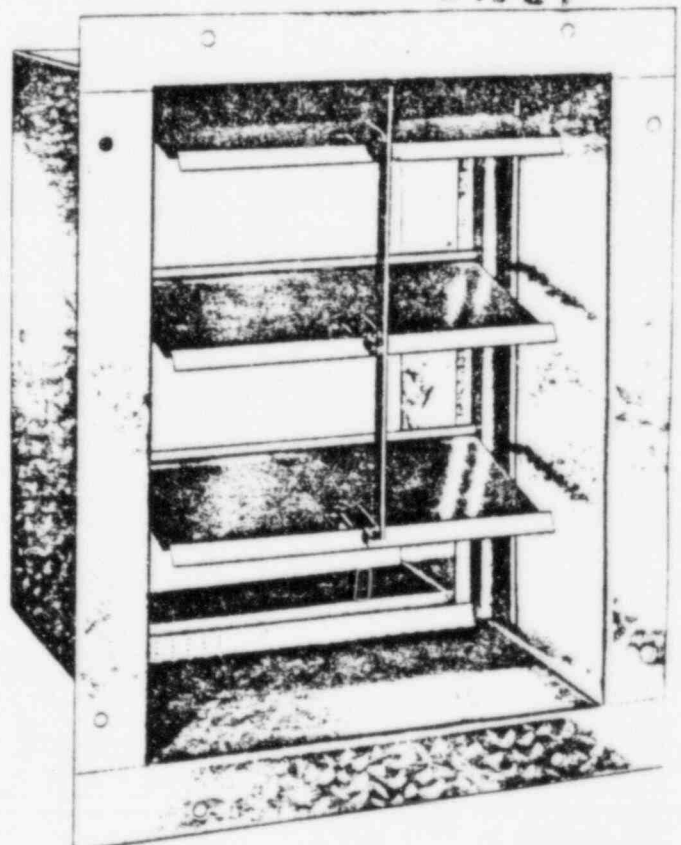
DESIGN 6 — This damper design has a welded structural steel channel frame with the blade shafts mounted in FAFNIR double grease shielded, permanently lubricated, ball bearings or equal. Good up to 250°F with the standard grease. If bearings are permanently lubricated with a silicone grease, the damper may be operable up to 450°F.

DESIGN 7 — This damper uses cast iron sleeve bearings set out from the welded structural channel frame by spacers containing two rings of braided asbestos packing. Good up to 600°F. Bearings for Design 4, 5, 6 & 7 dampers are pre-lubricated prior to shipment.

BELTED VENT SET DAMPERS

This back draft damper uses felt lined aluminum blades in an extruded aluminum frame. The blade shafts rotate in nylon bearings. Dampers are either gravity, motor or hand operated.

INFORMATION ONLY



STUFFING BOX

A stuffing box prevents air or gas from leaking out through the fan housing shaft hole. It usually has 4 rows of packing or 3 rows of packing and one grease lubricated lantern ring. In either case, the box is packed before shipment and grease added in stuffing boxes supplied with a lantern ring.

The standard packing is either Johns Manville #250 graphitized braided asbestos square packing or Johns Manville #350 plaited square packing with lead ribbon and asbestos yarns. Both good up to 3600 RPM and temperatures to 500°F. A metallic packing is used above 500°F. Replacement packing material may be obtained from Buffalo Forge. **BULK PACKING SHOULD NOT BE USED.**

If the fan is to be shut down for a considerable time, the packing should be removed from the stuffing box and the shaft and box thoroughly cleaned and slushed with a protective coating. This eliminates any possibility of pitting action and shaft seizure; keeps the wearing surfaces in good condition.

PACKING BREAK-IN

It is essential that the packing be put through a break-in period.

1. Check clearance between housing stuffing box and fan shaft with a feeler gage. The shaft must be centered in the stuffing box.
2. Check grease in the grease cup when a grease ring is supplied. Use a good grade of soap type packing grease.
3. If stuffing box is water-cooled, connect flexible water line with valve in drain return line to regulate flow. Let the water discharge to an open funnel so visual inspection will show water flowing. Adjust water flow to suit conditions.
4. Tighten the gland nuts finger tight. The packing should not be so tight that the shaft cannot be turned by hand.
5. Start the fan and run for 15 minutes. If the stuffing box gets too warm or you see smoke, stop the fan and loosen the gland.
6. If the gland cannot be loosened further, take one row of packing out of the stuffing box and coat it with light oil. Replace the gland and bring to finger tightness. Run the fan for a few hours until you can take up on the gland. Then replace the packing ring.
7. Make periodic inspections of the stuffing box.

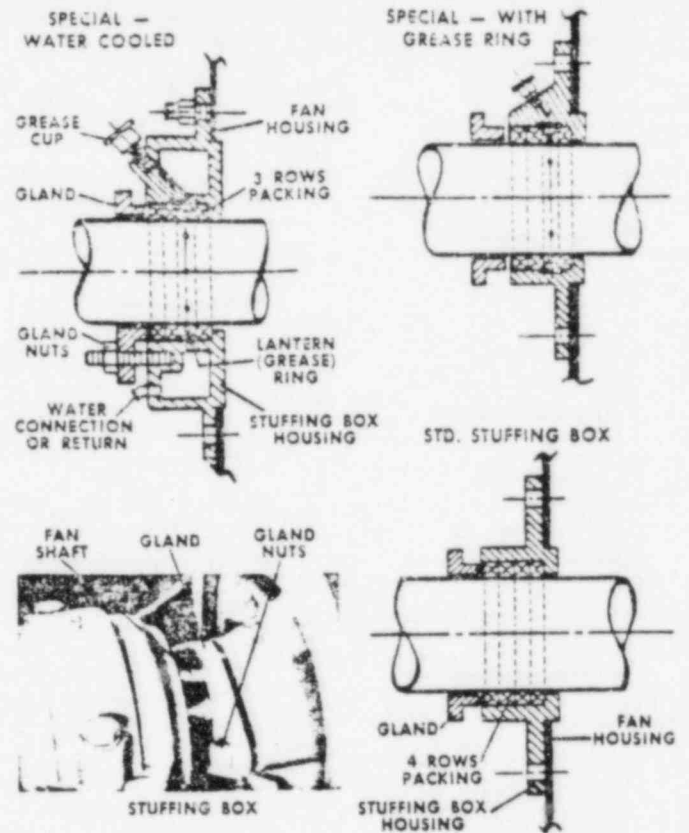
REPACKING A STUFFING BOX

1. Clean out the old packing including that below the lantern ring. Flexible packing hooks are available for removing the packing.

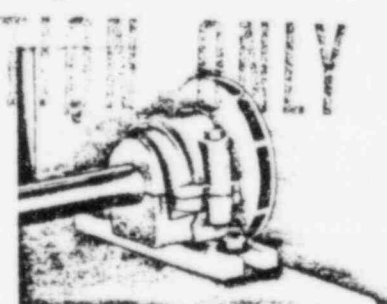
HEAT SLINGERS

A heat slinger is a split aluminum or steel rotor used on high temperature applications to help keep the bearings cool.

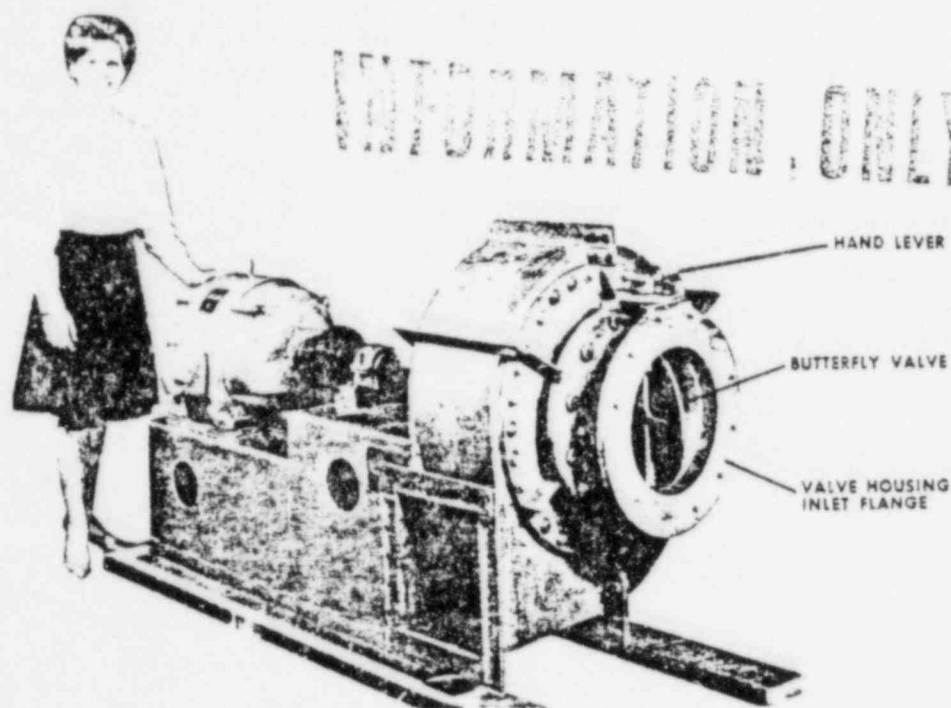
They are easily assembled by placing both halves over the shaft between the fan side pillow block and fan housing and bolting together. The assembly drawing shows their proper location.



2. Clean off any nicks or score marks found on the shaft.
3. Clean up the stuffing box housing.
4. Clean the channels and holes of the lantern ring.
5. The new packing rings should be cut to the proper length so ends come together but do not overlap.
6. Begin by installing the first ring. Grease or oil should be smeared on the I.D. of the ring to allow easy entry into the box. The entire ring could be immersed in oil before installing if desired. Start by installing one end of the ring and bring it around the shaft until it's completely inserted in the stuffing box.
7. With the aid of a split bushing, push the packing to the bottom of the box. Seat the ring firmly by replacing the gland and taking up on the bushing. Seat this bottom ring hard, because this first ring does most of the sealing.
8. Repeat this operation with each packing ring, making sure to stagger the joints 90° apart.
9. If a lantern ring is used, be sure it is properly positioned under the grease hole in the box.
10. After the last ring is installed, position the gland and take up bolts finger tight.
11. Now run the fan and follow Steps 1-7 in Packing Break-In above.



BUTTERFLY VALVES — These single vane devices control the flow of the air much the same way as the VIV. They can be controlled by a hand lever, hand wheel, chain wheel or chain lever. There are no points to lubricate on these valves. If used in a dusty atmosphere, it is advisable to open and close the valve disc once in awhile to keep shaft seals from binding.



ORDERING SPARE PARTS

Contact the local Buffalo Representative or the factory and supply the following information:

1. Fan shop order number stamped on nameplate.
2. Fan size and type stamped on nameplate.
3. Fan arrangement.
4. Description of part required.
5. Pattern number if part is a casting.
6. Special paints or coatings.

The particular fan parts lists attached to this manual will be useful in ordering.

HOUSING — does not include side plates if it is adjustable discharge. It does not include inlet cone, vanes or bearing supports if it is non-adjustable. Direction of discharge should be indicated if a non-adjustable discharge housing is ordered.

WHEEL — be sure to indicate direction of rotation of fan and type of wheel (flange, cone or paddle) and the operating speed. If the wheel is the back plate type, specify whether hub location is internal or external to the backplate. The bore and keyway dimensions are also required.

SHAFT — be sure to indicate type and make of bearings used. Length and location of shaft extensions are also required.

BEARINGS — the following information should be indicated when ordering various types of bearings:

Anti-Friction Bearings

1. State whether ball or roller
2. Manufacturer
3. Size and number
4. Fixed or floating
5. Parts required

Arrangement 2 Bearings

1. State whether ball or sleeve type
2. Size
3. Parts required

Dodge Ring Oiled Sleeve Bearings

1. Size
2. Babbitted or bronze sleeves
3. Plain or water jacketed
4. Whether fixed or floating
5. Parts required

RECOMMENDED SPARES

1. V-belts on V-belt driven fans
2. Fan bearings
3. Wheel(s) and shaft

OPERATION

BEFORE STARTUP

1. **Fastenings** — all foundation bolts, wheel hub set screws and bearing locking collars must be tight.
2. **Access doors** should be tight and sealed.
3. **Bearings** — check bearing alignment and make certain they are properly lubricated. Crack the water valve to water cooled bearings. Make sure there are no water leaks. See BEARING SECTION of this manual.
4. **Couplings** must be in alignment and lubricated if required.
5. **Fan wheel** — turn over rotating assembly by hand to see that it runs free and does not bind or strike fan housing. If wheel strikes housing, the wheel may have to be moved on the shaft or the bearing pillow blocks moved and re-shimmed. Check location of wheel in relation to fan inlets. Be sure fan housing is not distorted. See ALIGNMENT section.
6. **Driver** — check electrical wiring to the motor. See MOTOR section. Connections to a steam turbine should be made according to the manufacturer.
7. **V-belt drive** must be in alignment; with belts at proper tension. See V-BELT DRIVE section.
8. **Duct connections** from fan to ductwork must not be distorted. Ducts should never be supported by the fan. Expansion joints between duct connections should be used where expansion is likely to occur or when the fan is mounted on vibration isolators. All duct joints

should be sealed to prevent air leaks. All debris should be removed from ductwork and fan.

9. **Dampers and VIV's** should operate freely and blades close tightly. Adjust linkage to close any open blades. All dampers and VIV's should be partially closed during starting periods to reduce power requirements. This is particularly important for a fan designed for high temperature operation being "run in" at room temperature or at appreciably less than design temperature. When air is up to temperature, the damper or VIV may be opened. Completely closing dampers could cause the fan to run rough.

START-UP

10. "Bump" the motor or turbine to check for proper wheel rotation. The driver should be started in accordance with manufacturer's recommendations.
11. Fan may now be brought up to speed. Watch for anything unusual such as vibration, overheating of bearings and motors, etc. Multi-speed motors should be started at lowest speed and run at high speed only after satisfactory slow speed operation. Check fan speed on V-belt driven units and adjust motor sheave to give desired RPM. Balance system by adjusting dampers or VIV's.
12. At first indication of trouble or vibration, shut down fan and check for difficulty. See FAN TROUBLES/CORRECTION section.

INFORMATION ONLY

FAN BALANCING

Fan and blower wheels are balanced statically and dynamically by the factory and, if undamaged, should require no further balancing. Fans shipped completely assembled have had a running test to check balance.

Before any attempt is made at balancing, check other causes of vibration or unbalance as listed in the FAN TROUBLES/CORRECTION section.

Portable instruments are available that will indicate vibration displacement in mils (1 mil = 0.001 inches). The following table can be used as a guide to determine when a fan is operating with too much vibration:

TABLE I

FAN SPEED RPM	SMOOTH	FAIR	ROUGH	VERY ROUGH
600	2 mils	4 mils	8 mils	15-20 mils
900	1.5	2.75	6	8-10
1200	1.0	2	4.5	6-8
1800	0.75	1.5	3.5	5-7

The fan can also be balanced by a trial-and-error method. This is done by chalking the motor shaft on Arrangement 4 fans and the fan shaft on other arrangements.

Chalk the shaft as follows:

1. Bring the fan up to highest operating speed. If the fan and motor and bearing base are on vibration isolators, place blocks under the fan to make the isolators unoperative. The fan must be rigid while checking balance.
2. Clean the shaft by holding piece of emery cloth against rotating shaft at the housing on the drive side of single inlet fans. Double inlet fans must be chalked on both sides of the fan and balanced as if two separate wheels.
3. Hold a sharpened piece of chalk or soapstone so the point just touches the rotating shaft. The chalk will scribe a line on the shaft, the length of line indicating amount of unbalance. 3 or 4 lines should be made so an average can be taken. The chalk must be held firmly, so it will be touched only by the high spot, not allowed to "ride" the shaft. When there is unbalance, the shaft will be forced to deflect outward by the unbalanced weight, producing the highspot.
4. Stop the fan.
5. Turn wheel by hand to see how long and heavy the scribed lines show. Mark the center of the lines and place a trial weight on the

heel of the wheel blade opposite the heavy side—180 degrees away from the center mark.

6. "U" shaped or hairpin type clips can be used as trial weights; being made from sheet metal or bar stock. Weights should be made so they can be forced on the heel (inside) of a wheel blade where they will not fly off. For double inlet fans, it is a good idea to make clips in pairs.
7. Size of weight will be determined by length of lines on the shaft. Short lines will indicate fan badly out of balance and a larger weight should be used.
8. After the trial weight is placed on the heel of the blade, run the fan again and rechalk the shaft. If the scribed lines are longer and the center of the lines have not shifted from the ones scribed initially, add more weight on the same blade and run again. Repeat test runs with varying weights until the lines are scribed all around the shaft. A balance will then be obtained.
9. If the center of the lines shift from that scribed initially, move the weight forward or backward to the next wheel blade, so the center mark (heavy side) will not move from its initial position. Move weights less than 90° if vibration decreases. Move weights 180° if the lines remain in the same original position but vibration increases. When lines return to the original position, increase the weight until balance is obtained.
10. If the weight is too great, the center of the lines will shift 180° from the initial run. Reduce weight until balance is obtained; chalk line scribed all around shaft.
11. When the position and amount of weight are established, the trial weights, or equal weights, may be welded or riveted to the wheel, preferably on the outside of the flange or backplate. The weight of the weld bead or rivets should be taken into account.
12. If chalk marks extend all the way around the shaft but considerable vibration persists, a weak foundation or loose bolts might be the trouble.

A fan handling clean air should not need balancing once it is balanced. Dust build-up on fan blades or wear can unbalance the fan. Periodic inspection of the fan should be made to determine amount of dust build-up or wear.

INFORMATION ONLY

MAINTENANCE

1. A definite time schedule for inspecting all rotating parts should be established. The frequency of inspection depends on the severity of operation and the location of the equipment.
2. Fan Bearing and flexible coupling alignment should be checked at regular intervals. Misalignment can cause overheating, wear to bearing dust seals, bearing failure and unbalance.
3. Fan Bearings should be lubricated at regular intervals. Periodic inspections will be necessary. If oil lubrication is used and the oil becomes dirty or cloudy, it should be drained and the bearing flushed with mineral oil. Drain the mineral oil and add new lubricant. If grease is used and the grease is breaking down, flush the bearing out and re-grease to 1/3 full. See section on Bearing Lubrication & Cleaning.
4. Bearings on high speed fans tend to run hot — 50° to 75° above ambient. Do not replace a bearing because it feels hot to the touch. Place a contact thermometer against the bearing pillow block and check the temperature.
Ball or roller bearing pillow blocks can have total temperatures of 165°F (74°C) and ring oiled sleeve bearings may go up to 150°F (65.5°C) running temperature before the cause of high temperature be investigated. Water cooled sleeve bearings will run satisfactorily up to 110°F (43°C).
5. **All metal couplings** such as Falk Steelflex, Fast gear type and Waldron gear type couplings require periodic lubrication inspections. Lubricant should be maintained at proper level and be free of contaminants. Grease is recommended for operating periods exceeding six months. If oil is used re-lubricate at six month intervals for normal operation. Other conditions such as very slow speeds, ambient temperatures above 150°F and severe environments should be referred to the coupling manufacturer for specific recommendations.

In the absence of coupling manufacturers lubrication instructions, the following can be used for normal conditions with ambient temperatures below 150°F:

OILS: Use a mineral base oil having a viscosity no lighter than 150 ssu. Gear oil SAE 140 or #8AGMA oil is suitable.

GREASES: ESSO Fibre Grease C —
ESSO Standard Oil Co.
Atlantic Lubricant #17 —
Atlantic Refining Co.
Shell Alvania Grease #2 —
Shell Oil Co.
Litholine Multi-Purpose Grease
Sinclair Refining Co.
Marfak #1 Grease —
The Texas Co.

This grease list is far from complete. Equivalent lubricants by other manufacturers can be used.

To re-lubricate, remove both lube plugs (only one on Falk coupling — other plug is a grease fitting) and add lubricant until excess runs out lower opening. Replace lube plugs.

Other flexible couplings such as Thomas discring, T. B. Wood's rubber insert, Poole's rubber insert and Buffalo Forge's rubber bushed couplings do not need lubrication. Rubber bushed couplings should be inspected for wear of pins and bushings.

6. Foundation bolts and all set screws should be inspected for tightness.
7. Fans should be inspected for wear and dirt periodically. The wheel might have to be cleaned. A wash down with steam or water jet is usually sufficient. Cover the bearings so water won't enter the pillow block. Dirt piled in the housing should be removed. Fan wheels having badly worn blades should be replaced or rebuilt. Where wear is severe in spots, the worn places may be built up by welding, but be careful to prevent heating distortion. Rebuilt or repaired wheels require careful balancing before being returned to service. See Fan Balancing section.
8. On V-belt drives check belt wear, alignment and proper belt tension. Replace belts when necessary with all new belts. New belts will not work properly in conjunction with used belts due to difference in length. Always use matched belts.
9. If excessive vibration or bearing temperature occurs, it might be due to unbalance, misalignment, loose belts, poor lubrication, dirt build-up on the wheel, etc. **DO NOT PERMIT VIBRATION.**

MAINTENANCE (CONT.)

10. Repainting of exterior and interior parts of fans and ducts will extend the service life of the installation. Select a paint which will withstand the operating temperature. For normal temperature, a good machinery paint may be used. If moisture is excessive or if fans are exposed to the weather, bitumastic paint is suitable. Corrosive fumes require all internal parts to be wire brushed, scraped clean and repainted with an acid resisting paint. Competent advice should be secured when corrosive fumes are present.
11. Never run the fan at a higher speed than it was designed for unless you check Buffalo Forge first. The higher speed may be over the critical speed of the rotating parts, causing severe damage. Also, the power required by the fan may increase enough to overload and burn out the motor.
12. Re-grease or lubricate motor or turbine bearings according to the manufacturer's recommendations. **DO NOT OVER LUBRICATE.** Motor manufacturer's lubrication recommendations are printed on tags attached to the motor. Should these tags be missing, the following will apply:

A. FRACTIONAL HORSEPOWER SLEEVE BEARING MOTORS -

1. Under normal operation at ordinary temperatures and clean surroundings after 3 years of service. Then lubricate annually with electric motor or SAE 10 oil.
2. Under continuous operation at higher temperatures (but not to exceed 104°F ambient) after one year of service. Then lubricate annually with electric motor or SAE 10 oil.

B. FRACTIONAL HORSEPOWER BALL BEARING MOTORS -

1. Under normal conditions, ball bearing motors will operate for five years without re-lubrication. Under continuous operation at higher temperatures (but not to exceed 104°F ambient) re-lubricate after 1 year. To re-lubricate where motors are not equipped with pressure fittings, disassemble motor and clean the bearings and housings thoroughly. Repack each bearing and fill cavity in

back of bearing 1/3 full with ball bearing grease.

C. INTEGRAL HORSEPOWER BALL BEARING MOTORS -

1. Motors having pipe plugs or grease fittings should be re-lubricated while warm and at stand still. Replace one pipe plug on each end shield with grease fitting. Remove other plug for grease relief. Use low pressure grease gun and lubricate until new grease appears at grease relief. Allow motor to run for 10 minutes to expel excess grease. Replace pipe plugs.
2. Motors not having pipe plugs or grease fittings can be re-lubricated by removing end shields, cleaning grease cavity and refilling 3/4 of circumference of cavity.
3. Recommended re-lubrication intervals—general guide only.

TABLE II

MOTORS ONLY

HP RANGE	STANDARD DUTY 8 HRS. A DAY	SEVERE DUTY 24 HR. DAY Dirty, Dusty	EXTREME DUTY VERY DIRTY High Ambients
1 1/2 - 7 1/2	5 yrs.	3 yrs.	9 mos.
10-40	3 yrs.	1 yr.	4 mos.
50-150	1 yr.	9 mos.	4 mos.

4. These ball bearing greases or their equivalents are satisfactory for ambients from -15°F to 130°F. For motors:
 - Mobilplex EP #1 - Socony Mobil Oil Co.
 - Alvania grease #2 - Shell Oil Co.
 - Andok B grease - Esso Standard Oil Co.
 - Prestige #42 grease - Sun Oil Co.
13. Blow out open type motor windings with low pressure air to remove dust or dirt. Air pressures above 50 psi. should not be used as high pressures may damage insulation and blow dirt under loosened tape. Dust can cause excessive insulation temperatures.
14. Make certain motor is not overloaded. Check amps with nameplate.
15. **KEEP MOTORS DRY.** Where motors are idle for a long time, single phase heating or small space heaters might be necessary to prevent water condensation in windings.

INFORMATION ONLY

FAN TROUBLES / CORRECTION

In the event that trouble is experienced in the field, listed below are the most common fan difficulties. These points should be checked in order to prevent needless delay and expense of factory service.

1. CAPACITY OR PRESSURE BELOW RATING

- a. Total resistance of system higher than anticipated.
- b. Speed too low.
- c. Dampers or variable inlet vanes not properly adjusted.
- d. Poor fan inlet or outlet conditions.
- e. Air leaks in system.
- f. Damaged wheel.
- g. Incorrect direction of rotation.
- h. Wheel mounted backwards on shaft.

2. VIBRATION AND NOISE

- a. Misalignment of bearings, couplings, wheel or V-belt drive.
- b. Unstable foundation.
- c. Foreign material in fan causing unbalance.
- d. Worn bearings.
- e. Damaged wheel or motor.
- f. Broken or loose bolts and set screws.
- g. Bent shaft.
- h. Worn coupling.
- i. Fan wheel or driver unbalanced.
- j. 120 cycle magnetic hum due to electrical input. Check for high or unbalanced voltage.
- k. Fan delivering more than rated capacity.
- l. Loose dampers or VIVs.
- m. Speed too high or fan rotating in wrong direction.
- n. Vibration transmitted to fan from some other source.

3. OVERHEATED BEARINGS

- a. Too much grease in ball bearings.
- b. Poor alignment.
- c. Damaged wheel or driver.
- d. Bent shaft.
- e. Abnormal end thrust.
- f. Dirt in bearings.
- g. Excessive belt tension.

4. OVERLOAD ON DRIVER

- a. Speed too high.
- b. Discharging over capacity due to existing system resistance being lower than original rating.
- c. Specific gravity or density of gas above design value.
- d. Packing too tight or defective on fans with stuffing box.
- e. Wrong direction of rotation.
- f. Shaft bent.
- g. Poor alignment.
- h. Wheel wedging or binding on inlet bell.
- i. Bearings improperly lubricated.
- j. Motor improperly wired.

FOR INFORMATION ONLY

LUBRICATION OF ANTI-FRICTION BEARINGS

Bearings on assembled fans receive their initial lubrication at Buffalo Forge. Bearings shipped separate from the fan or as replacements are almost never lubricated before shipping, except prelubricated types such as the Fafnir RAK. When there is the slightest doubt, the safe practice is to assume that the bearing has not been lubricated. For lubrication type refer to page 32.

GREASE LUBRICATION

For grease lubricated ball or roller bearing pillow block, a good grade of grease, free from chemically or mechanically active material should be used.

These greases are a mixture of lubricating oil and a soap base to keep the oil in suspension. They have an upper temperature limit where oil and soap base oxidize and thermally decompose into a gummy sludge.

Separate lube data sheets list the lubricant installed at the factory in the particular bearings furnished on your Buffalo fan. For best results, use the same grease when relubricating. Mixing of different lubricants is not recommended. If necessary to change to a different grade, make, or type of lubricant, flush bearings thoroughly before changing. Regreasing will vary from 3 months to a year depending upon hours of operation, temperature and surrounding conditions. Special greases may be required for dirty or wet atmospheres (consult your lubricant supplier).

When grease is added, use caution to prevent any dirt from entering the bearing. The pipe plug or grease relief fitting should be open when greasing to allow excess grease to flow out. The pillow block should be about 1/3 full, as excess grease may cause overheating. Use low pressure grease gun.

OIL LUBRICATION

Oil lubricated ball or roller bearings should use mineral oils, free from water sediment, acid, resin and other substances not derived from petroleum products. Where possible, the viscosity at the operating temperature should be at least 70 Saybolt Universal Seconds (SUS) for ball bearings and 100 SUS for spherical roller bearings. Information regarding change in viscosity should be obtained from the oil supplier.

Oil lubricated bearings have an oil sight gauge or oil cup attached to the pillow block housing. With fan **stopped**, add oil until level is 1/4" below cap of oil cup (to prevent oil loss by capillary action) or until oil is at level mark indicated on

the sight gauge. Oil cup must be on down side of bearing rotation.

When not possible to stop fan to check oil level or add oil, an operating oil level must be determined. With oil at proper level, start and run fan until oil temperature stabilizes. Then mark operating oil level on indicator. The minimum safe operating oil level is 1/8" below the established operating oil level.

When the oil has been changed or on initial start-up of the fan, the unit should be brought up to speed and then stopped so the oil level can be rechecked. Then the fan can go into regular service.

A separate lube data sheet for your fan lists recommended oils (or equivalents) for normal operating conditions. Frequency of oil additions or changes depend primarily on the speed and temperature at which bearing operates. Deterioration of oil is caused by heat, oxidation, catalytic reactions and dirt or water contamination. Therefore, periodic oil changes must be made. Oil changes should be made when the oil becomes dirty or cloudy.

For unusual operating conditions such as extremely dirty or wet atmospheres, consult your lubricant supplier.

Frequency of Relubrication:

The frequency of relubrication to avoid corrosion and to aid in the purging out of any solid or liquid contaminants is difficult to establish as a hard and fast rule since it can vary considerably for various types of applications. It is advocated that the best approach to the frequency of relubrication is for the user to conduct an experimental test program where possible for his particular type or piece of equipment or obtain this information through accumulation of field experience. This experimental phase can be accomplished by relubricating the bearings at pre-established intervals and observe the condition of the grease as it is purged out of the seals or by periodic examination of the grease in the housing. The average type of application where

LUBRICATION OF ANTI-FRICTION BEARINGS (Cont.)

the environmental conditions are clean and the bearings subjected to normal room temperature only can quite often be successfully lubricated every three or four months to a period of six months. On the other hand, the exposure of bearings to either dirty or contaminated operating conditions of high temperatures will require that they be relubricated at more frequent intervals. A tentative relubrication guide based on variable environmental and operating temperature conditions is tabulated at right:

OPERATING CONDITION		BEARING OPERATING TEMPERATURE	GREASING INTERVALS
Dirt Fairly clean	Moisture None	32°F. to 120°F.	6 to 12 months
		120°F. to 160°F.	1 to 12 months
Moderate to extremely dirty	Moisture None	160°F. to 200°F.	1 to 4 weeks
		32°F. to 160°F.	1 to 4 weeks
Fairly clean	Heavy moisture & direct water splash	160°F. to 200°F.	1 week
		32°F. to 200°F.	1 week

STANDARD GREASE
LUBRICANT FOR BEARINGS

NAME AND TYPE OF GREASE USED IN BEARINGS FURNISHED WITH BUFFALO FORGE CO. EQUIPMENT

BEARING MFR.	BEARING TYPE	GREASE	GREASE BASE
FAFNIR	LAK, RAK, LCJ, RCJ, LCJO, RCJO, RSAO.	SHELL ALVANIA #3	LITHIUM
	SAOL	MOBIL MOBILUX #2	LITHIUM
	MUOA-IN B.F. CO. ARR. #2 PILLOW BLOCK	MOBIL MOBILUX #2	LITHIUM
	G-KRR-IN B.F. CO. ARR. #2 TRIPOD BLOCK	MOBIL MOBILUX #2	LITHIUM
LINKBELT	SERIES 200 & 300 B-22400 & B-22500	MASTER LUBRICANTS CO. LUBRIKO M32	SODIUM
	SERIES 6800 & 6900	MOBIL MOBILUX #2	LITHIUM
SEALMASTER	ALL TYPES	SOCONY-MOBIL ARMVAC #781	LITHIUM
SKF	SYR, FYR	SHELL ALVANIA #2	LITHIUM
	SY, FY	SHELL ALVANIA #3	LITHIUM
	SAF-22500 SAF-22600 SAF-1500 SAF-1600 SAF-22200 SAF-22300	MOBIL MOBILUX #2	LITHIUM

It is recommended that the same grease be used during relubrication. If not available, consult your local bearing or lubrication representative for a recommendation of a compatible grease.

The greases shown in this table are those applied to standard bearings for normal applications.

LUBRICATION OF ANTI-FRICTION BEARINGS (Cont.)

For normal service conditions the following table should be used as a guide for oil selection:

BALL BEARING		SPHERICAL ROLLER BEARING	
BEARING OPERATING TEMPERATURE	* OIL	BEARING OPERATING TEMPERATURE	* OIL
100-140° F	SAE 10	100-120° F	SAE 10
160° F	SAE 20	140° F	SAE 20
180° F	SAE 30	160° F	SAE 30
200° F	SAE 40	180° F	SAE 40
		200° F	SAE 50

* It is recommended to use a high grade turbine oil which includes an oxidation inhibitor.

LUBRICATION OF SLEEVE BEARINGS

Dodge sleeve bearing pillow blocks shipped mounted on assembled fan have oil added at the factory. The oil level should be checked before startup. Sleeve bearings shipped separate from fan do not have oil in them. Fill to top of red circle in oil gauge with good grade of turbine oil having suitable rust and oxidation inhibitors. After placing in operation, remove inspection covers and check oil rings to see that they are rotating freely and bringing up oil.

Temperature on Dodge plain sleeveoil pillow blocks reach 10 to 70° F above room temperature; decrease as operation continues.

Observe operation frequently first few days. If noise develops, check alignment of pillow block housing, collar runout, plunger screw and all operating parts.

A separate lube data sheet for your fan lists recommended oils (or equivalents) for normal operation. Additions or changes depend upon speed and temperature of operation. Oil should be changed when it becomes cloudy or dirty. If questionable, change it. As temperatures or speeds increase, heavier oils are desirable. For unusual or severe conditions, consult your lubricant supplier.

DODGE SLEEVEOIL GENERAL DATA

TABLE VIII

SIZE	COOLING WATER IF REQUIRED (gals. per min.)	OIL SUMP CAPACITY (pints)	WATER PIPE SIZE (inches)		THRUST COLLAR CLEARANCE (thousandths)	
			BABBITT LINER	BRONZE LINER	BABBITT LINER	BRONZE LINER
1-7/16	—	3/8	—	—	8-12	—
1-11/16	.5	1/2	1/4	—	8-12	—
1-15/16	.55	1/2	1/4	—	8-12	—
2-3/16	.6	5/8	1/4	—	8-12	—
2-7/16	.75	15/16	1/4	—	8-12	—
2-11/16	1.0	1-1/8	1/4	—	8-12	—
2-15/16	1.25	1-1/8	1/4	—	8-12	—
3-7/16	1.5	2-1/16	1/4	—	8-12	—
3-15/16	1.75	3-1/8	1/2	1	8-12	9-14
4-7/16	2.25	4	1/2	1	8-12	9-14
4-15/16	2.5	5-5/8	1/2	1-1/4	8-12	10-15
5-7/16	3	6-1/4	1/2	1-1/4	8-12	10-16
6	4	8-1/4	3/4	1-1/4	8-12	12-18
7	5	15	3/4	1-1/4	8-12	14-20
8	6.5	20	3/4	1-1/4	8-12	16-22
9	8	20 (24 w.c.)	1-1/4	2	8-12	16-22
10	9	20 (40 w.c.)	1-1/2	2-1/2	8-12	16-22

SALES REPRESENTATIVES

ALBANY, NY

ALLENTOWN, PA

ATLANTA, GA

(BALTIMORE)

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(BOSTON) WAKEFIELD, MA

BUFFALO, NY

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CINCINNATI, OH

CLEVELAND, OH

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LOUISVILLE, KY

MEMPHIS, TN

MIAMI, FL

MILWAUKEE, WI

MINNEAPOLIS, MN

NEW ORLEANS, LA

(NEW YORK) DARIEN, CT

(NORTHERN NEW JERSEY)

PLUCKEMIN, NJ

OKLAHOMA CITY, OK

(PHILADELPHIA)

WYNNWOOD, PA

PHOENIX AZ

PITTSBURGH, PA

RICHMOND, VA

ROCHESTER, NY

ST. LOUIS, MO

SALT LAKE CITY, UT

SAN ANTONIO, TX

(SAN FRANCISCO)

EMERYVILLE, CA

(SEATTLE) BELLEVUE, WA

SYRACUSE, NY

TAMPA, FL

TOLEDO, OH

TULSA, OK

(WASHINGTON) ROCKVILLE, MD

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EDMONTON, ALTA.

HAMILTON, ONT.

KITCHENER, ONT.

MONTREAL, QUE.

OTTAWA, ONT.

SAINT JOHN, N.B.

SARNIA, ONT.

SASKATOON, SASK.

TORONTO, ONT.

VANCOUVER 10, B.C.

WINNIPEG, MAN.

In Mexico:

GUADALAJARA, JAL.

MEXICO CITY, D.F.

MONTERREY, N.L.

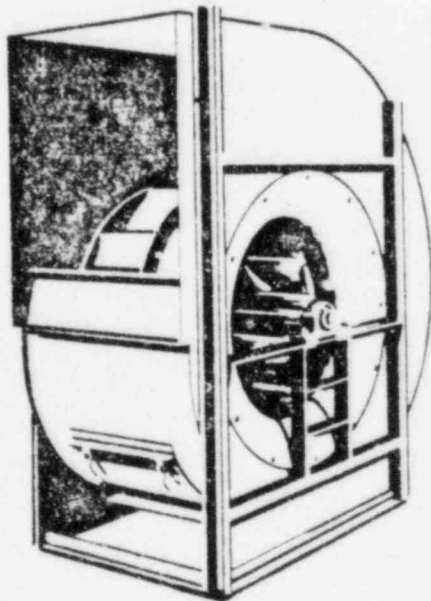
Buffalo Air Handling Equipment to —

Move • Heat • Cool • Humidify • Dehumidify and clean air and other gases —

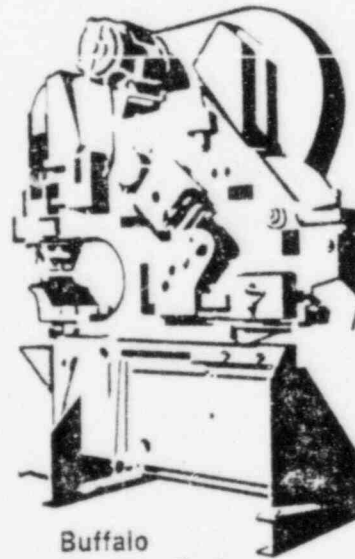
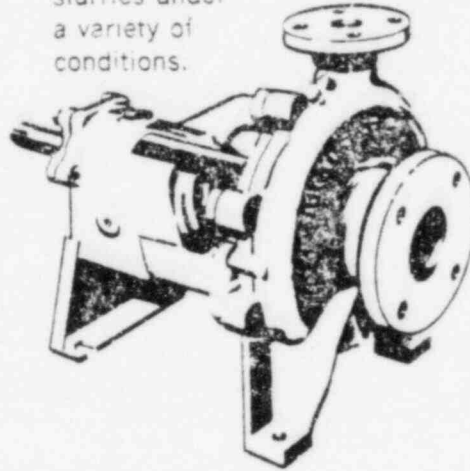
FANS • Centrifugal • Axial Flow • Propeller • Industrial Process • Heavy Duty.

ROOF VENTILATORS

CABINETS • Air Conditioning • Heating and Ventilating • Air Pollution Control • Scrubbers • Dust Collectors • Air Washers • Humidifiers • Dehumidifiers, etc.



Buffalo Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.



Buffalo Machine Tools to Drill • Punch Shear • Slit • Notch and Cope for production and/or plant maintenance.

INFORMATION ONLY



buffalo forge company

AIR HANDLING DIVISION/BUFFALO, NEW YORK 14240
Canadian Blower/Canada Pumps, Ltd./Kitchener, Ont.
Buffalo Forge S.A. de C.V./Tepic/Coahuila, Mexico

P.O. 403558



RECOMMENDED

safety practices

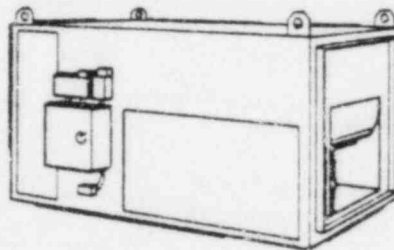
FOR AIR MOVING DEVICES



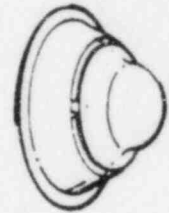
AMCA

PUBLICATION 410

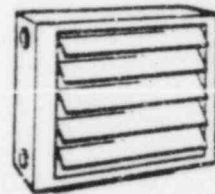
AMCA CAN ONLY



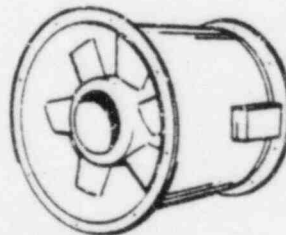
MAKE-UP AIR UNIT



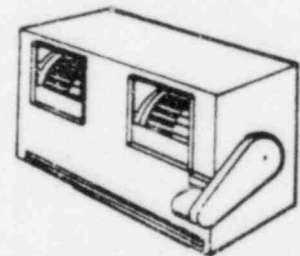
WALL EXHAUSTER



UNIT HEATER



AXIAL FAN



CENTRAL STATION UNIT

Fans and other air moving devices are made in a wide variety of types, sizes and arrangements. Properly used they help create a better environment for human comfort—both indoors and outdoors.

Improperly used or installed they become a potential danger to life and limb.

This guide is intended to assist in the safe installation of air moving equipment and to warn operating and maintenance personnel of some of the hazards associated with this equipment.

SAFETY
WARNING
READ CAREFULLY
BEFORE USING
ELECTRIC TOOLS
ALWAYS USE
PROPER
SAFETY
PRACTICES
AND
ELECTRIC
SAFETY
PRACTICES
ALWAYS
USE
PROPER
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PRACTICES
AND
ELECTRIC
SAFETY
PRACTICES

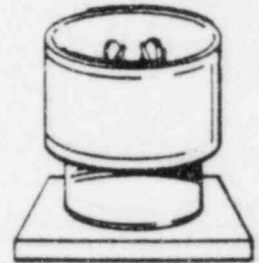


EBASCO SERVICES, INC.

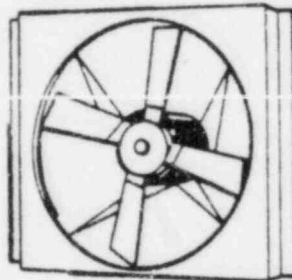
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JAN 1 1979

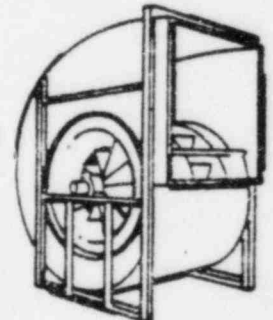
DOCUMENT CONTROL DEPT.
WATERFORD 3 FIELD



UPBLAST ROOF EXHAUSTER



PROPELLER FAN



CENTRIFUGAL FAN



POWER ROOF VENTILATOR

Installation should always be performed by experienced and trained personnel. In addition to following the manufacturer's installation instructions, care must be taken to insure compliance with federal, state and local government requirements.

RECEIVED
JAN 1 1979
DOCUMENT CONTROL DEPT.
WATERFORD 3 FIELD

FAN GUARDS

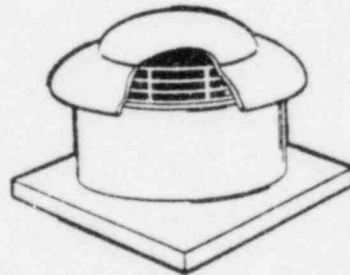
All fans have moving parts which require guarding in the same way as other moving machinery.

Because fan guards are often located in the airstream they must be designed to reduce the fan's performance as little as possible.

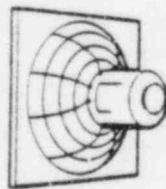
In areas which are accessible only to experienced and trained personnel, a standard industrial type guard may be adequate. This type of guard will prevent the entry of thrown or dropped objects with the minimum restriction of airflow.

Where the fan is accessible to untrained personnel or the general public, maximum safety guards should be used, even at the cost of some loss of performance. Fans located less than 7 feet above the floor require special consideration as specified in the Occupational Safety and Health Act.

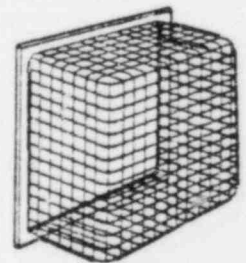
Even roof mounted equipment will require guards when access is possible, for example, by climbing children.



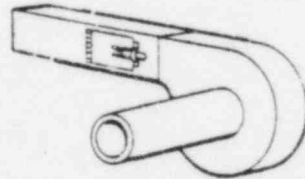
BIRD SCREEN ON ROOF VENTILATOR



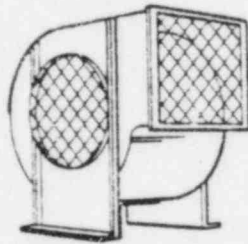
INDUSTRIAL TYPE GUARD
FOR PROPELLER FAN



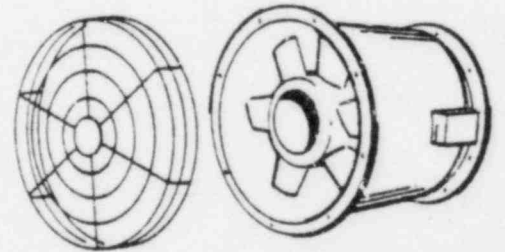
MAXIMUM SAFETY GUARD
FOR PROPELLER FAN



CENTRIFUGAL FAN PROTECTED BY DUCTWORK



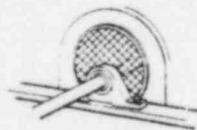
INLET AND OUTLET GUARDS
ON CENTRIFUGAL FAN



INLET GUARD FOR AXIAL FAN

INLET AND OUTLET GUARDS

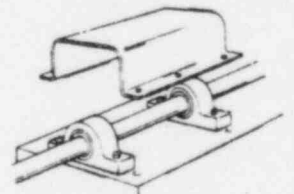
Axial and centrifugal fans are usually connected directly to ductwork which will prevent contact with the internal moving parts, but when the inlet or outlet is exposed a suitable guard should be installed.



HEAT SLINGER GUARD



DRIVE COUPLING GUARD



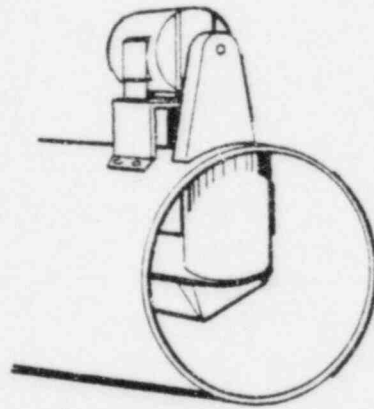
BEARING GUARD

DRIVE GUARDS

Fans may be driven directly from the motor shaft or through a belt drive. In every case where the bearing assembly, rotating shaft, sheaves, or belts are exposed a suitable guard should be provided.

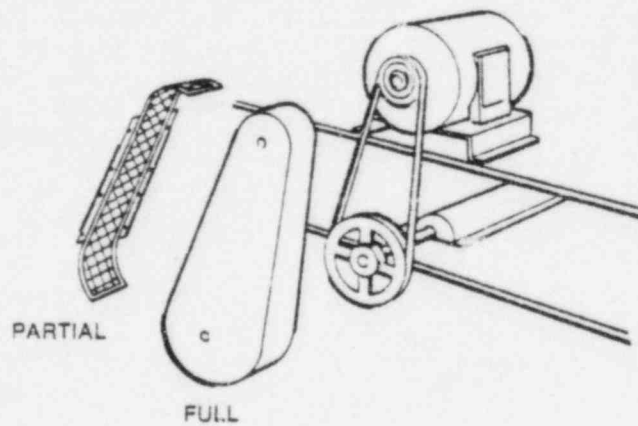
INFORMATION ONLY

Even on tubular or axial fans where only part of the drive is exposed a partial guard should be installed.



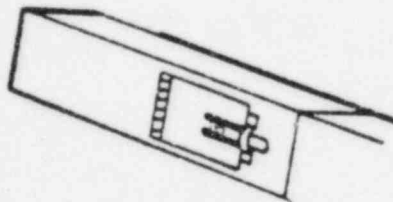
BELT AND BEARING GUARDS — AXIAL FAN

In restricted access areas one sided guards of expanded metal may be acceptable. Readily accessible locations may require maximum protection guards and even, in some cases, a fully enclosed sheet metal guard. In these cases the loss of fan performance must be weighed against the degree of safety provided.

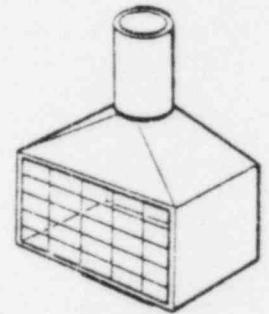


BELT GUARDS

FOR INFORMATION ONLY



ACCESS DOOR IN DUCT



SPECIAL PURPOSE
INTAKE SCREEN

THE HIDDEN DANGER

In addition to the normal dangers of rotating machinery, fans present an additional hazard in their ability to suck in not only air but loose material as well. Solid objects can pass through the fan and be discharged by the wheel as potentially dangerous projectiles.

Intakes to ductwork should, whenever possible, be screened to prevent the accidental entrance of solid objects. For example, on a sawdust handling system an intake screen should be provided which will allow the entry of sawdust but prevent the entry of chunks of wood.

Access doors to a duct system should never be opened with the fan running.

On the downstream (or pressure) side of the system, releasing the door with the system in operation may result in an explosive opening. On the upstream (or suction) side the inflow may be sufficient to suck in tools and clothing, etc., and may even cause a man to lose his balance. Where quick release handles are provided on access doors at least one positive bolt should be installed to prevent accidental opening.

When a fan is being started up for the first time, a complete inspection should be made of all of the ductwork and the interior of the fan as well to make certain there is no foreign material which can be sucked into or blown through the ductwork.

START UP CHECK LIST

Before putting any fan into operation the following check list should be completed.

1. Lock out primary & secondary power source.
2. Make sure installation is in accord with manufacturer's instructions.
3. Check & tighten all hold down (securing) bolts.
4. Spin wheel to see if rotation is free and does not bind or rub.
5. Inspect wheel to see if it is the proper rotation for the fan design.
6. Check all set screws and tighten if necessary.
7. Check v-drive or coupling for alignment—use recommended belt tension.
8. Check v-drive for proper sheave selection and make sure they are not reversed or the fan could run to excessive speeds.
9. Make certain there is no foreign loose material in ductwork leading to and from fan or in fan itself.
10. Properly secure all safety guards.
11. Secure all access doors to fan and ductwork.
12. Switch on electrical supply and allow fan to reach full speed.
13. Check carefully for:
 - (A) Correct wheel rotation
 - (B) Excessive vibration
 - (C) Unusual noise

If any problem is indicated SWITCH OFF IMMEDIATELY. Lock out the electrical supply, check carefully for the cause of the trouble and correct as necessary.

Even if the fan appears to be operating satisfactorily, shut down after a brief period and recheck items 3 through 11 as the initial start up may have relieved the tightness of bolts and set screws.

INFORMATION

The fan may now be put into operation but, during the first eight hours of running it should be periodically observed and checked for excessive vibration and noise. At this time checks should also be made of motor input current and motor and bearing temperatures to insure that they do not exceed manufacturer's recommendations.

After eight hours of satisfactory operation, the fan should be shut down and the power locked out to check the following items and adjust if necessary.

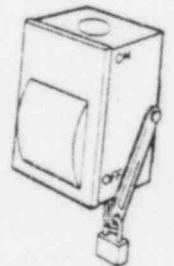
1. All set screws and hold down bolts.
2. Drive coupling alignment.
3. V-drive alignment.
4. V-drive belt tension should be readjusted to recommended tension.



REMOTE SWITCH



LOCK CARRIED BY
MAINTENANCE PERSONNEL



DISCONNECT SWITCH

ELECTRICAL ISOLATION

Every fan must be provided with a disconnect switch which will allow it to be isolated completely from the electrical supply.

Most roof mounted fans and many others are started by remote switches or push-buttons, by interlocks with other equipment, or by automatic controls.

In these cases a disconnect switch must be provided close to the fan so that maintenance personnel can "positively" cut off the power when working on the fan.

In some installations other equipment, such as gas burners, may be interlocked with the fan so that disconnecting the fan will automatically shut off the burner or other device. Maintenance on systems of this type should be performed only under the supervision of competent engineering personnel.

REVERSE
FAN
MOTOR
ELECTRICAL
ISOLATION
DISCONNECT
SWITCH
REMOTE
CONTROL
PUSH-BUTTON
INTERLOCK
AUTOMATIC
CONTROL

SPECIAL PURPOSE SYSTEMS

Fans which are used to move anything other than clean air at normal temperatures (say up to 150°F) may require special precautions to insure safe operation. Explosive or toxic fumes or gases, transported solids, high temperatures and corrosive contaminants will present special hazards which must be carefully considered. All federal, state and local codes should be reviewed together with any available national and industry standards which are applicable. The fan manufacturer's recommendations for the specific type of application should also be closely followed.

Where the system will handle explosive or inflammable fumes or gases fans of spark-resistant construction should be used. AMCA Standard 401-66 defines the industry's standard types of spark-resistant construction and should be consulted when specifying fans for this use.

If the fan is handling toxic or explosive fumes—even in traces—care must be taken to insure that fumes have not collected in areas which require access by workmen. Concentrations of fumes can collect in "air trap" areas, particularly when a system is shut down.

Material handling fans are specially designed to allow the fan to handle a specific type of material without excessive accumulation of material on the fan wheel. To insure satisfactory operation it is essential to observe the manufacturer's limitations concerning the type of material to be handled by the fan.

Fan ratings and maximum speed limits are based on the use of air at 70°F. At temperatures above the normal range (above, say 150°F) a reduction must be made in the maximum speed limit. Information on this reduction and on other precautions to be taken for high temperature applications should be obtained from the fan manufacturer.

Corrosive contaminants can be formed when moisture combines with an active airborne chemical. Unprotected fans subjected to corrosive attack will eventually fail but suitable protective coatings or material used in the fan construction will resist corrosion. Even protected fans must be regularly inspected to insure that the protection remains effective.

INFORMATION ONLY

ROUTINE MAINTENANCE

Under normal circumstances, handling clean air, the system will require cleaning only about once a year. However, the fan and system should be checked at regular intervals to detect any unusual accumulation.

The fan wheel should be specially checked for build-up of material or dirt which may cause an unbalance with resulting undue wear on bearings and v-belt drives. A regular maintenance program must be established as needed to prevent this build-up.

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected. If a disconnect switch has not been provided, remove all fuses from the circuit and lock the fuse panel so that they cannot be accidentally replaced.

TROUBLESHOOTING

EXCESSIVE VIBRATION

Check for material build-up on the wheel. Generally this will show up as material flaking off the fan wheel and causing an unbalance which may lead to fatigue failure of the wheel.

HIGH MOTOR TEMPERATURES

Check that cooling air to the motor has not been diverted or blocked by dirty guards or similar. Check input power. An increase may indicate that some major change has been made in the system.

HIGH BEARING TEMPERATURES

Usually caused by improper lubrication (either "over" or "under"). In every case if the cause of the trouble is not easily seen, experienced personnel should examine the equipment before it is put back into operation.

INFORMATION ONLY

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540 EAST 57TH STREET
CHICAGO, ILL. 60637
TEL: 773-936-3200
WWW.CHICAGO.EDU

SECTION II

FAN PARTS LIST

22-800 SERVICES

RECEIVED

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DOCUMENT CONTROL UNIT

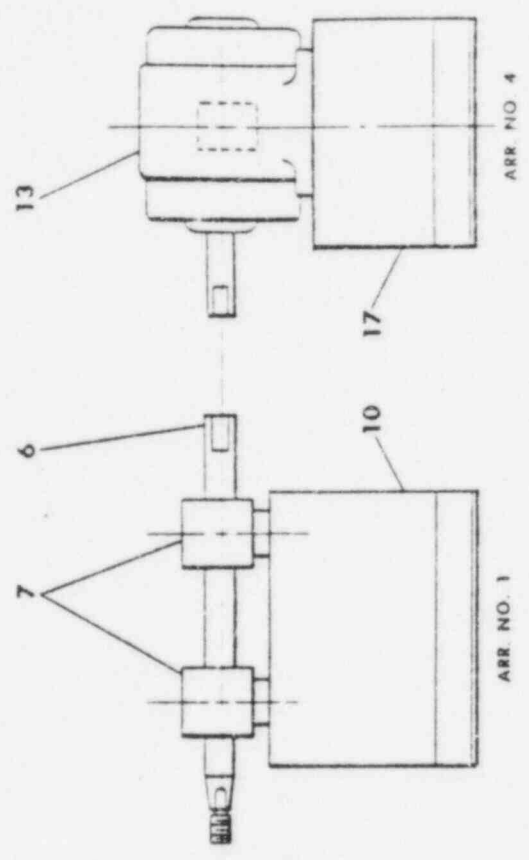
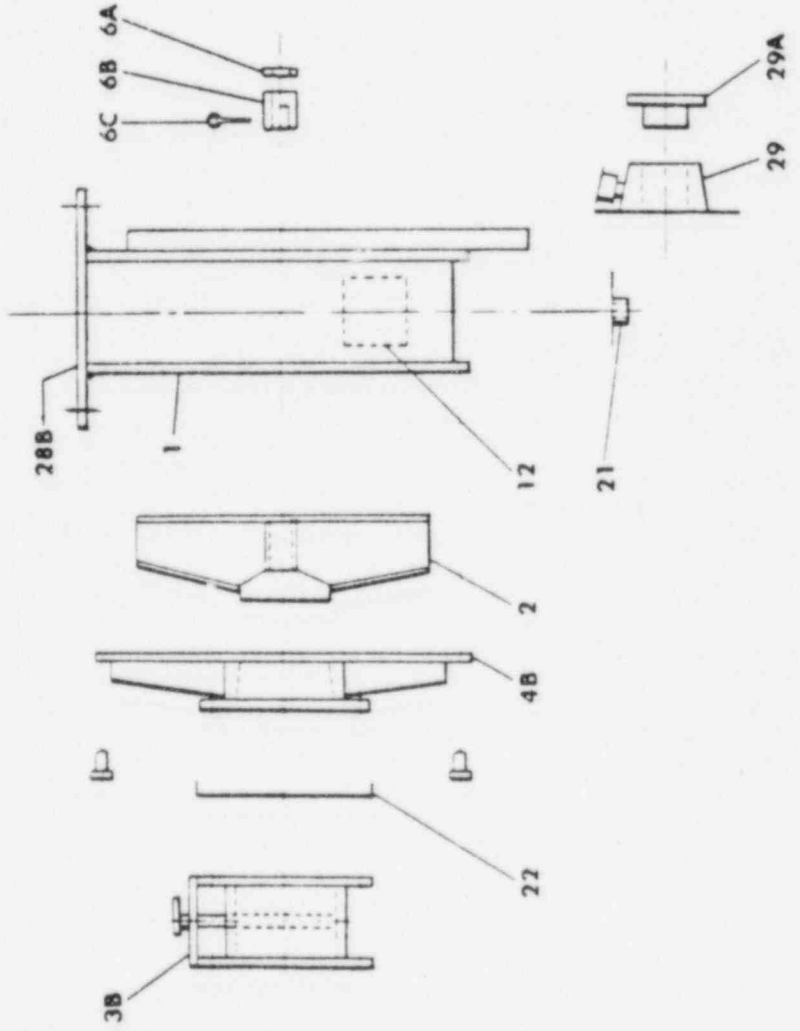
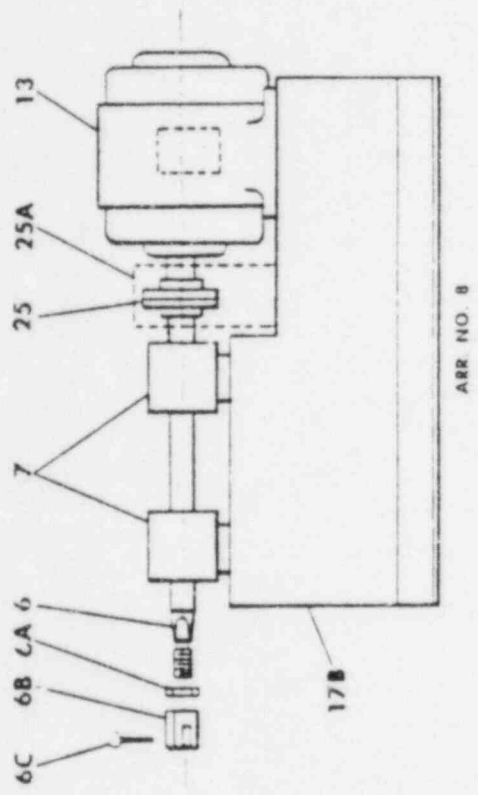
WATERFORD FIELD

- | | |
|---|---|
| 1 - Housing | 11B - Arr. 10 Motor Adjusting Screw |
| 1A - Top Half Housing | 12 - Standard or Raised Access Door |
| 1B - Bottom Half Housing | 13 - Motor |
| 1C - Power Side Half Housing | 14 - Combination All-Weather Cover & Belt Guard |
| 1D - Inlet Side Half Housing | 15 - V-Belts |
| 2 - Backplate & Flange Wheel | 15A - Motor Sheave |
| 2A - Centerplate & Flange Wheel | 15B - Fan Sheave |
| 2B - Open Wheel | 16 - Belt Guard |
| 2C - Paddle (Blast) Wheel | 17 - Arr. 4 Motor Base |
| 2D - Flange & Spider Wheel | 17A - Arr. 7 Motor Base |
| 3 - Inlet Cone or Bell | 17B - Arr. 8 Motor & Bearing Base |
| 3A - Variable Inlet Vanes | 18 - Shaft Seal |
| 3B - Butterfly Valve | 19 - Heat Slinger |
| 4 - Inlet Stand | 20 - Outlet Damper |
| 4A - Inlet Side Plate | 21 - Standard Drain, 1/2 Tapped Pipe Coupling |
| 4B - Flanged Inlet Side Plate | 21A - Flanged Type Drain |
| 4C - Drive Side Plate | 22 - Inlet Screen |
| 5 - Power Stand | 23 - Outlet Screen |
| 6 - Shaft | 24 - Outlet Cone or Evase |
| 6A - Washer | 25 - Coupling |
| 6B - Slotted Nut | 25A - Coupling Guard |
| 6C - Cotter Pin | 26 - Bearing Shield |
| 7 - Pillow Block Bearing | 27 - Unit Vibration Isolators |
| 8 - Arr. 2 Pillow Block Bearings | 27A - Rail Type Vibration Isolators |
| 9 - Arr. 2 Tripod Bearing Arm with Bearings | 28 - Inlet Collar |
| 10 - Bearing Base | 28A - Inlet Flange |
| 10A - Inlet Side Bearing Support | 28B - Outlet Flange |
| 10B - Power Side Bearing Support | 29 - Stuffing Box |
| 11 - Arr. 9 Motor Slide Rails | 29A - Stuffing Box Gland |
| 11A - Arr. 10 Motor Slide Rails | |

INFORMATION ONLY

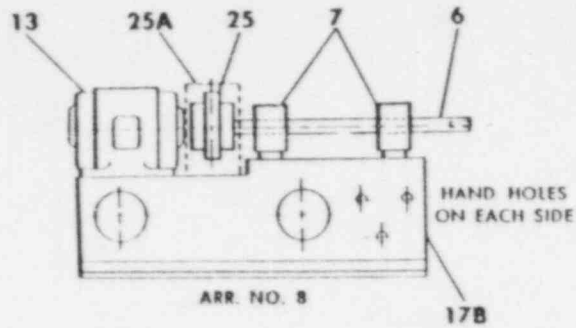
TYPES "CB" & "R"
SINGLE INLET

MANUFACTURED BY
MILITARY

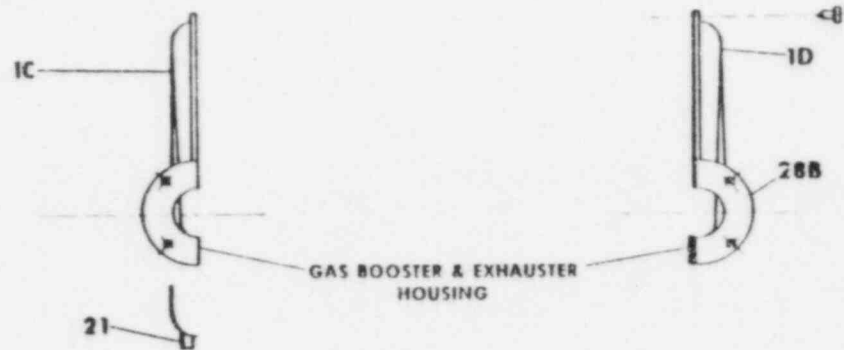
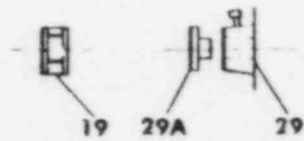
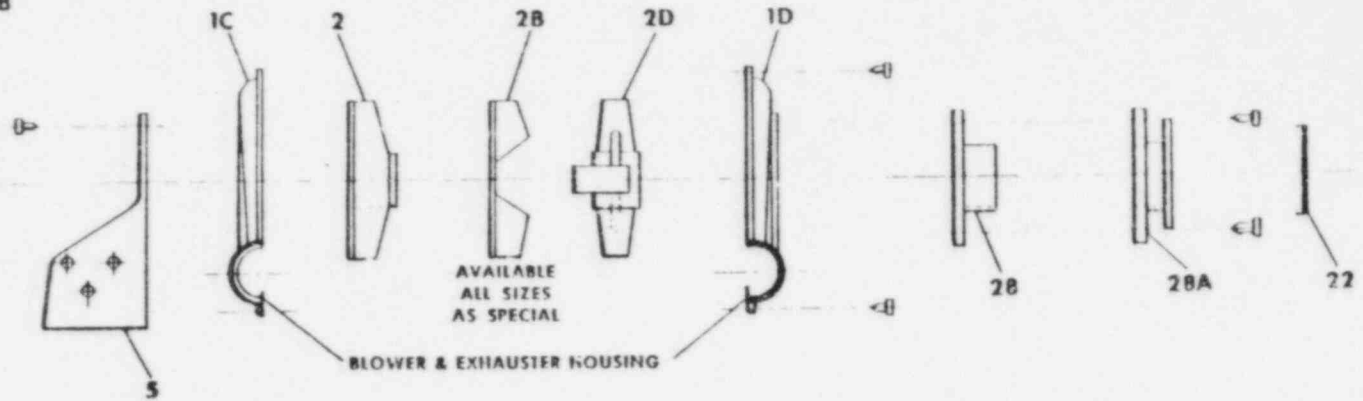
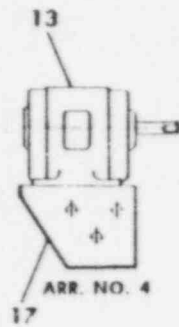
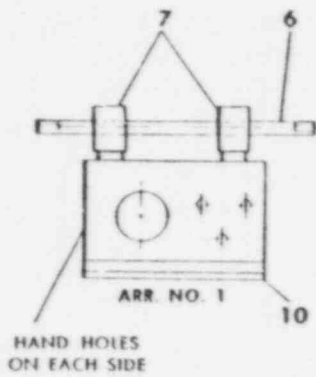


**TYPE E BLOWERS & EXHAUSTERS
GAS BOOSTERS & EXHAUSTERS
SINGLE INLET**

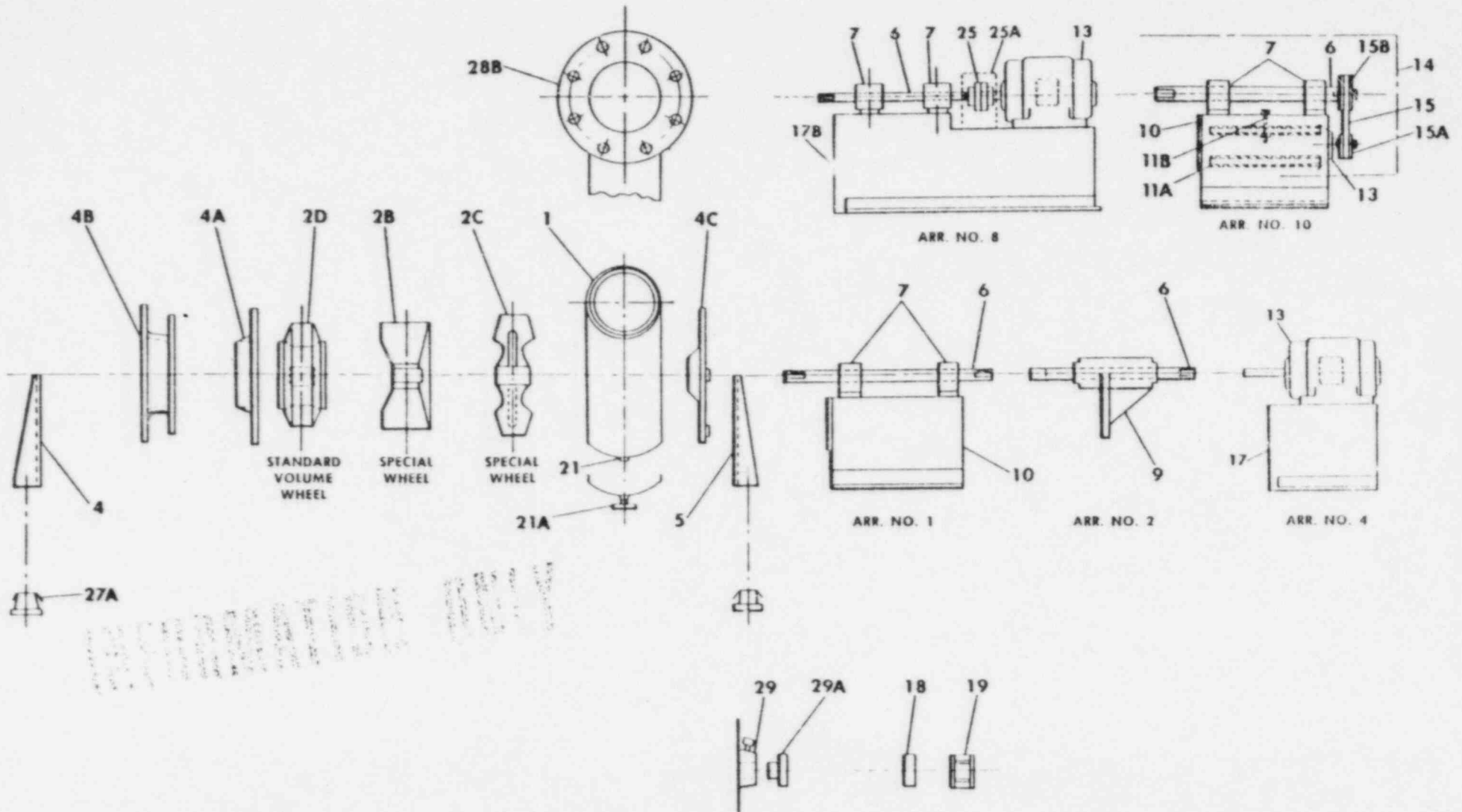
THE FOLLOWING INFORMATION IS FOR REFERENCE ONLY
 IT IS NOT TO BE USED AS A BASIS FOR DESIGN OR CONSTRUCTION
 OF ANY EQUIPMENT



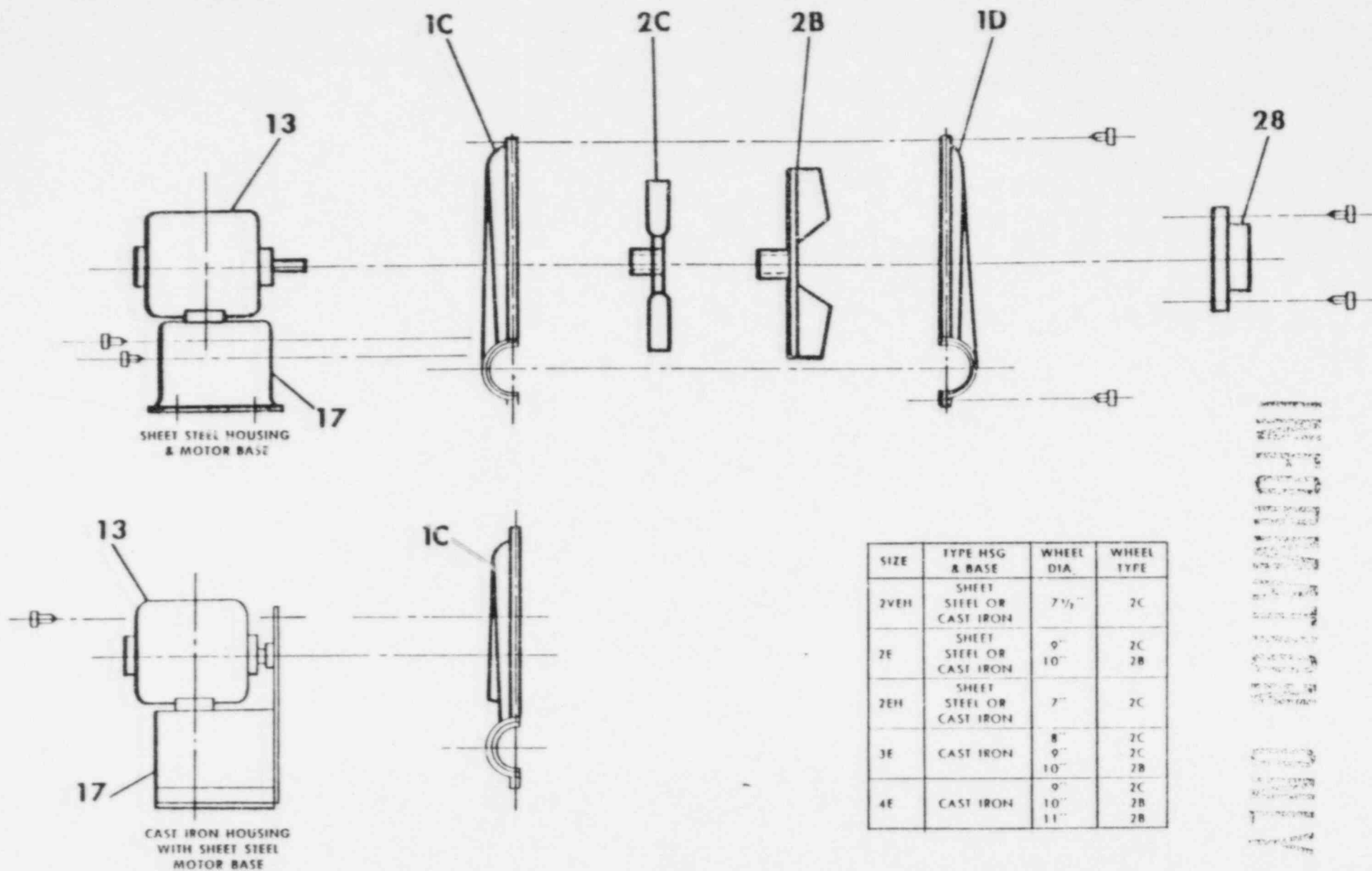
SIZE	STD WHEEL
4 1/2 E	2
5 E	2
5 1/2 E	2
6 E	2
7 E	2D
8 E	2D



**TYPE "V" VOLUME FANS
SINGLE INLET**

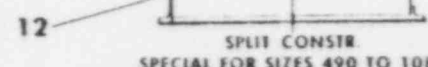
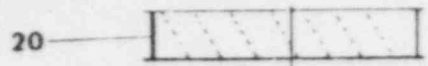


TYPE "E" BLOWERS & EXHAUSTERS
SINGLE INLET — ARR. NO. 4

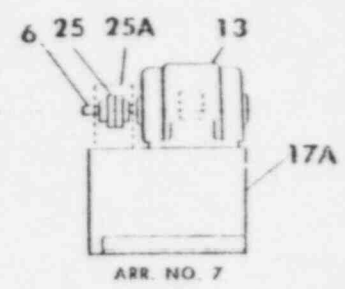
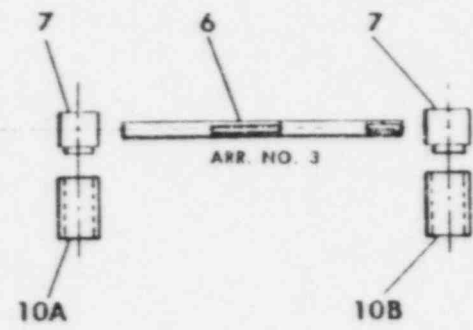
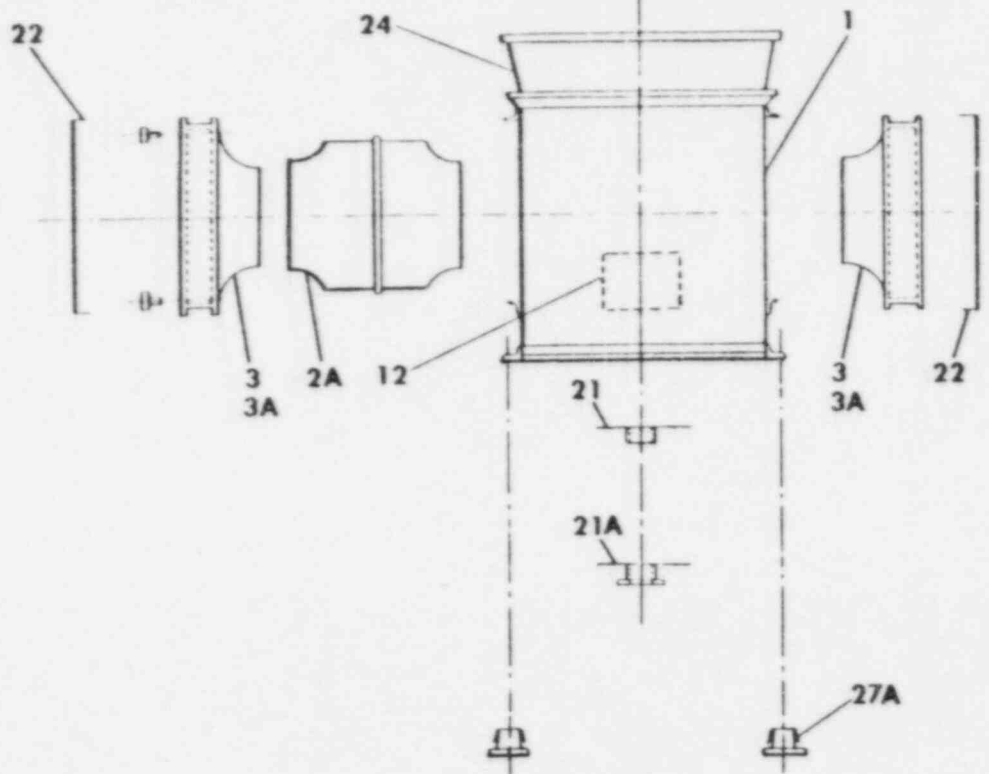


TYPES L39(BLH), L33(CL), L25(DL), & L21(EL)
 CLASS III & IV
 DOUBLE INLET

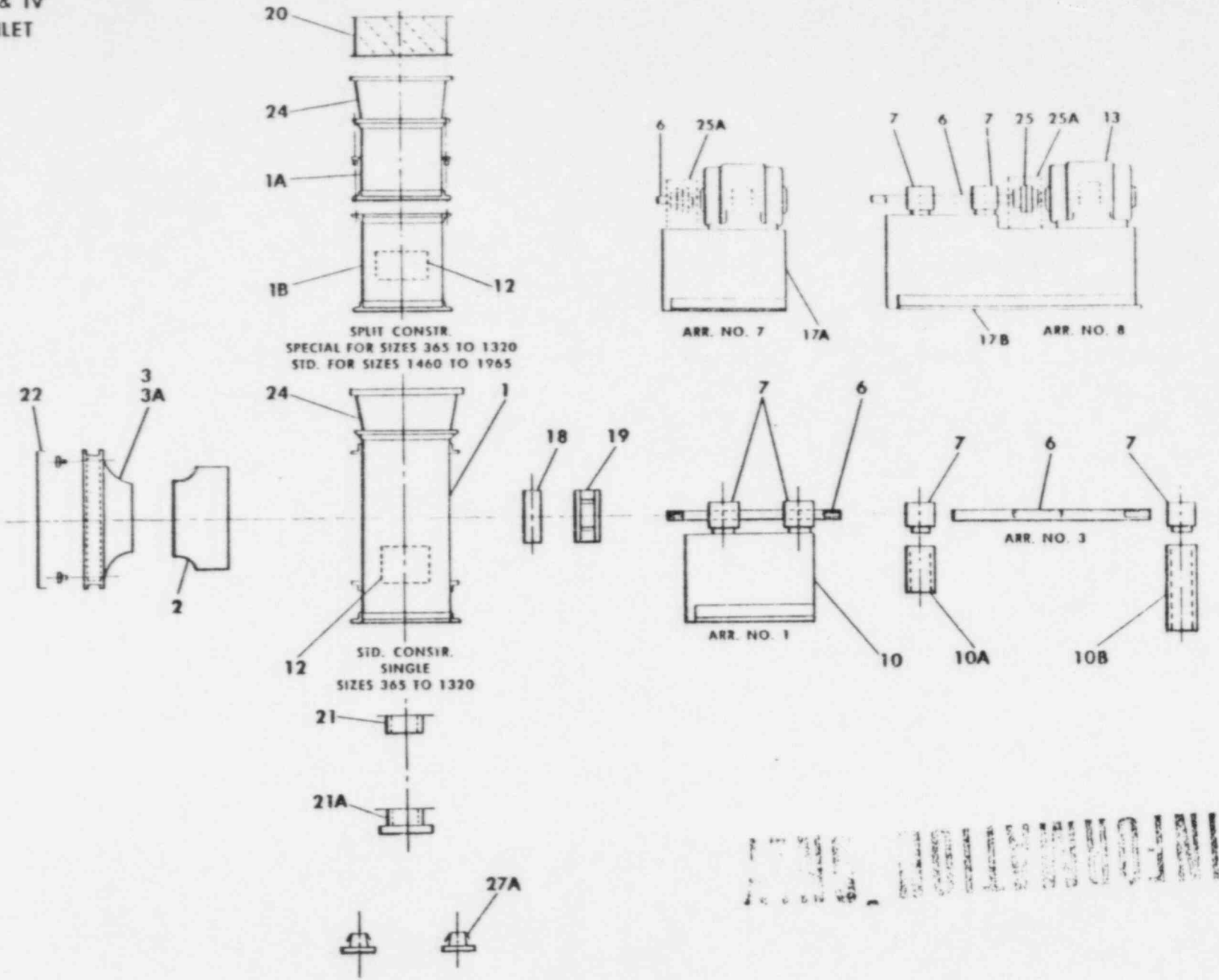
INFORMATION 4517



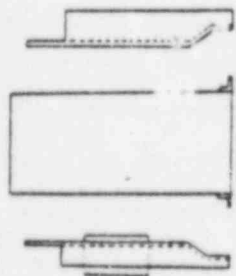
SPLIT CONSTR.
 SPECIAL FOR SIZES 490 TO 1085
 STD. FOR SIZES 1200 TO 1965



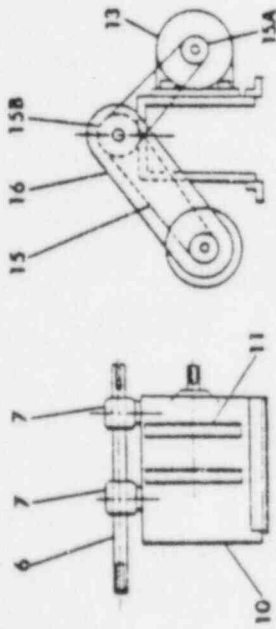
TYPES L39(BLH), L33(CL), L25(DL), L21(EL)
 CLASS III & IV
 SINGLE INLET



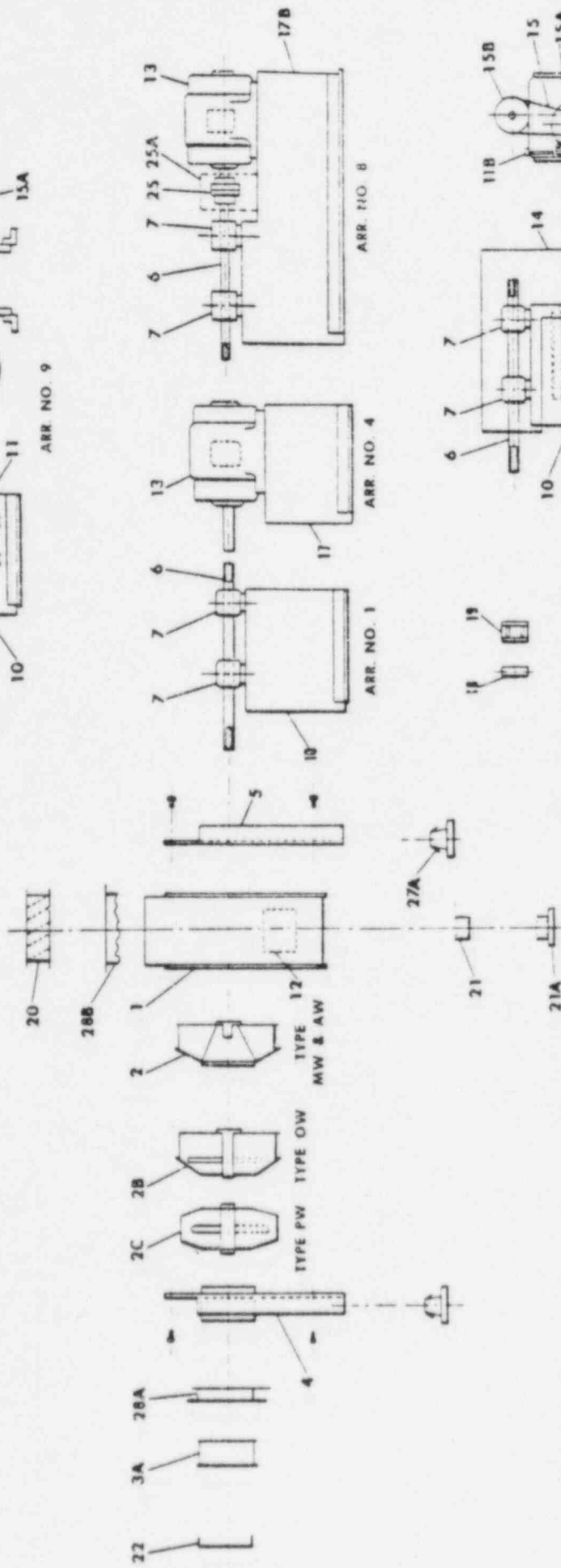
**INDUSTRIAL EXHAUSTERS
TYPES MW, AW & OW
SINGLE INLET**



**SPECIAL
REMOVABLE SCROLL
CONSTRUCTION**



ARR. NO. 9



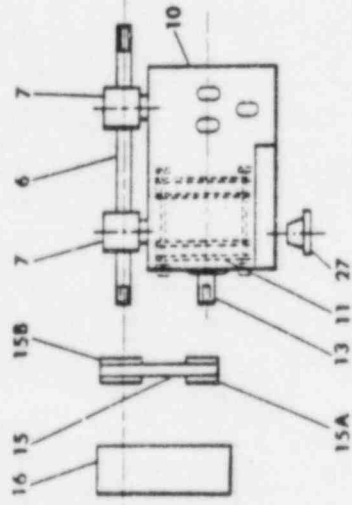
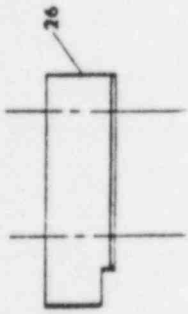
ARR. NO. 8

ARR. NO. 4

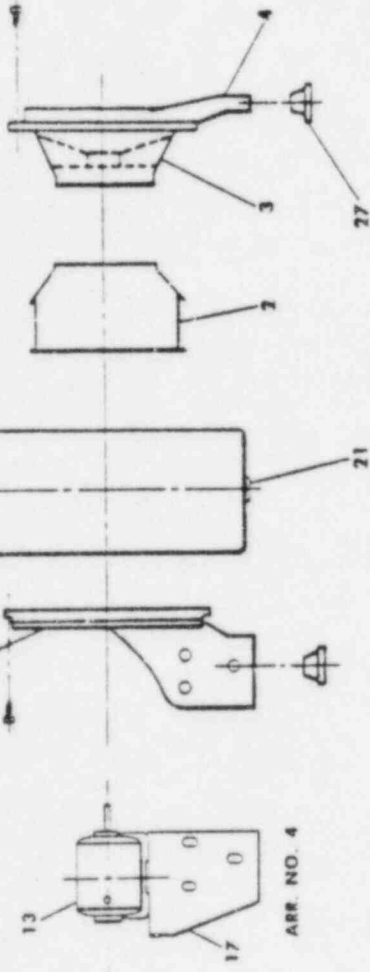
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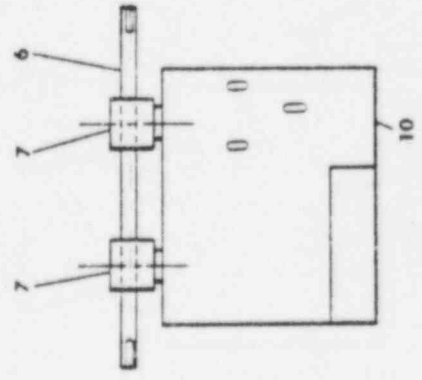
SIZE 2 1/2 CAST IRON LL
SINGLE INLET



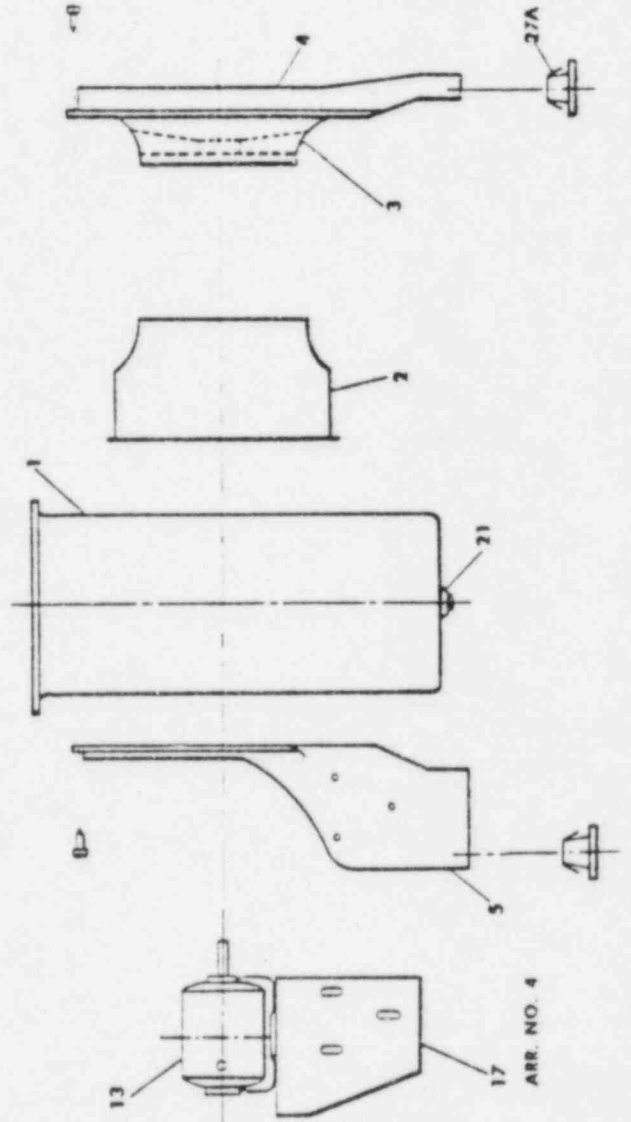
ARR. NO. 1 - LESS 11 & 13
ARR. NO. 9



SIZE 400 CAST IRON BL
SINGLE INLET



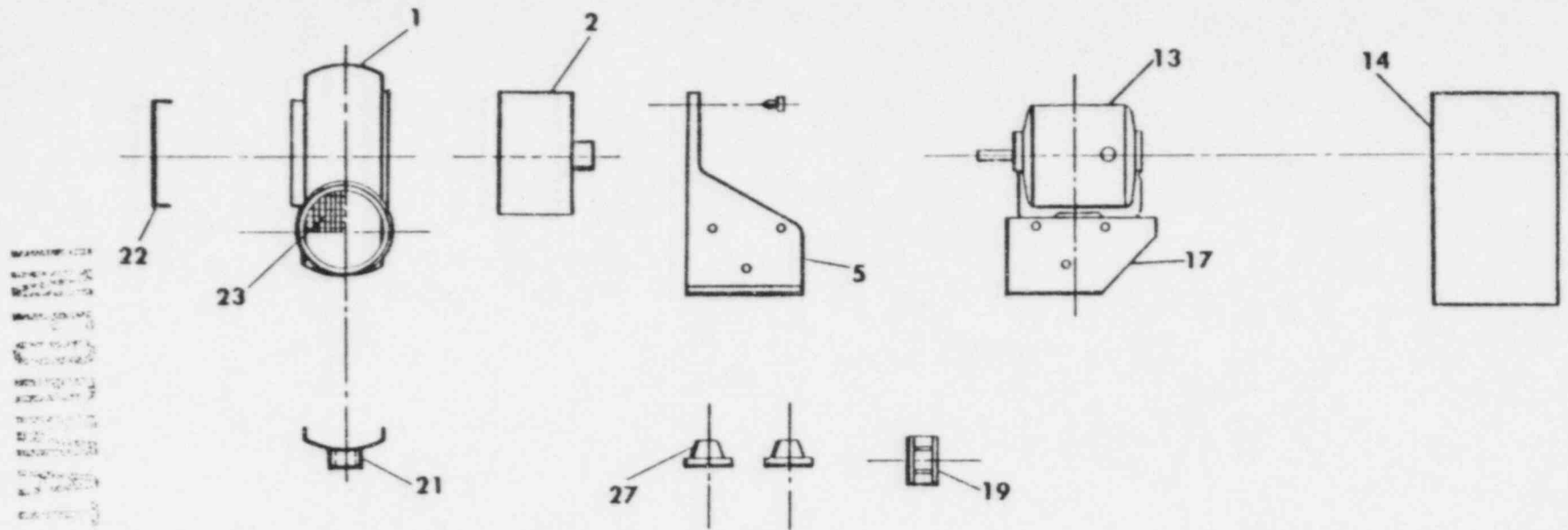
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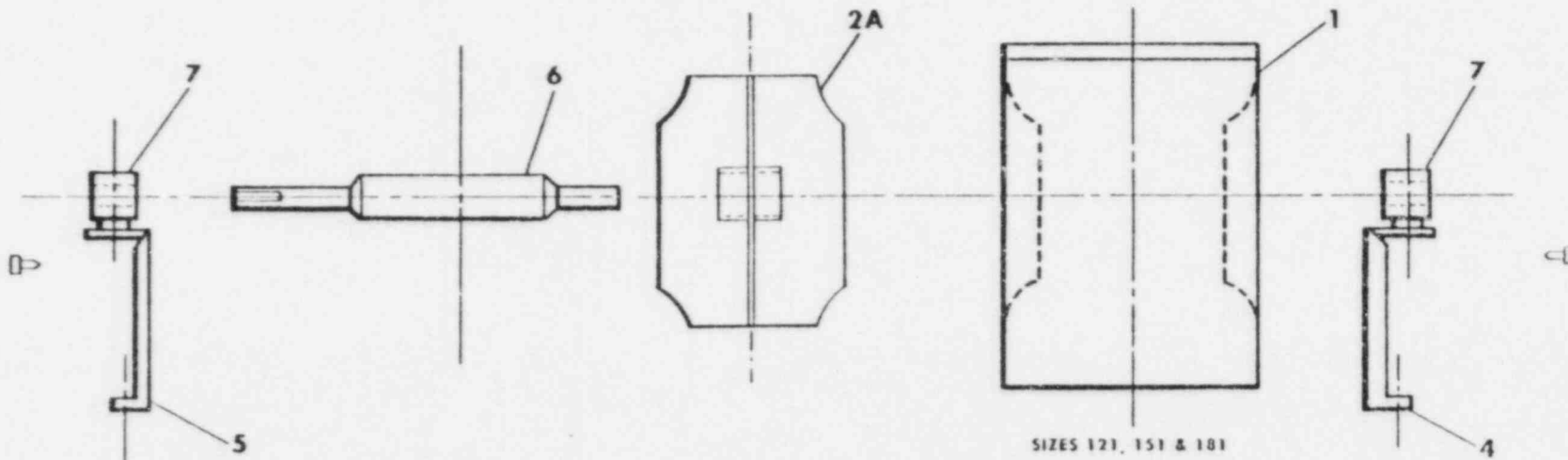
REPRODUCED FROM THE
DRAWINGS OF THE
U.S. PATENT OFFICE
OFFICE OF THE
COMMISSIONER OF PATENTS
WASHINGTON, D.C. 20540

**BABY VENT SET
SINGLE INLET**

ARR. NO. 4



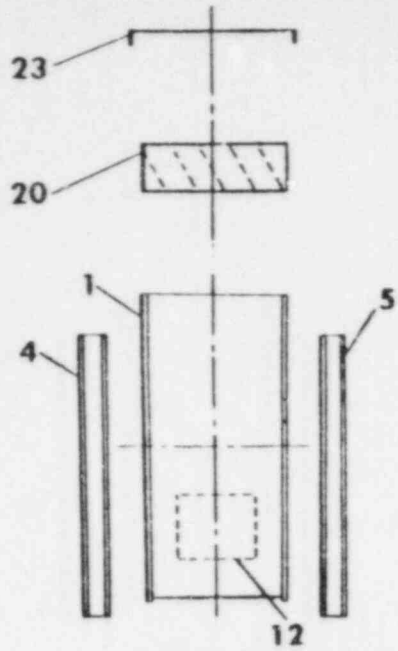
**TYPE HVA
DOUBLE INLET**



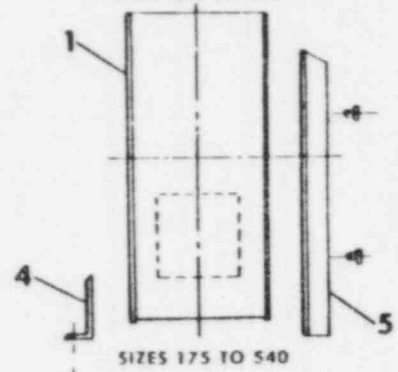
SIZES 121, 151 & 181

SIZES 122, 152 & 182 USES 2 WHEELS & 2 HOUSINGS WITH ONE SHAFT
SIZES 123, 153 & 183 USES 3 WHEELS & 3 HOUSINGS WITH ONE SHAFT

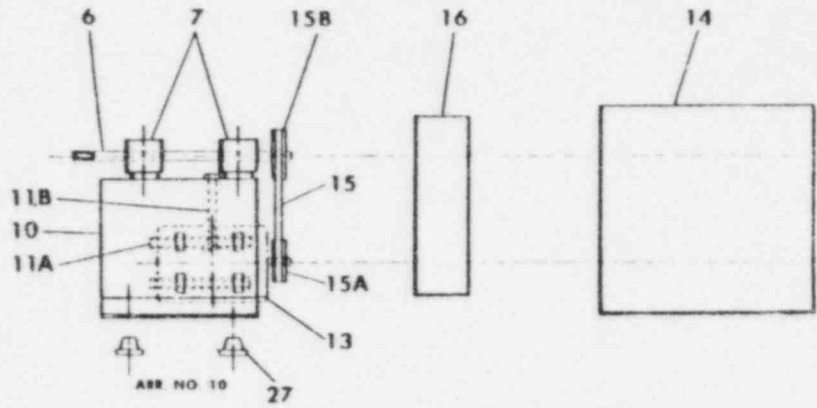
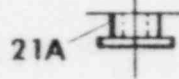
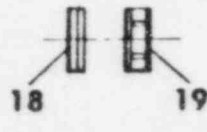
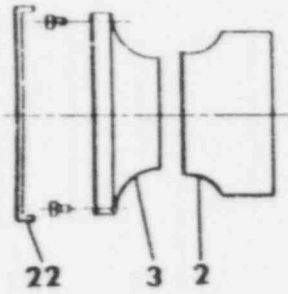
TYPE BLVS & MPVS
LIMIT LOAD
BELTED VENT SETS
SINGLE INLET



SIZES 600 TO 730*



SIZES 175 TO 540

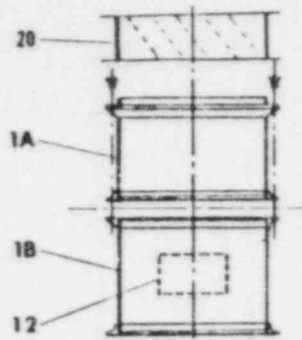


ARR NO 10

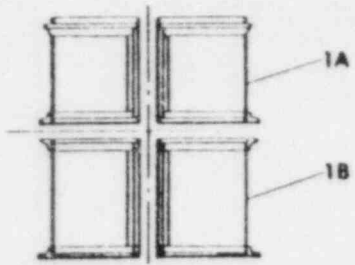
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27. BELTED VENT SETS

* 600 to 730 has square inlet with no collar on inlet bell

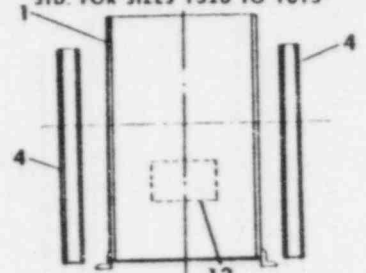
TYPES BL & BL-AEROFOIL
CLASS I & II
DOUBLE INLET



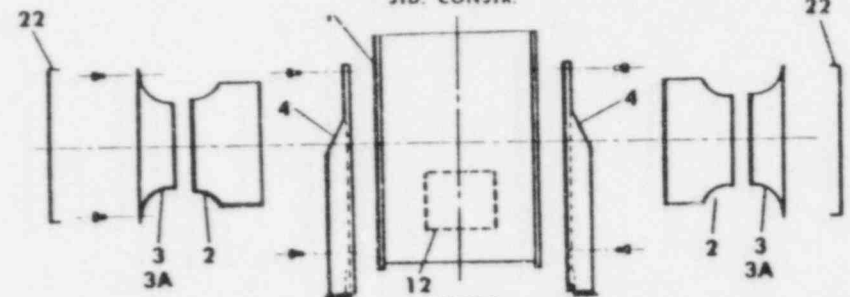
SPLIT CONSTR.
SPECIAL FOR SIZES 805 TO 1200
STD. FOR SIZES 1320 TO 1615*



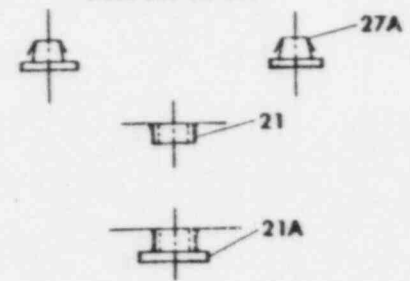
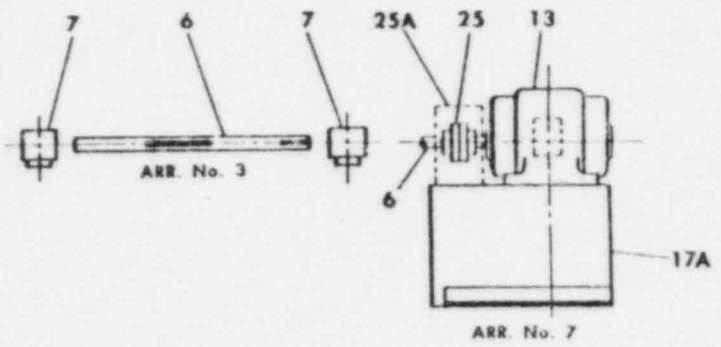
SPLIT CONSTR.
STD. FOR SIZES 1780 TO 2175



SIZES 600 TO 1200
STD. CONSTR.



DOUBLE
SIZES 245 TO 540

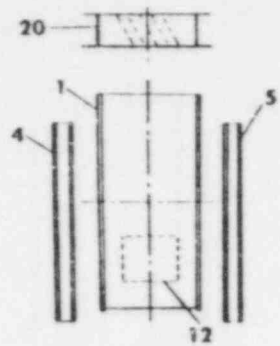


* 1320 and larger has collar on inlet bell

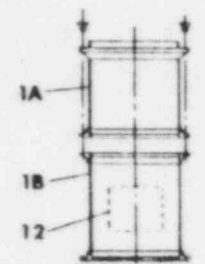
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TYPES BL & BL-AEROFOIL
 CLASS I & II
 SINGLE INLET

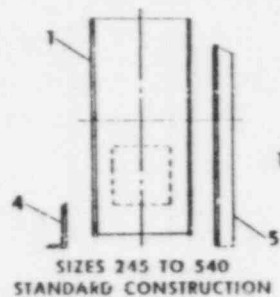
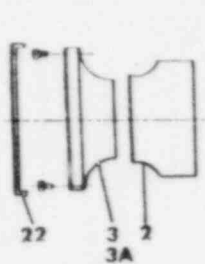
INFORMATION ONLY



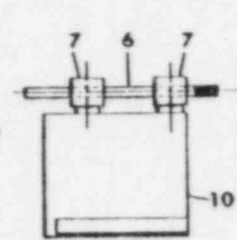
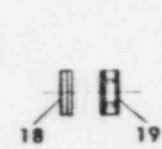
SIZES 600 TO 1200*
 STANDARD CONSTRUCTION



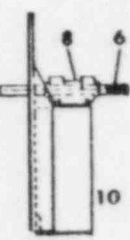
SPLIT CONSTR.
 SPECIAL FOR SIZES 805 TO 1200
 STANDARD FOR SIZES 1320 TO 2175



SIZES 245 TO 540
 STANDARK CONSTRUCTION



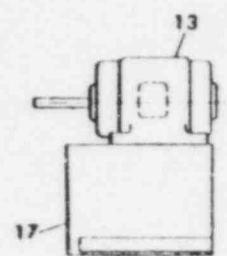
ARR. NO. 1



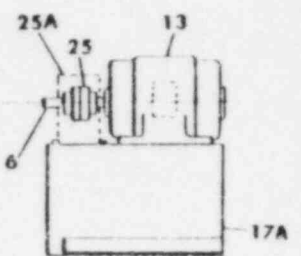
ARR. NO. 2



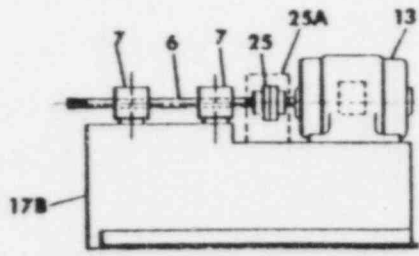
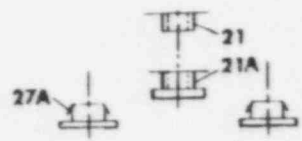
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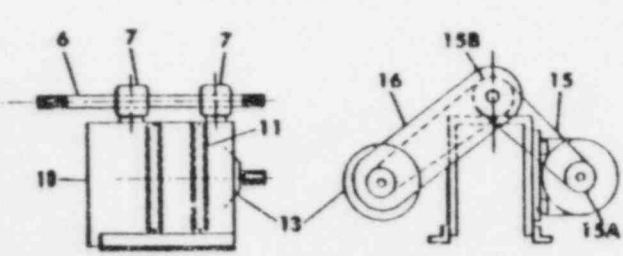
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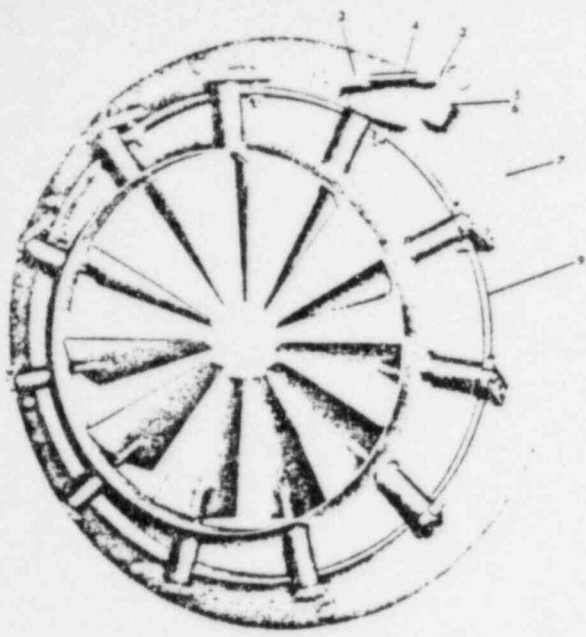


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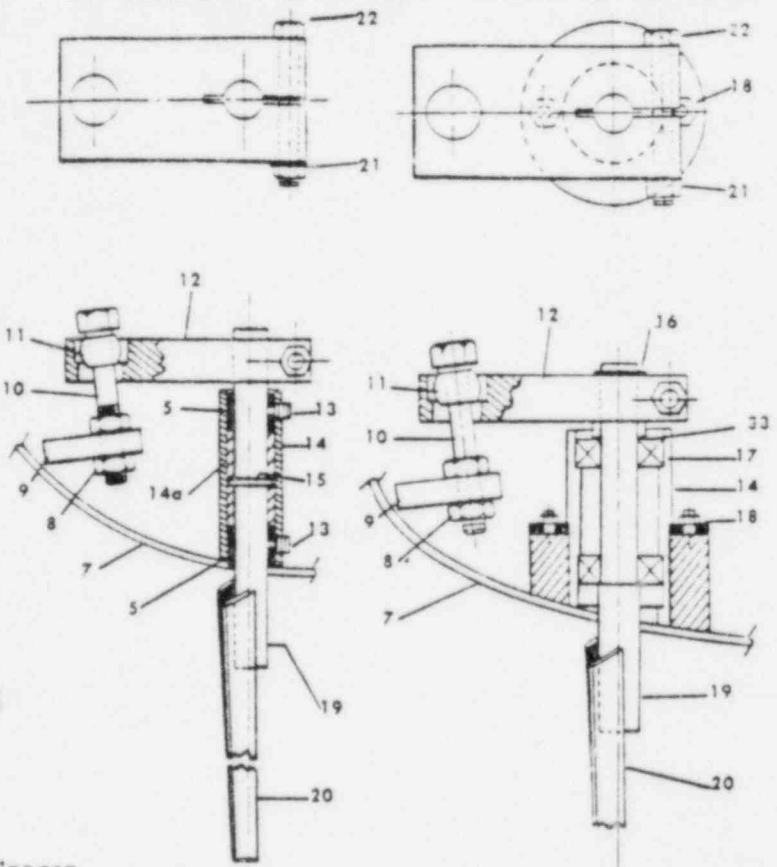


ARR. NO. 9

* 600 to 1200 has square inlet with no collar on inlet bell



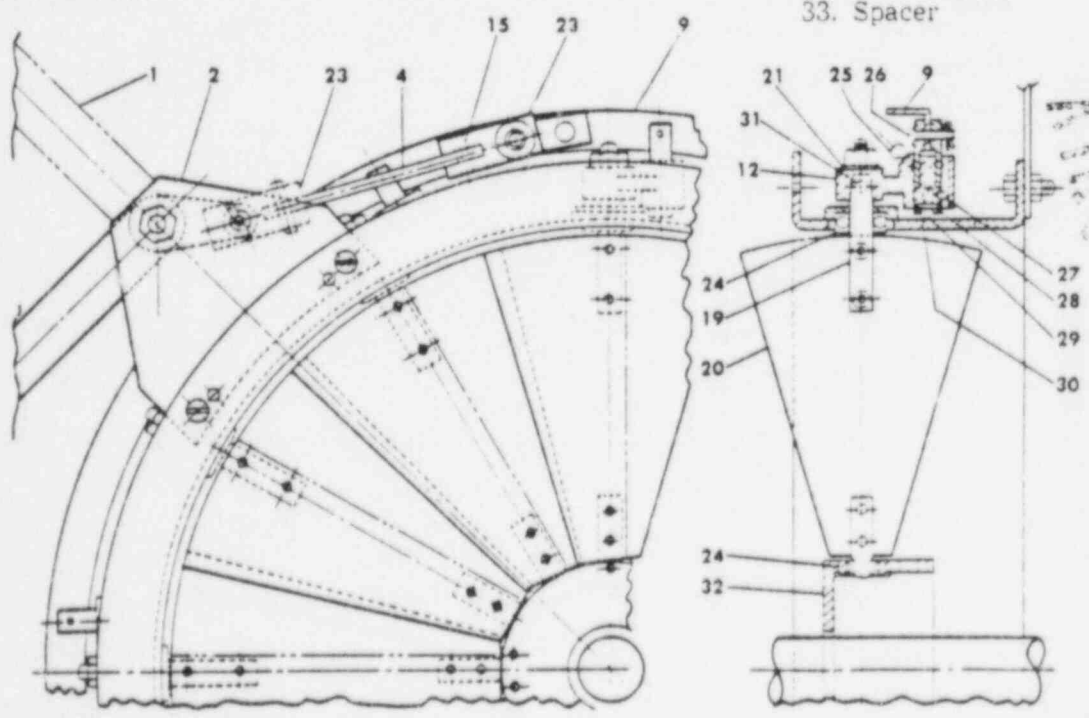
DESIGN 5 DESIGN 6 & 6A



**VARIABLE INLET VANES
Parts List**

- | | | |
|---|---|---|
| 1. Control Lever | 14a. Steel Spacer | 23. Knuckle |
| 2. Quadrant | 15. Roll Pin | 24. "Nice Co" Ball Bearings —
Run Dry — No Lube Req'd. |
| 3. Teflon Insert Rod End | 16. Retaining Ring | 25. Alemite Grease Fitting |
| 4. Control Rod | 17. Prelube Ball Bearing | 26. Connecting Pin |
| 5. Bronze Oilite Bearings | 18. Weld Studs and Nuts | 27. Pin |
| 6. Crank Assembly | 19. Vane Shaft | 28. Wheel Swivel |
| 7. Inlet Bell | 20. Vane | 29. Wheel |
| 8. Jam Nuts | 21. Flexloc Nut | 30. Wheel Pin |
| 9. Control Ring | 22. Hex Bolt — Torque 20 ft. lbs.
for 5/16" Bolt; 30 ft. lbs. for
3/8" Bolt | 31. Set Screw |
| 10. Bearing Bolt | | 32. Center Ring |
| 11. Teflon-Spherco Bearing | | 33. Spacer |
| 12. Vane Lever | | |
| 13. Half Dog Point Set Screw —
Do Not Loosen or Remove | | |
| 14. Bearing Housing | | |

**TYPE
HV**

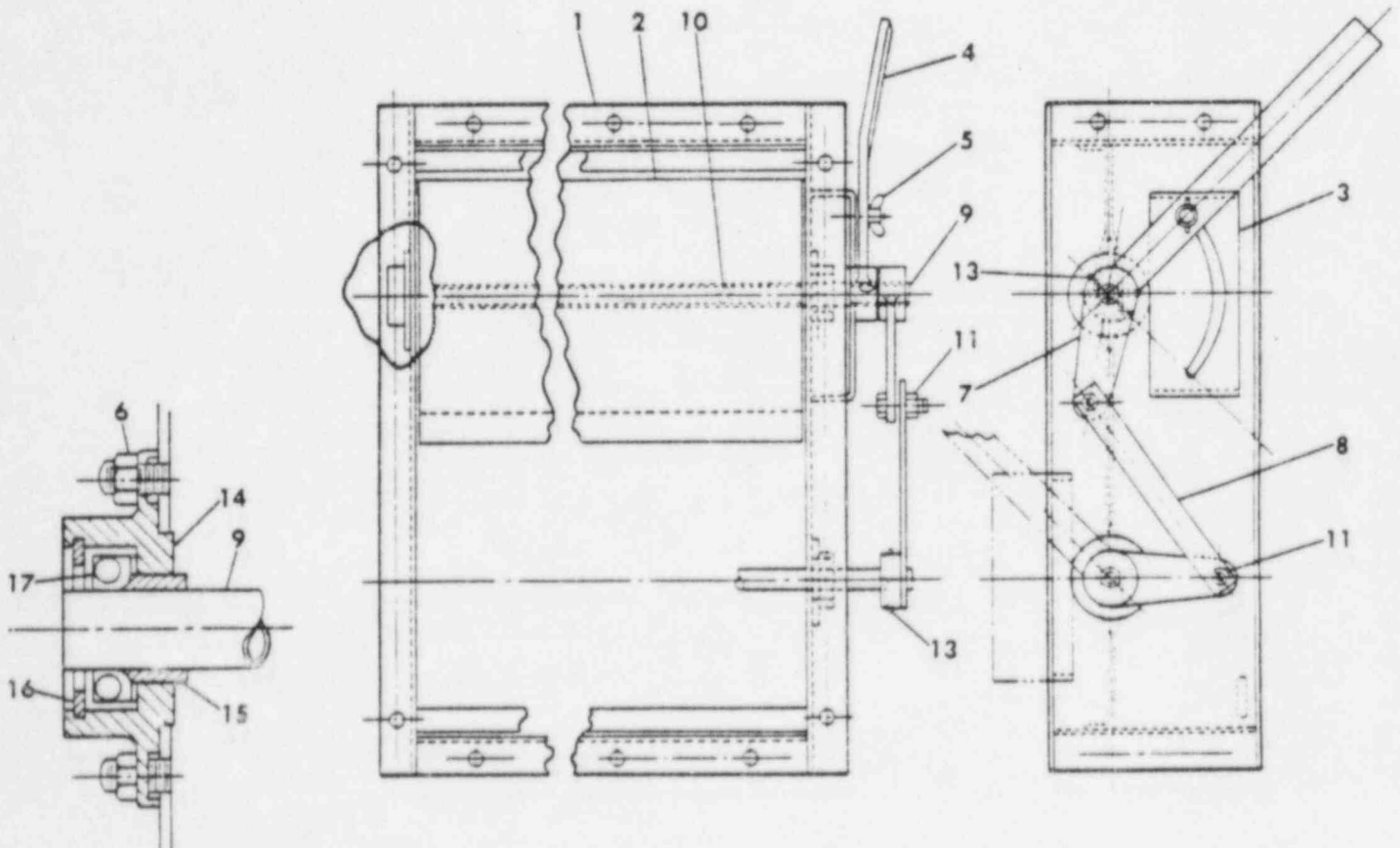


ALL DIMENSIONS IN INCHES
 UNLESS OTHERWISE SPECIFIED
 TOLERANCES ARE:
 FRACTIONS DECIMALS
 .0005 .0001
 .001 .0005
 .005 .0025
 .010 .0050
 .015 .0075
 .020 .0100
 .030 .0150
 .040 .0200
 .050 .0250
 .060 .0300
 .070 .0350
 .080 .0400
 .090 .0450
 .100 .0500
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OUTLET DAMPERS - Parts List

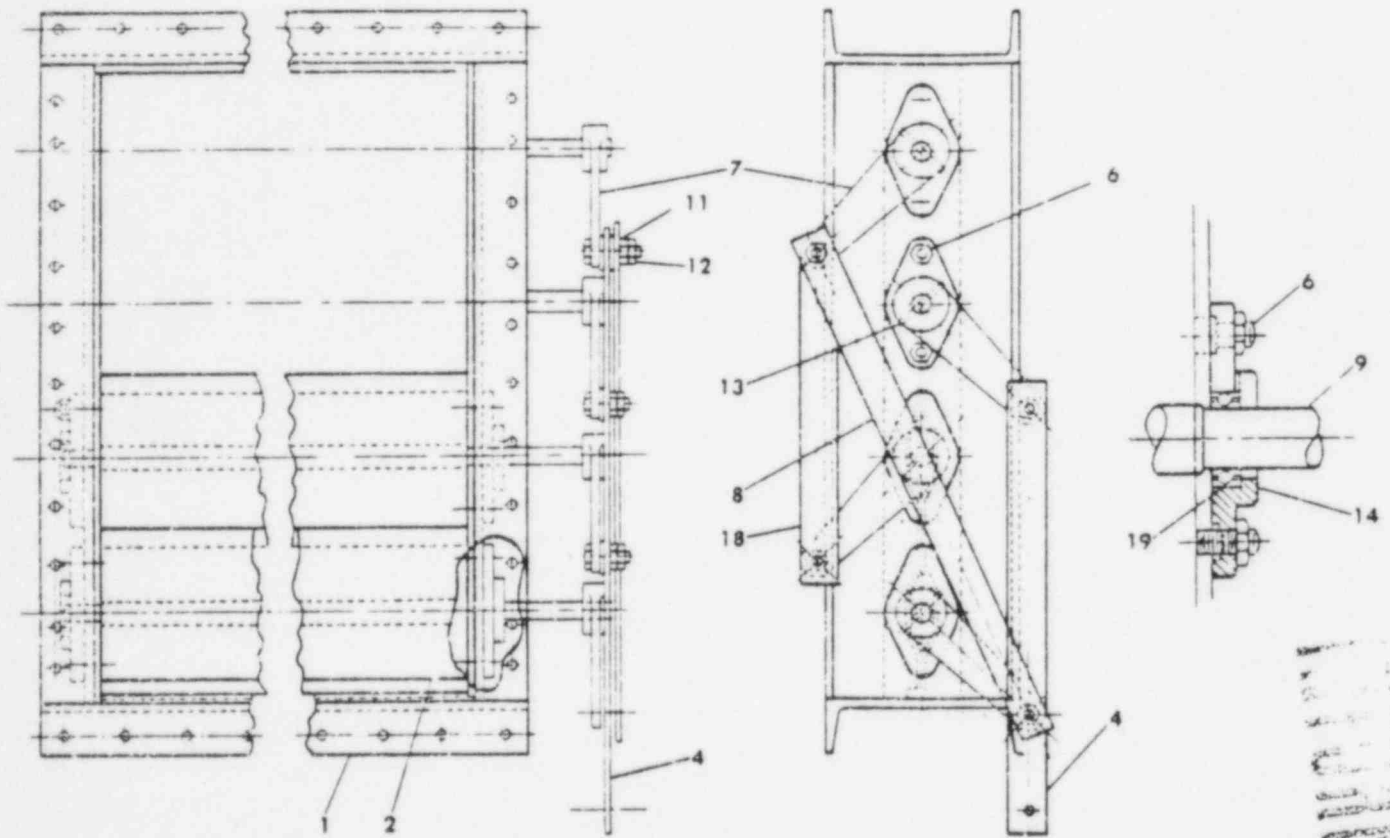
1. Channel Frame Assembly
2. Damper Blades
3. Quadrant
4. Control Lever
5. Wing Nut
6. KSM Weld Stud, Washer & Nut
7. Damper Lever
8. Cross Bar
9. Blade Shaft - Solid or Tubing
10. Huck Bolt
11. Hex Nut, Bolt & Lockwasher
12. Jam Nut
13. Roll Pin
14. Ball Bearing Housing
15. Bearing Spacer
16. Truarc Retaining Ring
17. Series 500 Nice Ball Bearings (or equal)
18. Connecting Bar
19. Fafnir Series 200 Shielded Ball Bearings (or equal)
20. Cast Iron Sleeve Bearing
21. Cast Iron Bearing Spacer
22. Johns Manville Style C Asbestos Packing (or equal)

DESIGN 4 & 5



INFORMATION ONLY

OUTLET DAMPERS - DESIGN 6



OUTLET DAMPERS - DESIGN 7

