

50-245

*NDS Document Transmittal

6/18/97

To: Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Addressee Unique# 140
ROUTINE distribution

The following documents have been revised. You are currently on distribution for these documents. Verify that all documents are included in this distribution set.

<u>DOCUMENT</u>	<u>REV</u>	<u>COPIES</u>
710.13-1	2	1
MP 710.13	2	1

A0019/1

240041

9706240162 970618
PDR ADOCK 05000245
P PDR



Return this form to NDS, MP475, 3rd Floor, C/O Rick Lundin (x2446) as soon as received.

Signature _____ Date: _____

[Signature]
Approval

6-11-97
Approval Date

6-20-97
Effective Date

1-97-092
PORC Mtg. No.

MOV Troubleshooting Data Sheet

Valve Local ID _____

AWO No. _____

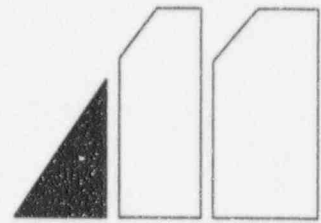
Operations personnel contacted on failure _____ Date _____

Step	Inspection	Results
4.1.1	Reason for valve stroke (surveillance, plant operation, auto-initiation, other)	
	Number of attempts to cycle valve electrically	
	Time between attempted starts	
	Motor feeder circuit breaker	Closed / Open / Tripped
	Thermal overload relay position	Normal / Tripped
	Control power status	Available / Unavailable
	"Open" direction limit switch(es) indication	Valve Open / Intermediate
	"Close" direction limit switch(es) indication	Valve Closed / Intermediate
	"Open" direction torque limit switch position	Contacts Closed / Open
	"Close" direction torque limit switch position	Contacts Closed / Open
4.6.4	Torque switch "Open" contacts	Contacts Closed / Open
	Torque switch "Close" contacts	Contacts Closed / Open
4.8.8.b.	Megger reading for motor Acceptance Criteria 125 VDC motors: $\geq 1 \text{ M}\Omega$ 480 VAC motors: $\geq 2 \text{ M}\Omega$ Megger Serial No. _____ Calibration Due Date _____	_____ $\text{M}\Omega$

COMMENTS _____

Form Initiator _____ Date _____

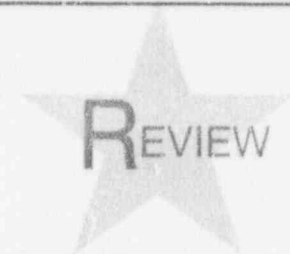
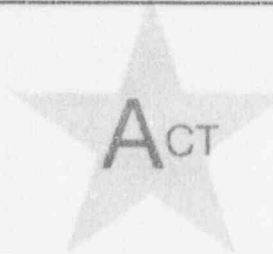
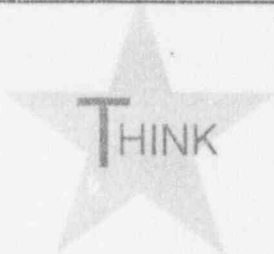
MILLSTONE NUCLEAR POWER STATION
MAINTENANCE PROCEDURE



MOV Troubleshooting

MP 710.13

Rev. 2



Approval:

PORC Mtg. No: 1-97-092

Date: 6-11-97

Effective Date: 6-20-97

Level of Use
Information

SME: W. Loweth

Millstone Unit 1
Maintenance Procedure

MOV Troubleshooting

TABLE OF CONTENTS

1.	PURPOSE	2
2.	PREREQUISITES	2
3.	PRECAUTIONS	5
4.	INSTRUCTIONS	6
4.1	Initial Parameters	6
4.2	MOV Fails To Fully Stroke	7
4.3	MOV Fails To Operate Electrically	9
4.4	Incorrect Position Indication	12
4.5	MOV Fails To Operate Manually	15
4.6	MOV Overtorques into Seat or Slams into Backseat When Operated Electrically	18
4.7	MOV Fails To Stroke Within Specified Time	22
4.8	Motor is in Locked Rotor Condition	24
4.9	Valve Motion is Opposite Desired Direction of Travel	27
4.10	Valve Does Not Open—Thermal Binding, Pressure Locking, or Differential Pressure Disc Pinching	28
5.	REVIEW AND SIGN-OFF	31
6.	REFERENCES	31
7.	SUMMARY OF CHANGES	32
	ATTACHMENTS AND FORMS	
	Attachment 1, "MOV Fails to Fully Stroke"	33
	Attachment 2, "MOV Fails to Operate Electrically"	36
	Attachment 3, "Incorrect Position Indication"	38
	Attachment 4, "MOV Fails to Operate Manually"	39
	Maint. Form MP 710.13-1, "MOV Troubleshooting Data Sheet"	

1. PURPOSE

1.1 Objective

The objective of this procedure is to provide instructions for troubleshooting MOVs.

1.2 Discussion

Instructions are provided to gather initial data and determine a possible cause of the failure. Once the failure is determined a course of corrective action is suggested to fix the problem.

This procedure is to be performed by personnel with extensive knowledge and training in MOVs. Any maintenance or corrective actions specified in this procedure must be reported to the FLS and performed in accordance with the approved operator preventive maintenance overhaul, or adjustment procedures. However, some maintenance tasks such as valve stem inspection and lubrication, handwheel inspection and lubrication, meggering, continuity checks of wiring, and limit switch inspection may be performed using this procedure.

MOV Coordinator must be consulted prior to troubleshooting valves that fail within the GL89-10 Program as indicated on the AWO. For these valves, MOV Coordinator may need to gain approval from site MOV Engineering group or a representative prior to performing specific sections of this procedure.

2. PREREQUISITES

2.1 General

2.1.1 An AWO has been prepared and approved by Unit 1 Operations Department and Performance Evaluations Department as necessary.

2.1.2 The valve has been declared INOPERABLE or unavailable prior to performing any maintenance described in Sections 4.2 through 4.10. (The valve does *not* need to be declared INOPERABLE or unavailable in order to gather the initial parameters information described in Section 4.1.)

2.2 Documents

2.2.1 WC 10, (Att), "Lifted Lead and Jumper Device Data Sheet"

- 2.2.2 Applicable control wiring diagram
- 2.2.3 Engineering—approved torque switch settings
- 2.2.4 C MP 703A1, "Limitorque Operator Preventive Maintenance (EQ)"
- 2.2.5 C MP 703A2, "Limitorque Operator (SMB 000 and SMB 00) Maintenance (EQ)"
- 2.2.6 C MP 703A3, "Limitorque Operator Maintenance (EQ) (SMB-0 to -4T, and SB-0 to -4)"
- 2.2.7 MP 710.3, "Overhaul of Crane Teledyne Motor Operated Valves (EQ)"
- 2.2.8 MP 710.9, "Preventive Maintenance for Crane Teledyne Motor Operated Valves (EQ)"
- 2.2.9 MP 711.12, "Repacking and Live Load Installation"
- 2.2.10 C PT 1420E, "Limitorque Actuator Test"
- 2.2.11 C PT1420X, "MOV Testing Using VOTES and MOVATS Torque Thrust Cell"

2.3 Measuring and Test Equipment (M&TE)

- 2.3.1 All M&TE has been calibrated in accordance with WC 8, "Control and Calibration of Measuring and Test Equipment" and the calibration is current.
- 2.3.2 Megger with a range of 0 to 1000 volts, and an accuracy of $\pm 1.5\%$ of full scale length, such as QA-1625
- 2.3.3 Digital multimeter with a range of 0 ohms to infinity and an accuracy of $\pm 2\%$ such as QA-1654
- 2.3.4 VOTES system 100 and accessories
- 2.3.5 Motor Power Monitor (MPM) System

2.4 Tools and Consumables

2.4.1 Tools

- Electrician's standard tool kit
- Mechanic's standard tool kit

2.4.2 Equipment

- Strip chart recorder or equivalent (i.e., VOTES test equipment)

2.4.3 Consumables

- Approved cleaning solution such as HydraFoam 2020 or Electra Clean
- Dowel rod or Tie-wrap
- Low-lint cloths
- Mobil 28 lubricant for valve stem

2.5 Personnel

- 2.5.1 Personnel performing this procedure must be trained and qualified on the operator under maintenance or an MOV Coordinator.

2.6 Responsibilities

- 2.6.1 Operations Department is responsible for electrically stroking valve and for Control Room communications as necessary.
- 2.6.2 Generation Test Services is responsible for connecting diagnostic equipment, when required, and obtaining valve signature.

3. PRECAUTIONS

- 3.1 Consumables to be used in or on power plant components must be controlled in accordance with CC 1, "Control of Chemical Consumable Products."
- 3.2 Hazardous waste must be disposed of in accordance with CC 1, "Control of Chemical Consumable Products."
- 3.3 During disassembly, all disassembled parts should be tagged or identified. All mating parts should be identified for proper match-up during assembly.
- 3.4 Environmental qualification of EQ equipment should be maintained by adhering to the requirements of specification SP-M1-EE-351, "Millstone Unit One Environmental Qualification Master List and Equipment Qualification Records."
- 3.5 Operations Department must operate valve unless blue tag is hung on operator handwheel, allowing maintenance personnel to operate.
- 3.6 MOV Coordinator must be consulted for development of a troubleshooting plan prior to start of any work on a GL89-10 Program valve (ie. diagnostic testing equipment required). Portions of this procedure may be used in conjunction with the specific troubleshooting plan.

4. INSTRUCTIONS

4.1 Initial Parameters

4.1.1 RECORD the following as-found conditions on Maint. Form 710.13-1:

- Reason for valve stroke (surveillance, plant operation, auto-initiation, other)
- IF applicable, number of attempts made to cycle valve electrically
- IF applicable, time between attempted starts
- Any known history of operational problems
- Comments relating to system conditions, pressure flow, temperature, noise, odor, and local position
- Motor feeder circuit breaker position
- Thermal overload relay position
- Control power status
- "Open" direction limit switch(es) indication
- "Close" direction limit switch(es) indication
- "Open" direction torque limit switch position
- "Close" direction torque limit switch position

4.1.2 Refer To Maint. Form 710.13-1, and DETERMINE if problem is one listed in Table - 1, and Go To the applicable section for further instructions.

Table - 1. Reported Problems	
PROBLEM	SECTION
MOV fails to fully stroke	4.2 & Attachment 1
MOV fails to operate electrically (ie., no valve movement)	4.3 & Attachment 2
Incorrect position indication	4.4 & Attachment 3
MOV fails to operate manually	4.5 & Attachment 4

Level of Use
Information

STOP

THINK

ACT

REVIEW

MP 710.13

Rev. 2

6 of 39

MOV overtorques into seat or slams into backseat when operated electrically	4.6
MOV fails to stroke within specified time	4.7
MOV found in motor locked rotor condition	4.8
Valve motion is opposite desired direction of travel	4.9
MOV fails to open (thermal binding, pressure locking or differential pressure disc pinching is suspected)	4.10

- 4.1.3 IF the problem *cannot* be identified as one listed in Table – 1, CONSULT MOV Coordinator for further instructions.

4.2 MOV Fails To Fully Stroke



CAUTION



If motor is in a locked rotor condition and is not immediately deenergized, permanent damage to motor will result.

NOTE

Attachment 1 provides a troubleshooting tree for anticipated sequence of tasks to be performed during troubleshooting of this problem. The tree should be used as guidance only and not to direct the performance of individual maintenance activities.

- 4.2.1 IF motor is in locked rotor condition, **PERFORM** the following:

- a. Immediately **DEENERGIZE** motor.
- b. Go To Section 4.8.

- 4.2.2 **REMOVE** limit switch compartment cover.

- 4.2.3 **CONSULT** Operations Department before changing valve position and **PERFORM** the following:

- a. **ATTEMPT** to operate valve manually and **DETERMINE** if valve is frozen on seat, in midposition, or on backseat.

NOTE

MOV Coordinator or FLS may direct Section 4.10 be performed, MOV diagnostic equipment be employed, or may provide opening torque value.

- b. IF valve is frozen on seat, in midposition, or on backseat, CONSULT MOV Coordinator or FLS for further direction.

CAUTION

When a weak-link analysis has been exceeded, operator disassembly may need to be performed. Further examination of weak link or gear casing is required before equipment can be returned to service.

- c. IF operator is on GL89-10 program valve, REQUEST MOV Design Engineering to determine if a weak-link evaluation has been exceeded and PERFORM operator disassembly and testing as directed.
- d. ESTABLISH communications with additional Maintenance personnel at MOV circuit breaker and PERFORM the following:
- 1) ATTEMPT to operate valve electrically and DETERMINE the point at which movement ceases.
 - 2) WHEN valve movement ceases, immediately DEENERGIZE motor.
- e. WHEN valve motion ceases, IDENTIFY cause of problem as one listed in Table - 2, and Go To applicable section or step.

Table - 2. Identified Causes

CAUSE	SOLUTION
Motor overload protective device actuated	Go To step 4.3.5.c.
Torque switch contacts opened	Go To step 4.6.8
Limit switch contacts opened	Go To step 4.6.7

4.3 MOV Fails to Operate Electrically



CAUTION



If motor is in a locked rotor condition and is not immediately deenergized, permanent damage to motor will result.

NOTE

Attachment 2 provides a troubleshooting tree for anticipated sequence of tasks to be performed during troubleshooting of this problem. The tree should be used as guidance only and not to direct the performance of individual maintenance activities.

- 4.3.1 CONSULT Operations Department before changing valve position.
- 4.3.2 ESTABLISH communications with additional Maintenance personnel at MOV circuit breaker and PERFORM the following:
- ATTEMPT to operate valve electrically.
 - IF valve is in locked rotor condition, immediately DEENERGIZE motor.

NOTE

MOV Coordinator or FLS may direct Section 4.10 be performed, MOV diagnostic equipment be employed, or manual valve stroke be attempted.

- 4.3.3 IF motor is in a locked rotor condition, CONSULT MOV Coordinator or FLS for further direction.
- 4.3.4 DETERMINE which of the following conditions exist:
- Motor is *not* running and motor is *not* in a locked rotor condition.
 - Motor is running and actuator is *not* moving valve stem.

4.3.5 IF motor is *not* running AND is *not* in a locked rotor condition, **PERFORM** the following:

- a. **DETERMINE** if line voltage is available at motor terminals.
- b. IF line voltage is available at motor terminals, **PERFORM** the following:
 - 1) **DEENERGIZE** and **REQUEST** Operations Department to tag out motor operator.
 - 2) **INSPECT** motor and motor leads for open circuit.
 - 3) IF necessary, **REQUEST** AWO to repair or replace motor leads.
 - 4) IF necessary, Refer To applicable overhaul procedure and **REQUEST** AWO to repair or replace motor.
- c. IF voltage is *not* available at motor terminals, **PERFORM** the following:
 - 1) **ENSURE** power is available to actuator control circuits.
 - 2) **INSPECT** motor overload device(s) for continuity and for correct type and size.
 - 3) **INSPECT** motor feeder conductors and motor windings for continuity.
 - 4) **INSPECT** motor and control circuits are properly connected.
 - 5) **PERFORM** point-to-point continuity checks of control circuits.
 - 6) IF loose or broken connections are found during continuity checks, **REQUEST** AWO to repair or replace wiring as necessary.
 - 7) IF continuity check results are satisfactory, manually **OPERATE** actuator and **INSPECT** for correct mechanical operation.

NOTE

If stem is not moving, *internal threads* of stem nut may be stripped.

4.3.6 IF valve stem is *not* moving, AND operator is Limitorque operator, PERFORM the following:

- a. DEENERGIZE and REQUEST Operations Department to tag out motor operator.
- b. Refer To operator removal section in applicable Limitorque operator overhaul procedure, and INSPECT stem nut thread engagement is satisfactory as follows:
 - IF necessary, REMOVE stem nut and ENSURE threads are not stripped.
 - IF necessary, REPLACE stem nut and locknut.
- c. Refer To motor removal section in applicable Limitorque operator overhaul procedure and REQUEST AWO to remove actuator motor.
- d. Refer To appropriate removal or inspection section in applicable Limitorque overhaul procedure and INSPECT the following for damage or abnormal wear:
 - Drive pinion
 - Worm shaft gear and key
 - Drive pinion mesh with worm shaft gear
 - Tripper finger position
 - Tripper block, fingers, and declutch shaft are free to move

4.3.7 IF valve stem is *not* moving AND operator is Teledyne operator, PERFORM the following:

- a. DEENERGIZE and REQUEST Operations Department to tag out motor operator.

- b. Refer To MP 710.3, "Overhaul of Crane Teledyne Motor Operated Valves (EQ)," and REMOVE actuator motor.
- c. Refer To appropriate removal or inspection section in MP 710.3 and INSPECT the following for damage or abnormal wear:
 - Motor drive helical gears
 - Splined bushing
 - Worm and worm gear
 - Pinion and ring gear
 - Clutch and clutch spring
- d. IF cause of malfunction has *not* been identified, CONSIDER damaged or stripped yoke sleeve causing binding.

4.3.8 IF cause of malfunction *cannot* be determined, Refer To applicable overhaul procedure and DISASSEMBLE and INSPECT actuator and yoke sleeve adapter.

4.4 Incorrect Position Indication

NOTE

Attachment 3 provides a troubleshooting tree for anticipated sequence of tasks to be performed during troubleshooting of this problem. The tree should be used as guidance only and not to direct the performance of individual maintenance activities.

- 4.4.1 REQUEST Operations Department to INSPECT Control Room valve position indicating lamps for failure.
- 4.4.2 IF necessary, REQUEST AWO to replace lamps.
- 4.4.3 ESTABLISH communications with Control Room.
- 4.4.4 ENSURE control power is available.

4.4.5 PERFORM one of the following as applicable:

- CONSULT Operations Department and electrically STROKE valve to its full open position.



CAUTION



Unless blue tag is hung on handwheel, Operations Department must be requested to operate handwheel.

- With actuator in manual mode, ROTATE handwheel in open direction and ENSURE valve is fully open.

4.4.6 IF Control Room open position light indicates valve is *not* open, DEENERGIZE control power and PERFORM the following:

- a. PERFORM point-to-point continuity checks of limit switch wiring.
- b. IF loose or broken connections are found during continuity checks, REQUEST AWO to repair or replace wiring as necessary.
- c. IF operator is Teledyne operator, Refer To control compartment inspection section of MP 710.9, "Preventive Maintenance for Crane Teledyne Motor Operated Valves (EQ)," and PERFORM the following
 - 1) IF necessary, REMOVE limit switch compartment cover.
 - 2) ENSURE limit switch mounting hardware and all parts are tight.
 - 3) INSPECT all indication contacts for dust, corrosion, and pitting.
 - 4) IF necessary, REQUEST AWO to repair or clean contacts.
 - 5) Refer To verification of limit switch operation in MP 710.10, "Post Overhaul Testing of Crane Teledyne Motor Operated Valves (EQ)" and VERIFY limit switch operation.

- 6) IF necessary, Refer To MP 710.10, "Post Overhaul Testing of Crane Teledyne Motor Operated Valves (EQ)" and REQUEST AWO to adjust limit switches.
- d. IF operator is Limitorque operator, Refer To limit switch compartment inspection section in C MP 703A1, "Limitorque Operator Preventive Maintenance (EQ)," and PERFORM the following:
 - 1) IF necessary, REMOVE limit switch compartment cover and INSPECT the following:
 - Limit switch rotor(s), including rotor-to-rotor shaft pin(s) engagement
 - Limit switch contacts
 - 2) Refer To limit switch grease inspection section in C MP 703A1, "Limitorque Operator Preventive Maintenance (EQ)," and INSPECT gear frame grease.
 - 3) IF necessary, Refer To limit switch compartment disassembly section in applicable overhaul procedure and REQUEST AWO to remove limit switch and inspect drive train components for damage.
 - 4) IF necessary, Refer To applicable overhaul procedure and REQUEST AWO to repair or replace damaged limit switch components.

4.5 MOV Fails To Operate Manually



CAUTION



Unless blue tag is hung on handwheel, Operations Department must be requested to operate handwheel.

NOTE

Attachment 4 provides a troubleshooting tree for anticipated sequence of tasks to be performed during troubleshooting of this problem. The tree should be used as guidance only and not to direct the performance of individual maintenance activities.

- 4.5.1 CONSULT Operations Department and PERFORM the following:
- a. OPERATE valve manually.
 - b. VERIFY declutch lever remains in manual mode position or is held down.
- 4.5.2 IF necessary, Refer To applicable overhaul procedure and REQUEST AWO to adjust declutch tripper mechanism.

4.5.3 IF operator remains in manual operation with motor running, Refer To applicable overhaul procedure and REQUEST AWO to inspect and repair the following as necessary:

- Deformed declutch shaft
- IF Limitorque operator, tripper fingers equal in length or not properly positioned on adjustment arm
- IF Teledyne operator, broken clutch spring or damaged clutch lugs
- Lubricant hardening
- Clutch key or clutch lugs stuck
- Machine marks on mating parts
- Motor pinion or worm shaft gear loose
- Worm shaft incorrectly assembled

NOTE

MOV Coordinator may provide instructions on use of any of the following:

- VOTES equipment to monitor pullout forces
- Use of cheater bar to open valve with engineering approval
- Applying heat to valve to relieve binding

4.5.4 IF valve does *not* operate manually after seating or backseating electrically, CONSULT MOV coordinator for method of moving valve.

4.5.5 IF handwheel turns during electrical valve operation, PERFORM the following:

- a. INSPECT for grease hardening on handwheel assembly and REMOVE hardened grease.
- b. IF necessary, REQUEST AWO and PERFORM the following:
 - 1) REMOVE handwheel assembly and housing cover.

- 2) INSPECT drive lugs for damage.
 - 3) REPAIR or REPLACE drive lugs as necessary.
 - 4) REMOVE hardened grease.
 - 5) INSPECT housing cover gasket.
- c. IF Teledyne operator, DETERMINE existing grease using the table below, and using the same grease, LUBRICATE handwheel assembly.

Lubricant	Base	Color
Mobil EP-0	Lithium	Medium Brown
Exxon Nebula EP-0	Calcium	Dark Tan

- d. IF Limatorque operator, using Exxon Nebula EP-0 grease, LUBRICATE handwheel assembly.

4.5.6 IF handwheel turns AND valve does *not* respond, Refer To applicable overhaul procedure, REQUEST AWO and PERFORM the following:

- a. REMOVE handwheel and housing cover assembly.
- b. INSPECT handwheel lugs for damage.
- c. REPAIR or REPLACE lugs as necessary.
- d. ENSURE clutch keys are protruding from their slot in upper drive assembly roller bearing.
- e. INSTALL handwheel and housing cover assembly.
- f. IF operator is Limatorque operator, REQUEST AWO to inspect the following for proper installation or damage and to repair as necessary:
 - Declutch tripper
 - Declutch shaft
 - Declutch fork

g. IF operator is Teledyne operator, REQUEST AWO to inspect the following for proper installation or damage and to repair as necessary:

- Clutch
- Clutch shaft

4.5.7 IF cause of actuator malfunction has *not* been determined at this point, Refer To applicable overhaul procedure, and REQUEST AWO to disassemble and inspect actuator.

4.6 **MOV Overtorques into Seat or Slams into Backseat When Operated Electrically**



CAUTION



When a weak-link analysis has been exceeded, operator disassembly may need to be performed. Further examination of weak link or gear casing is required before equipment can be returned to service.

4.6.1 IF operator is on GL89-10 program valve, REQUEST MOV Design Engineering to determine if a weak-link evaluation has been exceeded and PERFORM operator disassembly and testing as directed.

4.6.2 Refer To applicable control wiring diagram, and DETERMINE whether torque or limit switch should stop actuator for travel direction in question.

4.6.3 IF operator is on GL89-10 valve, REQUEST Engineering to provide approved torque switch settings.

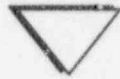
4.6.4 RECORD torque switch open and close contacts on Maint. Form MP 710.13-1.

4.6.5 Refer To the applicable preventive maintenance or adjustment procedure and INSPECT torque switch for correct setting.

4.6.6 REQUEST permission from Operations Department to manually cycle valve in direction of suspected fault, and DETERMINE which stroke limit device (torque or limit switch) is actually stopping valve motion.

4.6.7 IF actuator is being stopped by the limit switch, **PERFORM** the following:

- a. Refer To control wiring diagram and **OBTAIN** desired limit switch actuation position.



CAUTION



Unless blue tag is hung on handwheel, Operations Department must be requested to operate handwheel.

- b. **POSITION** valve manually to the position at which limit switch actuation is desired and **DETERMINE** if limit switch actuates.
- c. IF limit switch does *not* actuate at desired valve position, **ADJUST** limit switch.
- d. IF necessary, **CONNECT** strip chart recorder, or equivalent (i.e., diagnostic test equipment) to motor and control circuits such that the following may be recorded during valve operation:
 - Torque switch actuation
 - Open or closed limit switch operation
 - Motor operating current

NOTE

If valve coast is excessive after limit switch actuation, then one of the following conditions is true:

- Control circuit fault exists.
- Valve stem nut is loose.
- Stem or stem nut has an actuator ratio that is *not* self-locking.
- System line pressure is extending coast.

e. REQUEST Operations Department to electrically operate valve, and PERFORM the following:

- VERIFY correct limit switch actuation.
- OBSERVE any coast following limit switch actuation.

f. REQUEST Operations Department to electrically operate valve a minimum of two times and VERIFY proper operation.

g. IF limit switch actuates AND motor does *not* stop, PERFORM the following:

- 1) ENSURE motor starter contactors are free and operate smoothly.
- 2) ENSURE limit switch and motor control wiring are in accordance with applicable control wiring drawing(s).

4.6.8 IF actuator is being stopped by torque switch, PERFORM the following:

NOTE

The following step checks the mechanical movement integrity of the torque switch.

- a. IF Limitorque operator, *gently* ATTEMPT to move striker plate in both directions and ENSURE that it is in engaged in worm shaft.

b. INSPECT torque switch for the following:

- Proper installation
- Mechanical movement integrity
- Contact condition
- Physical damage

c. IF Teledyne operator, Refer To torque limit setting section of MP 710.3, "Overhaul of Crane Teledyne Motor Operated Valves (EQ)," DETERMINE degree of torque switch spring tension, and RECORD in "Comments" section on Maint. Form 710.13-1.

d. IF necessary, CONSULT Engineering and PERFORM the following as applicable:

- IF operator is Limitorque, Refer To torque switch balancing and adjustment section in C PT 1420E, "Limitorque Actuator Test," and REQUEST AWO to adjust torque switch setting.
- IF operator is Teledyne, Refer To torque limit setting section of MP 710.3, "Overhaul of Crane Teledyne Motor Operated Valves (EQ)," and REQUEST AWO to adjust torque limit setting.

e. IF torque switch settings are changed, PERFORM applicable action:

- IF valve is GL89-10 valve, CONSULT MOV Coordinator to direct performance of diagnostic testing and ENSURE valve does *not* overtorque into seat.
- REQUEST Operations Department to electrically cycle valve a minimum of two times and ENSURE valve does *not* overtorque into seat.

4.6.9 IF cause of malfunction *cannot* be determined, CONSULT MOV Coordinator for direction.

4.7 MOV Fails To Stroke Within Specified Time

NOTE

The following procedures may be used as necessary during the performance of this section:

- PT 1420E "Limitorque Actuator Test"
- C PT 1420B series procedures for VOTES equipment setup and data acquisition
- C PT 1420AA, "Motors and Motor Driven Machines"

4.7.1 CONSULT GTS and CONNECT strip chart recorder, or equivalent (i.e., VOTES test equipment), to motor and control circuits such that the following may be recorded during valve operation:

- Torque switch actuation
- Open or closed limit switch operation
- Motor operating current
- Motor terminal voltage(s)

4.7.2 REQUEST Operations Department to electrically operate valve and OBTAIN valve signature.

4.7.3 Refer To previously obtained strip chart recorder or VOTES traces (or baseline data) and COMPARE new data for the following:

- Motor running current
- Maximum current
- Terminal voltage readings

4.7.4 IF motor current has increased appreciably, PERFORM the following:

- a. INSPECT valve packing condition and adjustment.
- b. IF necessary, Refer To MP 711.12, "Repacking and Live Load Installation" and ADJUST or REPACK.

- c. ENSURE motor operator is *not* being operated under degraded voltage conditions.



CAUTION



Unless blue tag is hung on handwheel, Operations Department must be requested to operate handwheel.

- 4.7.5 Manually OPERATE valve and DETERMINE if excessive force is required to move valve.
- 4.7.6 IF determined that excessive force is required to move valve, Refer To valve stem inspection section in applicable preventive maintenance procedure and PERFORM the following:
- a. INSPECT valve stem for the following:
- Cleanliness
 - Lubrication
 - Damage
- b. IF stem is bent or damaged, REQUEST AWO to remove and repair actuator as necessary.
- c. IF stem is *not* bent or damaged, CLEAN stem, and, using Mobil 28 grease, LUBRICATE stem.
- 4.7.7 Refer To applicable preventive maintenance procedure and PERFORM the following:
- a. INSPECT actuator lubricant level.
- b. REMOVE small sample of actuator lubricant and INSPECT for hardening or contamination.
- c. IF lubricant is hardened or contaminated, Refer To applicable overhaul procedure and REQUEST AWO to perform the following:
- 1) REMOVE old lubricant and CLEAN actuator.
 - 2) FILL actuator with new lubricant.



CAUTION



Use caution to prevent mixing of grease types. If grease type *cannot* be identified, all grease must be replaced with new grease.

- d. IF lubricant level is low, ADD lubricant to desired level.
- 4.7.8 REQUEST Operations Department to electrically cycle valve.
- 4.7.9 DETERMINE whether stroke time is within specifications.
- 4.7.10 IF valve does *not* stroke within specified time limits, EVALUATE further.
 - a. INCLUDE but do *not* limit evaluation criteria to the following:
 - Degraded voltage
 - Degraded or incorrect lubricant
 - Degraded valve
 - Degraded actuator
 - Incorrect operator gear ratio

4.8 Motor is in Locked Rotor Condition

- 4.8.1 Immediately DEENERGIZE motor.

NOTE

MOV Coordinator may direct Section 4.10 be performed, or opening torque may be provided, or employment of diagnostic test equipment may be directed.

- 4.8.2 NOTIFY MOV Coordinator of locked rotor condition and OBTAIN instructions to manually cycle valve to ensure valve is *not* frozen in place on its seat or backseat.

- 4.8.3 IF valve is frozen in place, Refer To Section 4.10, and **CONSIDER** thermal binding, pressure locking, or differential pressure disc pinching as a possible cause of malfunction.



CAUTION



When a weak-link analysis has been exceeded, operator disassembly may need to be performed. Further examination of weak link or gear casing is required before equipment can be returned to service.

- 4.8.4 IF operator is on GL89-10 program valve, **REQUEST MOV** Design Engineering to determine if a weak-link evaluation has been exceeded and **PERFORM** operator disassembly and testing as directed.



CAUTION



Unless blue tag is hung on handwheel, Operations Department must be requested to operate handwheel.

- 4.8.5 Refer To applicable preventive maintenance procedure and **PERFORM** valve stem inspection including the following:
- **INSPECT** valve stem for bends or damaged threads.
 - **INSPECT** valve stem for cleanliness and lubrication.
 - IF necessary, **CLEAN** and **LUBRICATE** valve stem.
- 4.8.6 Refer To records of recent maintenance activities as necessary, and **DETERMINE** whether improper packing installation or adjustment is responsible for undue resistance to valve operation.
- 4.8.7 IF necessary, Refer To MP 711.12, "Repacking and Live Load Installation," **REQUEST AWO** to replace or adjust packing, and **RESOLVE** packing or lubrication problems as necessary.
- 4.8.8 **PERFORM** insulation resistance check as follows:
- a. **RECORD** megger serial number and calibration due date on Maint Form 710.13-1.

b. PERFORM applicable action and RECORD megger reading on Maint Form 710.13-1:

- IF motor is 125 VDC motor, using 500-volt megger, MEGGER motor.
- IF motor is 480 VAC motor, using 1000-volt megger, MEGGER motor.

c. IF megger value of motor does *not* meet the following acceptance criteria, CONSULT MOV Coordinator or FLS for further maintenance instructions:

- 125 VDC motors: $\geq 1 \text{ M}\Omega$
- 480 VAC motors: $\geq 2 \text{ M}\Omega$

4.8.9 INSPECT motor starting contactor for dirt or damage and REQUEST AWO to REPAIR as necessary.

4.8.10 Refer To applicable sections in overhaul procedure and REQUEST AWO(s) to perform the following:

- REMOVE actuator motor.
- PERFORM the following inspection:



CAUTION



For Limitorque operators, *do not* declutch to motor operating mode by full rotation of worm shaft.

- MOVE worm shaft gear and INSPECT for ease of movement to determine actuator binding or rotational lockup.
 - INSPECT motor for ease of rotation.
- c. REPAIR or REPLACE components as necessary.

4.8.11 IF valve stroked satisfactorily in manual mode in step 4.8.2, AND cause of malfunction has *not* been determined, **PERFORM** the following:

- a. **CONSULT** Operations Department and **ATTEMPT** to electrically operate valve through its full opening and closing strokes.
- b. IF valve does *not* stroke satisfactorily, Refer To removal and inspection sections in applicable overhaul procedure and **REQUEST AWO** to disassemble and inspect actuator.
- c. **EVALUATE** the following as possible causes or contributors to malfunction:
 - Minor disc thermal or hydraulic binding in closed position
 - Loose chemical, corrosion, or foreign material buildup on valve stem
 - Initial packing binding
 - Temporary foreign material fouling
 - Excessive differential pressure or vibration not present during troubleshooting
 - Hardened or degraded stem lubricant
 - Torque switch or control circuit fault
 - Loose stem locknut or faulty stem nut
- d. Refer To applicable maintenance procedures and **REQUEST AWO** to perform any inspections or repairs as necessary.

4.9 Valve Motion is Opposite Desired Direction of Travel

- 4.9.1 **ENSURE** correct phase sequence at line side of controller contactors.
- 4.9.2 Refer To control wiring diagram and **ENSURE** control switch(es) are properly connected.

NOTE

Interchanging any two ac motor phase leads changes rotational direction of operator drive motor.

4.9.3 Refer To control wiring diagram and ENSURE motor is properly connected.

4.10 Valve Does Not Open—Thermal Binding, Pressure Locking, or Differential Pressure Disc Pinching

NOTE

When a *solid or flexible* wedge gate valve is closed in a hot condition and then cools, attempts to open the valve may fail. In this instance some of the corrective measures may be as follows:

- Using approved heating method (heating blankets, wide-flame torch) and heating valve body to allow seats to widen
- Using torque wrench on MOV or valve handwheel and prying valve disc out of its seat
- Using MOV diagnostic-test equipment on valve stem to monitor disc pullout force
- Monitoring motor current at the motor control center if electrical operation is the preferred method for opening

4.10.1 CONSULT with Operations and DETERMINE if thermal binding is a probable cause.

4.10.2 IF thermal binding is suspected, REQUEST FLS or MOV Coordinator to provide instructions for performing corrective measures.

NOTE

When a flexible-wedge or parallel-disc gate valve is closed, water or steam may get trapped in the valve bonnet area. If the body heats up due to adjacent components or a fluid temperature increase, the trapped steam or water forces the discs more tightly against the seats, keeping the valve locked closed. In this instance, some of the corrective measures may be as follows:

1. To relieve pressure trapped in the bonnet area:
 - Loosening packing gland bolts
 - Removing the gland follower to allow packing to be partially worked out of the stuffing box
 - Loosening or removing a gland leak off plug or opening a gland leak off isolation valve
2. If above techniques are unsuitable:
 - Using torque wrench on MOV or valve handwheel to pry valve off its seat
 - Using MOV diagnostic test equipment on valve stem to monitor disc pullout forces

4.10.3 CONSULT with Operations and DETERMINE if pressure locking is a probable cause.

4.10.4 IF pressure locking is suspected, REQUEST FLS or MOV Coordinator to provide instructions for performing corrective measures.

NOTE

When valves (primarily solid-wedge gate valves) are closed under low-pressure conditions, subsequent increase and decrease in pipeline pressures may cause the wedge to get stuck between the seats. This phenomenon is referred to as differential pressure disc pinching. In this instance, some of the corrective measures may be as follows:

- Pressurizing both sides of the valve and attempting to open valve
- Using torque wrench on MOV or valve handwheel and prying valve off its seat
- Using MOV diagnostic test equipment on valve stem to monitor disc pullout forces

4.10.5 CONSULT with Operations and DETERMINE if differential pressure disc pinching is a probable cause.

4.10.6 IF differential pressure disc pinching is suspected, REQUEST FLS or MOV Coordinator to provide instructions for performing corrective measures.

4.11 Restoration

4.11.1 IF operator is part of GL89-10 program, REVIEW work performed and prior to operator return to service, ENSURE MOV diagnostic testing is performed as necessary.

4.11.2 REQUEST Engineering to determine valve operability.

5. REVIEW AND SIGN-OFF

- 5.1 The review and sign-off of this procedure is satisfied by the review and sign-off of the AWO.

6. REFERENCES

- 6.1 "NNECo Accident Prevention Manual"

6.2 Maintenance Procedures

- 6.2.1 C MP 703A1, "Limitorque Operator Preventive Maintenance (EQ)"
- 6.2.2 C MP 703A2, "Limitorque Operator Maintenance (EQ) (SB/SMB-000 and SB/SMB-00, and SBD-00)"
- 6.2.3 C MP 703A3, "Limitorque Operator Maintenance (EQ) (SMB-0 to -4T, and SB-0 to -4)"
- 6.2.4 C PT 1420E, "Limitorque Actuator Test"
- 6.2.5 C PT 1420X, "MOV Testing Using VOTES and MOVATS Limitorque Thrust Cell"
- 6.2.6 MP 710.9, "Preventive Maintenance for Crane Teledyne Motor Operated Valves (EQ)"
- 6.2.7 MP 710.3, "Overhaul of Crane Teledyne Motor Operated Valves (EQ)"
- 6.2.8 MP 711.12, "Repacking and Live Load Installation"

6.3 Administrative Procedures

- 6.3.1 CC 1, "Control of Chemical Consumable Products"
- 6.3.2 WC 8, "Control and Calibration of Measuring and Test Equipment"
- 6.3.3 WC 10, "Jumper, Lifted Lead, and Bypass Control"

7. SUMMARY OF CHANGES

- 7.1 Added section to provide instructions to consult with FLS and MOV Coordinator if thermal binding, pressure locking, or differential pressure disc pinching is a suspected cause of valve failing to open. This was done in response to AR 96003605, "MOV Troubleshooting Plan."
- 7.2 Added precaution and paragraph to Discussion section in regards to GL89-10 Program valves. A troubleshooting plan needs to be developed by the MOV Coordinator.
- 7.3 Portions of the procedure regarding locked rotor were reorganized to reflect the severity of the locked rotor and more MOV Coordinator responsibility was added.
- 7.4 Added requirement to record additional as-found data such as reason for valve stroke; number of attempts made to cycle valve; time between attempted starts; known history of operational problems; and comments relating to system conditions, pressure flow, noise, temperature, odor, and local position.
- 7.5 Added requirement to request MOV Design Engineering to determine if weak-link evaluation has been exceeded.
- 7.6 Added a prerequisite that the valve has been declared INOPERABLE or unavailable or both prior to performing any maintenance described in Sections 4.2 through 4.10.

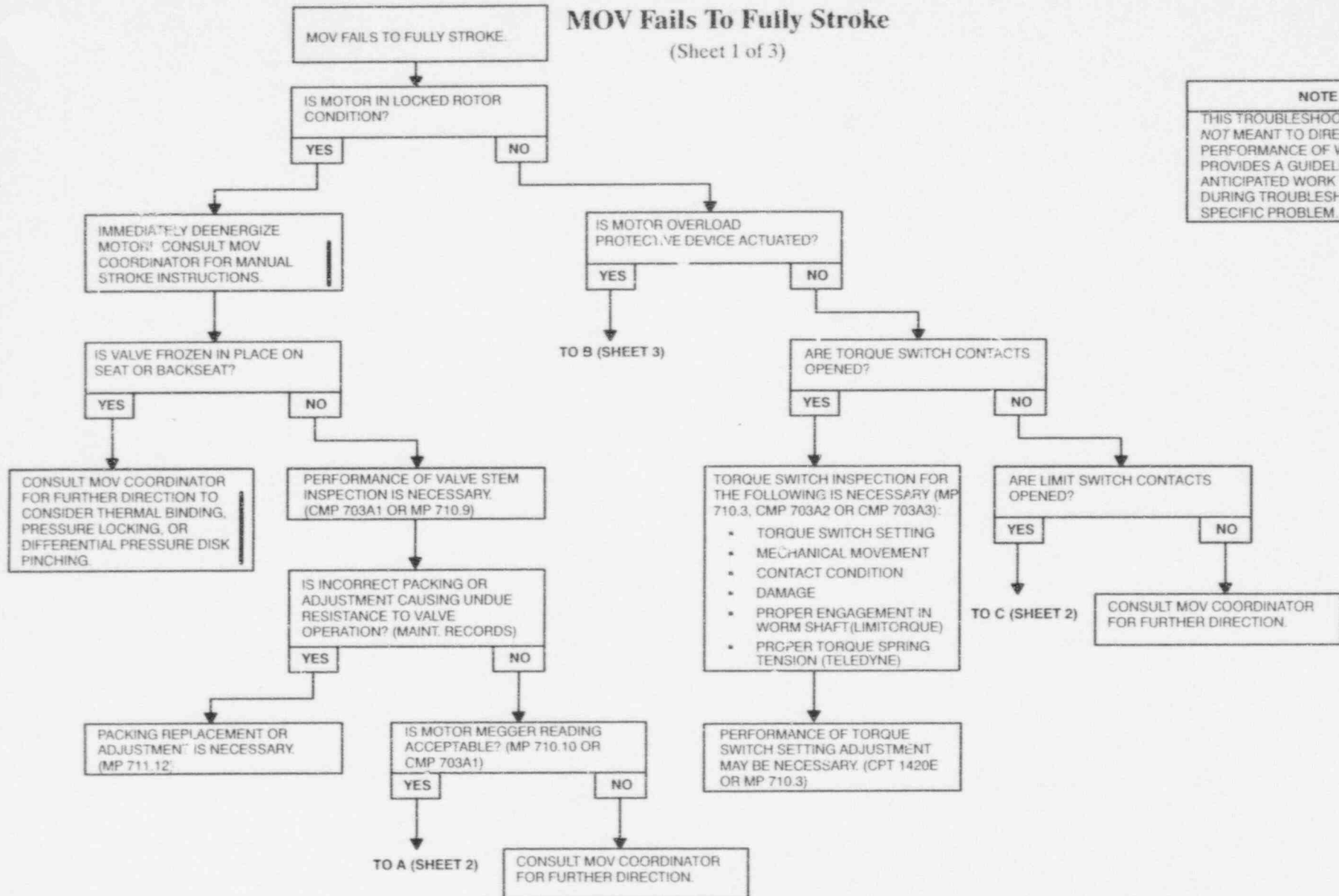
Attachment 1

MOV Fails To Fully Stroke

(Sheet 1 of 3)

NOTE

THIS TROUBLESHOOTING TREE IS NOT MEANT TO DIRECT THE PERFORMANCE OF WORK. IT PROVIDES A GUIDELINE FOR ANTICIPATED WORK TO BE DONE DURING TROUBLESHOOTING OF A SPECIFIC PROBLEM.



Level of Use
for action

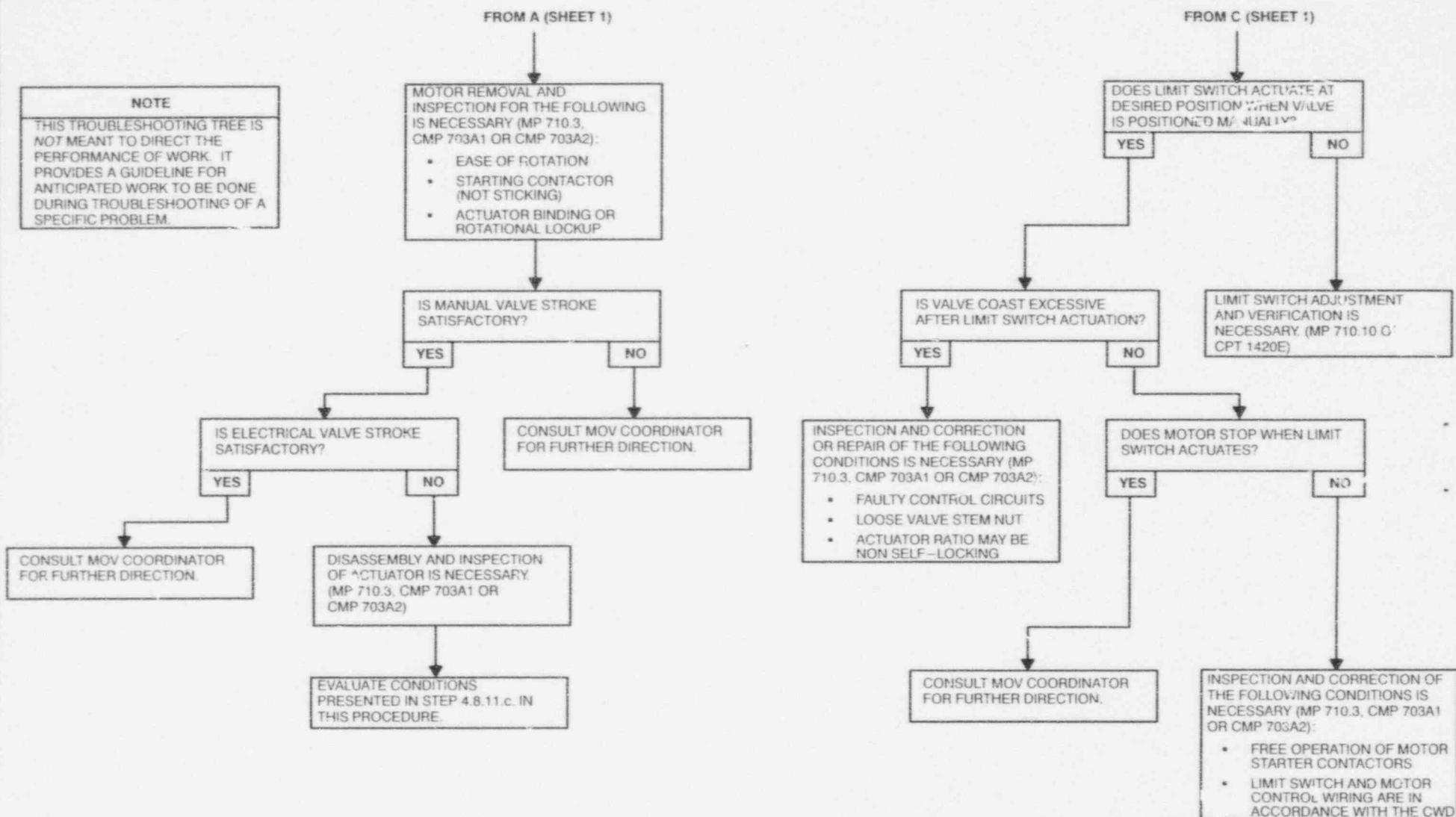
STOP THINK ACT REVIEW

MP 710.13
Rev. 2
33 of 39

Attachment 1

MOV Fails to Fully Stroke

(Sheet 2 of 3)



Level of Use
Information

STOP THINK ACT REVIEW

MP 710.13
Rev. 2
34 of 39

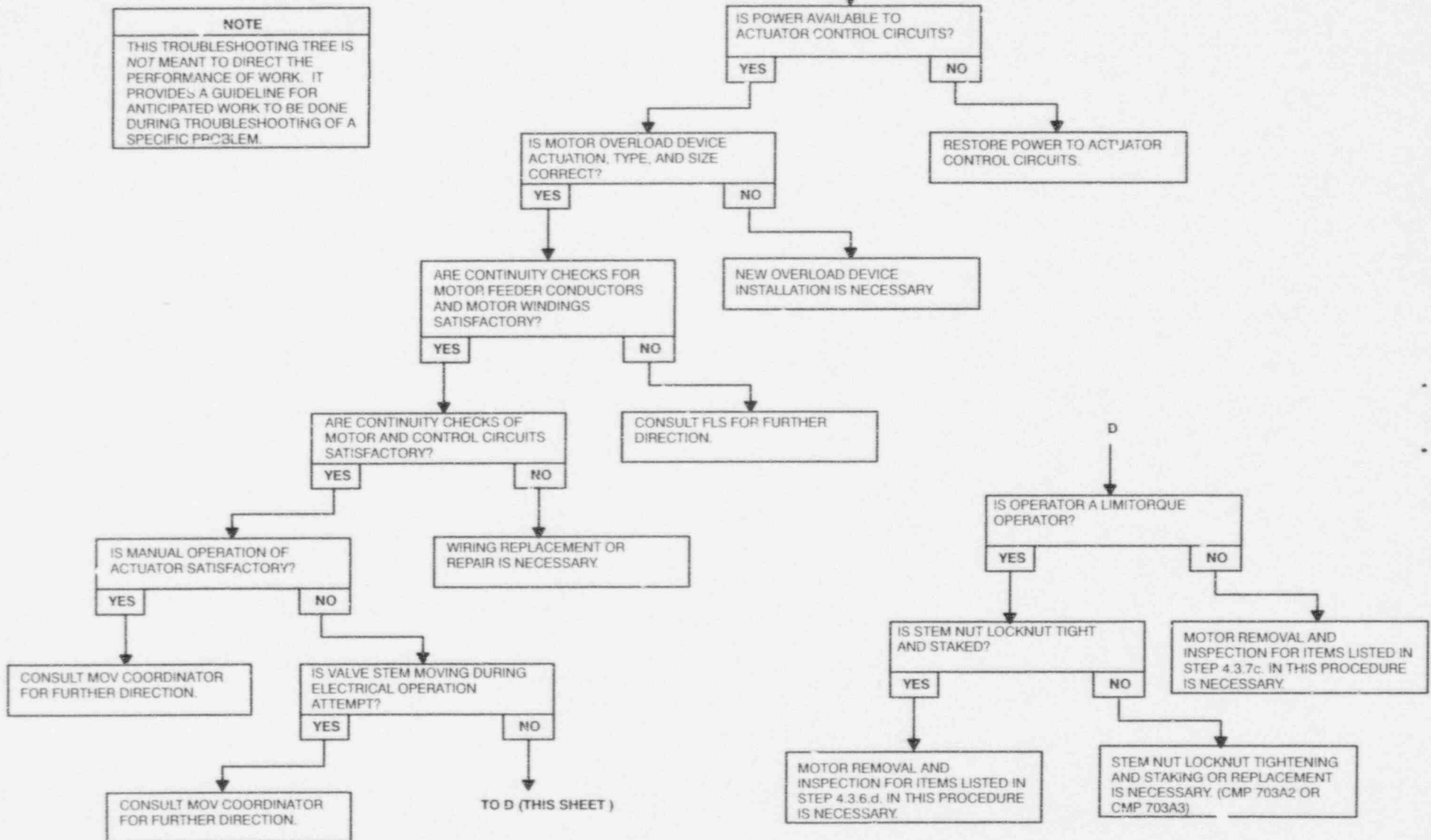
Attachment 1

MOV Fails to Fully Stroke

(Sheet 3 of 3)

FROM B (SHEET 1)

NOTE
THIS TROUBLESHOOTING TREE IS NOT MEANT TO DIRECT THE PERFORMANCE OF WORK. IT PROVIDES A GUIDELINE FOR ANTICIPATED WORK TO BE DONE DURING TROUBLESHOOTING OF A SPECIFIC PROBLEM.



Level of Use
Information

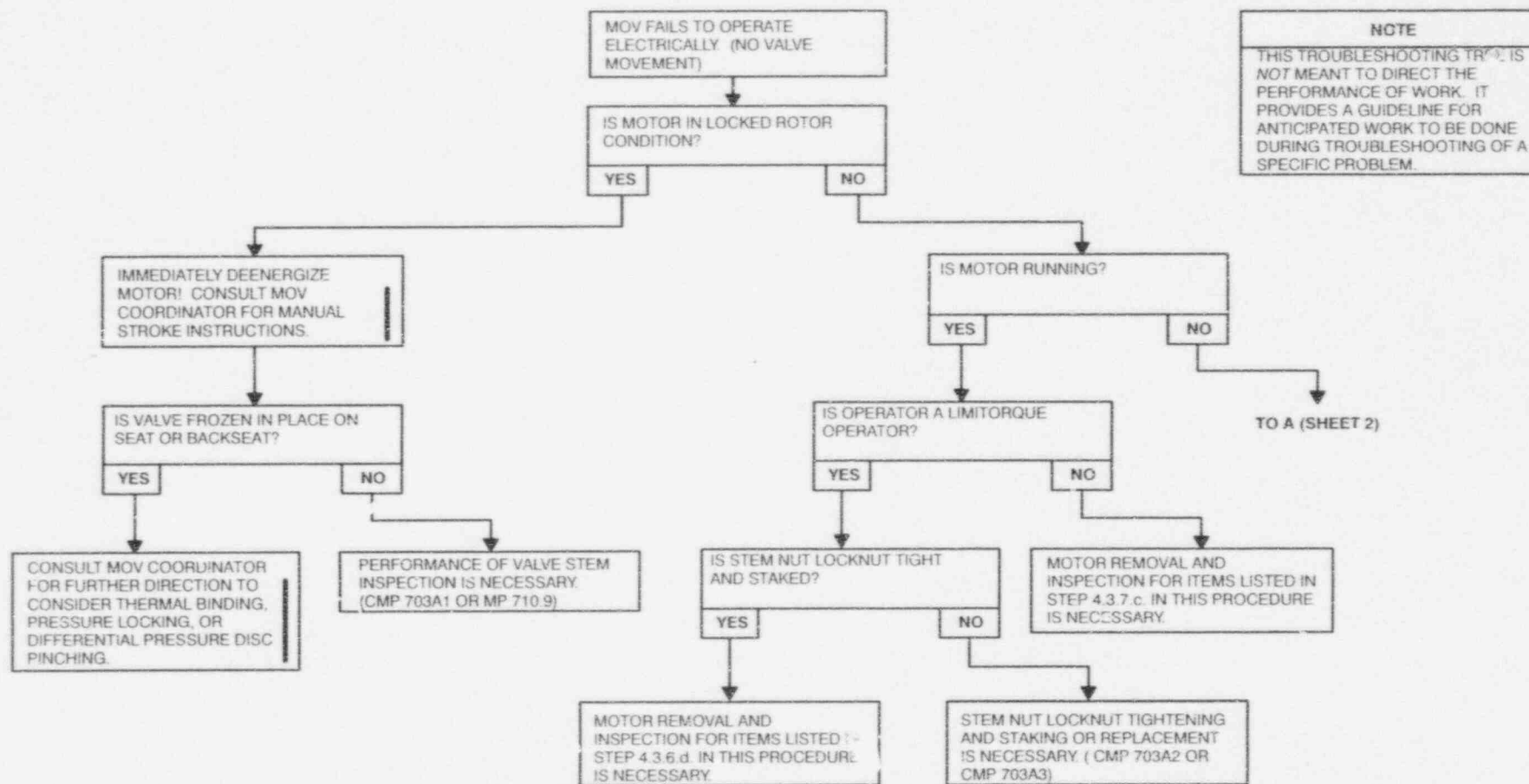
STOP THINK ACT REVIEW

MP 710.13
Rev. 2
35 of 39

Attachment 2

MOV Fails To Operate Electrically

(Sheet 1 of 2)



Level of Use
Information

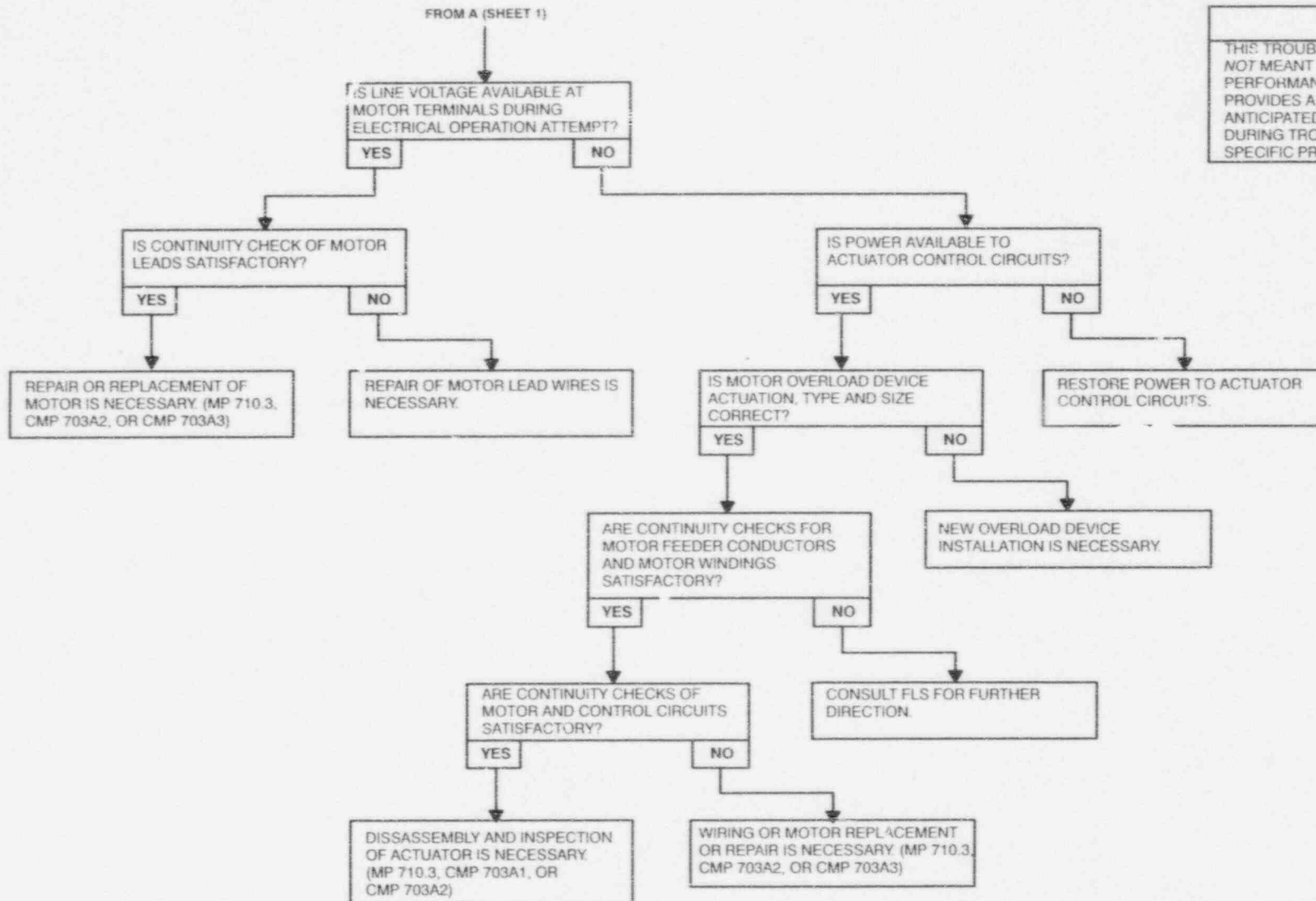
STOP THINK ACT REVIEW

MP 710.13
Rev. 2
36 of 39

Attachment 2

MOV Fails To Operate Electrically

(Sheet 2 of 2)



NOTE

THIS TROUBLESHOOTING TREE IS NOT MEANT TO DIRECT THE PERFORMANCE OF WORK. IT PROVIDES A GUIDELINE FOR ANTICIPATED WORK TO BE DONE DURING TROUBLESHOOTING OF A SPECIFIC PROBLEM.

Level of Use
Information

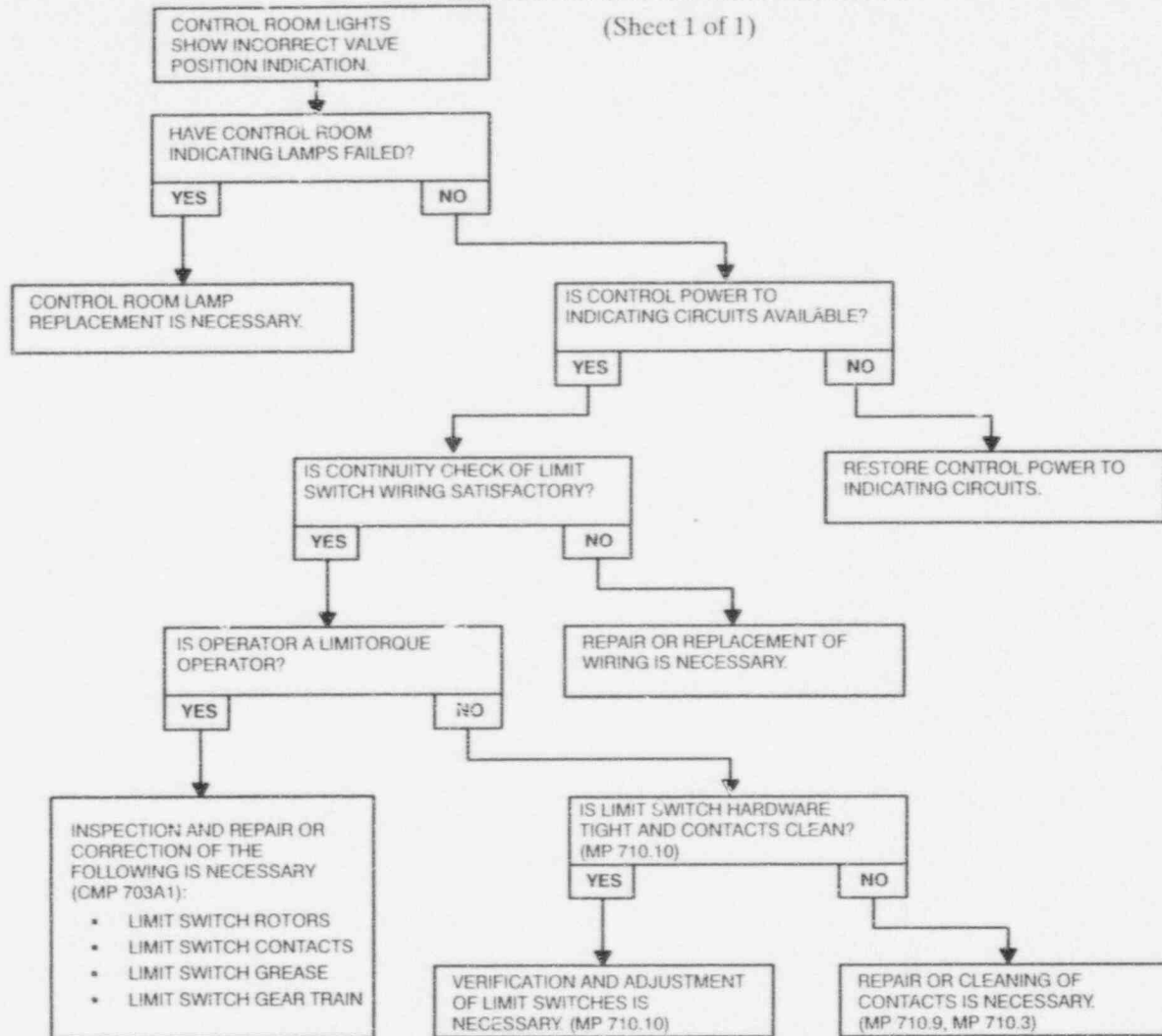
STOP THINK ACT REVIEW

MP 710.13
Rev. 2
37 of 39

Attachment 3

Incorrect Position Indication

(Sheet 1 of 1)



NOTE

THIS TROUBLESHOOTING TREE IS NOT MEANT TO DIRECT THE PERFORMANCE OF WORK. IT PROVIDES A GUIDELINE FOR ANTICIPATED WORK TO BE DONE DURING TROUBLESHOOTING OF A SPECIFIC PROBLEM.

Level of Use
Information

STOP

THINK

ACT

REVIEW

MP 710.13

Rev. 2

38 of 39

Attachment 4

MOV Fails to Operate Manually

(Sheet 1 of 1)

