07-498 91

May 29, 1986

POLICY ISSUE

(Notation Vote)

SECY-86-164

For: The Commissioners

From: Victor Stello, Jr.
Executive Director for Operations

Subject: PROPOSED RULE ON THE IMPORTANT-TO-SAFETY ISSUE

Purpose: To obtain Commission approval of proposed definitions of safety-related, important-to-safety, facility licensing documents, and normal industry practice and obtain additional Commission direction on the rulemaking option to be followed.

Category: This paper covers a significant policy issue.

Issue: This paper is the first step in implementing the Commission's decision to initiate rulemaking In the Matter of Long Island Lighting Company (Shoreham Nuclear Power Station, Unit 1) CLI-84-9, 19 NRC 1325 (June 5, 1984).

Background: In the Shoreham licensing decision (CLI-84-9, 19 NRC 1323, June 5, 1984) the Commission directed the staff to prepare a rulemaking package to resolve the issue concerning the definition and usage of the terms "safety-related" (SR) and "important-to-safety" (ITS). Subsequent to this Commission direction, the Utility Safety Classification Group petitioned (October 30, 1984) the NRC to define these terms in its regulations. In response to the Commission direction, on December 20, 1984, the staff provided an information paper, SECY-84-476, to the Commission concerning the steps the staff was taking to implement the Commission's directives in the area of equipment "important-to-safety." At that time, the staff informed the Commission that, after further discussion with interested industry groups, the staff was planning to go forward with a Notice of Proposed Rulemaking to the Commission for its decision in early 1985.

On January 31, 1985, a meeting was held between representatives of the Atomic Industrial Forum (AIF), the Utility Safety Classification Group (USCG) and the NRC staff concerning the important-to-safety issue. The staff and the industry representatives agreed that the interpretation of the term

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"important-to-safety" in General Design Criterion-1 to 10 CFR 50, Appendix A, and elsewhere in Part 50, only needed to be clarified to reflect the statement of past practice adopted by the Commission in the Shoreham decision.

On April 5, 1985 the staff presented the Commission with a proposed rulemaking package (SECY-85-119) which embodied the agreed upon interpretation, i.e., normal industry practice is acceptable for important-to-safety items that are not safety-related unless otherwise specified in licensing documents.

On December 31, 1985, the Office of the Secretary issued a Staff Requirements Memorandum which stated that the Commission had disapproved SECY-85-119, and that the proposed rule did not adequately differentiate nor clarify the terms important-to-safety and safety-related. Additionally, in the SRM the Commission requested the staff to address or clarify particular aspects of the issue, with Commissioner Asselstine requesting that two additional concerns be addressed.

Discussion: The December 31, 1985 Staff Requirements Memorandum (SRM) directed the staff to resubmit a revised proposed rule based on the guidance provided by the Commission. The staff is providing a revised Commission Paper for the Commission's consideration. This paper provides revised definitions of important-to-safety and safety-related, defines normal industry practice and facility licensing documents, and requests Commission approval of these definitions prior to developing the proposed rulemaking package.

As the staff understands the SRM, there are two basic issues involved: (1) what equipment should be classified as ITS, and (2) what requirements are imposed on this class of equipment. The staff has grouped the Commission's requests, guidance, and questions that appeared in the SRM into five general requests as listed below. The staff believes that the two basic issues have been addressed within the responses that follow.

1. Clarify the definitions of "important-to-safety" and "safety-related."

2. Define "normal industry practice."

3. Develop criteria for determining what equipment is ITS on a plant-specific basis.

4. Review the usage of the terms ITS and SR in 10 CFR for consistency and propose appropriate modifications if the usage is not consistent.

5. If any new requirements are imposed, the appropriate backfitting procedures will be used.

A discussion of the staff's response to and recommendation on each of these requests follows:

1. Clarify definitions of Important-to-Safety and Safety-Related

The Commission's guidance contained in the SRM concerning clarifying the definitions of "safety-related" and "important-to-safety" keyed on clarifying that "safety-related" is a subset of "important-to-safety" and the concept that the staff had required some "specialized treatment" in the plant's licensing documents for equipment "important-to-safety."

To stress the fact that "safety-related" is a subset of "important-to-safety," the staff has revised the definition of "safety-related" to specifically state "...safety-related is a subset of important-to-safety...." This action divides the general category of important-to-safety into two subsets, important-to-safety/safety-related (ITS/SR) and important-to-safety/non-safety-related (ITS/NSR).

A literal interpretation of the SRM would result in the following definition of important-to-safety:

> "Important-to-safety" when referring to structures, systems, and components means those structures, systems, and components for which the NRC staff has required the application of some specialized treatment in the facility licensing documents or generic regulatory requirements. Requirements imposed on important-to-safety items are only those which were specifically required by inclusion in the facility licensing documents or in generic regulatory requirements.

In order to assess the SRM guidance concerning the use of "specialized treatment," the staff reviewed the Final Safety Analysis Reports (FSARs) and selected portions of the other licensing documents for two nuclear power plants, Rancho Seco and River Bend. The purpose of the review was to determine what items that the staff traditionally considered "important-to-safety" would not be encompassed as such using the "specialized treatment" criteria. For this review the

staff considered specialized treatment to include references in the licensing documents to codes, standards, seismic design or qualification provisions, missile hazard prevention provisions, fire protection provisions, special calibration, testing, maintenance or inspection provisions, and any quality control or quality assurance provisions.

Documents submitted by the licensee in support of the application for an operating license were considered the facility licensing documents, i.e., documents submitted after the license was issued were not considered unless they were a condition of the license.

For Rancho Seco, the integrated control system, and the main turbine trip and control systems are examples of systems that are described in the FSAR but for which no "specialized treatment" is specified in the FSAR or the other licensing documents reviewed. The staff believes these systems are clearly important-to-safety as their failure would cause transients that would challenge the plant's safety-related systems.

For River Bend, the feedwater control system and the rod control and information system are examples of systems or components described in the FSAR but for which no "specialized treatment" exists in the FSAR or the other licensing documents reviewed and which the staff believes are important-to-safety.

Based on this review the staff believes the guidance in the SRM, if strictly followed, would not include systems that the staff considers "important-to-safety" nor would it make clear that the Commission expects that normal industry practice would be followed for these systems when "specialized treatment" has not been specified. The staff, with its limited resources, does not review every detail of an application and assure that the appropriate treatment is given to each ITS/NSR item. The staff review presumes that a body of good practice exists for plant structures, systems and components whether or not explicit specialized treatment is specified in the facility licensing documents.

Under this narrow definition of ITS proposed by the SRM, the systems listed above could be excluded from the category of ITS and therefore be beyond the requirements of the general design criteria (10 CFR 50, Appendix A). This could weaken the basis for taking action on safety concerns for any equipment for which specialized treatment is not required in facility licensing documents.

As an alternative to the SRM definition, the staff proposes the following definition of "important-to-safety:"

> "Important-to-safety" when referring to structures, systems, and components means those structures, systems, and components that are described in the facility licensing documents and that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public.

The staff further would define facility licensing documents for the staff definition as follows:

> "Facility licensing documents" are those documents that comprise the application and associated proceedings; NRC regulations; Final Safety Analysis Report; NRC orders; license conditions; and written licensee commitments to the NRC.

The staff's approach encompasses all the equipment, information, and commitments that served as a basis for issuing an operating license or a construction permit and for allowing continued operation or construction. There is, however, the possibility that for some plants not all equipment that the staff presently considers ITS is described in the facility licensing documents. Under the NRC's current regulatory requirements, a requirement by the staff to add a description to the FSAR for this equipment would be subject to a backfit analysis.

The Commission should note that although increased emphasis is being placed on ITS/NSR equipment because of recent operational events, the NRC inspection program has been and continues to be primarily focused on ITS/SR equipment due to resource limitations and the presumption that a body of good practice exists for plant structures, systems and components. The staff does not foresee a change in the level of inspection effort expended on ITS/NSR equipment solely as a result of this rulemaking.

2. Define Normal Industry Practice

The staff considered two options in responding to the Commission's request to define "normal industry practice:" (a) using the ATWS QA guidance previously developed for "important-to-safety but not safety-related" equipment or (b) develop new guidance which generally describes the

staff's interpretation. The staff considered the ATWS QA guidance as it is reasonably specific and already applies to some equipment falling in the ITS/NSR category. However, the staff determined that the application of the ATWS guidance to the entire ITS/NSR category may constitute a backfit for some equipment at some plants. The staff believes that a substantial effort would be required to develop a suitable backfit analysis and considers it doubtful that such an analysis would support the imposition of the guidance. Therefore, the staff concluded that such an imposition of the ATWS QA guidance on all ITS/NSR items would be inappropriate.

As an alternative, the staff proposes the following definition of "normal industry practice:"

> "Normal Industry Practice" when referring to structures, systems, and components important-to-safety but not safety-related (ITS/NSR), means that these items are: (1) designed, constructed, operated, inspected, tested, and maintained in accordance with applicable nuclear or non-nuclear codes and standards, and vendor- or manufacturer-supplied information or recommendations; (2) replaced with parts assured to be of at least the same quality as the original parts through inspections, tests, evaluation, or audits; and (3) evaluated to establish root causes and necessary corrective actions for any nonconforming items or operational performance problems that occur.

Based on the information gathering visits that have been made concerning licensees' handling of ITS/NSR structures, systems, and components, the staff considers that this description of normal industry practice describes the intent, if not in every case the practice, at operating plants.

Enclosure 1 to this paper provides examples of the maintenance, operation, and inspection aspects of normal industry practice for emergency power diesel generators and valve motor operators. This information is provided to show the level of detail that the staff considers acceptable in describing "normal industry practice" for ITS/NSR equipment. Although emergency power diesel generators are classified as safety-related by licensees, General Motors provides the diesels as commercial grade to a customer who assembles the diesel generator unit. The enclosed diesel vendor information is illustrative of the level of detail specified by vendors for complex equipment and is illustrative of "normal industry practice."

The Commission should note that neither current regulations nor the proposed rule, as presently perceived, would require licensees to comply with this definition of normal industry practice, although as stated above it is the opinion of the staff that most licensees already comply. If the Commission determines that compliance with this definition should be explored, the staff will make appropriate modifications to the proposed rule and prepare the requisite backfit analysis.

3. Develop Criteria for Determining what Equipment is ITS on a Plant Specific Basis

On the issue of guidance for determining what equipment is important-to-safety, the SRM stated that a list of equipment ITS/NSR is not required; that for NTOLs, equipment ITS/NSR could, in general, be determined during the normal licensing process; that it is not the intention of the rule to add new requirements; and that criteria for determining what equipment is ITS/NSR on a plant-specific basis should be developed.

To date neither the licensees nor the staff has compiled a list of ITS/NSR equipment. The licensee's FSARs contain descriptions of both ITS/SR and ITS/NSR structures systems, and components. The descriptions usually clearly state which equipment is ITS/SR but licensees have not specifically identified equipment which is ITS/NSR. The staff in their review of licensee's FSARs have, to date, including NTOLS, concentrated on structures, systems, and components which are ITS/SR. The Safety Evaluation Reports (SERs) issued by the staff specifically cover ITS/SR equipment. However, issuance of an SER does indicate general acceptance of the Safety Analysis Report. Therefore, although ITS/NSR equipment has not been specifically identified as such, equipment contained in the category ITS/NSR can generally be determined by using the staff's definitions of ITS and facility licensing documents. To do so would be a major undertaking for an individual licensee.

The staff also reviewed the dockets for those plants that have not received an operating license but are actively pursuing completion of the plants. For all plants except Bellefonte 1 & 2 and WNP 1 & 3, the staff has issued a Safety Evaluation Report thereby establishing what structures, systems, and components are ITS. Therefore, due to the small number of plants that would be affected by the proposed definitions, the staff proposes that for all currently docketed plants that ITS equipment be that which is or will be described in the facility licensing documents, as per the previously cited definition.

4. Review Usage of Terms ITS and SR

The staff has reviewed the use of the terms "safety-related" and "important-to-safety" in 10 CFR and concluded that the use of the terms is not internally consistent nor is it consistent with the proposed definitions. "Safety-related" appears 39 times and "important-to-safety" appears 126 times.

A clear example of a use inconsistent with the proposed definition of "important-to-safety" appears in General Design Criterion 2; "Structures, systems, and components important-to-safety shall be designed to withstand the effects of natural phenomena such as earthquakes ...without loss of capability to perform their safety functions...." In general, the staff has required that ITS/SR equipment meet this requirement, but most of the ITS/NSR equipment does not. As such, the proposed definition of ITS would tend to imply that all ITS equipment must be designed to operate after a design basis earthquake which is not intended by the staff. However, a direct substitution of "safety-related" for "important-to-safety" would not encompass certain aspects such as non-Category I seismic design requirements. Similarly, the adequacy and reliability of offsite power would not be encompassed by changing "important-to-safety" to "safety-related" in other General Design Criteria.

Due to the magnitude of the problem and the difficulties involved in developing acceptable alternatives, the staff has not pursued the issue of consistent usage of these terms. There are four options available to the Commission in implementing the definitions of important-to-safety and safety-related:

1. Withhold issuing a notice of proposed rulemaking on the proposed definitions until the rest of 10 CFR can be appropriately modified to be consistent with the proposed definitions. These usage changes would then be published with the proposed definitions in the same proposed rule.

2. Withhold issuing a notice of proposed rulemaking on the proposed definitions until 10 CFR Part 50 can be appropriately modified to be consistent with the new definitions. These usage changes would then be published with the proposed definitions in the same proposed rule.

3. Issue a notice of proposed rulemaking on the proposed definitions, review the public comments, finalize the definitions, receive Commission endorsement of the definitions and then prepare a second notice of proposed rulemaking on the appropriate changes to 10 CFR or 10 CFR 50 based on the final definitions.

4. Issue a policy statement announcing the Commission's adoption of the definitions and forego rulemaking.

The first option would attempt to achieve consistency in the usage of the terms safety-related and important-to-safety throughout the regulations. However, this effort would entail revising portions of Parts 2, 21, 34, 50; General Design Criteria 2, 3, 4, 5, 16, 17, 18, 44, 54 and 61 contained in Appendix A to Part 50; Appendix R to Part 50; and portions of Parts 60, 71, 72 and Appendix A to Part 100. It is the opinion of the staff that the two areas where the usage problem would be most difficult to resolve are the General Design Criteria and the inconsistencies between the parts of the regulations concerning production and utilization facilities versus the parts of the regulations concerning waste repositories, independent spent fuel storage facilities, and packaging and transportation of radioactive material. Additionally, the safety concerns and equipment involved are sufficiently different between production and utilization facilities and the waste repository, independent spent fuel storage, and transportation areas that different definitions and use of terminology between these areas will not create any significant loss of clarity. Moreover, the term safety-related is not used in regulations applicable to waste repositories, independent spent fuel storage, and transportation areas. The term important-to-safety, as it applies to these areas, is specifically defined in each of the relevant subparts of 10 CFR. Therefore, there is no uncertainty over the present usage of these terms in these portions of the regulations. For these reasons, the staff considers it unnecessary and inappropriate to attempt making the definitions and usage of the terms important-to-safety and safety-related consistent throughout 10 CFR. Additionally, any attempt to do so would take an effort substantially in excess of the other options and would not be the most appropriate use of staff resources. If extensive public comments are received that necessitate revision of the definitions, the effort would, in effect, have to be undertaken a second time.

The staff does not recommend the Commission approve this option.

The second option would resolve the issue of safety-related versus important-to-safety for the regulations concerning production and utilization facilities (principally power reactors). This is the area where the issue was originally raised and where the lack of definitions and consistent usage have created uncertainty. Additionally, the equipment involved and the rules governing that equipment are sufficiently different between production and utilization facilities and the waste repository, independent spent fuel storage, and transportation areas that different definitions and use of terminology between these areas will not adversely affect the regulatory environment. Restricting the rulemaking to those portions of 10 CFR concerning production and utilization facilities would reduce the areas considered difficult to resolve by the staff to General Design Criteria (GDC) 2, 3, 4, 5, 16, 17, 18, 44, 54 and 61. To fully resolve the usage problem it may be necessary to take the guidance currently contained in the Standard Review Plan and applicable Regulatory Guides and place that information in the GDC.

The staff currently estimates that this option would take two to three years and involve approximately two FTE per year just to issue the proposed rule. If extensive public comments are received that necessitate revision of the definitions, the effort would have to be repeated.

The staff recommends that any rulemaking be restricted to those parts of 10 CFR that concern production and utilization facilities.

Option three would postpone any action on resolution of the usage problem until the staff has had the benefit of public comments on the proposed definitions and the final definitions had received Commission approval. This option would have the advantage of early public comments on the proposed definitions with a very limited impact on staff resources and would also avoid the possible situation of having to attain staff agreement on the necessary modifications to the regulations twice. The disadvantage of this option is that the public would not have the benefit of reviewing the proposed definitions and the proposed revisions in the use of the definitions at the same time.

The staff believes that adopting this option would eliminate the possibility of having to revise the regulations twice, once to issue a proposed rule and the second time to address any changes to the definitions and their use resulting from public comments.

The Commission should note that this option can be pursued regardless of whether the Commission elects to restrict the rulemaking to those sections of the regulations that concern production and utilization facilities or elects to have the rulemaking cover all of 10 CFR.

The fourth option would forego rulemaking on this subject. The Commission would issue a policy statement announcing the adoption of the proposed definitions without any changes to the existing regulations. The advantages of this approach are the relatively short time span required, the very limited impact on staff resources, the clear establishment of a class of equipment that is important-to-safety but not safety-related, and a statement of the Commission's expectation that a standard of normal industry practice will be followed for such equipment. The disadvantages of this option are the lack of public comment and the possible continuing uncertainty among licensees resulting from the mixed usage of terms in the 10 CFP 50, Appendix A General Design Criteria.

5. Imposition of Backfit Procedures for New Requirements

In response to Commissioner Asselstine's request that the staff consider a rulemaking which would allow additions to or deletions from the scope of ITS equipment based on new information or analyses without applying the backfit rule, the staff considers a backfit analysis appropriate prior to requiring any additional equipment be classified important-to-safety for currently licensed plants. However, licensees may voluntarily amend their FSARs (after an appropriate 50.59 review) or make changes to the scope of ITS equipment as a result of operational events or other factors.

With respect to Commissioner Asselstine's request that the staff consider a rulemaking for future plants so that confusion and uncertainty do not persist and so that standardization can be enhanced, the staff prefers to wait to accumulate experience with the proposed definitions before considering further rulemaking. The staff anticipates that any existing confusion or uncertainty will be taken care of by the definitions proposed by this paper and the fact that current treatment of existing plant equipment will not change.

The importance of increased attention to ITS/NSR plant equipment was recently emphasized in an EDO memo dated November 26, 1985 on NRC lessons learned in the Davis Besse event:

"The paramount importance of proper maintenance in maintaining levels of reliability assumed in the safety analyses that form the licensing basis for operating plants has been accorded greater recognition and increased emphasis and attention by both NRC and utility management in the aftermath of the TMI accident. However, it appears from the circumstances noted in the review of the June 9 Davis-Besse event that an inappropriate, artificial distinction between the importance of safety-related vs nonsafety-related plant features may have led some licensees to place inadequate emphasis on proper maintenance of all equipment necessary to assure proper facility operations. Some balance-of-plant systems may actually have equal or perhaps greater safety importance (cumulatively) than equipment classified as safety-related because their too-frequent failure can needlessly challenge the safety-related systems, and their failure can also aggravate conditions under which the safety-related systems must respond. We need to give increased attention to assuring that the attention of licensee management is focused properly on this important aspect of plant operations and that important balance-of-plant systems and equipment receive adequate attention in the overall maintenance picture...."

The staff believes that the proposed definitions, while not in themselves imposing any new requirements, will bring to the attention of the industry the Commission's concern that a proper level of attention be paid to items which are not "safety-related" but which play a large role in assuring safe plant operation.

Recommendation: That the Commission:

1. Approve the staff's proposed definitions of important-to-safety, safety-related, facility licensing documents, and normal industry practice.

2. Approve and direct the staff to proceed, on a long term basis, with option 2 while, in the short term, direct the staff to develop as discussed in option 4, a Policy Statement announcing the Commission's adoption of the definitions and intent to codify them.

3. Provide additional guidance to the staff as to whether licensee compliance with the proposed definition of normal industry practice should be required.

4. Note:

   a. The staff does not recommend that the Commission pursue Option 1.

b. That a Backfit Analysis has not been performed for this paper since it only requests Commission approval of proposed definitions and additional guidance. The staff will perform an appropriate Backfit Analysis if the Commission chooses the rulemaking option.

c. That because this paper only requests Commission approval of proposed definitions and additional guidance, a Regulatory Analysis is not necessary. The staff will perform an appropriate Regulatory Analysis if the Commission chooses the rulemaking option.

Scheduling: If scheduled on the Commission agenda, I recommend this paper be considered at an open meeting.

Victor Stello, Jr.
Executive Director for Operations

Enclosure:
Examples of Normal Industry
Practice

Commissioners' comments or consent should be provided directly to the Office of the Secretary by c.o.b. Monday, June 16, 1986.

Commissioner Staff Office comments, if any, should be submitted to the Commissioners NLT Monday, June 9, 1986, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

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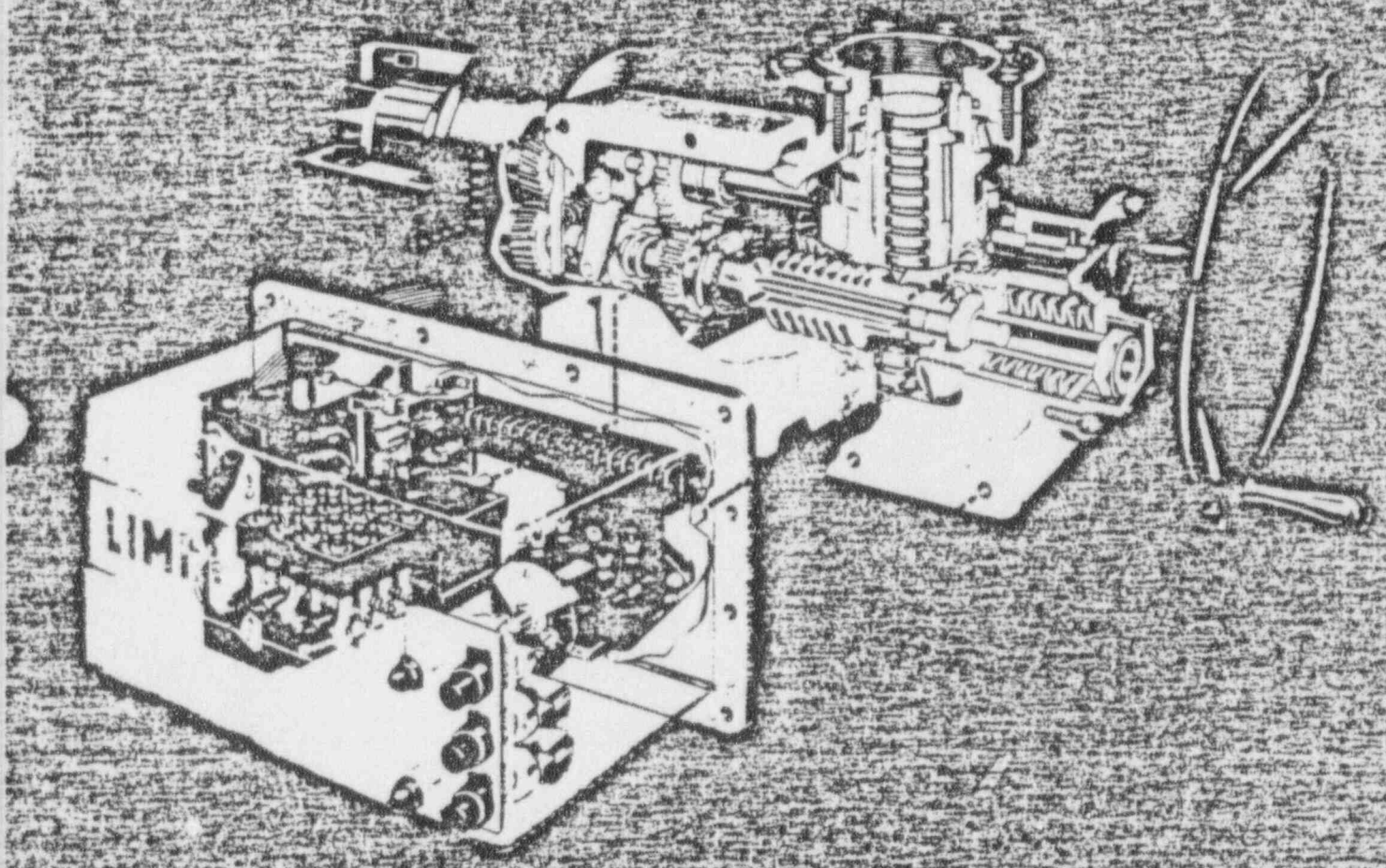
ENCLOSURE

EXAMPLES OF
NORMAL INDUSTRY PRACTICE

LIMITORQUE
TYPE SMB
INSTALLATION AND MAINTENANCE MANUAL



LIMITORQUE CORPORATION

INSTALLATION TIPS

Do:

1. Do store crated units under shelter. Your Limitorque is not weatherproof until properly installed.
2. Do cut power off before opening or replacing limit switch compartment cover.
3. Do check limit switch operation in conjunction with motor rotation. If motor is running in wrong direction interchange motor leads.
4. Do mount motors on horizontal plane, if possible. It is preferred to keep motor or limit switch compartment from hanging down. This prevents head of grease being against motor or switch seals.
5. Do connect space heaters if unit is to be stored in a damp place prior to installation.
6. Do keep valve stem clean and properly lubricated.
7. Do set up periodic operating schedule for Limitorque control if valve is infrequently used.
8. Do lubricate drive sleeve top bearing every six months, using grease gun on pressure fitting in housing cover.
9. Do keep geared limit and torque switch contacts clean. Use carbon tetrachloride or other solvent on lint-free cloth.
10. Do keep limit switch compartment clean and dry.
11. Do be sure area is clean before disassembling Limitorque. Clean all parts and housing before re-assembly.
12. Do apply fresh, clean lubricant after assembly.
13. Do reset geared limit switch before motor operation if Limitorque has been either dismantled or removed from valve.
14. Do replace whole limit switch gear box rather than attempt repairs in field.
15. Do replace moulded plastic conduit hub protectors (installed for shipping and storage only) with pipe plugs when installation wiring is completed.
16. Do check valve stem travel before mounting stem protection cover on rising stem valves. All stems should have protection cover.
17. Do check for proper direction of rotation of motor. If valve closes when open button is pushed the motor may have to be electrically reversed.
18. Do distinguish between "normally open" and "normally closed" terminals on geared limit switch micro switches (when used) when wiring control circuit.
19. Do keep armature clean and periodically check brushes for proper contact and wear when D.C. motors are employed.
20. Do remember that D.C. motor speed is not constant but will fluctuate widely with the load applied.
21. Do clean limit switch cover thoroughly and apply thin coat of grease on bearing surfaces before mounting on explosion proof Limitorque.
22. Do check and replace damaged limit switch cover gasket before securing on weatherproof Limitorque.
23. Do refer to parts list when ordering replacement or spare parts.
Give nameplate data

Unit Type	Order No
Unit Size	Serial No

24. Do check to be sure stem nut is secured tightly by locking nut and that top thread of lock nut is crimped or staked in two places.

Don't:

1. Don't force declutch lever into motor operation position. Lever returns to this position automatically when motor is energized.
2. Don't try to force declutch lever from motor operation position to hand operation position.
3. Don't use abrasive cloth or paper to clean silver contacts of geared limit switch and torque switch. Contacts should be burnished.
4. Don't depress declutch lever during motor operation to stop valve travel, except in emergency on SMD000 and SMD00.
5. Don't torque seat plug valves or butterfly valves unless valve manufacturer is consulted.
6. Don't use cheater on handwheel.
7. Don't plug motor—by alternately starting and stopping motor to open or close a valve too tight for normal operation.
8. Don't use oversize motor overload heaters—instead look for cause of overloading.
9. Don't reset torque switch seating heavier than maximum recommended by factory.
10. Don't run "plug" type valve against stop as damage may result to valve.
11. Don't attempt to remove either spring cartridge cap or housing cover from Limitorque while valve is torque seated. Always back valve off seat several handwheel turns before dismantling unit.
12. Don't attempt to set limit switches without first disconnecting control and power circuits.
13. Don't motor operate valve withhout first checking limit switch setting.

Trouble-Shooting:

If geared limit switch fails to stop valve travel, check the following:

A. Control wiring and motor reversing contactor.
B. Geared limit switch setting.
C. Setting rod to see that it has been backed off after each size of switch has been set.
D. Remove limit switch gear box cover and inspect for damaged or broken gear teeth.

If unable to operate Limitorque by motor:

A. Check both motor power and control circuits for supply and continuity.
B. Compare supply voltage with motor and controller nameplate rating. If O.K. then check motor amperage load.
C. If stalled motor is indicated, shut off power and operate Limitorque by handwheel to move valve.

Excessive handwheel effort can indicate the following:

A. Improperly lubricated or damaged valve stem.
B. Valve packing gland too tight.
C. Improperly lubricated valve.
D. Stem nut too tight on valve stem.
E. Faulty or damaged valve or parts.

TYPICAL OPERATION
SMB UNITS

Description of Motor Operation:

The motors used on the Limitorque valve controls are high starting torque totally enclosed motors. They are furnished in weatherproof explosion proof or submersible enclosures. All motors are furnished with ball bearings and provided with grease seals. No lubrication of these motors is necessary since they are lubricated at the factory for lifetime operation. All 3 phase AC motors are of the squirrel cage design and DC motors are compound wound.

Since the operation of the Limitorque valve control is basically the same for all SMB operators the following general description of the motor operation is applicable. Any of the parts drawings may be referred to in following this description. Although the various part numbers will differ for each size operator for the purpose of explanation we will refer to the parts list drawing*.

The electric motor has a helical pinion mounted on its shaft extension. This pinion pc. #40 drives the worm shaft clutch gear pc #41 which is engaged with pc #50 the worm shaft clutch. This piece is splined to the worm shaft pc. #40. Piece #50 the worm is splined to the worm shaft pc. #40. Piece #50 the worm is splined to the worm shaft and when it is rotated it turns pc #16 the worm gear. The worm gear has two lugs cast onto the top portion which engages the two lugs on the drive sleeve pc. #11. These lugs are spaced so that when the worm gear begins to turn during motor operation there is a certain amount of lost motion before the lugs engage and cause the hammer blow effect within the operator.

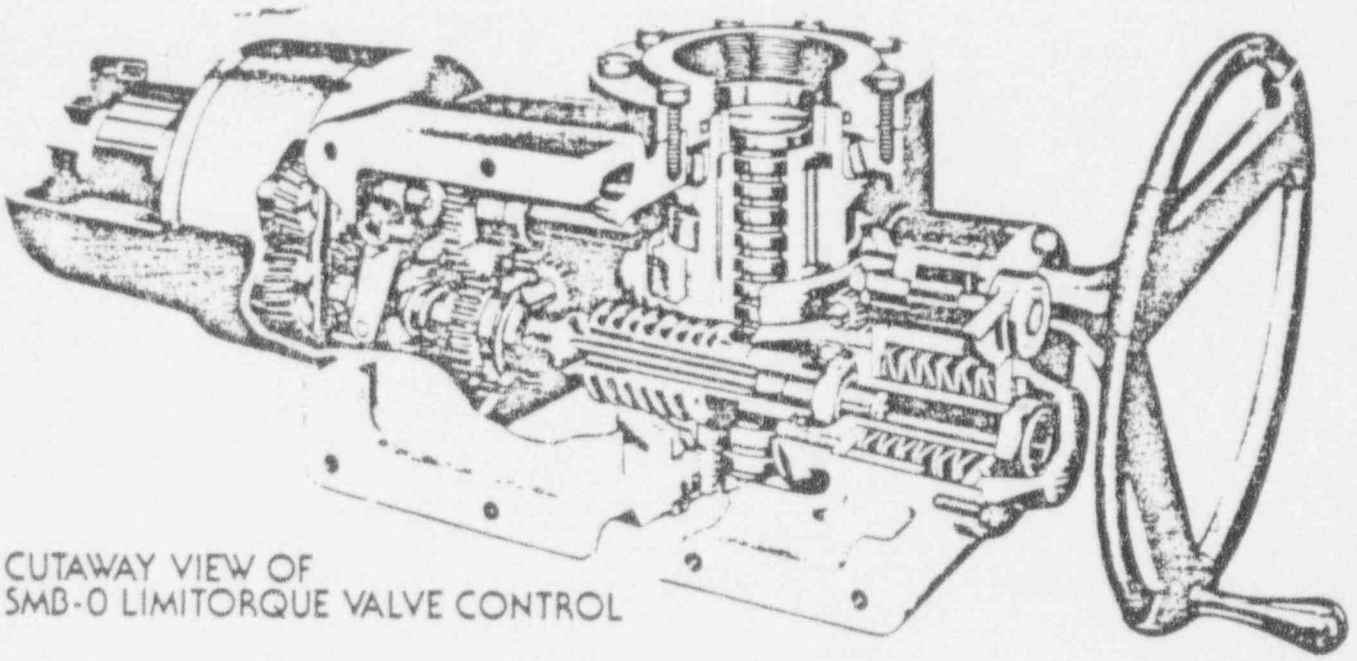
As soon as the worm gear lugs engage the drive sleeve being splined internally with pc. #20 the stem nut causes the stem nut to rotate and open or close the threaded stem of the valve. The stem nut is threaded to fit the thread of any rising stem valve. In the case of non-rising stem valves or where the electric operator is mounted in tandem with an additional gear drive the stem nut pc. #20 is merely bored and keyed to fit the shaft.

The thrust developed by a Limitorque valve control is absorbed by the heavy duty thrust bearings on the top and bottom of the main drive sleeve. As the Limitorque valve control develops greater torque when seating the valve the worm slides axially along the splines of the worm shaft and compresses the belleville springs pc. #56 which is the torque spring. These are calibrated springs and for every increment of compression for a given size unit a certain predetermined amount of torque is developed. The torque switch is mechanically actuated by the worm. When the worm moves back a preset distance and develops the determined amount of torque output required the torque switch opens and a pair of electrical contacts which are wired into the motor control circuit interrupts the circuit and stops the motor at this point.

The geared limit switch pc. #105 is directly geared to the worm shaft and is in step at all times with the movement of the Limitorque valve control. It cannot slip since there are no belts or other friction devices used in its operation. Once the geared limit switch is set to trip at its proper position of valve travel it will trip at the same point every time. See instructions on how to set the geared limit switch.

Generally the torque switch is wired into the motor control circuit to stop the operator in a full closed position of any rising stem type of operation and the geared limit switch is wired into the motor control circuit to stop the operator at the full open position. In the case of most 90° turn valves and sluice gates the geared limit switch is wired into the motor control circuit to stop the operation at both the full open and full close position of the valve. The torque switch is wired in series with the geared limit switch in both directions so that in the event a mechanical overload occurs the torque switch will open and cause the motor to stop. Check the wiring diagram of the actual installation to determine the correct wiring connections to be made for the torque switch and geared limit switch.

*Typical on page 22 SVB-1 thru SVB-4



CUTAWAY VIEW OF
SMB-0 LIMITORQUE VALVE CONTROL

Description of Hand Operation:

In the event of power failure a handwheel is provided for emergency hand operation of the Limitorque valve control. The SMB type of operator has an automatic handwheel declutching arrangement. In order to hand operate the type SMB operator the declutch lever is pulled downward. This mechanically disconnects the electric motor from the handwheel through the clutch assembly. In the case of the SMB-000 and SMB-00 (refer to page 18) the clutch ring pc #28 and clutch keys pc #14 are moved upward until the clutch keys engage with the lugs on the bottom of the handwheel. Where the handwheel is side mounted on the SMB-00 (refer to page 19) the clutch keys engage the lugs on the bottom of the bevel gear pc #100.

This assembly is held in this position by trippers which are illustrated on the parts drawing. The operator will remain in hand operation indefinitely until the electric motor is energized and the tripper cams mounted on the worm shaft cause the trippers to release the clutch ring and clutch keys from their hand position. This is an automatic feature of the Limitorque valve control.

This declutching action is similar in all the larger size SMB operators. Referring to the parts drawing for the SMB-0 it should be noted that when the declutch lever is depressed the declutch lever shaft causes the declutch fork to push the worm shaft clutch out of engagement with the motor helical gearing and into engagement with the handwheel clutch pinion. The worm shaft clutch is locked in this position by the trippers. Therefore when the handwheel is rotated the handwheel gear turns the handwheel clutch pinion and in turn the worm shaft putting the Limitorque operator into motion.

As soon as the electric motor is energized the tripper pins which are part of the worm shaft clutch gear cause the trippers to be released allowing the worm shaft clutch to be released from hand operation and engage in motor operation.

In all cases with the SMB operator when the handwheel is turned it does not rotate the motor. Similarly when the motor is in operation the handwheel does not turn.

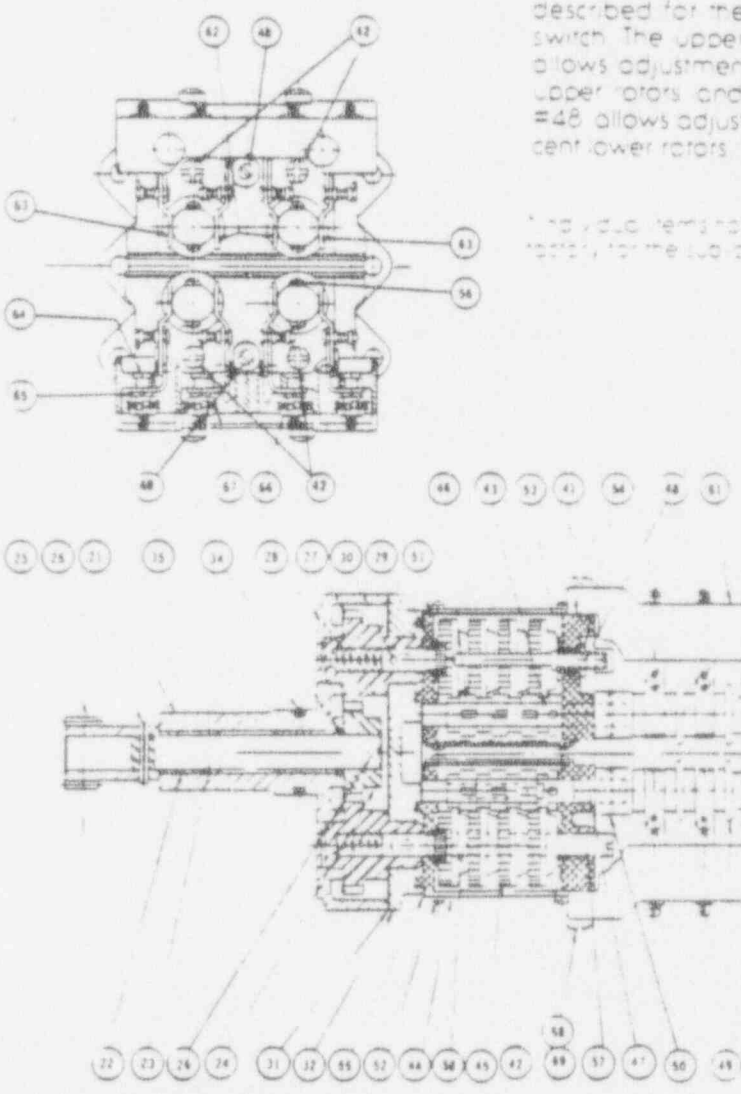
FOUR TRAIN GEARED LIMIT SWITCH-ROTOR TYPE*

Procedure for Setting:

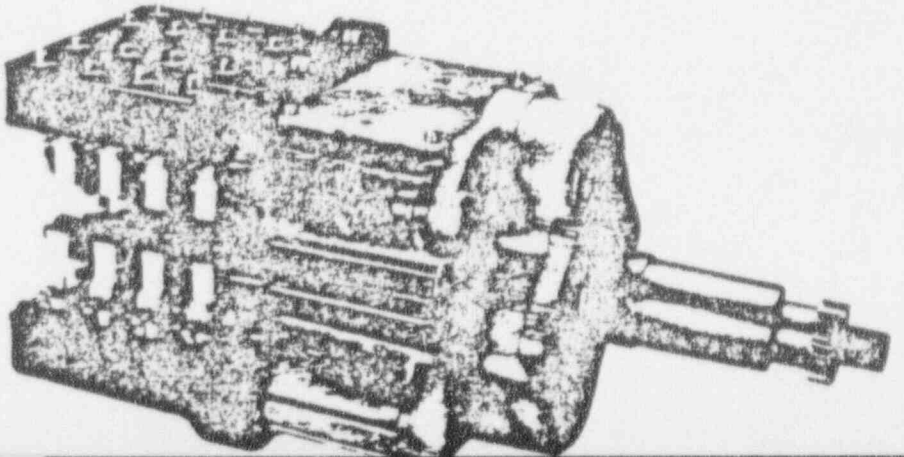
The four train geared limit switch (Rotor type) employs four rotary drum switches each having four contacts. When the rotor is properly set to trip at the desired position two of these contacts open and two close electric circuits. Generally one rotor is set to trip at full open position of the valve and one rotor is set to trip at full close position of the valve. The other two rotors are set at some intermediate position depending on the requirements of the project.

To set the switches of a four train rotor type switch follow the same procedure as described for the two train rotor type switch. The upper setting rod (pc. #49) allows adjustment of the two adjacent upper rotors and lower setting rod (pc. #48) allows adjustment of the two adjacent lower rotors.

* Many duplicate items not to be separately identified for the convenience of replacement.



PC. NO.	NO. REQD.	DESCRIPTION
21	1	CARTRIDGE
22	2	OILITE BUSHING
23	1	DRIVE SHAFT
24	1	DRIVE PINION (INTERNAL)
25	1	HELICAL PINION
26	2	GROOVE PIN 1/8 Ø x 1" LG.
27	2	DRIVE SLEEVE & GEAR
28	2	DECLUTCH SPRING
29	2	DRIVE PINION SPUR
30	2	PIN 1/8 Ø x 11/16 LG.
31	1	CARTRIDGE GASKET
32	1	CARTRIDGE MTG. PLATE
33	4	#1/4-20 x 3/4 LG. SOC. HD. C.S.
34	1	O"-RING #6227-11
35	1	O -RING #6227-21
36	4	#5/16-18 x 3/4" FILL. HD. CAP SCREW & L.W.
41	2	GEAR FRAME
42	4	INTER. GEAR SHAFT
43	4	INTER. PINION SHAFT
44	4	G.L. FRAME COVER
45	16	INTERMITTENT GEAR
46	12	INTERMITTENT PINION
47	4	STEM SPUR PINION
48	2	SET ROD
49	4	ROTOR
50	4	GROOVE PIN 3/32 Ø x 3/4" LG.
51	4	COVER GASKET
52	16	#6-32 x 1/4" LG. FILL. HD. M.S.
53	2	O -RING #1820-3
54	2	SETTING ROD BUSHING
55	2	GASKET, GEAR FRAME
56	16	INSERT (ROTOR)
57	2	O -RING #1820-5
58	2	GROOVE PIN 1/8 Ø x 1" LG.
61	2	FINGER BASE
62	16	R.H. FINGER ASS'Y
63	16	L.H. FINGER ASS'Y
64	32	#10-32 x 1" LG. HEX. HD. C.S.
65	32	#10 LOCKWASHER
66	64	#10-32 HEX NUT
67	64	#10 SW[illegible] WASHER
68	4	#1/4-20 x 1/2 FILL. HD. C.S.



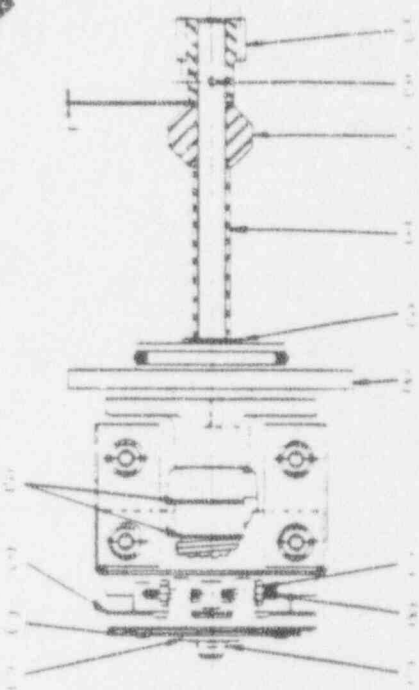
SMB-00 THRU SMB-5 DOUBLE TORQUE SWITCH*

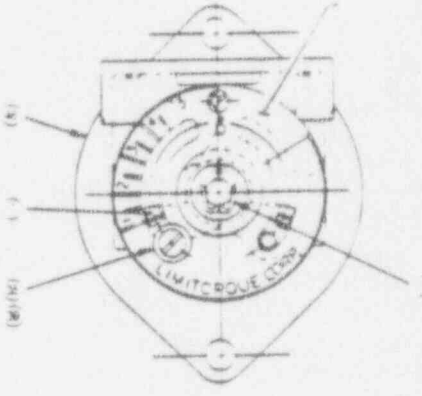
Procedure for Setting:

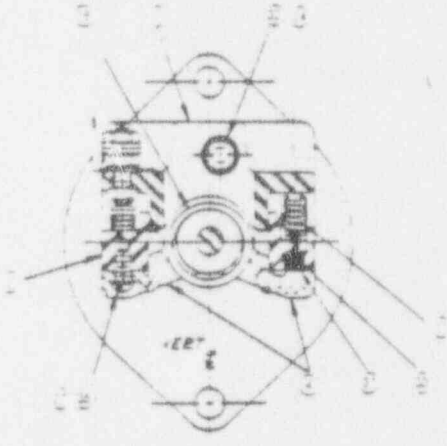
1. Torque settings must be made with motor mounted on valve/torque
2. Make sure all electric power is off
3. For the open direction torque switch or close direction torque switch loosen screw pc #35 and set pointer (pc #7) to desired torque setting. The higher the number the higher the torque output of the unit.
4. Tighten pc #35
5. Operate valve electrically to desired valve seating (tight shut off)
6. A maximum stop setting is established on all units. Do not exceed this setting without consulting factory.

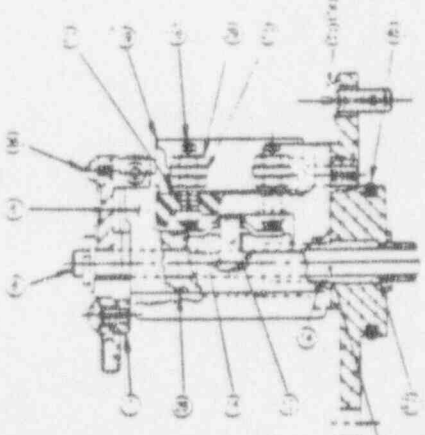
Indicates parts assembled with grease

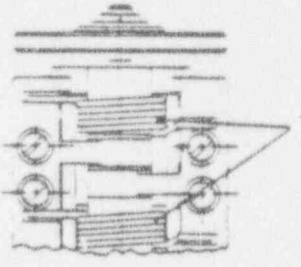
PC NO	NO REQ	DESCRIPTION
1	1	TERMINAL BLOCK
2	2	CONTACT BLOCK
4	2	ARM
5	1	DIAL
6	1	ACTUATING LINK
7	2	POINTER
8	1	SHAFT
9	1	SPACER
10	2	CONTACT SUPPORT
11	1	TORQUE LIMITER
12	1	BUSHING
13	1	TSW UNION
14	1	BEARING
15	2	CONTACT FINGER
16	4	TERMINAL STUD
17	2	COMPR SPRING
18	2	TORSION SPRING
19	1	INSULATOR
20	1	FLAT WASHER
21	1	O-RING
22	2	SCREW-ROUND HD SLOTTED #10-32 x 1/4 LG
23	1	ROLL PIN 3/32 DIA x 1/8 LG
24	1	LOCKWASHER #1
25	3	THRUST WASHER
26	2	#1 LOCKWASHER
27	12	LOCKWASHER #10
28	1	ROLL PIN 1/8 DIA x 3/4 LG
29	8	HEX NUT #10-32
30	2	HEX NUT #6-32
31	1	COTTER PIN 5/32 DIA x 3/4 LG
32	1	SCREW-SOC HD CAP #10-32 x 1/4 LG
33	2	SCREW-PAN HD SELF-TAPPING #4-40 x 1/4 LG
34	2	SCREW-HEX SOC SET #6-32 x 1/4 LG
35	6	SCREW-MACH RD HD #10-32 x 3/8 LG
36	1	SCREW-MACH RD HD #5-40 x 1/4 LG
37		WAX AS REQUIRED
39	2	LOCKWASHER
45	1	O-RING
46	1	MOUNTING BRACKET











NOTE APPLY GREASE AT ASSEMBLY

LUBRICATION
INSPECTION PROCEDURE & DATA

General:

Proper lubrication is an absolute essential in achieving the design life of all types of power transmission products and Limitorque valve controls are no exception.

The design of the actuator has been specially tailored to absolutely minimize the maintenance and re-lubrication requirements however periodic inspection is the only way to guarantee trouble-free service.

Limitorque utilizes a totally sealed gear case factory-packed with grease. The gear case can be mounted in any position as all penetrations into it are sealed however those mounting positions which would cause vulnerable areas of the operator (e.g. motor and limit switch compartment) to be saturated with lubricant should a seal failure occur should be avoided if possible and are not recommended. Grease is used in normal service instead of oil to minimize the impact of a seal failure should one occur.

No seal can remain absolutely tight at all times therefore it is not unusual to find a very small amount of weeping around shaft seals—especially during long periods of dryness such as storage. The use of grease minimizes this condition as much as possible. Should a small amount of weeping be found in the limit switch compartment on start-up it should be removed with a clean rag. Once the equipment has begun operating this phenomenon should disappear.

Lubrication Inspection:

It is recommended that all Limitorque operators be inspected for proper lubrication prior to operating—especially if they had been stored for a long period of time.

The frequency of lubrication inspections should be based upon stored data on the installed equipment. Every operator application has its own effect on lubricants and each facility should pattern its inspections around its particular needs. The following schedule of lubrication inspection should be followed until operating experience indicates otherwise.

Main Gear Case: Inspect lubrication at approximate intervals of 18 months or 500 cycles—whichever occurs first. Lubricate the Zerk fitting in the housing cover at the same interval.

Geared Limit Switch: Inspect lubrication at approximate intervals of 36 months or 1000 cycles—whichever occurs first.

The three primary considerations in lubrication inspection are 1) Quantity, 2) Quality, 3) Consistency.

Quantity—Limitorque operators are built to operate on the point where seal breathe. The primary concern is the amount of lubricant sweating while normally immersed in grease. This can be verified by the use of one or more of the many pipe and drain plugs provided on the operator housing.

Quality—When removing a pipe or drain plug to inspect the lube, remove a small amount and insure that it is clean and free of any foreign matter including water. Should dirt, water or other foreign matter be found, the unit should be flushed with a commercial degreaser cleaner like Exxon #1650 which is non-corrosive and does not affect seal materials such as Buna N or Viton. Recommended lubricant.

Consistency—The main gear case lubricant should be a good, high quality, moly disulfide NLGI #2 grease consistency or less. Greases such as Mobil #A or #2 oil may be added to, and the volume of the new does not exceed 20% of the total lubricant.

The geared limit switch lube should be similar to the lubricant approximating an NLGI #2 consistency or less.

LUBRICANTS
STANDARD/SUBSTITUTES/REQUIREMENTS

Standard Lubricants:

▲ Main Unit: Exxon EP-0 for unit sizes thru SMB-4 See chart below

Geared Limit Switch: Exxon—Beacon 325—Light Gray—acceptable substitute Mobil 26

Motor Bearings: Motors furnished with Limitorque valve controls are lubricated for life

▲ Note: SMB-SB-SBD-000 00 standard lubricant was Sun Oil Co. SOEP (XC-421-39 for serial no's up to 295809 Sun 50 EP (XC-421-39) cannot be mixed with Nebula EP-0

Lubricant Substitutes:

Typical commercially available lubricants other than those used by Limitorque for which manufacturers data indicates compatibility with Limitorque operators are shown below with the temperature range recommended by the manufacturer.

The standard lubricants used by Limitorque have been proven extremely reliable over many years of service. There are however many other lubricants available which may be used in place of the standard

Do not add a different lubricant to a Limitorque operator unless it is of the same soap base as the existing lubricant unless you have received the approval of the lubricant manufacturer.

The minimum lubricant qualities required by Limitorque are:

1. Should contain an EP additive
2. Must be suitable for the temperature range intended
3. Must be water and heat resistant and non-separating
4. Must not create more than 8% swell in Buna N or Viton
5. Must not contain any grit abrasive or fillers
6. Must slump—prefer NLGI grade 0 to 1
7. Must not be corrosive to steel gears ball or roller bearings
8. Dropping point must be above 316°F for temperature ranges of −20°F to 150°F

UNIT SIZE	APPROX VOLUME GALLONS	APPROX WEIGHT POUNDS
SMB/SB/SBD-000	.50	3.5
SMB/SB/SBD-00	.50	4.0
SMB/SB/SBD-0	1.00	9.5
SMB/SB/SBD-1	1.50	15.0
SMB/SB/SBD-2	1.75	14.5
SMB/SB/SBD-3	5.50	50.0
SMB/SB/SBD-4	8.50	75.0
SMB-4T	8.00	71.0
SMB-5T	7.50	65.0
SMB-5	8.50	72.0

STANDARD LUBRICANTS −20°F TO 150°F

UNIT SIZE	TYPE	MANUFACTURER	COLOR	BASE
*SMB/SB/SBD 000 00	NEBULA EPO	EXXON	DARK TAN	CALCIUM COMPLEX
*SMB/SB/SBD/WB 0 TO 4	NEBULA EPO	EXXON	DARK TAN	CALCIUM COMPLEX
*SMB-5	50 EP (XC-421-39)	SUN OIL CO	BLACK	LITHIUM LEAD

*FOR NUCLEAR CONTAINMENT UNITS, NEBULA EP-0 AND EP-1 ARE THE ONLY APPROVED LUBRICANTS FOR SMB-000 TO 5.

LUBRICANT SUBSTITUTES

MANUFACTURER	TYPE	TEMPERATURE RANGE	BASE
EXXON	**BEACON P290	−40°F TO 120°F	LITHIUM LINE
ARCO	LITHOLINE HEP1	−10°F TO 220°F	LITHIUM
GULF OIL	GULFCROWN EPO	−20°F TO 220°F	LITHIUM
CITIES SERVICE	CITY AP	−0°F TO 220°F	LITHIUM
MOBIL OIL CO	MOBILUX EPO	−10°F TO 220°F	LITHIUM 12
SHELL OIL	DARINA 0	−10°F TO 250°F	HYDROXYSTEARATE NO SOAP
FISKE	LUBRIPLATE LOW TEMP	−40°F TO 150°F	LITHIUM
TEXACO	MARFAK 0	+20°F TO 200°F	SODIUM
	LOW TEMP EP	−40°F TO 200°F	LITHIUM
TIDEWATER OIL	VEEDOL ALITHO 10	−10°F TO 150°F	LITHIUM

**TESTED AND USED BY LIMITORQUE FOR APPLICATIONS AT LOW TEMPERATURES −50°F TO −70°F CONSULT LIMITORQUE IF THE TEMPERATURE RANGE IS BEYOND THE LIMITATIONS SHOWN ABOVE

MAINTENANCE PROCEDURE

Routine Maintenance:

A schedule should be made to periodically inspect all limit valve equipment. The time interval of this inspection should depend upon the frequency of operation and the ambient environmental conditions in which the equipment is stored or installed. A minimum inspection period of eighteen months should be used as a base until experience indicates otherwise. This routine maintenance should include:

1. Remove limit switch compartment and or control cabinet cover. Should moisture be evident dry the compartment and components.

2. Inspect and clean all electrical contacts and contacts of the limit switch compartment and or control cabinet. This cleaning should consist of wiping clean of all electrical contacts with a good solvent cleaner such as TF or TC. Clean and remove all foreign residue.

3. Check all terminal connections for tightness.

4. Clean gasketed surfaces on limit switch compartment and or control cabinet cover. Replace all damaged gaskets or seals for weatherproof or submersible units. Apply a coating, approximately 2 mils of grease, on gasketing surface or surfaces that are exposed to weather or damages for protection.

5. Inspect conduit seal for proper operation. Replace if faulty. Check that all terminations of seal, sealing compound, sealing strand, retaining screws should be replaced. Slight amount of sealing compound should be used. See MAJOR MAINTENANCE.

6. Megger the motor. One MEGOHM or better is considered normal.

7. Clean and lubricate the valve stem according to the manufacturer's recommendations. Lubricant for sealing stem should be:

Major Maintenance:

The need for major maintenance of motor valve equipment occurs when some abnormal or defective service exists. Care must be taken to evaluate the defect(s) in order to determine the extent to which the major maintenance should proceed. Major maintenance should include routine maintenance requirements but in addition should proceed as follows:

1. Disassembly of defective component or equipment.

2. Replacement of any damaged or excessively worn component with new factory parts. It is recommended that worn and worn parts be replaced as a set to ensure the greatest benefit from the replacement.

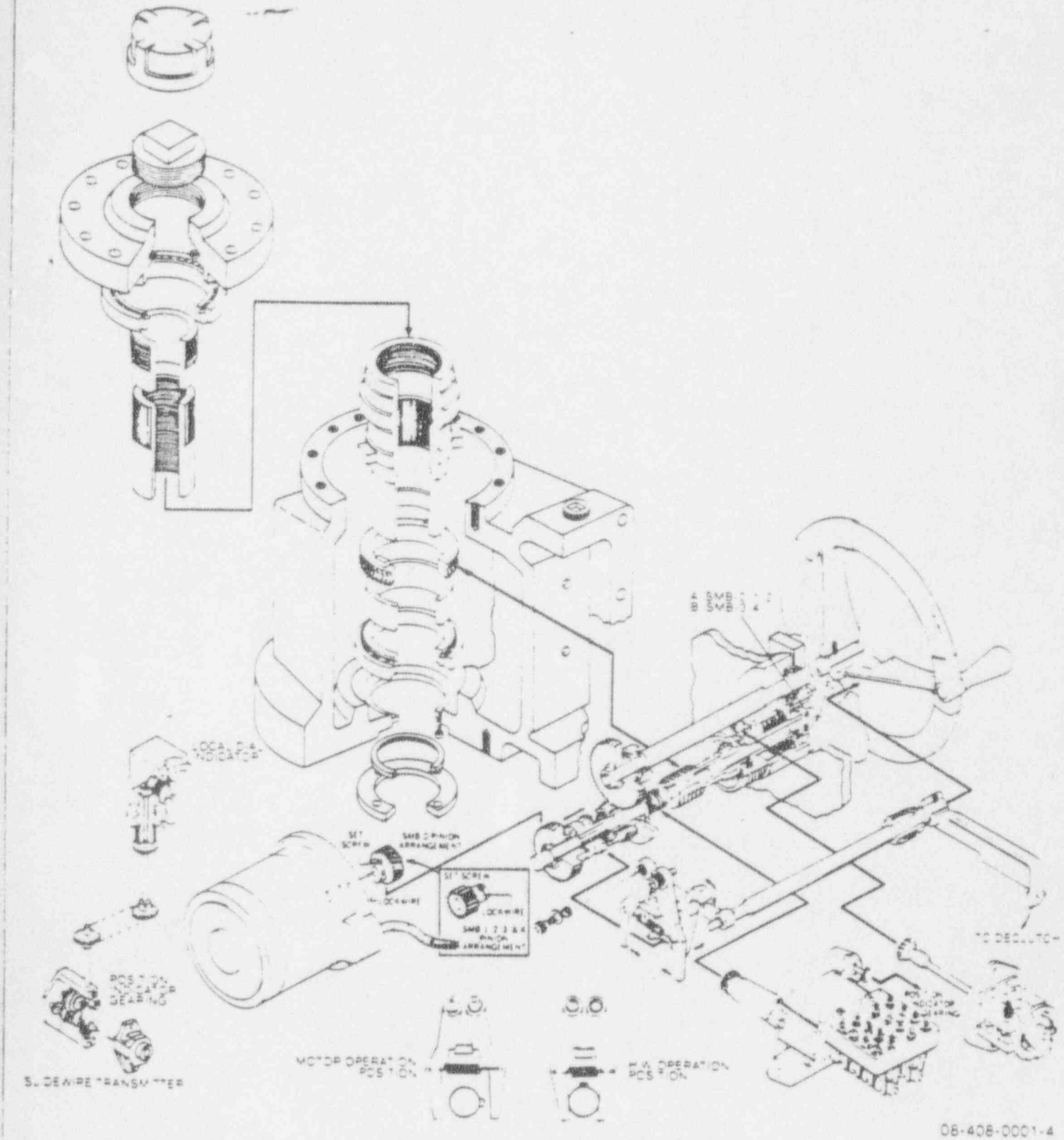
3. Replacement of lubricant in gear box was involved in the major maintenance.

4. Replacement of actuator gasket and seals.

5. Inspect stem and stem nut/sleeve for wear and or damage.

6. Check operation of limit switch compartment before returning unit

SMB-0 TO SMB-4 & SMB-4T



08-408-0001-4

SMB-5 & SMB-5T
DISASSEMBLY OF VALVE OPERATOR

General:

Exploded View 08-408-0002-4

Thrust Assembly 01-410-0060-4

The SMB-5 is a thrust type actuator made up of an SMB-5T torque type unit mounted on a thrust bearing assembly. If the existing unit is an SMB-5T torque only, disregard the first section of this procedure Steps A1 and A2.

SMB-5 (Thrust Unit Only):

A1. **CAUTION:** Ensure that unit is not under load and that valve is not under pressure before proceeding. If so, the valve must be in the full open position.

A. Remove drive sleeve locknut pc #100

WARNING! SMB-5 drive sleeve locknut has left hand threads and must be rotated clockwise to remove.

B. Rotate handwheel to close valve causing stem nut pc #27 to rise up threaded valve stem until stem nut splines are free of drive sleeve pc #26

C. Rotate stem nut by hand for remainder of length of valve stem and remove

A2. Remove thrust adapter assembly pc #125 from operator.

NOTE: If disassembly of thrust adapter assembly is not required continue to Step 4. If thrust adapter is to be disassembled proceed as follows.

A. Remove seal retainer plate pc #129 and oil seal pc #132

B. Loosen set screw and remove thrust bearing carriage pc #128 from thrust adapter housing pc #125

C. Remove upper bearing roller assembly pc #131

D. Lift thrust drive sleeve pc #26 out of thrust adapter housing pc #125

E. Remove lower bearing roller assembly pc #131

SMB-5T (Torque Unit):

1. To disassemble please observe the following procedure

A. Remove limit switch compartment cover pc #12

B. Disconnect motor leads and leads to torque switch pc #116 and geared limit switch pc #117

Note: Ensure leads are labeled for reassembly

C. Remove torque switch and geared limit switch

2. Using lifting eyebolts remove housing cover pc #3 drive sleeve pc #1 and worm gear pc #1

3. Remove handwheel washer pc #60 and pull off handwheel pc #10 and handwheel clutch pc #13 from handwheel shaft pc #40

4. Remove worm shaft end cap pc #7 and declutch housing cover pc #4

5. Remove declutch assembly as follows

A. Remove declutch stop pc #28 stopper spring pc #67 stoppers pc #34 and roll pin pc #113

B. Loosen set screws on declutch lever pc #9 and collar pc #103 remove declutch lever declutch shaft end cap pc #59 and slide declutch shaft pc #30 out through bottom of unit

C. Remove declutch fork pc #14 and other declutch shaft mounted components pc #66 pc #70 pc #69 and pc #103 from unit

D. Remove handwheel shaft and pinion pc #40

6. Remove drive shaft pc #43 and flexible jaw clutch pc #50 as integral assembly gear clutch spacer pc #47 sliding clutch gear pc #51 and clutch compression spring pc #68

7. Remove splined insert pc #54 using jack screws Spirolox ring pc #107 and handwheel gear pc #6

8. A. Remove gear mounting bracket pc #8 using jackscrews bearing pc #93 and bearing adapter pc #65

B. Pull hollow drive shaft pc #55 toward declutch end and remove Spirolox ring pc #106

9. Remove declutch housing pc #2

10. A. Push hollow drive shaft pc #55 toward motor end loosen set screw and remove bearing locknut pc #99 Hold hollow drive shaft using pliable scanner on splines

B. Remove bearing pc #95 by pushing hollow drive shaft toward declutch end

C. Remove gear pc #42 threaded collar pc #32 and key

D. Remove hollow drive shaft pc #55 from declutch end of unit

11. A. Loosen set screw in carriage stem locking nut pc #48 and recede declutch housing pc #2 with two screws to compress torque spring

B. Remove locking nut pc #48

12. **CAUTION!** Declutch Housing is under spring load.

A. Remove declutch housing pc #2

B. Pull bearing carriage stem pc #45 out partially and remove thrust washers pc #46 torque limit sleeve pc #52 and springs pc #58

13. Remove bearing carriage worm assembly from unit to disassemble further

A. Loosen two set screws on bearing carriage cap pc #44 and unscrew bearing carriage stem pc #45

B. Slide bearing carriage cap off toward worm threads

C. Loosen set screw and remove bearing locknut pc #100

D. Press off two bearings pc #97 and pc #94

14. Remove motor pc #115 motor adapter pc #5 intermediate pinion gear assembly pc #15 pc #41 as an integral assembly drive shaft gear pc #42 and bearing spacer pc #64

SMB-5 & SMB-5T
REASSEMBLY OF VALVE OPERATOR

SMB-5T
Torque Unit):

o reassemble observe the following rocedure

A Press two bearings pcs #90 and 9 onto worm pc #56 ensuring that bearing races are matched It may be necessary to apply heat to bearings Ensure that bearing spacer pc #92 is installed

B Install bearing locknut pc # 0 and tighten set screw

C Apply heat to bearing cartridge cap pc #44 and drop on bearing from worm end Ensure that cartridge cap seats on bearing

D Thread bearing cartridge stem pc #45 tightly into cartridge cap and tighten two set screws

E Install bearing cartridge worm assembly in housing

A Replace in following order thrust washer pc #46 Belleville springs pc #58 torque limit sleeve pc #62 and thrust washer pc #46 Ensure flat side of thrust washer is against springs

B Thread cartridge stem nut pc #48 onto bearing cartridge stem pc #45 by hand

C Slide bearing cartridge worm assembly into housing

A Install hollow drive shaft pc #55

B Install gear limit threaded collar pc #62 and key on motor end of hollow drive shaft with threaded end toward worm

C Slide bearing pc #95 onto shaft

D Thread bearing locknut pc #99 on shaft and tighten set screw Hold drive shaft using adjustable spanner on splines

A Push hollow drive shaft pc #55 to declutch end and install bearing spacer pc #64

B Install motor gearing by meshing drive shaft gear pc #42 and intermediate pinion pc #15 and pressing combined assembly into housing bores

C Install motor gearing shims in motor adapter bearing bores and install motor adapter gasket pc #84 and motor adapter pc #5 Top adapter to ensure bearings seat

D Check intermediate pinion and shaft for proper shims

E Install motor

5 A Install Spirolox ring pc #106 on hollow drive shaft pc #55

B Install declutch housing pc #2 using two screws only to compress Belleville spring set pc #58

C Utilizing two screws thread cartridge stem nut pc #48 on bearing cartridge stem pc #45 until nut is snug against thrust washer pc #46

D Remove declutch housing and tighten cartridge stem nut set screw

E Re-install declutch housing

6 A Install bearing mounting bracket assembly pcs #8 #65 and #90

B Install handwheel gear pc #6 and Spirolox ring pc #107

C Install splined insert pc #54 spring washer pc #61 and clutch compression spring pc #68

7 A Install sliding gear clutch pc #51 onto hollow drive shaft splines pc #55

B Install drive shaft pc #40 ensuring that gear clutch spacer pc #47 is in place Align splines on drive shaft and drive shaft gear and push drive shaft into unit from declutch end

8 Mount bearings pcs #94 and #97 on handwheel shaft and pinion pc #40 and install assembly into unit

9 A Install declutch shaft pc #30 and torsion spring pc #57 into declutch cap pc #59

B Install declutch shaft assembly through bottom of declutch housing pc #2 Declutch shaft assembly consists of declutch shaft torsion spring declutch cap drum pc #27 declutch arm pc #66 declutch shaft washers pc #70 3 pcs declutch fork pc #14 declutch shaft spacer pc #69 and collar pc #100

NOTE: Declutch shaft must be installed with keyseat facing right side of declutch housing when viewed from declutch end of unit

C Fasten declutch cap

D Insert roll pin pc #110 through declutch arm and shaft

E Ensure that declutch shaft seats against declutch cap push up or against top of housing and tighten collar set screw

10 A Ensure that oil seal pc #105 is in place

B Install declutch lever pc #9 and tighten set screw

C Rotate declutch lever clockwise hold in position and install declutch lever stop pc #28

11 A Install clutch trippers pc #33 pc #34 and tripper spring pc #67

B Install declutch housing cover pc #4 and gasket pc #82

C Ensure that handwheel oil seal pc #108 is in place

D Install worm shaft end cap pc #7 and gaskets pc #80

NOTE: Ensure that same number of gaskets are installed as were removed during disassembly Thickness of gaskets must be sufficient to prevent end cap from bearing on drive shaft

12 A Install worm gear pc #17

B Install torque drive sleeve pc #11 and drive sleeve thrust bearing pc #19

C Apply fresh clean lubricant in unit housing (approximately 20 pounds

D Install housing cover gasket pc #79 and housing cover pc #3

13 Install handwheel clutch pc #13 handwheel pc #10 and handwheel washer pc #50 on handwheel shaft pc #40

14 A Install torque switch pc #116 and geared limit switch pc #117

B Connect motor leads and leads to torque switch and geared limit switch

SMB-5 & SMB-5T
REASSEMBLY OF VALVE OPERATOR

SMB-5 (Thrust Unit Only):

D1 If thrust adapter assembly pc #125 was not disassembled continue to Step D2.

NOTE: Thrust bearing races should be pressed on thrust drive sleeve pc #126 and in thrust adapter housing pc #125 and thrust bearing cartridge pc #128 prior to beginning assembly procedure.

A Install lower bearing roller assembly pc #101 in thrust adapter housing pc #125.

B Install short end of thrust drive sleeve pc #126 into thrust adapter housing pc #125.

C Install upper bearing roller assembly pc #101 on thrust drive sleeve pc #126.

D Install thrust bearing cartridge pc #128, thread in right or until drag is felt on thrust drive sleeve and tighten set screw.

E Install oil seal pc #132 and seal retainer plate pc #129.

D2 Lift unit or turn upside down and install housing thrust adapter assembly pc #125. Ensure that thrust drive sleeve O ring pc #104 is in place.

D3 Install stem nut pc #127.

D4 Install drive sleeve locknut pc #130 and crimp or stake the four threads in two places.

WARNING! SMB-5 drive sleeve locknut has left hand threads and must be rotated counter-clockwise to install.

PC NO	DESCRIPTION
1	HOUSING
2	DECLUTCH HOUSING
3	HOUSING COVER
4	DECLUTCH HOUSING COVER
5	MOTOR ADAPTER
6	HANDWHEEL GEAR
7	WORM SHAFT END CAP
8	GEAR MOUNTING BRACKET
9	DECLUTCH LEVER
10	HANDWHEEL
11	TORQUE DRIVE SLEEVE
12	LIMIT SWITCH COMPT COVER
13	HANDWHEEL CLUTCH
14	FORK
15	INTERMEDIATE PINION AND SHAFT
17	WORM GEAR
18	DRIVE SLEEVE BUSHING
19	DRIVE SLEEVE THRUST BEARING
20	WORM BUSHING
21	BUSHING HANDWHEEL GEAR
22	RETAINING RING
23	GEAR INSERT
24	SPLIT RING
25	SPIROLOX
27	DECLUTCH LEVER DRUM
28	DECLUTCH LEVER STOP
30	DECLUTCH SHAFT
31	TRIPPER BOLT
32	O L THREADED COLLAR
33	CLUTCH TRIPPER #1
34	CLUTCH TRIPPER #2
35	HANDLE END
36	HANDLE CHROME PLATE
37	HINGE UPPER
38	HINGE LOWER
39	MOTOR PINION
40	HANDWHEEL SHAFT & PINION
41	MOTOR DRIVE INTERMEDIATE GEAR
42	DRIVE SHAFT GEAR
43	DRIVE SHAFT SOLID
44	BEARING CARTRIDGE CAP
45	BEARING CARTRIDGE STEM
46	THRUST WASHER
47	GEAR CLUTCH SPACER
48	NUT CARTRIDGE STEM
49	FORK ROLLER
50	FLEXIBLE JAW CLUTCH HOUSING
51	SLIDING GEAR CLUTCH
52	MOTOR CLUTCH GEAR CAM PIN
53	PIN FORK ROLLER
54	SPLINED INSERT
55	HOLLOW DRIVE SHAFT
56	WORM
57	TORSION SPRING
58	BELLEVILLE SPRING

PC NO	DESCRIPTION
61	SPRING WASHER
62	TORQUE LIMITER SLEEVE
63	HANDWHEEL GEAR SPACER
64	BEARING SPACER
65	BEARING ADAPTER
66	DECLUTCH ARM
67	TRIPPER SPRING
68	DECLUTCH COMPRESS N SPRING
69	DECLUTCH SHAFT SPACER
70	DECLUTCH SHAFT WASHER
71	DECLUTCH LEVER NAME PLATE
72	STUD PIVOT
73	FLEXIBLE JAW CLUTCH SLEEVE
74	FLEXIBLE JAW CLUTCH SPACER
75	NYLON INSERT
76	METAL SPACER
79	HOUSING COVER GASKET
80	DECLUTCH HOUSING GASKET
81	DECLUTCH CAP GASKET
82	DECLUTCH COVER GASKET
83	WORM SHAFT END CAP GASKET
84	MOTOR ADAPTER GASKET
85	GASKET MOTOR
86	LIMIT SWITCH COVER GASKET
90	BEARING CONE
91	BEARING CUP
92	BEARING SPACER
93	BEARING
94	HANDWHEEL SHAFT BEARING
95	BEARING
96	BEARING
97	BEARING
98	BEARING LOCKNUT
99	BEARING LOCKNUT
100	BEARING LOCKNUT W CUP ET
101	ROLLER PIN
102	RETAINING RING
103	HANDWHEEL COLLAR SPLINE
104	QUAD RING
105	OIL SEAL
106	SPIROLOX RING
107	SPIROLOX RING
108	OIL SEAL
109	GROOVE PIN
110	ROLL PIN
111	GREASE FITTING
112	WELSH PLUG
114	MOTOR
116	TORQUE SWITCH
117	GEAR LIMIT SWITCH
124	HOUSING COVER
125	HOUSING THRUST ADAPTER
126	THRUST DRIVE SLEEVE
127	STEM NUT
128	THRUST BEARING CARTRIDGE
129	SEAL RETAINER PLATE
130	DRIVE SLEEVE LOCKNUT
131	THRUST BEARING
132	OIL SEAL
133	GREASE FITTING
134	O RING
135	GASKET
136	GASKET
137	THREADED FLANGE

ELECTRO-MOTIVE

M.I. 1728
*Rev. G

MAINTENANCE INSTRUCTION

SCHEDULED MAINTENANCE PROGRAM DOMESTIC STATIONARY POWER UNITS WITH TURBOCHARGED ENGINES

INTRODUCTION

This Maintenance Instruction provides average recommendations which should ensure satisfactory engine operation and economical maintenance cost where average load factors and average climatic conditions are encountered. It is intended to serve as a guide when establishing maintenance schedules that will meet the particular requirements of individual operations, and planned economic life of the engine and associated equipment.

These recommendations are based on the following conditions:

1. Fuel oil used will meet the specifications of Maintenance Instruction 1750.

2. Lubricating oil used will meet the specifications of Maintenance Instructions 1760 and 1764 and will be changed at the intervals specified in this M.I.

3. Engine coolant used will meet the specifications in Maintenance Instruction 1748.

4. Lubricating oil filters will be of a quality equal to original equipment and will be changed at the intervals specified in this M.I.

5. Operating load limitations will be adhered to.

6. Torquing procedures contained in this M.I. will be followed for new engines and newly installed replacement assemblies.

This Maintenance Instruction is divided into three sections. The first section is maintenance performed before and after each start, the second section is performed on a "calendar period" basis, and the third section is performed on a "running time" basis. Because operating requirements for this equipment can vary from standby, to periodic, to continuous usage, the maintenance procedures must be modified to suit individual requirements.

REFERENCES

Abbreviations are used in this instruction to reference publications that contain information related to maintenance. The following examples are provided to aid in understanding the abbreviations used.

EMM	means Engine Maintenance Manual
OM	means Operating Manual
M.I.	means Maintenance Instruction

*This bulletin is revised and supersedes previous issues of this number. Areas of change are indicated by vertical bars.

CAUTION

If the only available diesel fuel does not meet the sulfur content, distillation recovery, or sediment and ash specifications contained in M.I. 1750, observe the schedules and cautions given in M.I. 1725, Scheduled Maintenance Program — Export Stationary Power Units With Turbocharged Engines.

The use of good quality, high alkaline reserve lubricating oils is strongly recommended where only high sulfur fuels are available for use.

NOTE

The following recommendations are applicable to stationary power units used for emergency power.

1. Unit should be operated at least once a week.
2. Operate unit at idle for a sufficient period of time to allow coolant temperature to stabilize at 49° C (120° F) or higher.

   If minimum temperature cannot be obtained at idle speed, gradually apply load until temperature stabilizes.
3. Operate unit at full speed, full load for a minimum of one hour.

BEFORE EACH START

(NON-AUTOMATIC START UNITS)

LUBE OIL SYSTEM

Check for lube oil in pan and strainer housing. Add oil if required.	EMM, M.I. 1760

NOTE

If engine requires prelube, recheck lube oil level in pan as a quantity will transfer to external system (cooler, filter, strainer and piping). Add oil if required.

COOLING SYSTEM

Check coolant level. Add coolant if necessary.	OM, M.I. 1748

NOTE

Do not continue to operate engine requiring periodic addition of coolant. Check for possible coolant leak and repair if required.

FUEL SYSTEM

Check fuel supply and open fuel supply valves.	OM
Prime system.	OM

BEFORE EACH START (CONT'D)

(NON-AUTOMATIC START UNITS)

AIR SYSTEM

Drain condensate.	OM
Check system pressure.	OM
Check oil supply in air line lubricator.	EMM

ENGINE

Check overspeed trip lever OST to ensure it is in the running "latched" position.	EMM
Open cylinder test valves and manually bar over engine one complete revolution, check for liquid ejected from valves, and close test valves.	If fluid discharge is observed from any cylinder, find the cause and make necessary repairs prior to starting the engine.
Prelube engine if unit has been shut down for over 48 hours.	EMM. Unless equipped with immersion heater system.
Check racks.	EMM. Move injector control lever to check for freedom of movement with no binding of injectors.
Ensure exhaust stack is open.	

GOVERNOR

Check oil level. Add oil if necessary.	EMM. M.I. 1764

IMMEDIATELY AFTER EACH START

(NON-AUTOMATIC START UNITS)

INSPECT FOR LEAKS

Cooling system
Fuel oil system
Lube oil system
Exhaust system
Air system

LUBE OIL SYSTEM

Check lube oil level in pan with engine at idle.	EMM
Check lube oil pressure at engine.	OM

COOLING SYSTEM

Check operation of external cooling system.	OM

FUEL SYSTEM

Check for proper fuel pressure.	OM

IMMEDIATELY AFTER EACH START (CONT'D):

(NON-AUTOMATIC START UNITS)

ENGINE

Check cylinder test valves for leakage. Tighten if required.	EMM
Check handhole covers for leakage. Tighten if required.	EMM
Check air box drains for proper operation and clean, if necessary.	EMM. If drains are kept closed, drain every 4 hours.
Check for unusual noises or sounds, or any fault indications (lights or alarm), as provided.	

PERFORM THE FOLLOWING ITEMS ON CALENDAR TIME BASIS

DAILY

(NON-AUTOMATIC START UNITS)

INSPECT FOR LEAKS

Cooling system
Fuel oil system
Lube oil system
Exhaust system
Air system

LUBE OIL SYSTEM

Check lube oil level in pan. Add oil if required.	EMM, M.I. 1760

COOLING SYSTEM

Check coolant level. Add coolant if necessary.	OM, M.I. 1748

NOTE
Do not continue to operate engine requiring periodic addition of coolant. Check for possible coolant leak and repair as required.

FUEL SYSTEM

Check fuel supply.	OM

AIR SYSTEM

Drain condensate from lines and tanks.

GOVERNOR

Check oil level. Add oil if required.	EMM, M.I. 1764

WEEKLY

(AUTOMATIC STARTS UNITS)

ENGINE SHUT DOWN

LUBE OIL SYSTEM

Check for lube oil in pan and strainer housing. Add oil if required.	EMM, M.I. 1760

NOTE
If engine requires prelube, recheck lube oil level in pan as a quantity will transfer to external system (cooler, filter, strainer and piping). Add oil if required.

COOLING SYSTEM

Check coolant level. Add coolant if necessary.	OM, M.I. 1748

NOTE
Do not continue to operate engine requiring periodic addition of coolant. Check for possible coolant leak and repair if required.

FUEL SYSTEM

Check fuel supply.	OM

AIR SYSTEM

Drain condensate.	OM
Check system pressure.	OM
Check oil supply in air line lubricator.	EMM

ENGINE

Prior to maintenance start, check overspeed trip lever OST to ensure it is in the running "latched" position.	EMM
Prior to maintenance start, open cylinder test valves and manually bar over engine one complete revolution, check for liquid ejected from valves, and close test valves.	If fluid discharge is observed from any cylinder, find the cause and make the necessary repairs prior to starting the engine.
Prelube engine if unit has been shut down for over 48 hours.	EMM. Unless equipped with immersion heater system.
Check racks.	EMM. Move injector control lever to check for freedom of movement with no binding of injectors.
Prior to maintenance start, ensure that exhaust stack is open.	

WEEKLY (CONT'D)

ENGINE SHUT DOWN

GOVERNOR

Check oil level. Add oil if necessary.	EMM, M.I. 1764

ENGINE RUNNING

INSPECT FOR LEAKS

Cooling system
Fuel oil system
Lube oil system
Exhaust system
Air system

LUBE OIL SYSTEM

Check lube oil level in pan with engine at idle.	EMM
Check lube oil pressure at engine.	OM

COOLING SYSTEM

Check operation of external cooling system.	OM

FUEL SYSTEM

Check for proper fuel pressure.	OM

ENGINE

Check cylinder test valves for leakage. Tighten if required.	EMM
Check handhole covers for leakage. Tighten if required.	EMM
Check air box drains for proper operation and clean, if necessary.	EMM. If drains are kept closed, drain every 4 hours.
Check for unusual noises or sounds, or any fault indications (lights or alarm), as provided.	

EVERY MONTH

LUBE OIL SYSTEM

Take sample for analysis.	The services of a competent laboratory should be used to monitor the suitability of the oil for continued use according to M.I. 1760.

LUBE OIL CIRCULATING PUMP AND MOTOR (Where Used)

Check for proper operation.	OM

EVERY MONTH CONT'D

IMMERSION HEATER (Where Used)

Check for proper operation.	OM

EVERY TWO MONTHS

AUXILIARY TURBOCHARGER FILTER (Where Used)

Replace elements.	OM

IN-LINE LUBE OIL STRAINER (Where Used)

Clean strainer screen.	

EVERY YEAR

LUBE OIL CIRCULATING PUMP AND MOTOR (Where Used)

Inspect and clean with dry air.	
Replace brushes.	If equipped with DC motor.
Remove and clean check valve.	

LUBE OIL FILTERS

Change filter elements.	EMM. Unless the 1400 hour filter change has occurred first.
Clean lube oil strainer.	EMM. Fill strainer housing with oil before starting engine.

TURBOCHARGER OIL FILTER

Replace filter elements.	EMM. Unless 1400 hour filter change has occurred first.

SOAK BACK OIL FILTER (Where Used)

Replace filter element.	EMM. Unless 1400 hour filter change has occurred first.

EVERY YEAR (CONT'D)

ELECTRICAL CONTROL CABINET AND ASSOCIATED EQUIPMENT (Where Used)

Check operation of protective devices.	Protective switches, relays, and alarm indicators.
Visually inspect and clean:	
Voltage regulator.	M.I. 4523 or appropriate manufacturer's voltage regulator manual.
All relays, contactors, and circuit breakers.	OM
Remove circuit breakers from compartments.	
Clean insulators.	
Lubricate linkage bearings.	
Check operation.	

COOLING SYSTEM

Check operation and setting of engine water temperature control(s).	
Check torque on flexible pipe coupling bolts.	
Take cooling water sample for lab analysis and corrosion test.	M.I. 1748. Unless 2000 hour sampling has occurred first.

LUBE OIL COOLER

Check temperature differential between lube oil and cooling water into engine.	OM and M.I. 927. Clean cooler, if necessary.

EVERY TWO YEARS

FUEL FILTERS

Change engine mounted filter elements.	EMM. Unless 2000 hour filter change has occurred first.
Clean or replace suction strainer element.	OM. Unless 2000 hour maintenance has occurred first.

ENGINE PROTECTOR

Replace or recondition and requalify.	M.I. 259 or M.I. 260. Qualify on test stand after renewing springs, "O" rings, and diaphragms.

LUBE OIL CIRCULATING PUMP AND MOTOR (Where Used)

Replace.	Replacement can be EMD Unit Exchange.

EVERY THREE YEARS

COOLING SYSTEM THERMOSTATIC VALVE

Replace "O" rings and thermostatic elements.	EMM, M.I. 581

EVERY FOUR YEARS

COOLING SYSTEM PRESSURE CAP

Replace.	Unless 16,000 hour replacement has occurred first.

EVERY FIVE YEARS

FREQUENCY GENERATOR COUPLING SPIDER (Where Used)

Replace.	Unless 16,000 hour replacement has occurred first.

EVERY SIX YEARS

ENGINE

Replace top deck cover seals and check latches.	EMM. Unless 8000 hour replacement has occurred first.
Replace cylinder head grommets, inlet and outlet seals, and lower liner seals.	EMM. Unless 16,000 hour cylinder assembly replacement has occurred first.

MAIN GENERATOR

Remove bearing cover and inspect for grease contamination, excessive wear, and overheating. Apply new grease.	Unless 48,000 hour lubrication has occurred first. M.I. 3327 or M.I. 3328 for EMD generators. If generator is other than EMD, refer to manufacturer's manual.

PERFORM THE FOLLOWING ITEMS ON RUNNING TIME BASIS

AFTER THE FIRST 350 HOURS OF OPERATION

ENGINE NUT AND BOLT TIGHTNESS CHECK	Check that the following nuts and bolts are tightened to the corect values specified in the EMM.
Cylinder head crab nuts.	All except those equipped with plate type crabs.
Exhaust manifold flange bolts.	
Cylinder liner water inlet line nuts and bolts.	
Head frame to crankcase bolts.	
Turbocharger to air duct bolts, aftercooler to air duct bolts, and air duct to crankcase bolts, and turbine inlet link bolts.	
Engine mounting bolts.	
Miscellaneous nuts and bolts, and all piping connections.	

ENGINE	
Inspect air box.	EMM
Inspect crankcase.	EMM
Inspect crankshaft and connecting rods.	EMM
Inspect pistons and piston rings.	EMM
Inspect cylinder liners.	EMM
Inspect cylinder head mechanism with engine idling and at operating temperature.	EMM
Inspect engine fuel lines and connection for leaks.	EMM
Inspect engine water system for leaks.	EMM

EVERY 350 HOURS

FUEL FILTER	
Check fuel pressure gauge with engine at rated RPM.	On units where gauge is connected to filter input side, change filter elements if pressure is greater than 345 kPa (50 psi). On units where gauge is connected on filter output side, change filter elements if pressure is less than 83 kPa (12 psi).

EVERY 350 HOURS (CONT'D)

LUBE OIL FILTER

Check lube oil pressure at filter input with engine at rated RPM.	Change filter elements if input pressure is greater than 172 kPa (25 psi).

EVERY 700 HOURS

ENGINE PROTECTOR

Check operation.	EMM, M.I. 259 or M.I. 260

SOAK BACK PUMP AND MOTOR

Check operation.	With the engine shut down and soak back pump motor running, remove left rear handhole cover and check oil flow through gear train. Observe camshaft bearings. If lube oil flows from camshaft bearings with soak back pump running and engine shut down, inspect turbo filter outlet check valve for proper operation.

ENGINE AIR FILTER - CYCOIL TYPE (Where Used)

Check oil level.	OM, M.I. 442

ENGINE AIR FILTER - PANEL TYPE OIL BATH (Where Used)

Check oil level.	OM, M.I. 440

ENGINE AIR FILTER - PAPER OR FIBERGLASS TYPE (Where Used)

Check indicator. If tripped, take manometer readings and replace elements, if necessary.	OM

HEAT EXCHANGER

Inspect corrosion zinc electrodes.	EMM

EVERY 1400 HOURS

LUBE OIL FILTERS

Change filter elements.	OM
Clean lube oil strainers.	EMM. Fill strainer housing with oil before starting engine.

EVERY 1400 HOURS (CONT'D)

TURBOCHARGER OIL FILTER	
Replace filter element.	Filter elements must be of a quality equal to original equipment. The interval of change for turbocharger and soak back filter elements is influenced by load factor, kind of lubricating oil, type of operation, climatic conditions, and maintenance of main lube oil filters.
SOAK BACK OIL FILTER (Where Used)	
Replace filter element.	Same as above.
AUXILIARY TURBOCHARGER FILTER (Where Used)	
Replace elements.	EMM
PROTECTIVE DEVICES	
Check operation.	OM, EMM

EVERY 2000 HOURS

FUEL FILTERS	
Clean or replace suction strainer element.	OM
Change engine mounted filter elements.	EMM. Use only elements equal to original equipment.
COOLING SYSTEM	
Take cooling water sample for lab analysis and corrosion test.	M.I. 1748. Unless the yearly sampling has occurred first.
ENGINE AIR FILTERS - CYCOIL TYPE (Where Used)	
Change oil. Drain and fill only.	OM, M.I. 442
ENGINE AIR FILTER - PANEL TYPE OIL BATH (Where Used)	
Change oil. Drain and fill only.	OM, M.I. 440
ENGINE AIR FILTERS - PAPER TYPE (Where Used)	
Take manometer readings. Replace elements if necessary.	

NOTE
Take manometer readings whenever the annunciator light indicates a plugged filter.

EVERY 2000 HOURS (CONT'D)

ENGINE AIR FILTERS - FIBERGLASS TYPE	
Replace elements.	OM
STARTING MOTORS (Electric)	
Blow out with dry air.	EMM
ENGINE	
Inspect air box.	EMM
Inspect crankcase.	EMM
Inspect crankshaft and connecting rods.	EMM
Inspect pistons and piston rings.	EMM
Inspect cylinder liners.	EMM
Inspect cylinder head mechanism with engine idling and at operating temperature.	EMM
Inspect engine fuel lines and connections for leaks.	EMM
Inspect engine water system for leaks.	EMM

EVERY 4000 HOURS

EXHAUST SYSTEM	
Remove exhaust manifold-to-turbocharger adapter assembly.	EMM. Clean screen and trap box. Observe recommendations found in EMM concerning checking for cracks.
TURBOCHARGER EXHAUST DIFFUSER	
Visually inspect for evidence of warpage or damage.	EMM
EDUCTOR TUBE (Exhaust Stack Mounted)	
Inspect for carbon deposits and clean, if necessary.	EMM

EVERY 4000 HOURS (CONT'D)

LUBE OIL SYSTEM

Change engine oil.	EMM. Evaluation of engine and oil condition should dictate the frequency of this item. Type of service, type of oil, quality of filter elements, and condition of engine will influence the frequency of oil change.
Clean oil pan.	EMM
Clean filter housing.	EMM
Clean oil suction screens.	EMM
Clean scavenging oil screens.	EMM. Fill strainer housing with oil before starting engine.

ENGINE

Check pressure drop across aftercoolers; oil bath filter equipped engines only.	EMM. Clean air passages if necessary.
Check exhaust manifold base flange bolts for proper tightness.	EMM

MAIN GENERATOR

If equipped, inspect brushes and collector rings. Replace brushes if required.	M.I. 3327 or M.I. 3328 for EMD generator. If generator is other than EMD, refer to manufacturer's manual.
If equipped, reverse polarity of collector rings.	

GOVERNOR

Change oil.	EMM, M.I. 1764
Lubricate linkage moving parts.	EMM
Lubricate governor synchronizing motor, motor bearings. (Where used.)	EMM

EVERY 8000 HOURS

ENGINE NUT AND BOLT RETORQUING

Cylinder head crab nuts.	Follow retorquing procedures if called for in the EMM.
Main lube oil and piston cooling oil pump shaft nut.	EMM
Head frame to crankcase bolts.	EMM
Turbocharger to air duct bolts, aftercooler to air duct bolts, air duct to crankcase bolts, and turbine inlet link bolts.	EMM
Engine mounting bolts.	
Miscellaneous nuts and bolts, and all piping connections.	

ENGINE

Replace top deck cover seals and check latches.	EMM
Qualify injectors.	EMM
Check injector timing and injector rack length.	EMM
Check engine speed.	EMM
Check overspeed trip.	EMM
Remove and clean oil separator element.	EMM
Check pressure drop across aftercooler; paper and fiberglass filter equipped engines only.	EMM. Clean air passages if necessary.
Inspect crankshaft damping device.	EMM
Remove, clean, and inspect; replace if necessary:	EMM
Soak back check valve in the turbo filter inlet.	
Soak back oil pressure relief valve in the soak back filter head.	
Soak back filter bypass valve in the soak back filter head.	
Turbo oil filter check valve in the turbo filter head.	

EVERY 8000 HOURS (CONT'D)

EXHAUST SYSTEM

Inspect manifold sections for possible cracked leg baffles or expansion joints and replace, if necessary.	EMM

MAIN GENERATOR AND BRUSHLESS EXCITER (If Equipped)

Clean and visually inspect.	M.I. 3327 or M.I. 3328
If equipped, replace collector ring brushes.	M.I. 3327

EXTERNAL EXCITER

Clean and visually inspect.	M.I. 3706
Inspect and replace brushes when required. Replace brushes in sets only.	

ENGINE AIR FILTER - CYCOIL TYPE (Where Used)

Change oil and clean sump.	OM, M.I. 442
Check operation of variflow valves.	
Check condition of hoses.	

ENGINE AIR FILTERS - PANEL TYPE OIL BATH (Where Used)

Change oil. Clean sump and filter media.	OM, M.I. 440

SOAK BACK PUMP MOTOR (Where Used)

Inspect and clean with dry air.	M.I. 4101
Replace brushes.	M.I. 4101

COOLING SYSTEM

Inspect and perform pressure test.	OM
Replace pressure cap if defective.	OM

LUBE OIL FILTER

Remove internal oil filter bypass valve; clean, inspect, and test. (Where used.)	M.I. 926

LUBE OIL FILTER AND OIL COOLER BYPASS VALVES (Where Used)

Remove; clean, inspect, and test.	EMM

EVERY 8000 HOURS (CONT'D)

STARTING MOTORS (Air)	
Disassemble, clean, inspect and lubricate.	EMM
STARTING MOTORS (Electric)	
Disassemble, clean, inspect and lubricate.	EMM
Inspect brushes and replace if necessary.	EMM

EVERY 16,000 HOURS

FUEL PUMP	
Replace coupling spider.	
SOAK BACK PUMP (Where Used)	
Replace coupling spider.	
FREQUENCY GENERATOR (Where Used)	
Replace coupling spider.	
COOLING SYSTEM	
Replace pressure cap. (Where used.)	OM
Inspect filler neck for damage. Replace if damaged. (Where used.)	OM
ENGINE	
Replace cylinder assemblies.	EMM
Replace injectors.	EMM. Replacement should be EMD Unit Exchange or equivalent.
Inspect and qualify connecting rod bearings.	EMM
Inspect and qualify piston cooling tubes.	EMM
Check rocker arms, rocker arm bushings, and cam followers.	EMM
Check lash adjusters.	EMM
Check exhaust valve timing.	EMM
Inspect lower liner inserts, and replace if required.	EMM

EVERY 24,000 HOURS

ENGINE

Install new thrust collars.	EMM
Install new lower main bearings.	EMM
Replace water pump seals and all worn parts.	EMM

TURBOCHARGER

Unit Exchange.	EMM. Average individual operating conditions will determine frequency.

TURBOCHARGER-TO-FILTER AIR DUCT (Where Used)

Replace.	

COOLING SYSTEM

Replace flexible coupling seals.	

LUBE OIL COOLER

Inspect, clean, and test.	M.I. 927

HEAT EXCHANGER

Inspect, clean, and test.	EMM

EVERY 32,000 HOURS

GOVERNOR

Replace.	Replacement should be EMD Unit Exchange or equivalent.

GOVERNOR BOOSTER SERVO (Where Used)

Disassemble, clean, inspect, and replace O-ring seals.	EMM

FUEL PUMP

Replace or recondition.	M.I. 4110. Replacement can be EMD Unit Exchange.

SOAK BACK PUMP AND MOTOR (Where Used)

Replace or recondition.	M.I. 4101, M.I. 4110. Replacement can be EMD Unit Exchange.

EVERY 48,000 HOURS

ENGINE

Replace vibration damper or harmonic balancer. (Where used.)	EMM. Replace with gear type damper.
Replace or recondition oil pumps.	EMM. Replacement can be EMD Unit Exchange.
Remove oil pressure relief valve; clean, inspect, and test.	EMM
Replace lower liner inserts.	EMM
Inspect injector control linkage. Replace links, seals, and bearings, if required.	

MAIN GENERATOR

Remove bearing cover and inspect for grease contamination, excessive wear and overheating. Apply new grease.	M.I. 3327 or M.I. 3328 for EMD generators. If generator is other than EMD, refer to manufacturer's manual.

EVERY 72,000 HOURS

ENGINE

Replace crankshaft damping device.	EMM. Replace with new or reconditioned gear type damper. If already equipped with gear type damper, recondition and requalify.

EVERY 96,000 HOURS

ENGINE

Unit Exchange.

GENERATOR

Unit Exchange.

07-499-91

ACTION - Taylor, IE
Cys: Dircks
Roe
Rehm
Stello
Minogue
Denton
GCunningham
Ankrum, IE
Goldberg, IE
Philips

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

OFFICE OF THE SECRETARY

December 31, 1985

MEMORANDUM FOR: William J. Dircks, Executive Director for Operations

FROM: for Samuel J. Chilk, Secretary

SUBJECT: STAFF REQUIREMENTS -- SECY-85-119 - "ISSUANCE OF PROPOSED RULE ON THE IMPORTANT-TO-SAFETY ISSUE"

The Commission, by a vote of 5-0 has disapproved SECY-85-119. The Commission agrees that the proposed rule does not adequately differentiate nor clarify the terms "Important-to-Safety" (ITS) and "Safety Related" (SR).

The Commission continues to believe that it is necessary to resolve the apparent confusion surrounding usage of the term "Important-to-Safety". The Commission directs you to resubmit a proposed rule concerning ITS. The Commission believes the following guidelines should be followed in redrafting the proposed rule.

(A) Concerning the ITS definition:

1. If a term such as "normal industry practice" is to be applied in the definition, that term also needs clarification. For example, how is normal industry practice determined?

2. Safety-related is a subset of ITS.

3. ITS refers to those systems, structures, and components at a specific plant for which the staff has explicitly required the application of some specialized treatment in that plant's licensing documents or to which certain generic regulatory requirements have been added. Furthermore, the requirements imposed on those systems, structures, and components determined to be ITS are only those which were specifically required in the plants' current licensing documents or in the generic regulatory requirements.

4. Specialized treatment is not restricted just to QA/QC requirements. It includes, among other things, codes, standards, missile hazard prevention requirements, fire protection requirements, etc.

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Ford OM, EDO
Date...1-2-86
Time...8A

5. A specific listing of safety-related equipment is required to be maintained. A specific listing of ITS equipment is not required to be maintained.

(B) Concerning the process for making changes to the commitments associated with items ITS or for new determinations of items ITS:

1. It is not the intention of the rule to add new requirements, to modify existing requirements, or to broaden the existing scope of the Commission's requirements.

2. As with all systems, structures, and components, appropriate backfitting procedures will be used in all instances where new requirements are proposed by the NRC staff.

3. Systems, structures, and components that will be called ITS for NTOLs will be determined during the normal licensing process.

4. Formal guidance should be included on how determinations of items ITS will be made, including criteria to be used to determine on a plant-specific basis what equipment is ITS.

(C) Concerning the review and amendment of existing regulations and other regulatory documents:

1. It is expected that 10 CFR will be reviewed to determine if use of the terms "safety-related" and "important-to-safety" is appropriate and consistent with the new definition. If not consistent, staff should propose appropriate modifications to 10 CFR.

2. The Commission suspects this will require more than the addition of a formal definition to Part 50 of 10 CFR.

3. The staff should inform the Commission of the results of its review.

(D) In addition to the above guidelines, Commissioner Asselstine would appreciate staff consideration of the following:

1. A rulemaking defining "important to safety" that would allow additions to or deletions from that set based on new information or analyses without going through the full gamut of the backfit rule.

can only be done if all parties really want understanding (not pursuing some regulatory changes)

2. A rulemaking defining "ITS" for future plants so that confusion and uncertainty do not persist and so that standardization can be enhanced.

(EDO) (SECY SUSPENSE: 3/21/86)

Copies:
Chairman Palladino
Commissioner Roberts
Commissioner Asselstine
Commissioner Bernthal
Commissioner Zech
Commission Staff Offices

May 29, 1986

POLICY ISSUE
(Notation Vote)

SECY-86-164

For: The Commissioners

From: Victor Stello, Jr.
Executive Director for Operations

Subject: PROPOSED RULE ON THE IMPORTANT-TO-SAFETY ISSUE

Purpose: To obtain Commission approval of proposed definitions of safety-related, important-to-safety, facility licensing documents, and normal industry practice and obtain additional Commission direction on the rulemaking option to be followed.

Category: This paper covers a significant policy issue.

Issue: This paper is the first step in implementing the Commission's decision to initiate rulemaking In the Matter of Long Island Lighting Company (Shoreham Nuclear Power Station, Unit 1) CLI-84-9, 19 NRC 1325 (June 5, 1984).

Background: In the Shoreham licensing decision (CLI-84-9, 19 NRC 1323, June 5, 1984) the Commission directed the staff to prepare a rulemaking package to resolve the issue concerning the definition and usage of the terms "safety-related" (SR) and "important-to-safety" (ITS). Subsequent to this Commission direction, the Utility Safety Classification Group petitioned (October 30, 1984) the NRC to define these terms in its regulations. In response to the Commission direction, on December 20, 1984, the staff provided an information paper, SECY-84-476, to the Commission concerning the steps the staff was taking to implement the Commission's directives in the area of equipment "important-to-safety." At that time, the staff informed the Commission that, after further discussion with interested industry groups, the staff was planning to go forward with a Notice of Proposed Rulemaking to the Commission for its decision in early 1985.

On January 31, 1985, a meeting was held between representatives of the Atomic Industrial Forum (AIF), the Utility Safety Classification Group (USCG) and the NRC staff concerning the important-to-safety issue. The staff and the industry representatives agreed that the interpretation of the term

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"important-to-safety" in General Design Criterion-1 to 10 CFR 50, Appendix A, and elsewhere in Part 50, only needed to be clarified to reflect the statement of past practice adopted by the Commission in the Shoreham decision.

On April 5, 1985 the staff presented the Commission with a proposed rulemaking package (SECY-85-119) which embodied the agreed upon interpretation, i.e., normal industry practice is acceptable for important-to-safety items that are not safety-related unless otherwise specified in licensing documents.

On December 31, 1985, the Office of the Secretary issued a Staff Requirements Memorandum which stated that the Commission had disapproved SECY-85-119, and that the proposed rule did not adequately differentiate nor clarify the terms important-to-safety and safety-related. Additionally, in the SRM the Commission requested the staff to address or clarify particular aspects of the issue, with Commissioner Asselstine requesting that two additional concerns be addressed.

Discussion: The December 31, 1985 Staff Requirements Memorandum (SRM) directed the staff to resubmit a revised proposed rule based on the guidance provided by the Commission. The staff is providing a revised Commission Paper for the Commission's consideration. This paper provides revised definitions of important-to-safety and safety-related, defines normal industry practice and facility licensing documents, and requests Commission approval of these definitions prior to developing the proposed rulemaking package.

As the staff understands the SRM, there are two basic issues involved: (1) what equipment should be classified as ITS, and (2) what requirements are imposed on this class of equipment. The staff has grouped the Commission's requests, guidance, and questions that appeared in the SRM into five general requests as listed below. The staff believes that the two basic issues have been addressed within the responses that follow.

1. Clarify the definitions of "important-to-safety" and "safety-related."

2. Define "normal industry practice."

3. Develop criteria for determining what equipment is ITS on a plant-specific basis.

4. Review the usage of the terms ITS and SR in 10 CFR for consistency and propose appropriate modifications if the usage is not consistent.

5. If any new requirements are imposed, the appropriate backfitting procedures will be used.

A discussion of the staff's response to and recommendation on each of these requests follows:

1. Clarify definitions of Important-to-Safety and Safety-Related

The Commission's guidance contained in the SRM concerning clarifying the definitions of "safety-related" and "important-to-safety" keyed on clarifying that "safety-related" is a subset of "important-to-safety" and the concept that the staff had required some "specialized treatment" in the plant's licensing documents for equipment "important-to-safety."

To stress the fact that "safety-related" is a subset of "important-to-safety," the staff has revised the definition of "safety-related" to specifically state "...safety-related is a subset of important-to-safety...." This action divides the general category of important-to-safety into two subsets, important-to-safety/safety-related (ITS/SR) and important-to-safety/non-safety-related (ITS/NSR).

A literal interpretation of the SRM would result in the following definition of important-to-safety:

> "Important-to-safety" when referring to structures, systems, and components means those structures, systems, and components for which the NRC staff has required the application of some specialized treatment in the facility licensing documents or generic regulatory requirements. Requirements imposed on important-to-safety items are only those which were specifically required by inclusion in the facility licensing documents or in generic regulatory requirements.

In order to assess the SRM guidance concerning the use of "specialized treatment," the staff reviewed the Final Safety Analysis Reports (FSARs) and selected portions of the other licensing documents for two nuclear power plants, Rancho Seco and River Bend. The purpose of the review was to determine what items that the staff traditionally considered "important-to-safety" would not be encompassed as such using the "specialized treatment" criteria. For this review the

staff considered specialized treatment to include references in the licensing documents to codes, standards, seismic design or qualification provisions, missile hazard prevention provisions, fire protection provisions, special calibration, testing, maintenance or inspection provisions, and any quality control or quality assurance provisions.

Documents submitted by the licensee in support of the application for an operating license were considered the facility licensing documents, i.e., documents submitted after the license was issued were not considered unless they were a condition of the license.

For Rancho Seco, the integrated control system, and the main turbine trip and control systems are examples of systems that are described in the FSAR but for which no "specialized treatment" is specified in the FSAR or the other licensing documents reviewed. The staff believes these systems are clearly important-to-safety as their failure would cause transients that would challenge the plant's safety-related systems.

For River Bend, the feedwater control system and the rod control and information system are examples of systems or components described in the FSAR but for which no "specialized treatment" exists in the FSAR or the other licensing documents reviewed and which the staff believes are important-to-safety.

Based on this review the staff believes the guidance in the SRM, if strictly followed, would not include systems that the staff considers "important-to-safety" nor would it make clear that the Commission expects that normal industry practice would be followed for these systems when "specialized treatment" has not been specified. The staff, with its limited resources, does not review every detail of an application and assure that the appropriate treatment is given to each ITS/NSR item. The staff review presumes that a body of good practice exists for plant structures, systems and components whether or not explicit specialized treatment is specified in the facility licensing documents.

Under this narrow definition of ITS proposed by the SRM, the systems listed above could be excluded from the category of ITS and therefore be beyond the requirements of the general design criteria (10 CFR 50, Appendix A). This could weaken the basis for taking action on safety concerns for any equipment for which specialized treatment is not required in facility licensing documents.

As an alternative to the SRM definition, the staff proposes the following definition of "important-to-safety:"

> "Important-to-safety" when referring to structures, systems, and components means those structures, systems, and components that are described in the facility licensing documents and that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public.

The staff further would define facility licensing documents for the staff definition as follows:

> "Facility licensing documents" are those documents that comprise the application and associated proceedings; NRC regulations; Final Safety Analysis Report; NRC orders; license conditions; and written licensee commitments to the NRC.

The staff's approach encompasses all the equipment, information, and commitments that served as a basis for issuing an operating license or a construction permit and for allowing continued operation or construction. There is, however, the possibility that for some plants not all equipment that the staff presently considers ITS is described in the facility licensing documents. Under the NRC's current regulatory requirements, a requirement by the staff to add a description to the FSAR for this equipment would be subject to a backfit analysis.

The Commission should note that although increased emphasis is being placed on ITS/NSR equipment because of recent operational events, the NRC inspection program has been and continues to be primarily focused on ITS/SR equipment due to resource limitations and the presumption that a body of good practice exists for plant structures, systems and components. The staff does not foresee a change in the level of inspection effort expended on ITS/NSR equipment solely as a result of this rulemaking.

2. Define Normal Industry Practice

The staff considered two options in responding to the Commission's request to define "normal industry practice:" (a) using the ATWS QA guidance previously developed for "important-to-safety but not safety-related" equipment or (b) develop new guidance which generally describes the

staff's interpretation. The staff considered the ATWS QA guidance as it is reasonably specific and already applies to some equipment falling in the ITS/NSR category. However, the staff determined that the application of the ATWS guidance to the entire ITS/NSR category may constitute a backfit for some equipment at some plants. The staff believes that a substantial effort would be required to develop a suitable backfit analysis and considers it doubtful that such an analysis would support the imposition of the guidance. Therefore, the staff concluded that such an imposition of the ATWS QA guidance on all ITS/NSR items would be inappropriate.

As an alternative, the staff proposes the following definition of "normal industry practice:"

> "Normal Industry Practice" when referring to structures, systems, and components important-to-safety but not safety-related (ITS/NSR), means that these items are: (1) designed, constructed, operated, inspected, tested, and maintained in accordance with applicable nuclear or non-nuclear codes and standards, and vendor- or manufacturer-supplied information or recommendations; (2) replaced with parts assured to be of at least the same quality as the original parts through inspections, tests, evaluation, or audits; and (3) evaluated to establish root causes and necessary corrective actions for any nonconforming items or operational performance problems that occur.

Based on the information gathering visits that have been made concerning licensees' handling of ITS/NSR structures, systems, and components, the staff considers that this description of normal industry practice describes the intent, if not in every case the practice, at operating plants.

Enclosure 1 to this paper provides examples of the maintenance, operation, and inspection aspects of normal industry practice for emergency power diesel generators and valve motor operators. This information is provided to show the level of detail that the staff considers acceptable in describing "normal industry practice" for ITS/NSR equipment. Although emergency power diesel generators are classified as safety-related by licensees, General Motors provides the diesels as commercial grade to a customer who assembles the diesel generator unit. The enclosed diesel vendor information is illustrative of the level of detail specified by vendors for complex equipment and is illustrative of "normal industry practice."

The Commission should note that neither current regulations nor the proposed rule, as presently perceived, would require licensees to comply with this definition of normal industry practice, although as stated above it is the opinion of the staff that most licensees already comply. If the Commission determines that compliance with this definition should be explored, the staff will make appropriate modifications to the proposed rule and prepare the requisite backfit analysis.

3. Develop Criteria for Determining what Equipment is ITS on a Plant Specific Basis

On the issue of guidance for determining what equipment is important-to-safety, the SRM stated that a list of equipment ITS/NSR is not required; that for NTOLs, equipment ITS/NSR could, in general, be determined during the normal licensing process; that it is not the intention of the rule to add new requirements; and that criteria for determining what equipment is ITS/NSR on a plant-specific basis should be developed.

To date neither the licensees nor the staff has compiled a list of ITS/NSR equipment. The licensee's FSARs contain descriptions of both ITS/SR and ITS/NSR structures systems, and components. The descriptions usually clearly state which equipment is ITS/SR but licensees have not specifically identified equipment which is ITS/NSR. The staff in their review of licensee's FSARs have, to date, including NTOLs, concentrated on structures, systems, and components which are ITS/SR. The Safety Evaluation Reports (SERs) issued by the staff specifically cover ITS/SR equipment. However, issuance of an SER does indicate general acceptance of the Safety Analysis Report. Therefore, although ITS/NSR equipment has not been specifically identified as such, equipment contained in the category ITS/NSR can generally be determined by using the staff's definitions of ITS and facility licensing documents. To do so would be a major undertaking for an individual licensee.

The staff also reviewed the dockets for those plants that have not received an operating license but are actively pursuing completion of the plants. For all plants except Bellefonte 1 & 2 and WNP 1 & 3, the staff has issued a Safety Evaluation Report thereby establishing what structures, systems, and components are ITS. Therefore, due to the small number of plants that would be affected by the proposed definitions, the staff proposes that for all currently docketed plants that ITS equipment be that which is or will be described in the facility licensing documents, as per the previously cited definition.

4. Review Usage of Terms ITS and SR

The staff has reviewed the use of the terms "safety-related" and "important-to-safety" in 10 CFR and concluded that the use of the terms is not internally consistent nor is it consistent with the proposed definitions. "Safety-related" appears 39 times and "important-to-safety" appears 126 times.

A clear example of a use inconsistent with the proposed definition of "important-to-safety" appears in General Design Criterion 2; "Structures, systems, and components important-to-safety shall be designed to withstand the effects of natural phenomena such as earthquakes ...without loss of capability to perform their safety functions...." In general, the staff has required that ITS/SR equipment meet this requirement, but most of the ITS/NSR equipment does not. As such, the proposed definition of ITS would tend to imply that all ITS equipment must be designed to operate after a design basis earthquake which is not intended by the staff. However, a direct substitution of "safety-related" for "important-to-safety" would not encompass certain aspects such as non-Category I seismic design requirements. Similarly, the adequacy and reliability of offsite power would not be encompassed by changing "important-to-safety" to "safety-related" in other General Design Criteria.

Due to the magnitude of the problem and the difficulties involved in developing acceptable alternatives, the staff has not pursued the issue of consistent usage of these terms. There are four options available to the Commission in implementing the definitions of important-to-safety and safety-related:

1. Withhold issuing a notice of proposed rulemaking on the proposed definitions until the rest of 10 CFR can be appropriately modified to be consistent with the proposed definitions. These usage changes would then be published with the proposed definitions in the same proposed rule.

2. Withhold issuing a notice of proposed rulemaking on the proposed definitions until 10 CFR Part 50 can be appropriately modified to be consistent with the new definitions. These usage changes would then be published with the proposed definitions in the same proposed rule.

3. Issue a notice of proposed rulemaking on the proposed definitions, review the public comments, finalize the definitions, receive Commission endorsement of the definitions and then prepare a second notice of proposed rulemaking on the appropriate changes to 10 CFR or 10 CFR 50 based on the final definitions.

4. Issue a policy statement announcing the Commission's adoption of the definitions and forego rulemaking.

The first option would attempt to achieve consistency in the usage of the terms safety-related and important-to-safety throughout the regulations. However, this effort would entail revising portions of Parts 2, 21, 34, 50; General Design Criteria 2, 3, 4, 5, 16, 17, 18, 44, 54 and 61 contained in Appendix A to Part 50; Appendix R to Part 50; and portions of Parts 60, 71, 72 and Appendix A to Part 100. It is the opinion of the staff that the two areas where the usage problem would be most difficult to resolve are the General Design Criteria and the inconsistencies between the parts of the regulations concerning production and utilization facilities versus the parts of the regulations concerning waste repositories, independent spent fuel storage facilities, and packaging and transportation of radioactive material. Additionally, the safety concerns and equipment involved are sufficiently different between production and utilization facilities and the waste repository, independent spent fuel storage, and transportation areas that different definitions and use of terminology between these areas will not create any significant loss of clarity. Moreover, the term safety-related is not used in regulations applicable to waste repositories, independent spent fuel storage, and transportation areas. The term important-to-safety, as it applies to these areas, is specifically defined in each of the relevant subparts of 10 CFR. Therefore, there is no uncertainty over the present usage of these terms in these portions of the regulations. For these reasons, the staff considers it unnecessary and inappropriate to attempt making the definitions and usage of the terms important-to-safety and safety-related consistent throughout 10 CFR. Additionally, any attempt to do so would take an effort substantially in excess of the other options and would not be the most appropriate use of staff resources. If extensive public comments are received that necessitate revision of the definitions, the effort would, in effect, have to be undertaken a second time.

The staff does not recommend the Commission approve this option.

The second option would resolve the issue of safety-related versus important-to-safety for the regulations concerning production and utilization facilities (principally power reactors). This is the area where the issue was originally raised and where the lack of definitions and consistent usage have created uncertainty. Additionally, the equipment involved and the rules governing that equipment are sufficiently different between production and utilization facilities and the waste repository, independent spent fuel storage, and transportation areas that different definitions and use of terminology between these areas will not adversely affect the regulatory environment. Restricting the rulemaking to those portions of 10 CFR concerning production and utilization facilities would reduce the areas considered difficult to resolve by the staff to General Design Criteria (GDC) 2, 3, 4, 5, 16, 17, 18, 44, 54 and 61. To fully resolve the usage problem it may be necessary to take the guidance currently contained in the Standard Review Plan and applicable Regulatory Guides and place that information in the GDC.

The staff currently estimates that this option would take two to three years and involve approximately two FTE per year just to issue the proposed rule. If extensive public comments are received that necessitate revision of the definitions, the effort would have to be repeated.

The staff recommends that any rulemaking be restricted to those parts of 10 CFR that concern production and utilization facilities.

Option three would postpone any action on resolution of the usage problem until the staff has had the benefit of public comments on the proposed definitions and the final definitions had received Commission approval. This option would have the advantage of early public comments on the proposed definitions with a very limited impact on staff resources and would also avoid the possible situation of having to attain staff agreement on the necessary modifications to the regulations twice. The disadvantage of this option is that the public would not have the benefit of reviewing the proposed definitions and the proposed revisions in the use of the definitions at the same time.

The staff believes that adopting this option would eliminate the possibility of having to revise the regulations twice, once to issue a proposed rule and the second time to address any changes to the definitions and their use resulting from public comments.

The Commission should note that this option can be pursued regardless of whether the Commission elects to restrict the rulemaking to those sections of the regulations that concern production and utilization facilities or elects to have the rulemaking cover all of 10 CFR.

The fourth option would forego rulemaking on this subject. The Commission would issue a policy statement announcing the adoption of the proposed definitions without any changes to the existing regulations. The advantages of this approach are the relatively short time span required, the very limited impact on staff resources, the clear establishment of a class of equipment that is important-to-safety but not safety-related, and a statement of the Commission's expectation that a standard of normal industry practice will be followed for such equipment. The disadvantages of this option are the lack of public comment and the possible continuing uncertainty among licensees resulting from the mixed usage of terms in the 10 CFR 50, Appendix A General Design Criteria.

5. Imposition of Backfit Procedures for New Requirements

In response to Commissioner Asselstine's request that the staff consider a rulemaking which would allow additions to or deletions from the scope of ITS equipment based on new information or analyses without applying the backfit rule, the staff considers a backfit analysis appropriate prior to requiring any additional equipment be classified important-to-safety for currently licensed plants. However, licensees may voluntarily amend their FSARs (after an appropriate 50.59 review) or make changes to the scope of ITS equipment as a result of operational events or other factors.

With respect to Commissioner Asselstine's request that the staff consider a rulemaking for future plants so that confusion and uncertainty do not persist and so that standardization can be enhanced, the staff prefers to wait to accumulate experience with the proposed definitions before considering further rulemaking. The staff anticipates that any existing confusion or uncertainty will be taken care of by the definitions proposed by this paper and the fact that current treatment of existing plant equipment will not change.

The importance of increased attention to ITS/NSR plant equipment was recently emphasized in an EDO memo dated November 26, 1985 on NRC lessons learned in the Davis Besse event:

"The paramount importance of proper maintenance in maintaining levels of reliability assumed in the safety analyses that form the licensing basis for operating plants has been accorded greater recognition and increased emphasis and attention by both NRC and utility management in the aftermath of the TMI accident. However, it appears from the circumstances noted in the review of the June 9 Davis-Besse event that an inappropriate, artificial distinction between the importance of safety-related vs nonsafety-related plant features may have led some licensees to place inadequate emphasis on proper maintenance of all equipment necessary to assure proper facility operations. Some balance-of-plant systems may actually have equal or perhaps greater safety importance (cumulatively) than equipment classified as safety-related because their too-frequent failure can needlessly challenge the safety-related systems, and their failure can also aggravate conditions under which the safety-related systems must respond. We need to give increased attention to assuring that the attention of licensee management is focused properly on this important aspect of plant operations and that important balance-of-plant systems and equipment receive adequate attention in the overall maintenance picture...."

The staff believes that the proposed definitions, while not in themselves imposing any new requirements, will bring to the attention of the industry the Commission's concern that a proper level of attention be paid to items which are not "safety-related" but which play a large role in assuring safe plant operation.

Recommendation: That the Commission:

1. Approve the staff's proposed definitions of important-to-safety, safety-related, facility licensing documents, and normal industry practice.

2. Approve and direct the staff to proceed, on a long term basis, with option 2 while, in the short term, direct the staff to develop as discussed in option 4, a Policy Statement announcing the Commission's adoption of the definitions and intent to codify them.

3. Provide additional guidance to the staff as to whether licensee compliance with the proposed definition of normal industry practice should be required.

4. Note:

   a. The staff does not recommend that the Commission pursue Option 1.

b. That a Backfit Analysis has not been performed for this paper since it only requests Commission approval of proposed definitions and additional guidance. The staff will perform an appropriate Backfit Analysis if the Commission chooses the rulemaking option.

c. That because this paper only requests Commission approval of proposed definitions and additional guidance, a Regulatory Analysis is not necessary. The staff will perform an appropriate Regulatory Analysis if the Commission chooses the rulemaking option.

Scheduling: If scheduled on the Commission agenda, I recommend this paper be considered at an open meeting.

Victor Stello, Jr.
Executive Director for Operations

Enclosure:
Examples of Normal Industry
Practice

Commissioners' comments or consent should be provided directly to the Office of the Secretary by c.o.b. Monday, June 16, 1986.

Commissioner Staff Office comments, if any, should be submitted to the Commissioners NLT Monday, June 9, 1986, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

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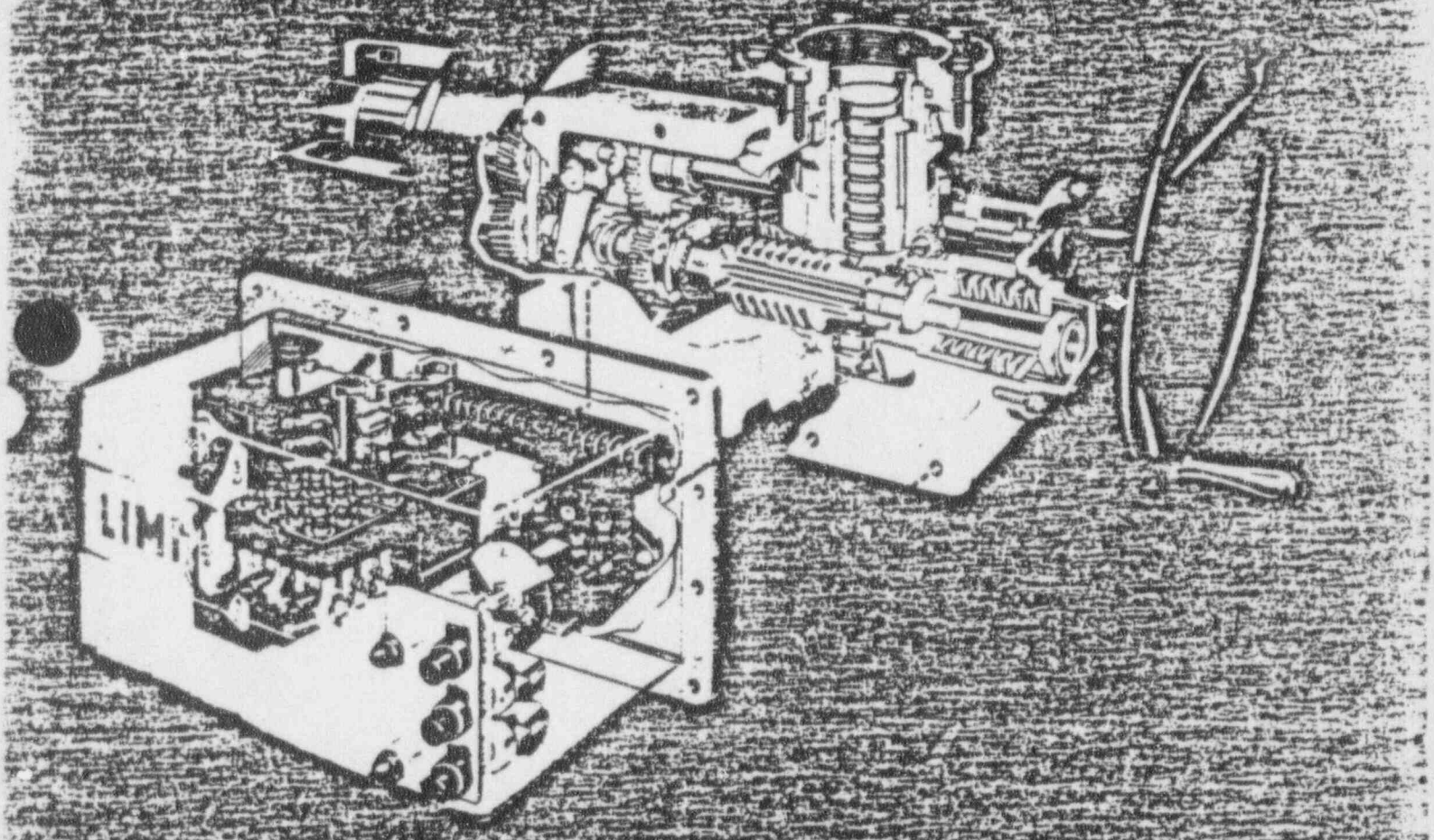
ENCLOSURE

EXAMPLES OF
NORMAL INDUSTRY PRACTICE

TORQUE
TYPE SMB
MAINTENANCE MANUAL



TYPICAL OPERATION
SMB UNITS

Description of Motor Operation:

The motors used on the Limitorque valve controls are high starting torque totally enclosed motors. They are furnished in weatherproof explosion proof or submersible enclosures. All motors are furnished with ball bearings and provided with grease seals. No lubrication of these motors is necessary since they are lubricated at the factory for lifetime operation. All those AC motors are of the squirrel cage design and DC motors are compound wound.

Since the operation of the Limitorque valve control is basically the same for all SMB operators the following general description of the motor operation is applicable. Any of the parts drawings may be referred to in following this description although the various part numbers will change for each size operator for the purpose of explanation we will refer to the SB-00 operator drawing.

The electric motor has a helical pinion mounted on its shaft extension. This pinion pc #40 drives the worm shaft clutch gear pc #41 which is engaged with pc #50 the worm shaft clutch. This piece is splined to the worm shaft pc #40. Piece #50 the worm is splined to the worm shaft pc #40. Piece #50 the worm is splined to the worm shaft and when it is rotated it turns pc #10 the worm gear. The worm gear has two lugs cast onto the top portion which engages the two lugs on the drive sleeve pc #11. These lugs are spaced so that when the worm gear begins to turn during motor operation there is a certain amount of lost motion before the lugs engage and cause the hammer blow effect within the operator.

As soon as the worm gear lugs engage the drive sleeve being splined internally with pc. #20 the stem nut causes the stem nut to rotate and open or close the threaded stem of the valve. The stem nut is threaded to fit the thread of any rising stem valve in the case of non-rising stem valves or where the electric operator is mounted in tandem with an additional gear drive the stem nut pc #20 is merely bored and keyed to fit the shaft.

The thrust developed by a Limitorque valve control is absorbed by the heavy duty thrust bearings on the top and bottom of the main drive sleeve. As the Limitorque valve control develops greater torque when seating the valve the worm slides axially along the splines of the worm shaft and compresses the belleville springs pc #56 which is the torque spring. These are calibrated springs and for every increment of compression for a given size unit a certain predetermined amount of torque is developed. The torque switch is mechanically actuated by the worm. When the worm moves back a preset distance and develops the determined amount of torque or thrust required the torque switch opens and a pair of electrical contacts which are wired into the motor control circuit interrupts the circuit and stops the motor at this point.

The geared limit switch pc #105 is directly geared to the worm shaft and is in step at all times with the movement of the Limitorque valve control. It cannot slip since there are no belts or other friction devices used in its operation. Once the geared limit switch is set to trip at its proper position of valve travel it will trip at the same point every time. See instructions on how to set the geared limit switch.

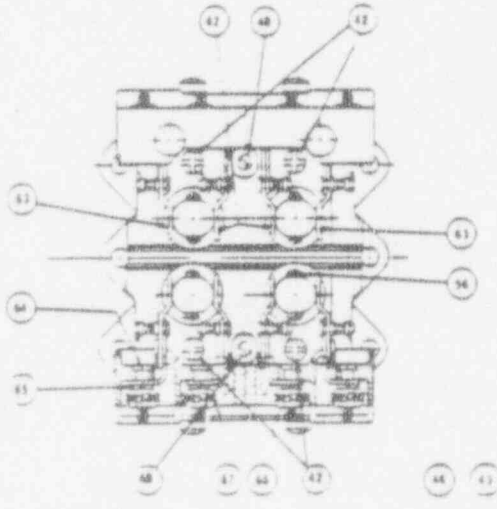
Generally the torque switch is wired into the motor control circuit to stop the operator in a full closed position of any rising stem type of operation and the geared limit switch is wired into the motor control circuit to stop the operator at the full open position. In the case of most 90° turn valves and sluice gates the geared limit switch is wired into the motor control circuit to stop the operation at both the full open and full close position of the valve. The torque switch is wired in series with the geared limit switch in both directions so that in the event a mechanical overload occurs the torque switch will open and cause the motor to stop. Check the wiring diagram of the actual installation to determine the correct wiring connections to be made for the torque switch and geared limit switch.

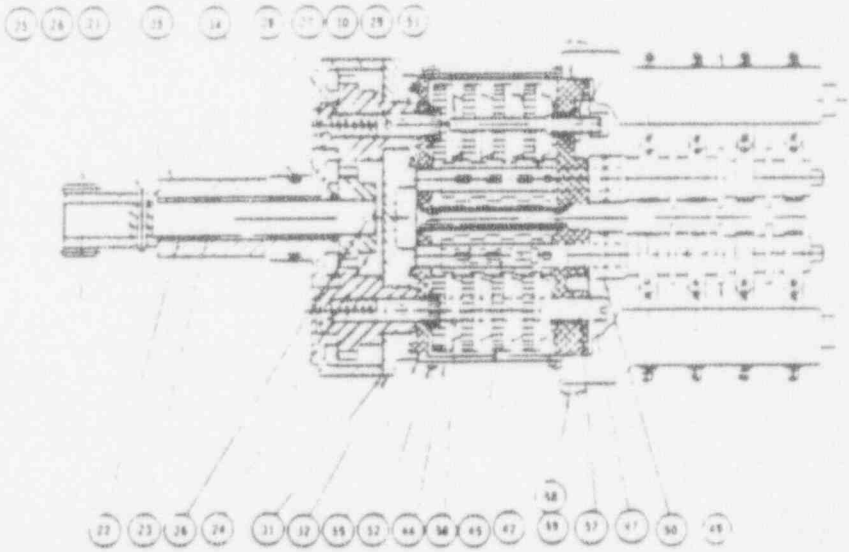
FOUR TRAIN GEARED LIMIT SWITCH-ROTOR TYPE*

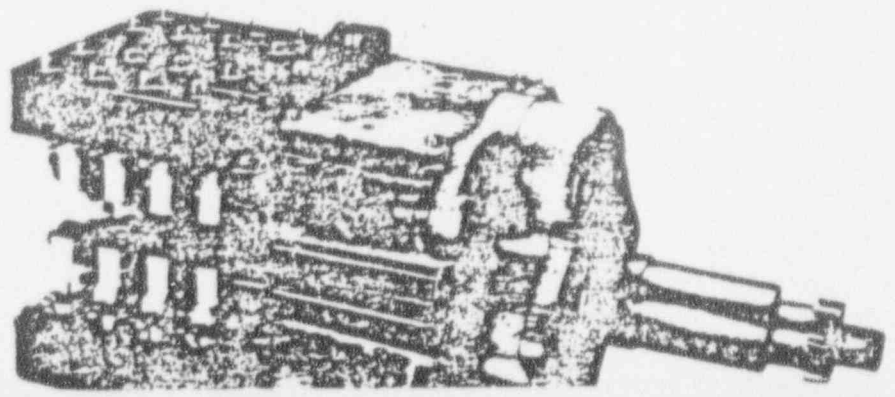
Procedure for Setting:

The four train geared limit switch (Rotor type) employs four rotary drum switches each having four contacts. When the rotor is properly set to trip at the desired position, two of these contacts open and two close electric circuits. Generally one rotor is set to trip at full open position of the valve and one rotor is set to trip at full close position of the valve. The other two rotors are set at some intermediate position depending on the requirements of the project.

To set the switches of a four train rotor type switch, follow the same procedure as described for the two train rotor type switch. The upper setting rod (pc. #48) allows adjustment of the two adjacent upper rotors and lower setting rod (pc. #48) allows adjustment of the two adjacent lower rotors.







PC. NO.	NO. REQD.	DESCRIPTION
21	1	CARTRIDGE
22	2	OILITE BUSHING
23	1	DRIVE SHAFT
24	1	DRIVE PINION (INTERNAL)
25	1	HELICAL PINION
26	2	GROOVE PIN 1/8 Ø x 1" LG.
27	2	DRIVE SLEEVE & GEAR
28	2	DECLUTCH SPRING
[illegible]	2	DRIVE PINION SPUR
[illegible]	2	PIN 1/8 Ø x 11/16 LG.
31	1	CARTRIDGE GASKET
32	1	CARTRIDGE MTG. PLATE
33	4	#1/4-20 x 3/4 LG. SOC. HD. C. S.
34	1	O-RING #6227-11
35	1	O-RING #6227-21
36	4	#3/8-16 x 3/4" FILL. HD. CAP SCREW & LW.
41	2	GEAR FRAME
42	4	INTER. GEAR SHAFT
43	4	INTER. PINION SHAFT
44	4	G.L. FRAME COVER
45	16	INTERMITTENT GEAR
46	12	INTERMITTENT PINION
47	4	STEM SPUR PINION
48	2	SET ROD
49	4	ROTOR
50	4	GROOVE PIN 3/32 Ø x 3/4" LG.
51	4	COVER GASKET
52	16	#6-32 x 1/4" LG. FILL. HD. M.S.
53	2	O-RING #1820-3
54	2	SETTING ROD BUSHING
55	2	GASKET, GEAR FRAME
56	16	INSERT (ROTOR)
[illegible]	2	O-RING #1820-5
[illegible]	1	GROOVE PIN 1/8 Ø x 1" LG.
61	1	FINGER BASE
62	16	R.H. FINGER ASSY.
63	16	L.H. FINGER ASSY.
64	32	#10-32 x 1" LG. HEX. HD. C.S.
65	32	#10 LOCKWASHER
66	64	#10-32 HEX NUT

LUBRICATION
INSPECTION PROCEDURE & DATA

General:

Proper lubrication is an absolute essential in achieving the design life of all types of power transmission products and Limitorque valve controls are no exception.

The design of the actuator has been specially tailored to absolutely minimize the maintenance and re-lubrication requirements however periodic inspection is the only way to guarantee trouble-free service.

Limitorque utilizes a totally sealed gear case factory-packed with grease. The gear case can be mounted in any position as all penetrations are oil sealed however those mounting positions which would cause vulnerable areas of the operator (e.g. motor and limit switch compartment) to be saturated with lubricant should a seal failure occur should be avoided if possible and are not recommended. Grease is used in normal service instead of oil to minimize the probability of seal failure should one occur.

No seal can remain absolutely tight at all times therefore it is not unusual to find a very small amount of weeping around shaft seals—especially during long periods of cold storage. The use of grease minimizes this condition as much as possible. Should a small amount of weeping be found during limit switch compartment or stem nut inspection it should be removed with a cleaning rag. Once the equipment has begun operating this condition should disappear.

Lubrication Inspection:

It is recommended that all Limitorque operators be inspected for proper lubrication prior to operating—especially if they had been stored for a long period of time.

The frequency of lubrication inspections should be based upon service data of the installed equipment. Every operator application has its own effect on lubricants and each facility should develop its inspection procedure based upon its particular needs. The following schedule of lubrication inspections should be followed until operating experience indicates otherwise.

Main Gear Case: Inspect lubrication at approximate intervals of 6 months or 500 cycles—whichever occurs first. Lubricate the Zerk fitting on the housing cover at the same interval.

Geared Limit Switch: Inspect lubrication at approximate intervals of 36 months or 1000 cycles—whichever occurs first.

The three primary considerations for lubrication inspection are: 1. Quantity 2. Quality 3. Consistency.

Quantity—Limitorque operators are supplied with the proper quantity of grease. The primary concern is the amount of lubricant that may escape from the housing, immersion of gears in the lubricant can be affected by the use of excessive amounts of the wrong lubricant and other problems.

Quality—When removing the cover for lubrication inspection, use extreme care to maintain a clean and free of contaminants housing. Water, dirt or other foreign materials in the housing should be flushed with a commercial degreaser (carbon tetrachloride, etc.) and when such corrosive type materials are encountered, materials such as Buna N, Viton, Neoprene, Low Temperature Lubricant.

Consistency—The main gear case lubricant should be a high quality, heavy bodied, moly disulfide type grease of the consistency of #2 Multi-Purpose Lithium Base. It should be noted that the use of lighter consistency lubricants than specified may result in leakage problems.

The specified lubricant should be used in the main gear case at normal operating temperatures. Use of lubricants of other consistency or less

MAINTENANCE PROCEDURE

Routine Maintenance:

A schedule should be made to perform routine inspection of the equipment. The time interval of this inspection should be based upon the frequency of operation and the amount of environmental contaminations to which the equipment is subjected. A maximum inspection period of eighteen months should be used as a base on experience indicates otherwise. This routine maintenance should include:

1. Remove limit switch compartment and control cabinet cover. Should moisture be evident, dry the compartment and components.

2. Inspect and clean all electrical contacts and contactors in the limit switch compartment and control cabinet. This check may include cleaning of arcing deposits on contacts with electrical contact solvent cleaner, such as CRC Electro Clean and a fine bristle brush.

3. Check all terminals for proper tightness.

4. Clean gasketed surfaces on limit switch compartment and control cabinet cover. Replace damaged gaskets. Lightly coat gaskets with petroleum jelly.

5. Inspect conduit seal fittings. Replace if damaged. Check for proper sealing.

6. Inspect conduit for damage. Replace if damaged. Check for proper sealing.

7. Check all terminals for proper tightness.

Major Maintenance:

The need for major maintenance is determined by routine equipment inspection. Evidence of the need for major maintenance may include:

1. Excessive corrosion of equipment.

2. Replacement of any damaged limit switch or other component. Any replacement may require readjustment of limit switch settings. Refer to the limit switch adjustment procedure.

3. Replacement of control cabinet components as necessary. Refer to the control cabinet recommended spare parts list for ordering information.

4. Replacement of motor and gearbox as necessary.

5. Inspect item and item conveyance components for wear and damage.

6. Check overall alignment of equipment before returning to service.

SMB-5 & SMB-5T
DISASSEMBLY OF VALVE OPERATOR

General:

Exploded view 08-403-0002-4

Thrust Assembly 01-410-0003-4

The SMB-5 is a thrust type actuator made up of an SMB-5T torque type unit mounted on a thrust bearing assembly. If the existing unit is an SMB-5T torque only, disregard the first section of this procedure (Steps A1 and A2).

SMB-5 (Thrust Unit Only):

A1 CAUTION: Ensure that unit is not under load and that valve is not under pressure before proceeding. If so, the valve must be in the full open position.

A. Remove drive sleeve locknut pc #100.

WARNING! SMB-5 drive sleeve locknut has left hand threads and must be rotated clockwise to remove.

B. Rotate handwheel to close valve. Using stem nut pc #125 to raise up threaded valve stem, until stem nut lugnes are free of drive sleeve pc #126.

C. Rotate stem nut by hand for remainder of length of valve stem and remove.

A2 Remove thrust adapter assembly pc #125 from operator.

NOTE: If disassembly of thrust adapter assembly is not required continue to Step A. If thrust adapter is to be disassembled proceed as follows.

A. Remove seal retainer plate pc #129 and oil seal pc #102.

B. Loosen set screw and remove thrust bearing carriage pc #128 from thrust adapter housing pc #125.

C. Remove upper bearing roller assembly pc #131.

D. Lift thrust drive sleeve pc #126 out of thrust adapter housing pc #125.

E. Remove lower bearing roller assembly pc #131.

SMB-5T (Torque Unit):

1. To disassemble, please observe the following procedure.

A. Remove limit switch compartment cover pc #12.

B. Disconnect motor leads and leads to torque switch pc #116 and geared limit switch pc #117.

Note: Ensure leads are labeled for reassembly.

C. Remove torque switch and geared limit switch.

2. Using lifting eyebolts, remove housing cover pc #3, drive sleeve pc #1, and worm gear pc #7.

3. Remove handwheel washer pc #60 and pull off handwheel pc #10 and handwheel clutch pc #70 from handwheel shaft pc #40.

4. Remove worm shaft end cap pc #7 and declutch housing cover pc #4.

5. Remove declutch assembly as follows:

A. Remove declutch stop pc #28, cover spring pc #67, washers pc #34 and roll pin pc #110.

B. Loosen set screws on declutch lever pc #9 and collar pc #103, remove declutch lever, declutch shaft end cap pc #59 and slide declutch shaft pc #30 out through bottom of unit.

C. Remove declutch fork pc #14 and other declutch shaft mounted components pc #66, pc #70, pc #69 and pc #103 from unit.

D. Remove handwheel shaft and pinion pc #40.

6. Remove drive shaft pc #43 and flexible jaw clutch pc #50 as integral assembly, gear clutch spacer pc #47, sliding clutch gear pc #51 and clutch compression spring pc #68.

7. Remove splined insert pc #54 using jack screws, Spirolox ring pc #107 and handwheel gear pc #6.

8. A. Remove gear mounting bracket pc #8 using jackscrews, bearing pc #93 and bearing adapter pc #65.

B. Pull hollow drive shaft pc #55 toward declutch end and remove Spirolox ring pc #106.

9. Remove declutch housing pc #2.

*10 A. Push hollow drive shaft pc #55 toward motor end, loosen set screw and remove bearing locknut pc #33. Hold hollow drive shaft using pc #55 as pliers on splines.

B. Remove bearing pc #95 by pushing hollow drive shaft towards declutch end.

C. Remove gear with threaded collar pc #32 and key.

D. Remove hollow drive shaft pc #55 from declutch end of unit.

**11 A. Loosen set screw in carriage stem locking nut pc #46 and rotate declutch housing pc #2 a few turns to compress torque spring.

B. Remove locking nut pc #46.

*12 CAUTION! Declutch Housing is under spring load.

A. Remove declutch housing pc #2.

B. Pull bearing carriage stem pc #45 out partially and remove thrust washers pc #48, torque limit sleeve pc #52 and springs pc #58.

*13 Remove bearing carriage, worm assembly from unit. To disassemble further:

A. Loosen hex set screws on bearing carriage cap pc #44 and unscrew bearing carriage stem pc #45.

B. Slide bearing carriage cap off of worm/worm threads.

C. Loosen set screw and remove bearing locknut pc #33.

D. Press off two bearings pc #91 and pc #91.

*14 Remove motor pc #115, motor adapter pc #5, intermediate pc #4 and gear assembly pc #15 pc #47 as an integral assembly, drive shaft gear pc #42 and bearing spacer pc #52.

SMB-5 & SMB-5T
REASSEMBLY OF VALVE OPERATOR

SMB-5 (Thrust Unit Only):

01. If thrust actuator assembly pc #125 was not disassembled, complete to Step 02.

NOTE: Thrust bearing races should be pressed on thrust drive sleeve pc #126 and in thrust actuator housing pc #125 and thrust bearing carriage pc #128 prior to beginning assembly procedure.

02. Install lower bearing roller assembly pc #131 in thrust actuator housing pc #125.

03. Install short end of thrust drive sleeve pc #126 into thrust actuator housing pc #125.

04. Install upper bearing roller assembly pc #131 on thrust drive sleeve pc #126.

05. Install thrust bearing carriage pc #128 threaded in right or until drag is felt on thrust drive sleeve and tighten set screw.

06. Install oil seal pc #122 and seal retainer plate pc #120.

07. Lift operator up inside cover and install housing thrust actuator assembly pc #125. Ensure that thrust drive sleeve O-ring pc #104 is in place.

08. Install stem nut pc #127.

09. Install drive sleeve locknut pc #100 and clamp or stake the two threads in two places.

WARNING! SMB-5 drive sleeve locknut has left hand threads and must be rotated counter-clockwise to install.

NO.	DESCRIPTION
1	HOUSING
2	GEAR TOP HOUSING
3	HOUSING COVER
4	GEAR TOP HOUSING WASHER
5	MOTOR ADAPTER
6	HANDWHEEL GEAR
7	WORM SHAFT END CAP
8	GEAR MOUNTING BRACKET
9	PERMA-TEX LEVER
10	HANDWHEEL
11	THROVE DRIVE SLEEVE
12	LIMIT SWITCH ACTUATOR LEVER
13	HANDWHEEL CLUTCH
14	FORK
15	INTERMEDIATE PINION AND SHAFT
16	WORM GEAR
18	DRIVE SLEEVE BUSHING
19	DRIVE SLEEVE THRUST BEARING
20	WORM BUSHING
21	BUSHING - HANDWHEEL GEAR
22	RETAINING RING
23	GEAR INSERT
24	SPLIT RING
25	SPIROLOX
27	DECLUTCH LEVER DRUM
28	DECLUTCH LEVER STUD
29	DECLUTCH SHAFT
31	TRIPPER BOLT
32	3/8 THREADED COLLAR
33	DECLUTCH TRIPPER #1
34	CLUTCH TRIPPER #2
35	HANDLE BAR
36	HANDLE CHROME PLATE
37	HINGE PIN
38	HINGE-LOWER
39	MOTOR PINION
40	HANDWHEEL SHAFT & PINION
41	MOTOR DRIVE INTERMEDIATE GEAR
42	DRIVE SHAFT GEAR
43	DRIVE SHAFT SCUD
44	BEARING CARTRIDGE CAP
45	BEARING CARTRIDGE STEM
46	THRUST WASHER
47	GEAR TOP SPACER
48	NUT - CARTRIDGE STEM
49	FORK - ROLLER
50	FLEXIBLE JAW CLUTCH HOUSING
51	BEARING GEAR TOP
52	MOTOR CLUTCH GEAR CAM PIN
53	PIN FORK ROLLER
54	SPLINED INSERT

NO.	DESCRIPTION
61	SPRING WASHER
62	GEAR TOP STUD
63	HANDWHEEL GEAR SPACER
64	BEARING SPACER
65	BEARING ADAPTER
66	GEAR TOP LUBE
67	TRIPPER SPRING
68	GEAR TOP HOUSING PLUG
69	DECLUTCH SHAFT SPACER
70	GEAR TOP SHAFT WASHER
71	PERMA-TEX LEVER NAME PLATE
72	GEAR TOP STUD
73	FLEXIBLE JAW CLUTCH SLEEVE
74	FLEXIBLE JAW CLUTCH INSERT
75	NYLON INSERT
76	THRUST SPACER
79	HOUSING COVER GASKET
81	GEAR TOP HOUSING WASHER
82	GEAR TOP CAP GASKET
83	GEAR TOP COVER GASKET
84	WORM SHAFT END CAP GASKET
85	MOTOR ADAPTER GASKET
86	GASKET MOTOR
88	LIMIT SWITCH COVER GASKET
90	BEARING CONE
91	BEARING CUP
92	BEARING SPACER
93	BEARING
94	HANDWHEEL SHAFT BEARING
95	BEARING
96	BEARING
97	BEARING
98	BEARING LOCKNUT
99	BEARING LOCKNUT
100	BEARING LOCKNUT N CUP
101	BEARING
102	RETAINING RING
103	ACTUATOR SCREW STEM
104	O-RING
105	BEARING
106	SPIROLOX RING
107	BEARING
108	OIL SEAL
109	GROOVE PIN
110	ROLL PIN
111	GREASE FITTING
112	WELSH PLUG
113	GEAR
114	THROVE SWITCH
115	GEAR LIMIT SWITCH
124	HOUSING COVER
125	THRUST ACTUATOR ASSEMBLY
126	THRUST DRIVE SLEEVE
127	STEM NUT
128	THRUST BEARING CARRIAGE
129	SEAL RETAINER PLATE
130	DRIVE SLEEVE LOCKNUT
131	THRUST BEARING
132	OIL SEAL
133	GREASE FITTING
134	O-RING

ELECTRO-MOTIVE

M.I. 1728
*Rev. G

MAINTENANCE INSTRUCTION

SCHEDULED MAINTENANCE PROGRAM DOMESTIC STATIONARY POWER UNITS WITH TURBOCHARGED ENGINES

INTRODUCTION

This Maintenance Instruction provides average recommendations which should ensure satisfactory engine operation and economical maintenance cost where average load factors and average climatic conditions are encountered. It is intended to serve as a guide when establishing maintenance schedules that will meet the particular requirements of individual operations, and planned economic life of the engine and associated equipment.

These recommendations are based on the following conditions:

1. Fuel oil used will meet the specifications of Maintenance Instruction 1750.
2. Lubricating oil used will meet the specifications of Maintenance Instructions 1760 and 1764 and will be changed at the intervals specified in this M.I.
3. Engine coolant used will meet the specifications in Maintenance Instruction 1748.
4. Lubricating oil filters will be of a quality equal to original equipment and will be changed at the intervals specified in this M.I.
5. Operating load limitations will be adhered to.
6. Torquing procedures contained in this M.I. will be followed for new engines and newly installed replacement assemblies.

This Maintenance Instruction is divided into three sections. The first section is maintenance performed before and after each start, the second section is performed on a "calendar period" basis, and the third section is performed on a "running time" basis. Because operating requirements for this equipment can vary from standby, to periodic, to continuous usage, the maintenance procedures must be modified to suit individual requirements.

REFERENCES

Abbreviations are used in this instruction to reference publications that contain information related to maintenance. The following examples are provided to aid in understanding the abbreviations used.

EMM	means Engine Maintenance Manual
OM	means Operating Manual
M.I.	means Maintenance Instruction

*This bulletin is revised and supersedes previous issues of this number.
Areas of change are indicated by vertical bars.

BEFORE EACH START (CONT'D)

(NON-AUTOMATIC START UNITS)

AIR SYSTEM

Drain condensate	OM
Check system pressure.	OM
Check oil supply in air line lubricator.	EMM

ENGINE

Check overspeed trip lever OST to ensure it is in the running "latched" position.	EMM
Open cylinder test valves and manually bar over engine one complete revolution, check for liquid ejected from valves, and close test valves.	If fluid discharge is observed from any cylinder, find the cause and make necessary repairs prior to starting the engine.
Prelube engine if unit has been shut down for over 48 hours.	EMM. Unless equipped with immersion heater system.
Check racks.	EMM. Move injector control lever to check for freedom of movement with no binding of injectors.
Ensure exhaust stack is open.	

GOVERNOR

Check oil level. Add oil if necessary.	EMM, M.I. 1764

IMMEDIATELY AFTER EACH START

(NON-AUTOMATIC START UNITS)

INSPECT FOR LEAKS

Cooling system
Fuel oil system
Lube oil system
Exhaust system
Air system

LUBE OIL SYSTEM

Check lube oil level in pan with engine at idle.	EMM
Check lube oil pressure at engine.	OM

COOLING SYSTEM

Check operation of external cooling system.	OM

FUEL SYSTEM

Check for proper fuel pressure.	OM

WEEKLY

(AUTOMATIC STARTS UNITS)

ENGINE SHUT DOWN

LUBE OIL SYSTEM

Check for lube oil in pan and strainer housing. Add oil if required.	EMM, M.I. 1760

NOTE
If engine requires prelube, recheck lube oil level in pan as a quantity will transfer to external system (cooler, filter, strainer and piping). Add oil if required.

COOLING SYSTEM

Check coolant level. Add coolant if necessary.	OM, M.I. 1748

NOTE
Do not continue to operate engine requiring periodic addition of coolant. Check for possible coolant leak and repair if required.

FUEL SYSTEM

Check fuel supply.	OM

AIR SYSTEM

Drain condensate.	OM
Check system pressure.	OM
Check oil supply in air line lubricator.	EMM

ENGINE

Prior to maintenance start, check overspeed trip lever OST to ensure it is in the running "latched" position.	EMM
Prior to maintenance start, open cylinder test valves and manually bar over engine one complete revolution, check for liquid ejected from valves, and close test valves.	If fluid discharge is observed from any cylinder, find the cause and make the necessary repairs prior to starting the engine.
Prelube engine if unit has been shut down for over 48 hours.	EMM. Unless equipped with immersion heater system.
Check racks.	EMM. Move injector control lever to check for freedom of movement with no binding of injectors.
Prior to maintenance start, ensure that exhaust stack is open.	

EVERY MONTH CONT'D

IMMERSION HEATER (Where Used)

Check for proper operation. OM

EVERY TWO MONTHS

AUXILIARY TURBOCHARGER FILTER (Where Used)

Replace elements. OM

IN-LINE LUBE OIL STRAINER (Where Used)

Clean strainer screen.

EVERY YEAR

LUBE OIL CIRCULATING PUMP AND MOTOR (Where Used)

Inspect and clean with dry air.

Replace brushes. If equipped with DC motor.

Remove and clean check valve.

LUBE OIL FILTERS

Change filter elements. EMM. Unless the 1400 hour filter change has occurred first.

Clean lube oil strainer. EMM. Fill strainer housing with oil before starting engine.

TURBOCHARGER OIL FILTER

Replace filter elements. EMM. Unless 1400 hour filter change has occurred first.

SOAK BACK OIL FILTER (Where Used)

Replace filter element. EMM. Unless 1400 hour filter change has occurred first.

EVERY THREE YEARS

COOLING SYSTEM THERMOSTATIC VALVE

Replace "O" rings and thermostatic elements.	EMM, M.I. 581

EVERY FOUR YEARS

COOLING SYSTEM PRESSURE CAP

Replace.	Unless 16,000 hour replacement has occurred first.

EVERY FIVE YEARS

FREQUENCY GENERATOR COUPLING SPIDER (Where Used)

Replace.	Unless 16,000 hour replacement has occurred first.

EVERY SIX YEARS

ENGINE

Replace top deck cover seals and check latches.	EMM. Unless 8000 hour replacement has occurred first.
Replace cylinder head grommets, inlet and outlet seals, and lower liner seals.	EMM. Unless 16,000 hour cylinder assembly replacement has occurred first.

MAIN GENERATOR

Remove bearing cover and inspect for grease contamination, excessive wear, and overheating. Apply new grease.	Unless 48,000 hour lubrication has occurred first. M.I. 3327 or M.I. 3328 for EMD generators. If generator is other than EMD, refer to manufacturer's manual.

EVERY 350 HOURS (CONT'D)

LUBE OIL FILTER

Check lube oil pressure at filter input with engine at rated RPM.	Change filter elements if input pressure is greater than 172 kPa (25 psi).

EVERY 700 HOURS

ENGINE PROTECTOR

Check operation.	EMM, M.I. 259 or M.I. 260

SOAK BACK PUMP AND MOTOR

Check operation.	With the engine shut down and soak back pump motor running, remove left rear handhole cover and check oil flow through gear train. Observe camshaft bearings. If lube oil flows from camshaft bearings with soak back pump running and engine shut down, inspect turbo filter outlet check valve for proper operation.

ENGINE AIR FILTER - CYCOIL TYPE (Where Used)

Check oil level.	OM, M.I. 442

ENGINE AIR FILTER - PANEL TYPE OIL BATH (Where Used)

Check oil level.	OM, M.I. 440

ENGINE AIR FILTER - PAPER OR FIBERGLASS TYPE (Where Used)

Check indicator. If tripped, take manometer readings and replace elements, if necessary.	OM

HEAT EXCHANGER

Inspect corrosion zinc electrodes.	EMM

EVERY 1400 HOURS

LUBE OIL FILTERS

Change filter elements.	OM
Clean lube oil strainers.	EMM. Fill strainer housing with oil before starting engine.

EVERY 2000 HOURS (CONT'D)

ENGINE AIR FILTERS - FIBERGLASS TYPE

Replace elements.	OM

STARTING MOTORS (Electric)

Blow out with dry air.	EMM

ENGINE

Inspect air box.	EMM
Inspect crankcase.	EMM
Inspect crankshaft and connecting rods.	EMM
Inspect pistons and piston rings.	EMM
Inspect cylinder liners.	EMM
Inspect cylinder head mechanism with engine idling and at operating temperature.	EMM
Inspect engine fuel lines and connections for leaks.	EMM
Inspect engine water system for leaks.	EMM

EVERY 4000 HOURS

EXHAUST SYSTEM

Remove exhaust manifold-to-turbocharger adapter assembly.	EMM. Clean screen and trap box. Observe recommendations found in EMM concerning checking for cracks.

TURBOCHARGER EXHAUST DIFFUSER

Visually inspect for evidence of warpage or damage.	EMM

EDUCTOR TUBE (Exhaust Stack Mounted)

Inspect for carbon deposits and clean, if necessary.	EMM

EVERY 8000 HOURS

ENGINE NUT AND BOLT RETORQUING

Cylinder head crab nuts.	Follow retorquing procedures if called for in the EMM.
Main lube oil and piston cooling oil pump shaft nut.	EMM
Head frame to crankcase bolts.	EMM
Turbocharger to air duct bolts, aftercooler to air duct bolts, air duct to crankcase bolts, and turbine inlet link bolts.	EMM
Engine mounting bolts.	
Miscellaneous nuts and bolts, and all piping connections.	

ENGINE

Replace top deck cover seals and check latches.	EMM
Qualify injectors.	EMM
Check injector timing and injector rack length.	EMM
Check engine speed.	EMM
Check overspeed trip.	EMM
Remove and clean oil separator element.	EMM
Check pressure drop across aftercooler; paper and fiberglass filter equipped engines only.	EMM. Clean air passages if necessary.
Inspect crankshaft damping device.	EMM
Remove, clean, and inspect; replace if necessary:	EMM
Soak back check valve in the turbo filter inlet.	
Soak back oil pressure relief valve in the soak back filter head.	
Soak back filter bypass valve in the soak back filter head.	
Turbo oil filter check valve in the turbo filter head.	

EVERY 8000 HOURS (CONT'D)

STARTING MOTORS (Air)

Disassemble, clean, inspect and lubricate.	EMM

STARTING MOTORS (Electric)

Disassemble, clean, inspect and lubricate.	EMM
Inspect brushes and replace if necessary.	EMM

EVERY 16,000 HOURS

FUEL PUMP

Replace coupling spider.	

SOAK BACK PUMP (Where Used)

Replace coupling spider.	

FREQUENCY GENERATOR (Where Used)

Replace coupling spider.	

COOLING SYSTEM

Replace pressure cap. (Where used.)	OM
Inspect filler neck for damage. Replace if damaged. (Where used.)	OM

ENGINE

Replace cylinder assemblies.	EMM
Replace injectors.	EMM. Replacement should be EMD Unit Exchange or equivalent.
Inspect and qualify connecting rod bearings.	EMM
Inspect and qualify piston cooling tubes.	EMM
Check rocker arms, rocker arm bushings, and cam followers.	EMM
Check lash adjusters.	EMM
Check exhaust valve timing.	EMM
Inspect lower liner inserts, and replace if required.	EMM

EVERY 48,000 HOURS

ENGINE

Replace vibration damper or harmonic balancer. (Where used.)	EMM. Replace with gear type damper.
Replace or recondition oil pumps.	EMM. Replacement can be EMD Unit Exchange.
Remove oil pressure relief valve; clean, inspect, and test.	EMM
Replace lower liner inserts.	EMM
Inspect injector control linkage. Replace links, seals, and bearings, if required.	

MAIN GENERATOR

Remove bearing cover and inspect for grease contamination, excessive wear and overheating. Apply new grease.	M.I. 3327 or M.I. 3328 for EMD generators. If generator is other than EMD, refer to manufacturer's manual.

EVERY 72,000 HOURS

ENGINE

Replace crankshaft damping device.	EMM. Replace with new or reconditioned gear type damper. If already equipped with gear type damper, recondition and requalify.

EVERY 96,000 HOURS

ENGINE

Unit Exchange.

GENERATOR

Unit Exchange.

07-H99-91

ACTION - Taylor, IE
Cys: Dircks
Roe
Rehm
Stello
Minogue
Denton
GCunningham
Ankrum, IE
Goldberg, IE
Philips

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

OFFICE OF THE SECRETARY

December 31, 1985

MEMORANDUM FOR: William J. Dircks, Executive Director for Operations

FROM: for Samuel J. Chilk JCH Secretary

SUBJECT: STAFF REQUIREMENTS -- SECY-85-119 - "ISSUANCE OF PROPOSED RULE ON THE IMPORTANT-TO-SAFETY ISSUE"

The Commission, by a vote of 5-0 has disapproved SECY-85-119. The Commission agrees that the proposed rule does not adequately differentiate nor clarify the terms "Important-to-Safety" (ITS) and "Safety Related" (SR).

The Commission continues to believe that it is necessary to resolve the apparent confusion surrounding usage of the term "Important-to-Safety". The Commission directs you to resubmit a proposed rule concerning ITS. The Commission believes the following guidelines should be followed in redrafting the proposed rule.

Concerning the ITS definition:

1. If a term such as "normal industry practice" is to be applied in the definition, that term also needs clarification. For example, how is normal industry practice determined?

2. Safety-related is a subset of ITS.

3. ITS refers to those systems, structures, and components at a specific plant for which the staff has explicitly required the application of some specialized treatment in that plant's licensing documents or to which certain generic regulatory requirements have been added. Furthermore, the requirements imposed on those systems, structures, and components determined to be ITS are only those which were specifically required in the plants' current licensing documents or in the generic regulatory requirements.

4. Specialized treatment is not restricted just to QA/QC requirements. It includes, among other things, codes, standards, missile hazard prevention requirements, fire protection requirements, etc.

8601160559 XA

For OA, EDO
Date 1-2-86
Time 8A

5. A specific listing of safety-related equipment is required to be maintained. A specific listing of ITS equipment is not required to be maintained.

Concerning the process for making changes to the commitments associated with items ITS or for new determinations of items ITS:

1. It is not the intention of the rule to add new requirements, to modify existing requirements, or to broaden the existing scope of the Commission's requirements.

2. As with all systems, structures, and components, appropriate backfitting procedures will be used in all instances where new requirements are proposed by the NRC staff.

3. Systems, structures, and components that will be called ITS for NTOLs will be determined during the normal licensing process.

4. Formal guidance should be included on how determinations of items ITS will be made, including criteria to be used to determine on a plant-specific basis what equipment is ITS.

Concerning the review and amendment of existing regulations and other regulatory documents:

1. It is expected that 10 CFR will be reviewed to determine if use of the terms "safety-related" and "important-to-safety" is appropriate and consistent with the new definition. If not consistent, staff should propose appropriate modifications to 10 CFR.

2. The Commission suspects this will require more than the addition of a formal definition to Part 50 of 10 CFR.

3. The staff should inform the Commission of the results of its review.

In addition to the above guidelines, Commissioner Asselstine would appreciate staff consideration of the following:

1. A rulemaking defining "important to safety" that would allow additions to or deletions from that set based on new information or analyses without going through the full gamut of the backfit rule.

2. A rulemaking defining "ITS" for future plants so that confusion and uncertainty do not persist and so that standardization can be enhanced.

(EDO) (SECY SUSPENSE: 3/21/86)

Copies:
Chairman Palladino
Commissioner Roberts
Commissioner Asselstine
Commissioner Bernthal
Commissioner Zech
Commission Staff Offices