

OCT 2 1989

Docket No. 50-289

GPU Nuclear Corporation
ATTN: Mr. H. D. Hukill
Vice President and Director of TMI-1
P. O. Box 480
Middletown, Pennsylvania 17057

Gentlemen:

Subject: Maintenance Program Team Inspection

This letter is to inform you that the NRC intends to perform a team inspection of your Maintenance Program at Three Mile Island Nuclear Station, Unit 1. Based on discussions between you and Mr. T. Martin of this office, we understand that significant corrective and preventive maintenance activities will be performed prior to rather than during the outage scheduled to begin in January 1990. For this reason, some of our inspection activities will take place prior to your outage. The exact dates of the inspection will be determined by your maintenance schedules.

The inspection will focus on the performance of maintenance and whether components, systems, and structures of your plant are adequately maintained and properly repaired so that they are available to perform their intended safety function.

In order for us to properly prepare for the inspection, to schedule the actual inspection dates, and to maximize the time spent in observation of maintenance in progress, we request that you provide a schedule of planned maintenance between now and the start of your outage and also furnish us the reference material listed in the enclosure to this letter. Please note that we need your pre-outage maintenance schedule as soon as possible in order to plan our inspection dates. The team leader will be contacting you shortly to obtain the information that will be needed prior to the start of the inspection and to arrange a suitable date for a meeting to explain the inspection and assessment methodology. In addition, please provide to us the name and phone number of the person who will be your principle contact for this inspection.

A copy of the NRC Temporary Instruction 2515/97, "Maintenance Inspection" is enclosed for your information and to aid in the preparation for the inspection.

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Thank you for your cooperation in this matter. If you have any questions regarding this matter, please contact Walter Baunack at (215) 337-5175 or Robert Gallo at (215) 337-5291.

Sincerely,

Original Signed By:

for Norman Blumberg
Robert M. Gallo, Chief
Operations Branch
Division of Reactor Safety

Enclosures:

1. Request for Material
2. NRC Temporary Instruction 2515/97 Maintenance Inspection

cc w/enclosures:

T. G. Broughton, Operations and Maintenance Director, TMI-1
C. W. Smyth, Manager, TMI-1 Licensing
R. J. McGoey, Manager, PWR Licensing
E. L. Blake, Jr., Esquire
TMI-Alert (TMIA)
Susquehanna Valley Alliance (SVA)
Public Document Room (PDR)
Local Public Document Room (LPDR)
Nuclear Safety Information Center (NSIC)
NRC Resident Inspector
Commonwealth of Pennsylvania

bcc w/enclosures:

Region I Docket Room (with concurrences)
DRP Section Chief
R. Hernan, PM, NRR
K. Abraham, PAO
Wayne Hodges, DRS
Robert Gallo, DRS
Jacque Durr, DRS
W. Baunack, DRS
N. Blumberg, DRS
E. Wenzinger, DRP
C. Cowgill, DRP
DRS Files (2)

bcc w/o enclosures:

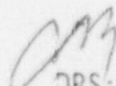
A. Gody, NRR

J. Chung, NRR

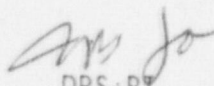
J. Dyer, NRR

Management Assistant, DRMA

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Blumberg

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DRS:RI
Gallo

9/29/89

ENCLOSURE

To aid us in preparation for the maintenance inspection, please provide us with the following documents, procedures, and information in accordance with the designated numbers. If you do not have the requested document or information, it is not necessary to generate it to comply with this request. We recognize that many of the documents requested separately may be inclusive in a larger single document. Please provide three sets of the requested documents. A member of our staff will contact you regarding the best method of transmitting the documents to us.

Section 1 - Description of General Plant Maintenance Activities

- 1-1 Maintenance administrative procedures which describe your corrective, preventive, and predictive maintenance activities.
- 1-2 Organization charts, including the maintenance organization and plant-wide organizations.
- 1-3 Procedures, charts and other documents which describe your Planning Department and its activities.
- 1-4 Documents which describe maintenance planning and scheduling meetings and status of maintenance reports.
- 1-5 Documents which describe the Maintenance and Operations interface during planning, scheduling, work start, work closeout and post-maintenance/functional testing.
- 1-6 Documents which describe your work control process: how a work order is started, planned, executed, completed, closed out, and equipment returned to service. Where contractors are used, how are they integrated into the process and controlled?
- 1-7 Documents which describe training and retraining of plant and contractor maintenance personnel, including radiation protection specific training. (For maintenance activities only, do not include GET).
- 1-8 Documents which describe interfaces and communications among the technical support, engineering support, and the maintenance/I&C Departments.
- 1-9 Documents which describe maintenance work procedure establishment and control: Criteria as to when a procedure is to be used, initial write-up, reviews and approval, revisions, human factors reviews, QA reviews, requirements for conduct of work; troubleshooting criteria, work closeout, post-maintenance testing, and restoration of systems.

1-10 Description of methods by which maintenance performance is measured. Are performance indicators used? What are they? Who is informed of the reports that are used to assess maintenance performance.

1-11 Description of process for communications with vendors for technical services and latest technical information on equipment and systems installed at the plant, and interfaces with equipment and NSSS vendors for training, modifications, and equipment replacement.

1-12 Documents which describe the preventive maintenance and predictive maintenance programs.

Which equipment is included?

How is maintenance frequency determined?

What is done with results of these maintenance actions?

1-13 Documents which describe management involvement in maintenance.

Are there goals set for the maintenance and I&C Departments?

Are these goals used in the performance evaluation of managers and supervisors?

Are these goals communicated to first line supervisors?

1-14 Documents which describe the Industrial Safety Policy and its incorporation into the maintenance program (safety manual, safety training, safety audits, accident reporting and investigations).

1-15 Documents which describe the interfaces between Maintenance and Health Physics in work planning, scheduling, and actual performance of maintenance activities.

1-16 Indexes of department procedures.

Section 2 - Status of Plant and Contractor Personnel Who Perform Maintenance

2-1 The number of craft personnel for electrical, mechanical, and I&C maintenance organizations. Please include foremen and the foreman to craft ratio.

2-2 The average years of experience for each individual and the turnover rate.

2-3 Description of shift work and work assignments. How do licensee supervisors decide on which craft or contractor is to perform what type of work?

Section 3 - Status of Plant Equipment and Plant Maintenance

- 3-1 What equipment failures occurred during the last year of operations?
- 3-2 What equipment failures have been found during shutdown of plant, since and including the last refueling outage?
- 3-3 Describe maintenance and testing for diesel generators and IE electrical equipment.
- 3-4 What component failures present greatest risk from a probabilistic risk standpoint to the plant, and how is this information utilized in establishing preventive and predictive maintenance?
- 3-5 What have been the areas of high maintenance activity on safety-related and non-safety-related equipment and components?
- 3-6 Provide the following status concerning Maintenance Work Orders (MWOs).

Current total listing and status of MWOs, number in planning, number in final sign-off, number on hold for lack of parts, number on hold for engineering assistance, number available to be worked on.

Projected number of corrective MWOs to be outstanding at start-up by priority.

Rate of completion of corrective MWOs in terms of number completed per month and manhours expended (by craft) per month for the past 12 months.

Current number of preventive maintenance work orders overdue.

Rate of completion of preventive MWOs for the past 12 months.

Estimated manhours required to complete current preventive maintenance MWOs.

Number MWOs requiring rework over the past six months.

- 3-7 Provide five corrective maintenance procedures for work that is scheduled for the upcoming outage (e.g., MOVs, PRVs, Solenoid Operated Valves, Safety/Relief Valves, ECS Pumps, Batteries, Switchgear, etc.).
- 3-8 Provide five preventive maintenance procedures that are scheduled prior to your next scheduled outage.
- 3-9 Provide your overall maintenance schedule prior to the outage.



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

NRC INSPECTION MANUAL

DLPQ

TEMPORARY INSTRUCTION 2515/97

MAINTENANCE INSPECTION

2515/97-01 PURPOSE

This temporary instruction (TI) provides guidance for conducting a performance-based inspection of an established and implemented maintenance process at all operating nuclear power stations.

2515/97-02 OBJECTIVES

The primary objective of this TI is to determine whether all components, systems, and structures of nuclear power plants are adequately maintained so that they are available to perform their intended functions. Additionally, this TI should determine whether the maintenance process provides for the prompt repair of plant components, systems, and structures, as appropriate to their prescribed functions.

2515/97-03 BACKGROUND

NRC has examined their nuclear power plant maintenance programs and has found a wide variation in their effectiveness. Inadequate maintenance has been a significant contributor to plant and system reliability problems and, thus, is a safety concern. Analysis of operational events has shown that nuclear power plant components are not being maintained at a level commensurate with their importance to safety.

This TI was developed to inspect and assess the effectiveness of maintenance at selected nuclear power plant sites. A Maintenance Inspection Tree (logic tree) will be used as guidance during these inspections to collate and present inspection findings. The tree is intended to provide a systematic approach to the performance of the inspections and to ensure consistency.

2515/97-04 CONDUCTING TEAM INSPECTIONS

The maintenance team inspections will be announced when the team leader prepares for the pre-inspection visit (Section 04.01) to the site. The full-scope inspection cycle will generally be of a 6-week duration, with the team leader possibly taking an additional 2 weeks to initially coordinate the inspection, gather information, and issue the final inspection report.

Issue Date: 11/03/88

The 6 weeks of team effort should generally consist of 1 week of preparation, 1 week of in-office inspection, 2 weeks of onsite inspection, and 2 weeks of documentation. The sequence of the inspection effort will be determined by the regional office. For example, the 2 weeks of onsite inspection may be consecutive or separated by 1 week of in-office inspection.

Generally, the inspection team will be composed of the following six members:

- one team leader (region)
- two reactor/project engineers (region)
- one radiation specialist (region)
- two engineers (HQ)

The team composition and/or the extent of effort for individual members may be adjusted by the region. For example, the extent of involvement of the radiation specialist may be less than 6 full weeks, as determined by the regional office. In addition, the regions may include involvement of the resident inspector (RI) to the extent that is normally covered by IP-62703 monthly examinations. The RI should be provided training in the use of the logic tree by the appropriate team leader for this purpose.

The project manager (PM) will be generally involved with each inspection to the following extent:

- be available to the team leader to facilitate contacts with the licensee
- attend 1 to 2 days of the team preparation
- attend final pre-exit team meeting
- attend exit meetings

The team will determine what recent failures of significant equipment (probabilistic risk assessment (PRA)-identified, safety-related, or balance of plant (BOP) that affects safety-related and special interest items) have occurred and will inspect the licensee's maintenance activities to schedule, repair, and prevent further failure of that equipment. Other selective examinations of equipment failures attributed to maintenance will be examined to determine the adequacy of licensee corrective actions and root-cause determinations of the failures. The inspection should be performed following review of the elements of the Maintenance Inspection Tree (working tree) and the additional inspection guidance provided in the Maintenance Inspection Guidance Volumes I and II (separately distributed). This guidance should be used as an aid in determining adequacy and implementation of maintenance activities and to evaluate them. The tree is also used as a tool to provide uniformity in inspection structure and in the preliminary recording of the inspection results. It is important to stress that the tree does not drive the inspection, but it does represent guidance on the areas of inspection to be addressed, with inspection results recorded on the tree to the extent completed. The tree consists of three major sections: (1) Overall Plant Performance, (2) Management Support of Maintenance, and (3) Maintenance Implementation.

The inspection requirements for Maintenance Implementation, which focus on the plant systems, components, test and surveillance data, and related activities, will receive the major portion (at least 80 percent, including direct observations of maintenance being performed) of the inspection effort.

It should be recognized that inspection results from the Maintenance Implementation area will also provide input to the Management Support area. It is expected that portions of the Management Support of Maintenance sections of the tree, especially the Management Commitment and Management Organization sections, could be conducted by a single team member in a relatively short time.

The amount of inspection effort devoted to the individual subsections of the tree will be determined by the regional office, taking into account recent inspection findings, time and staff limitations, and future inspections planned to cover specific areas.

The inspection is to determine the effectiveness of the total integrated maintenance process of the power reactor licensees. Therefore, the team inspection may be directed into areas for which explicit regulatory requirements may not exist. Thus, the inspection is oriented toward analyzing the performance of maintenance activities rather than toward the identification of violations. A specific example of an area not subject to explicit requirements is the licensee's participation with the Institute of Nuclear Power Operations (INPO). Review of licensee resolution of INPO activities shall be conducted in accordance with established policy and, thus, observations in this area, when warranted, should be treated as indicators of strengths or weaknesses.

Although the inspection may result in the identification of inadequacies that are not covered by explicit regulatory requirements, there is no intent to "ratchet" licensees. Individual findings that licensees are not following published NRC guides and industry guidelines do not necessarily indicate that a program or area is inadequate. The goal of the inspection effort is to emphasize the use of plant experience, test and surveillance data, recent component failures, PRA insights, and items of interest in evaluating the licensee's maintenance process in terms of capabilities and performance, and to identify major strengths and weaknesses as they are related to safety significance.

04.01 Team Leader Preparation. A meeting should be planned and held with the licensee to describe the scope of the inspection and to obtain preliminary review materials, such as the licensee's procedures for planning, conducting and assessing maintenance, as well as organizational charts, work schedules, equipment lists, component failure data, completed work orders, and related quality control (QC) inspection procedures. The material obtained by the team leader from the licensee should be distributed to the team members for their review. Following completion of the in-office review of the licensee's maintenance process, the team leader will discuss the results of these reviews with the team members and factor them into the plan for the onsite inspection.

04.02 Inspection Preparation. In preparation for site inspections, the inspection team should review the elements of the Maintenance Inspection Tree to determine which areas may have received recent inspections, which areas may not be applicable, and which areas will be reviewed at the plant site. The three major parts of maintenance (i.e., overall plant performance, management support of maintenance, and maintenance implementation) should be inspected to the degree required to provide a valid conclusion regarding the effectiveness of the licensee's maintenance program.

During the preparation phase, the team should select several components and/or systems for detailed inspection either through consideration of PRA insights, recent component failures in safety-related or BOP systems that affect safety, or selected equipment of heightened interest to the Commission, such as check valves, motor-operated valves, solenoid-operated valves, and air systems. The PRA insights may be used to select components or activities whose potential failures are predicted to contribute most to the risk at that plant. At least one high-risk system should be included to verify that all performance-related maintenance has been accomplished, including preventive maintenance. Recent equipment failures provide a vehicle for review of various aspects of maintenance, including root-cause analysis, equipment history, corrective actions, and past maintenance (preventive or corrective). Inspection of failed equipment repairs or work packages will provide the opportunity to examine the adequacy of the interaction of all licensee functions supporting maintenance, including engineering analyses and trending.

Review of performance indicator data, systematic assessment of licensee performance (SALP) reports, previous inspection findings, licensee event reports (LERs), maintenance radiation exposure history, and other direct measures may identify potential weak areas at that plant for which more detailed inspection may be required. Figure 1 (Inspection Flowchart) depicts the initiators that may be selected to enter the tree.

During the preparation phase, program strengths and weaknesses in certain areas may be recorded on the Maintenance Inspection Tree (working tree). If there are sufficient data to provide an evaluation rating during the preparation, the elements should be rated in accordance with the Maintenance Inspection Guidance. However, selected items and, in particular, identified weaknesses should be verified during the onsite inspection, even if an evaluation rating is assigned during the preparation.

04.03 Onsite Inspection. An entrance meeting shall be held with the licensee to detail the scope and schedule of the inspection, introduce the team members, and establish the licensee's contacts for the inspection. The team should obtain from the licensee the status of ongoing work applicable to the inspection or that may affect the performance of the inspection or the inspection schedule. Schedules and plans for the exit meetings and the interim meetings between the team leader and licensee management should also be established during the entrance meeting.

Team members shall perform a detailed walkdown inspection of the plant on the first or second day on site to observe the overall plant and equipment material condition. This walkdown inspection, in which the team should observe the condition of numerous valves, pumps, motors, etc., should include, but not be limited to the following:

- ° Condition of components
- ° Significance of tagged equipment
- ° Housekeeping and environment
- ° Adequacy of labeling
- ° Comparisons with drawings and/or procedures
- ° Status of annunciators

This walkdown inspection may provide indications of areas requiring further examination during the inspection.

The onsite inspection should focus on the direct observation of work in progress, including the following of licensee work with equipment in progress (e.g., tagouts, procedures, work packages, engineering support, materials, communications, testing, approvals, quality control holdpoints, etc.), significance of the maintenance backlog, rework, licensee assessment of the performance of maintenance, work control processes, control of interfaces, post-maintenance testing, plant material condition, and maintenance facilities.

On the basis of the collected data, the team should determine the apparent cause of any problems noted; that is, if the cause is related to the adequacy of procedures, work packages, qualification of personnel, management, engineering, etc. This analysis should provide entry into specific elements of the tree, which then becomes a tool to explore the suspected causes and to assess effectiveness of the implementation of applicable elements. All areas listed need not be used in forming conclusions for each element. Furthermore, other areas of inspection selected by the team may be used for entry to tree elements.

04.04 Analysis. Using the inspection findings and results noted on the Maintenance Inspection Tree, the team should determine whether each of the areas inspected has been adequately implemented by the licensee and whether or not there is enough information to assign a rating. The Maintenance Inspection Guidance and Criteria previously provided also assists use of the Maintenance Inspection Tree. The team will assign a rating to the applicable elements identified on the work sheets.

The team should assign an overall evaluation rating to each of the elements inspected. When this analysis has been completed, an overall rating can be determined in accordance with the Maintenance Inspection Guidance and Criteria.

04.05 Exit Meeting. Before the final days of inspection, issues and findings should be reduced to definitive writing and then used to highlight the presentation version of the Maintenance Inspection Tree (the Presentation Tree) and to complete the rating roll-up. The exit meeting should include a brief discussion of the preliminary inspection findings using the Presentation Tree to depict inspection results in a summary fashion; however, the licensee should be informed that the findings are preliminary until they are reviewed by regional management and the inspection report is issued.

04.06 Report Preparation. Because of the broad extent of the inspection, documentation of inspection activities should begin early in the process to minimize the time required to complete the final report. The final report should document the assumptions used, the elements inspected, the elements that were not applicable, licensee strengths and weaknesses, and overall conclusions consistent with IMC-0610. The report should address elements of the tree to at least the depth of the tier with eight areas (e.g., Direct Measures, Management Commitment and Involvement, etc.).

04.07 Follow Up. Any unresolved findings identified during the inspection will be appropriately tracked and resolved by the regional office.

The inspection shall include selective examinations of the aspects of maintenance listed in Sections 05.01 through 05.03, including each of the areas and related elements of licensee activities identified under the sections. To the extent possible, selective examinations should be based on observation of maintenance and equipment work activities in progress, review of licensee implementation of maintenance procedures and controls, results of review of selected documents (such as work packages, equipment test results, and engineering evaluations), and interviews with personnel).

05.01 Overall Plant Performance Related to Maintenance

- a. Direct Measures. The team shall conduct appropriate examinations of plant operability, equipment availability, and plant material condition that can be directly related to the effective implementation of a maintenance process.

Before conducting the inspection of plant performance, the inspector should review available plant information on (1) availability, (2) operability, and (3) reliability. Information on these items can be obtained from the plant's operating history. Other sources for obtaining the information are SALP reports, Performance Indicator Data, AEOD-Scram Studies, ESF Actuation Studies, Safety System Unavailability Studies, Technical Specification Violations, Monthly Operating Report Data, and Capacity Factors from NUREG-0020. Data collection should be directed to those measures related to safety significant aspects of the maintenance process. In addition, the inspector should conduct a detailed walkdown inspection of the overall plant material condition to assess the effectiveness of the licensee's maintenance process to the extent that it is reflected in plant housekeeping and in the external condition of equipment. The scope of the inspection should include examination of direct measures by using information gleaned from plant and equipment for the following:

- Historical data
- Material condition

05.02 Management Support of Maintenance

- a. Management Commitment and Involvement. The examination of management effectiveness concerning maintenance should be directed to determining the extent of corporate and plant management awareness and support of the maintenance and resolution of maintenance problems and should include examination of:

- The application of industry initiatives
- Extent of management direct participation in maintenance and in corrective actions (management vigor and example)

- b. Management Organization and Administration. The inspection of management organization and administration controls should be directed to determining how the organization supports maintenance activities, what maintenance activity plan has been established, how the maintenance activity plan has been implemented, corrected, and controlled, and the control of resources. The inspection should include examination of:

- Program coverage for maintenance
- Policy, goals, and objectives for maintenance
- Allocation of resources
- Definition of maintenance requirements
- Performance measurement
- Document Control System for maintenance
- Maintenance decision process

c. Technical Support. The areas that are to be selectively examined for the technical support organizations with regard to maintenance are as follows:

- Internal and/or corporate communication channels
- Engineering control
- Incorporation of PRA into the maintenance process
- Quality control
- Incorporation of radiological controls into maintenance process
- Safety Review Committees
- Regulatory documents

Examples of the applicable departments or organizations subject to this inspection are:

- Engineering (nuclear, instrumentation and control (I&C), mechanical, electrical, licensing, systems, etc.)
- Quality Assurance (QA)
- Quality Control (QC)
- Health Physics (HP)
- Safety
- Fire Protection
- Operations

05.03 Maintenance Implementation

a. Work Control. The inspection of the work control process should be directed to work order documentation, equipment history, observation of testing in progress, planning and scheduling, and document review. The inspection should include selective examination of:

- Review of maintenance in progress
- Work order control
- Maintenance of equipment records and history
- Job planning
- Work prioritization
- Maintenance work scheduling
- Backlog controls
- Maintenance procedures
- Post-maintenance testing
- Review of completed work control documents

b. Plant Maintenance Organization. The inspection of the plant maintenance organization should be directed to how the organization supports maintenance activities, how the maintenance activities are controlled, implemented, and corrected, how personnel are controlled, how the organization establishes documentation, the effectiveness of

the coordination and feedback lines of communication between plant management and craft personnel, and the effectiveness of interfaces with other departments, especially operations. The inspection should include selective examination of:

- ° Control of plant maintenance activities
 - ° Control of contracted maintenance
 - ° Deficiency identification, control, and corrective action system
 - ° Maintenance trending
 - ° Support interfaces
- c. Maintenance Facilities, Equipment, and Materials Control. The following are to be selectively examined for the area of facilities, equipment, and material controls, as well as for their support of the maintenance process:
- ° Maintenance facilities and equipment
 - ° Material controls
 - ° Maintenance tool and equipment control
 - ° Control and calibration of measurement and test equipment
- d. Personnel Control. The following areas of personnel control are to be selectively examined, including consideration of staffing, training, and qualification:
- ° Staffing control
 - ° Personnel training
 - ° Test and qualification process
 - ° Assessment of the current personnel control status

2515/97-06 REPORTING REQUIREMENTS

The appropriate regional office will document the findings and the actions taken in an inspection report and, in addition to the normal distribution, will forward one copy to the Director, Division of Licensee Performance and Quality Evaluation, Office of NRR, and one copy to the Director, Division of Reactor Safety, in each of the other regional offices.

2515/97-07 COMPLETION SCHEDULE

Inspections should be scheduled so that they are completed within 2 years of the issuance of this instruction.

2515/97-08 EXPIRATION

This temporary instruction shall remain in effect for 24 months or until the inspections have been completed.

2515/97-09 NRR CONTACT

Any questions regarding this temporary instruction should be addressed to A. T. Gody (301-492-1117).

2515/97-10 STATISTICAL DATA REPORTING

For 766 or RITS input, the actual inspection effort should be recorded against this TI, module number 25597.

2515/97-11 ORIGINATING ORGANIZATION INFORMATION

11.01 Organization Responsibilities. The Performance and Quality Evaluation Branch of NRR will provide support and overall guidance for these inspections.

11.02 Estimated Resources. Each inspection is planned for 6 weeks for 6 persons with 2 of the 6 weeks being direct onsite inspection (12 staff weeks) and 1 week in-office inspection, with expected additional effort by the team leader (a total of 38 staff weeks). This total includes preparation, inspection and report writing.

11.03 Parallel Inspection Procedures

The inspection procedures that this TI may satisfy totally or in part are listed below. Where credit is taken, the inspection report should note the module number per IMC-0610. The region should make final determinations based on the scope and documentation of the inspection.

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|-----------|-----------|--------------|
| 37701 | 56700 | 62704 |
| 37702 | 61700 | 62705 |
| 37828 CIP | 61725 | 72701 |
| 38701 | 62700 | 83000 series |
| 38702 | 62702 | 92700 CIP |
| 41400 | 62703 CIP | 92701 |

END

FIGURE 1

