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WANL-TNR-088
REVISION E

PRODUCT ASSURANCE
PROGRAM PLAN

MASTER

AUGUST 22, 1966

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SECTION I - INTRODUCTION

1.0 GENERAL

The Product Assurance Program Plan consists of the Reliability Program Plan and the Quality Program Plan for the NERVA Engine Program. It is a logical extension of the Product Assurance Program Plan for the NERVA Technology Program presented in WANL-TNR-088, Rev. D, dated September 30, 1965, which will continue in effect for the completion of the NRX and XE technology programs.

The NERVA Nuclear Subsystem, as defined in the Model Specification (WANL-MS-1001), is a major subsystem of the NERVA Engine to be used in flight and must meet high standards of reliability and safety. All phases of the NERVA Nuclear Subsystem program will be conducted with reliability and safety as the prime considerations and will not be compromised by other factors. To achieve high reliability, primary emphasis will be placed on detecting and correcting actual or potential problems early in the program. The reliability program will provide for a formalized, systematic effort to insure that all problems are identified, through failure mode analysis and failure reporting, and carried as open items until corrected.

The successful achievement of the reliability objectives depends upon many operations, from design through procurement, fabrication, shipment, installation, and checkout on the nuclear subsystem--as well as on instrumentation, ground support equipment, and test facilities. In view of the many detailed steps which must be performed, the objectives can be met only if every member of the NERVA Project is acutely aware of the need for attention

to detail and is continually on the alert for any item which might compromise the achievement of the objectives.

The basic responsibility for providing the necessary reliability in the NERVA Nuclear Subsystem rests with the designer. The maximum reliability can be obtained only by the proper incorporation of the mechanical, thermal, and nuclear requirements into the engineering drawings and specifications. The engineering design will be supported by appropriate analysis or component testing.

The basic responsibility for minimizing any degradation from the maximum possible reliability inherent in the design rests with the fabricators, assemblers, and testers.

Implementation of the reliability and quality control functions is provided for in the Work Statement for the NERVA Nuclear Subsystem Program under Subcontract _____ as Subtask 2.6, "Product Assurance." The program plan presented herein represents the Westinghouse Astronuclear Laboratory's interpretation of the applicable portions of NASA Quality Publication NPC-200-2 and NASA Reliability Publication NPC-250-1. The plan describes the policy for meeting the applicable requirements of those documents in the achievement of the reliability objectives. Implementation of this agreed-upon Program Plan is detailed in the WANL Reliability Manual and the WANL Quality Control Manual.

2.0 ORGANIZATION

The Product Assurance Organization is shown in Figure I - 1. The Product Assurance Manager has direct, unimpeded access to NERVA Top Management, and his reporting responsibilities are to the WANL Division General Manager.

Figure I - 1 WANL Product Assurance

3.0 PROGRAM DOCUMENTATION

3.1 General

The Reliability and Quality Control portions of the Product Assurance Program Plan outlined herein are documented in detail in subsidiary operating procedures including, but not limited to, those referenced in the applicable sections of this document. They provide detailed instructions relative to implementation of the Program Plan and are submitted for review.

3.2 Reliability and Quality Control Manuals

The WANL Reliability Manual describes in detail the responsibilities and procedures for conducting the Reliability Program. Individual sections of this manual are issued as Reliability Methods and Procedures (RMP's), and are referenced as such in this report. An RMP is an instruction by NERVA Management to all project personnel on the implementation of a specific portion of the Product Assurance Program Plan. The Reliability Manager is responsible for issuing RMP's.

The WANL Quality Control Manual describes in detail the responsibilities and procedures for conducting the Quality Control Program. The individual sections of this manual are issued as Quality Methods and Procedures (QMP's) and are referenced as such in this report. A QMP is an instruction by NERVA Management to all project personnel on the implementation of the Quality Control portions of the Product Assurance Program Plan. The Quality Control Managers are responsible for issuing QMP's.

3.3 Program Plan Changes

Changes to the program plan, WANL-TNR-088, will be submitted to AGC and SNPO-C for approval, except that contemplated changes to Section I - 2.0, "Organization," will be submitted upon implementation of such changes. Changes in the reporting responsibilities of the Product Assurance Manager will be subject to the prior approval of AGC/SNPO-C.

3.4 Product Assurance Reporting

Reliability and Quality Control progress will be reported quarterly as part of the NERVA Nuclear Subsystem Quarterly Progress Report. The report includes the following, as appropriate:

- 1) Narrative discussions of Product Assurance activities and problems occurring during the period.
- 2) Corrective action taken or planned for the problems reported, and follow-up of previously reported problems.
- 3) Discussions of significant events programmed for the next report period.
- 4) Summaries of design reviews, failure mode analyses, test plan reviews, corrective action, audits, vendor surveillance, inspection activities, special test equipment evaluations, and new procedures issued.
- 5) Status of milestones occurring during the period and milestones for the next quarter.

Reliability and Quality Control significant events will be reported in the Weekly Significant Events Report.

Product Assurance project costs are reported in the monthly WANL Cost Report, NERVA Nuclear Subsystem.

3.5 NTO Reliability and Quality Assurance Program Plan

The Reliability and Quality Control activities affecting the NERVA Nuclear Subsystem at NRDS are described in the NTO Reliability and Quality Assurance Program Plan, NTO-A-0013. This plan, which will be an extension of, and consistent with, WANL-TNR-088, Rev. E, is written by NTO and requires the approval of AGC, SNPO-C, and WANL. WANL Product Assurance Management has the primary responsibility to insure that the NTO Plan and the implementation of the plan by NTO are adequate to meet the Nuclear Subsystem program objectives.

3.6 Documents Submitted for Approval, Review, and Information

Documents in these categories are detailed, as applicable, in Section II, Reliability, and Section III, Quality Control. General philosophy and documents applicable to Product Assurance Management are as follows:

Documents Submitted for Approval

AGC/SNPO-C approval or disapproval will be submitted in writing within two weeks from transmittal date. WANL shall not implement documents in this category until AGC/SNPO-C approval is granted. Neither approval, nor waiver of such approval shall relieve WANL of the obligation to meet requirements of the contract.

The Product Assurance Program Plan, WANL-TNR-088, rewrites and changes are subject to AGC/SNPO-C approval.

Documents Submitted for Review

Documents in this category will be submitted to AGC/SNPO-C a minimum of two weeks prior to their use by WANL. If WANL has not been notified of disapproval within this period, implementation may proceed.

Should an emergency require it, WANL may--based on its own best judgement--take action within the two-week review period; but with the knowledge of the AGC/SNPO-C residents. In this case, advance copies of the pertinent document will be provided to the residents.

Documents Submitted for Information

Documents in this category shall be transmitted for the purpose of communicating current Product Assurance Program status, progress, and future planning.

- 1) NERVA Nuclear Subsystem Quarterly Report
- 2) Weekly Significant Events Report
- 3) The Fuel Element Process and Inspection Plan published on a reactor-by-reactor basis--consisting of Engineering Process Specifications, Purchasing Department Specifications, WAFF QIP's, AFF Process Specifications, and Engineering Design Drawings--will be compiled, submitted, and updated by the Product Assurance Manager's office.

SECTION II - RELIABILITY PROGRAM PLAN

1.0 INTRODUCTION

The Reliability Program Plan presented herein is designed to insure the achievement of the reliability objectives of the NERVA Nuclear Subsystem as defined in the Model Specification. It is based on the requirements of NASA Reliability Publication NPC-250-1. This assures that all pertinent reliability program elements are considered and that all program disciplines and functions are included. The plan places emphasis on the early detection and correction of actual or potential problems by the application of thorough, systematic techniques and procedures. It also provides for the qualification of components and subsystems.

While the primary emphasis is on achieving the reliability objectives of the Nuclear Subsystem, the plan also recognizes and provides for the application of reliability program efforts to facilities and ground support equipment to insure the highest probability of successful ground reactor and engine tests.

In order to insure the economical achievement of the NERVA Program objectives, it is necessary that the reliability program be initiated at the outset of the NERVA Reactor Program so as to insure that the inherent reliability is initially designed into the nuclear subsystem.

The Reliability program is based on a logical extension of the reliability activities on the NERVA technology program and makes maximum use of experience and information gained in that program.

The section numbers and headings used in the plan are consistent with those of NPC-250-1, and each section describes the degree of compliance with the similarly numbered section of NPC-250-1. Terms used in the plan are generally consistent with those of NPC-250-1 but incorporate the necessary variations to cover the NERVA Nuclear Subsystem. To insure standardization of terms, a glossary of terms is presented in Appendix A.

2.0 PROGRAM MANAGEMENT

2.1 Organization

2.1.1 General

The Reliability Manager is responsible for the management of the reliability efforts in accordance with the approved plan for the NERVA Nuclear Subsystem and associated facilities and support equipment.

The Reliability organization is responsible for insuring that all necessary reliability program functions are accomplished in an effective timely manner. Certain reliability functions may be accomplished by other organizational units, but this does not relieve the Reliability organization of the responsibility for insuring that they are accomplished correctly.

The Reliability organization will include the following major functions:

- 1) Insure, through analyses and reviews, that the necessary inherent reliability to meet project objectives is designed into systems and components.
- 2) Evaluate reliability status of various components and subsystems relative to reliability and qualification goals.

3) Audit all operations from fabrication to end use to prevent degradation of inherent reliability.

4) Acquire and report all data pertinent to reliability evaluations or qualification determinations.

The organization will be structured to be most efficient for each phase of the NERVA Program.

The current Reliability organization and functional responsibilities are shown in RMP 2-1.

2.1.2 NRDS Reliability

Certain reliability functions relative to NRDS test facilities and their operation will be delegated to NTO Reliability personnel. These include:

1) Reliability review and assessment of facility components specified by NTO Engineering.

2) Reporting of failures and problems in testing operations and corrective action follow-up on items of NTO responsibility.

WANL Reliability will, however, be responsible for insuring that items 1) and 2) are carried out effectively and will be responsible for incorporating the results of item 1) into over-all system reliability analyses.

2.2 Reliability Program Plan

This section (Section II) of the Product Assurance Plan constitutes the Reliability Program Plan. Any changes will be submitted to AGC and SNPO-C for approval as indicated

in Section I, Paragraph 3.6. The Reliability Program Plan is supplemented by the Reliability Manual, which is a collection of Reliability Methods and Procedures (RMP's) that provides specific operating instructions to NERVA personnel who will participate in implementing the plan. The RMP's and subsequent revisions will be submitted to AGC and SNPO-C for review as explained in Section I, Paragraph 3.6.

2.3 Reliability Program Reviews

Informal reviews of the Reliability Program Plan may be conducted at any time as requested by AGC, SNPO-C, or WANL. Any changes resulting from these reviews shall be submitted to AGC and SNPO-C, as agreed upon in the review meeting, provided that such changes are within the intent and scope of the current contract work statement. Any changes beyond the scope of the contract work statement resulting from such reviews shall be subject to negotiations between the WANL Program Manager and AGC/SNPO-C.

2.4 Reliability Program Control

Planned significant events and budgeted costs will not be included in this program plan, but will be included in the contract work statement as applicable.

Control and scheduling of the Reliability effort will be conducted by considering the scheduled engineering and testing, and then scheduling the appropriate Reliability functions such as design review and failure mode analyses. Priority will be given to those functions which are most critical in achieving high reliability in the NERVA Nuclear Subsystems. The

schedules will be available to AGC and SNPO-C residents for review.

2.5 Reliability Indoctrination and Training

Reliability will monitor any training and indoctrination programs conducted by other departments to insure that all personnel are made aware of the part they play in achieving the reliability objectives for the NERVA Nuclear Subsystem. When it is deemed necessary by Reliability, recommendations will be made for training in potential reliability problem areas. Informal education programs will be conducted by the Reliability organization, including conferences, films, and articles in the WANL employee publications. Appropriate training, including professional society meetings and formal reliability courses, will be provided for Reliability personnel to aid them in the performance of their duties.

2.6 Subcontract and Supplier Control

Outside procurements involving a design function or a testing function on the part of the supplier will be reviewed by Reliability Engineering to determine the effect of the subcontracted item on the over-all Nuclear Subsystem reliability. The supplier reliability program requirements will be determined based on the criticality of the item. The requirements are specified to the supplier by invoking in the subcontract the applicable portions of WANL-RS-201, "Reliability Program Requirements for Suppliers," included in the Reliability Manual. WANL-RS-201 provides for the accomplishment of Reliability Engineering functions per NPC-250-1 under the monitorship of Reliability.

Reliability will provide the following surveillance when the project work statement defines WANL Reliability cognizance over the work being performed by other SNPO-C contracts:

- 1) Invoke the applicable sections of WANL-RS-201 which define the reliability requirements for suppliers. This will include, at a minimum, the review of drawings, specifications, and test plans; design reviews; monitoring the vendor design and reliability program; and providing for failure reporting and corrective action.

- 2) Recommend changes to procedures and testing where appropriate.

- 3) Assure that all interfaces directly affecting system reliability are reviewed and corrective action items are completed.

2.7 Control of Government-Furnished Property

An evaluation will be made by the Reliability organization of the reliability of any Government-furnished components or equipment which are judged by the Reliability organization to be critical to the operation or testing of the nuclear subsystem. When reliability information from NASA, or other sources, on the equipment is available, it will be used in such evaluation, provided that the information is applicable to the environmental conditions and other similar factors.

2.8 Audit Program

A program has been established to audit the activities, including those at NRDS, which affect the reliability and quality of the nuclear subsystem. Formal audits conducted at NRDS

will be coordinated with AGC to prevent duplication of effort. The Reliability organization has the primary responsibility for the audit program. Audits are made by engineers not having line responsibility for the area being audited. Audit programs cover the adequacy of procedures and systems, and the compliance to the established procedures and systems. Items considered for incorporation as part of these audit programs include the following:

- 1) Effectiveness of feedback and corrective action.
- 2) Existence and adequacy of Quality Control procedures and instructions, inspections and tests.
- 3) Existence of and adequacy of process instructions and process controls.
- 4) Certification of personnel.
- 5) Effectiveness of failure and trouble-reporting system.
- 6) Availability of required documentation for any operation.
- 7) Familiarity of personnel with required documents.
- 8) Effectiveness of the Engineering Review Board (ERB) and Material Review Board (MRB) actions.
- 9) Effectiveness of change control system.
- 10) Effectiveness of the data reporting system.
- 11) Effectiveness of training programs.

The audit team may require reinspection of work as required to determine the effectiveness of a quality control operation.

The results of each audit are first discussed with the responsible organization, then presented formally, along with recommended corrective action, to the cognizant manager of the area being audited, to the Reliability Manager, and the Product Assurance Manager. Reports are available to SNPO and AGC for information. Summaries of audit results are submitted as part of the NERVA Nuclear Subsystem Quarterly Progress Report.

Guidelines for the Audit Program Plan are described in RMP 14-1. The Audit Program Plan, which will be maintained by Reliability, will specify details such as items to be audited, frequency of audit, and other details.

3.0 RELIABILITY ENGINEERING

3.1 Purpose

The primary purpose of the Reliability Engineering effort is to insure a high inherent reliability in the design of ground test systems and flight systems. The ground test system includes the reactor, controls, facilities, and other support equipment. The flight systems include the reactor, controls, and those additional systems, such as anti-criticality poison wire removal and engine clustering system, which comprise flight configurations. The Reliability organization has the prime responsibility for conducting the various functions defined in the Reliability program. Where any of these functions are being conducted by Engineering or other activities, the Reliability organization will monitor and approve the activities to insure that they are accomplished effectively. This work will be conducted as an integral part of the design and development program through the close cooperation of Engineering and Reliability personnel.

3.2 Design Specifications

Design specifications are defined as the Model Specification and E-Specifications, which provide requirements for specific components. These specifications cover performance, environmental, life cycle, and reliability requirements. Reliability will review and must concur with these specifications.

3.3 Reliability Prediction and Estimation

Reliability predictions and estimates will be made on components and systems when available data or analytical techniques make such prediction feasible and when the information is required for design and program management purposes. To facilitate such predictions, reliability prediction models will be developed. Work on this will be initiated during Contract Year 1967 with the effort being directed toward critical systems where reliability predictions will be of most value for engineering trade-off studies and program management decisions early in the NERVA Development Program. Initial reliability prediction models for the NERVA Nuclear Subsystem will be available prior to the NR-1 test. The prediction models will be based on a combination of probabilistic and qualitative techniques and will be structured so as to permit predictions in terms of the following:

- 1) Mission success
- 2) Nuclear hazard prevention

Provisions will be made for revising prediction models in accordance with design changes, test results, reliability analyses, and changes in mission profiles and safety criteria.

3.4 Failure Mode Effect and Criticality Analyses

The failure mode, effect, and criticality analysis (hereinafter called failure mode analysis) is the primary means, prior to the occurrence of failure modes in testing, of identifying potential failure modes and reliability problems. It is the means of determining the effect of all failures, including those identified by analysis and those identified by test failures, on the engine system or the flight mission. Likewise, it provides the means of estimating the probability of any adverse effects on the mission, thereby constituting a measure or indication of criticality to system performance. This permits the focusing of maximum effort by all project disciplines on the most critical problem areas as determined by a systematic analysis technique. The failure mode analysis therefore forms the basis for the over-all system of identifying and correcting problems. It will be revised and updated based on test results, failure reports, design reviews, etc. to further define failure modes and the status of corrective action to remove their causes.

The failure mode analysis will serve as a major project management tool in determining the status of various problem areas. The object will be to insure that all critical failure modes, and their respective causes, are adequately dispositioned prior to critical points in the program. For example, all reactor failure modes critical to engine test will be resolved prior to an engine test, and those critical to mission success will be resolved prior to the first flight.

The failure mode analysis will serve as a basis for design reviews, for test planning, as well as for determining the adequacy of a design for the next higher level of use--for example, the use of a component in the reactor, the use of the reactor in an engine test, and

the use of the engine in a flight test. Thus, the satisfactory resolution of all problems indicated in the failure mode analysis will be a vital element in determining qualification or PFRT status.

Reliability will be responsible for conducting and updating the failure mode analysis and for reporting the results to all cognizant personnel. Reliability will coordinate efforts with other principal contractors to insure that analyses are consistent with those of other contractors, particularly in terms of analyzing effects across interfaces and on mission success.

Development and use of failure mode analyses during a Nuclear Subsystem (NSS) design-build-use cycle will be implemented in the following manner: At the layout stage, preliminary failure mode analyses will be utilized as input to design reviews and the design selection. As the design progresses, the failure mode analyses will be updated and provide inputs to stress analyses and other continuing design activities, and to development and/or qualification test activity. The failure mode analysis for an item (component, subassembly) will be completed prior to assembly, assuring the timely input of results of this effort into a readiness review for the item in question.

The implementation of failure mode analyses for controls, ground support equipment, and facilities will follow a pattern similar to that described for the reactor. Where significant interfaces develop, such as at a test facility, the joint efforts of principal contractors will be utilized to complete the task.

The planned failure mode analyses are noted as events on individual program networks as defined by the responsible engineering groups.

Detailed procedures for conducting failure mode analyses are presented in RMP 3-5.

These procedures provide for:

- 1) Identification of the component, subsystem, or system
- 2) Determination of the function for each item
- 3) Determination of all possible modes of failure
- 4) Determination of the effects of each failure mode at the system level of

investigation and at a higher level, where appropriate

- 5) Determination of possible causes of each failure mode
- 6) Estimating the likelihood of occurrence of the failure mode
- 7) Providing recommendations or comments relative to removal of the failure mode

cause

- 8) Documentation of analyses on suitable forms and transmittal of results to

cognizant design groups

- 9) Obtaining feedback on recommendations resulting from the analyses
- 10) Issuing status reports

Failure mode analysis will be used for:

- 1) Input to configuration analyses and design selection
- 2) Design review check list
- 3) Input to safety and countermeasure evaluations
- 4) Guidance and review of development, proof, and qualification test planning

- 5) Evaluation of total systems, including test facilities
- 6) Determining requirements for further evaluation
- 7) A guide in the review of nonconforming material
- 8) Guidance of Quality Control Planning

Other organizations, such as the Design activities, will be encouraged to perform their own failure mode analyses. When other organizations conduct such analyses, Reliability will review the proposed methods and assist where possible in conducting the failure mode analyses.

3.5 Maintainability and Elimination of Human-Induced Failures

The human factor is recognized as a major problem in achieving high reliability. In all reviews of design, specifications, test procedures, etc., as covered in other sections, the human factor will be considered. Reviews will consider the adequacy of:

- 1) Fool-proof features
- 2) Accessibility
- 3) Repairability
- 4) Check-out and inspection procedures
- 5) Personnel instructions and training
- 6) Automated Operations

In any operations where human-induced failure represents a significant risk, Reliability will require redesign, procedure changes, increased Quality Control inspection, or monitoring, as appropriate.

The provisions of this section will apply to all operations concerning the nuclear subsystem, its controls and supporting equipment--including procurement, fabrication, assembly, handling, shipping, test disassembly, packing and preservations.

3.6 Design Review Program

3.6.1 Design Reviews by the Contractor

Design reviews will be conducted for purposes of determining that all feasible actions have been taken to assure that the component, subassembly, assembly, etc. will meet its design and reliability objectives.

This will be accomplished at the design review meeting through consideration of design adequacy, prior history, reliability status, operating procedures, stress reports, etc., and using the failure mode analysis as a check list, as noted in the guidelines given in RMP 3-1.

Formal design reviews are scheduled prior to completion of design layouts on major subassemblies such as the core, outer reflector, etc. Notification as to the subject and time of formal design reviews will be provided by Reliability to the local AGC/SNPO-C representatives at least five working days before the design review.

Reports on the design review results, including agreed-upon action items will be made available to the local representatives within twenty-one days following the meeting, or sooner, if agreed upon in the meeting. Formal design reviews will be conducted in accordance with RMP 3-2.

Informal, internal design reviews will also be scheduled on the individual program PERT networks. At a minimum, informal design reviews will occur at the following stages in each design and build cycle:

- 1) At the layout stages prior to formal design reviews
- 2) Prior to assembly, at the time of readiness review

Unscheduled, informal design reviews may be called at any time by Engineering or Reliability. The procedures governing informal design reviews are shown in RMP 3-3.

3.6.2 Design Reviews by Subcontractors

Design reviews will be conducted by subcontractors having a design responsibility. WANL Reliability, Engineering, and Quality personnel, as appropriate, will participate in such reviews in accordance with the requirements of WANL-RS-201, "Reliability Program Requirements for Suppliers," which describes the extent of this participation by WANL and the subcontractor.

3.6.3 Engineering Design Changes

Engineering design changes in the Nuclear Subsystem are accomplished by Engineering Change Orders (ECO's) initiated by Engineering. Each ECO will be reviewed and concurred with by Reliability.

The review by Reliability will include:

- 1) An immediate assessment of the effect of the change on system reliability.
- 2) The effect of the change on previous design reviews and failure mode analyses.
- 3) The effect of the change on the qualification status of the item involved.

When a review of a proposed Engineering change indicates the necessity, additional design reviews will be scheduled, and changes in the qualification status will be so indicated on the Qualification Status List. In the case of a change to a previously qualified item where there is a reason to believe the new design is not typical of the one qualified, a requalification is required.

Changes to test facility systems are made by Functional Requirements for new systems and Work Authorizations for changes to existing facility systems. These documents will be reviewed by Reliability in conjunction with Instrumentation and Control for any factors which may adversely affect the probability of achieving a successful ground reactor or engine test. Where such reviews indicate that a proposed change may have an adverse effect on test reliability, Reliability will recommend changes to Instrumentation and Control. These will include use of:

- 1) Redundancy
- 2) Reliable components
- 3) Automated protective devices
- 4) Improved maintainability or operating procedures

3.7 Failure Reporting and Correction

The reporting of all failures and problems coupled with a closed-loop system to insure the analysis of failure causes and elimination of the causes is a vital part of the reliability program. A system will be established to require that all failures and problems be reported and evaluated as to their effect on the program objectives and to insure that appropriate corrective action is taken to prevent recurrence. A problem/failure reporting system is described in RMP 11-2.

A failure is defined as the inability of a part or subsystem to meet specification requirements following acceptance of the part or subsystem. Inability to meet requirements in a component proof test, component qualification, or a reactor test is defined as a failure. Failures in proof tests, where parts are deliberately overstressed to failure, are not reportable unless the part fails at a stress lower than the specification requirement. Anomalies in the reactor as determined by post-mortem examination will be reported as failures.

A problem is defined as the inability of a procedure or operation to consistently obtain the desired results. A fabrication procedure which results in recurring defective material will be reported as a problem.

All problem/failure reports will be reviewed by Reliability for corrective action necessary to prevent recurrence. Recommendations for corrective action, including analyses of specific failures, will be made by Reliability to the cognizant organization with follow-up provided by Reliability. RMP 11-1 provides the detail procedure for implementing corrective action requests. Records will be kept of failures and malfunctions to measure effectiveness of the corrective action. These records will become part of the reliability data system. Periodic reports will be made on the status of corrective action. See RMP 9-4.

Periodic reviews will be made by Reliability of the status of corrective action based upon the problem/failure reports. These will be conducted at critical points in the program, such as prior to a reactor or engine test.

The satisfactory resolution of all problems and failures, including analysis of the cause and conclusive demonstration that the cause has been eliminated by corrective action will be a part of the qualification procedures for a part or subsystem.

At NRDS all deficiencies will be reported promptly by NTO Quality Control via a common reporting format, and analyzed for effect on subsequent Experimental Plans or the next reactor or engine test.

3.8 Standardization of Design Practices

Standardization and control of design practices and processing procedures is recognized as an important factor in the achievement of high reliability. The standardization of design practices is the responsibility of Engineering, and the standardization of operating procedures is the responsibility of the operating departments, such as the Astrofuel Facility and Reactor Assembly. The Reliability organization will monitor the use of design and processing standards and will encourage their development by the responsible activities. The standardization of design practices and processing procedures will be a major consideration in the determination of qualification status because of its importance in reducing variability between items.

Deviations from established standards will require justification in design reviews and in the reliability review of Engineering Change Orders.

3.9 Parts and Materials Program

3.9.1 Parts and Materials Group

The Materials Department is responsible for advising the Design activities on application and selection of materials. The cognizant Design activities are responsible for

the application and selection of parts. The Reliability organization shall maintain a file of reliability data for component parts to be used by the Design activities and for use in design reviews and other reliability analyses. Examples of these files are the Failure Rate Data Program (FARADA) reports and the Parts Reliability Information Center (PRINCE) index. Reliability Engineering shall also maintain contact with other companies, Government agencies, and Westinghouse Divisions to have access to available reliability data.

3.9.2 Parts Selection

The selection of component parts such as those used in controls, instrumentation, or ground support equipment shall be based on available NASA-preferred parts lists, where they are applicable, or shall be qualified per Paragraph II - 3.9.4 if the criticality of the application warrants. This criticality shall be determined through failure mode, criticality, and effects analyses, as described in Paragraph 3.4, and as the result of design reviews.

The selection of NSS component parts in the layout stage will be based upon the design and development program. When the proof test, qualification tests, and reactor test results indicate a design to be acceptable for meeting Model Specification requirements, it will appear on the Qualification Status List as qualified.

3.9.3 Parts and Material Specifications

Process Specifications and Purchasing Department Specifications will be reviewed by Reliability for adequate requirements.

3.9.4 Parts and Materials Qualification Tests

Parts qualification will be determined by a series of tests, examination of documents and processes that a part is capable of meeting performance requirements as prescribed in the Model Specification. Since qualification of a part always requires reactor grade hardware, qualification of the material involved is included.

Components will be qualified to a qualification criteria established by Engineering and reviewed by Reliability. Qualification criteria will be defined early in the program in order to guide planning since it affects numbers of tests, facilities, etc. and to provide a common basis for determining component readiness for flight system use.

When possible, qualification will include functional tests of the component in the environment specified in the Model Specification. When such tests are not possible, qualification tests will be based on one or more of the following:

- 1) Testing to failure in the critical failure modes as determined by a failure mode analysis. For components in which several modes of failure are critical, it may be necessary to run several types of tests and use engineering analysis to predict the performance effect under a combined environment.

- 2) Existing data - available on components which have been qualified on other programs under similar environments when it can be demonstrated that the component is the same as the component tested in a previous program. This will apply particularly to control systems, instrumentation, and ground support equipment.

3) Engineering analysis, under some conditions, will be used as the sole means of qualifying a component short of reactor testing. For example, in a simple structural member, it may be shown that the operating stress is sufficiently below the allowable stresses in the material that no further work is necessary to qualify the part. Some engineering analysis will of necessity be part of every qualification since it will be necessary to combine the effects of various environments and their resistance to the various failure modes, etc.

Components shall demonstrate the qualification criteria prior to Preliminary Flight Rating. The record of each component; its qualification criteria; and its qualification status constitutes a Qualification Status List that is maintained as part of the Reliability Data System.

While parts will be qualified at the part level, higher level system tests such as reactor tests, and engine tests will contribute to the qualification determination for a part. Qualification determination for the nuclear subsystem will include the qualification status of its component parts as well as the reactor tests.

A typical logic diagram for a part qualification is shown in Figure II - 1.

3.9.5 Approved Parts and Material Lists

The Qualification Status List will constitute and shall be the basis for an approved parts list to be used by Engineering.

3.9.6 Parts and Materials Application Review

Prior to the finalization of each design containing purchased components (such as electronic controls), a thorough review will be made to assure that the application is

QUALIFICATION LOGIC DIAGRAM

FIGURE II - 1

commensurate with good reliability practices. The review shall include, but not be limited to:

- 1) Worst case analysis
- 2) Circuit mechanization (mechanical layout of wiring, components, and housing)
- 3) Qualification as previously described

The application of mechanical components used in the nuclear subsystem and in critical ground support equipment shall be reviewed considering the results of failure mode analyses. The results of design analyses will be utilized by Reliability to evaluate the criticality and the relative probability of occurrence of component failure modes. These reviews will be made as a part of the design review program.

3.10 Equipment Logs

The equipment logs for end items are defined in the Quality Program Plan as End Item Reports. For support equipment, the maintenance of the equipment log is the responsibility of the cognizant Engineering or test activity responsible for the equipment. Reliability will, however, specify the requirements for equipment logs consistent with requirements of NPC-250-1, and will audit other activities in compliance with these requirements to insure that equipment is being used and maintained in a condition adequate for its use in the program. Details of these activities are described in RMP 9-3.

4.0 TESTING AND RELIABILITY EVALUATION

4.1 General

A program will be established for evaluating part and subsystem reliability throughout the design and development program. Since reliability evaluation in the statistical

demonstration sense will not be feasible, use will be made of development tests, proof tests, and qualification tests to evaluate reliability status. The evaluation will be a combination of probabilistic and qualitative techniques. It will consider, as a major factor, the status and resolution of every potential problem, as indicated by failure mode analyses and all actual failures and problems encountered.

A reliability data system will collect and report all the data necessary for the reliability evaluation. This system is described in RMP 9-4.

4.2 Reliability Evaluation Plan

A plan will be developed and maintained up to date to periodically evaluate the reliability status of the nuclear subsystem and its components. The plan will provide for reliability evaluations at pertinent points in the program. It will include the analytical reliability assessments, Paragraph 4.4.

Reliability will be responsible for the plan, which is presented in Appendix B.

4.3 Testing

4.3.1 Scope

The concept of an integrated test program will be used to insure that all tests are planned, conducted, and results reported in a manner to maximize their usefulness in reliability evaluation. Overstress testing, lifetime tests, and tests to failure will be used wherever feasible.

Quality Control acceptance tests will be conducted on all hardware defined by drawings and process specifications developed for Preliminary Flight Rating Tests.

4.3.2 Concept of Testing

Testing will, in general, be directed toward the identification of potential failure modes and the demonstration of an adequately low probability of critical failure modes occurring. The results of the failure mode analysis will form a major element in test planning. As failure patterns are developed through reports of test failures or problems, they will be reflected in test plans. Tests will be planned to accelerate potential failure by overstressing, and tests to failure will be used where feasible to demonstrate resistance to critical failure modes. In addition, test programs will be conducted to verify adequacy of non-destructive Quality Control tests in detecting defects which may compromise mission reliability.

4.3.3 Test Specifications, Procedures, and Reports

Test Specifications and Test Procedures are used to state test objectives and to prescribe the steps in conducting tests. Test Specifications and Test Procedures are reviewed by Reliability in accordance with RMP 6-1.

Test reports are reviewed by Reliability for information pertinent to reliability assessment and for anomalies or problems requiring corrective action. Submittal of Test Reports to AGC/SNPO-C is a part of the Engineering program.

4.3.4 Reliability Demonstration Tests

Formal reliability demonstration tests will not be required in the NERVA PFRT Development Program. Reliability assessments which make use of development tests, proof tests, qualification tests, etc. will be utilized instead.

4.4 Reliability Assessment

Reliability assessments will be conducted at specified points as indicated in the Reliability Evaluation Plan. These assessments will utilize the reliability prediction models (Section II - 3.3) and the failure mode analyses. The latter will be updated to include the results of test programs, design changes, and Problem/Failure reports. An important element of the reliability assessment will be the review of the status of action relative to all potential or actual failure modes.

The reliability assessments will constitute a major input to the PFRT determination and to various other readiness determination points as shown in the Reliability Evaluation Plan. (Paragraph 4.2)

4.5 Reliability Evaluation Program Reviews

Reviews of the Reliability Evaluation Program will be conducted with AGC/SNPO-C personnel prior to the following program milestones:

- 1) NR-1 test
- 2) NR-3 test
- 3) NE-1 test
- 4) NE-3 test
- 5) NE-6 test

The purpose of these reviews will be to determine the adequacy of the evaluation program and to consider the effectiveness of the program as demonstrated by prior evaluations.

Agreed upon changes to the Reliability Evaluation Plan resulting from the reviews will be documented by Reliability and submitted by them to AGC/SNPO-C for review within 30 days following the review.

5.0 RELIABILITY DOCUMENTATION

5.1 Purpose

Results of all reliability activities such as failure mode analyses, design reviews, etc. shall be documented and distributed in accordance with Section II, Paragraph 5.3.

5.2 Reliability Progress Reports

Weekly Summaries

Weekly reporting of significant events in the Reliability Program will be accomplished through the Weekly Significant Events Report, per Section I, Paragraph 3.4.

Quarterly Progress Report

Progress and status of the Reliability Program will be reported quarterly, per Section I, Paragraph 3.4.

5.3 Summary of Technical Documentation

The following list summarizes the documentation specified in Appendix F of NPC-250-1, and the action prescribed in this plan:

Item	Reference Paragraph	Action
Reliability Program Plan	2.2	Submit for Approval
Reliability Program Plan Revisions	2.2	Submit for Approval
Reliability Evaluation Plan	4.2	Submit for Approval
Reliability Evaluation Program Review Reports	4.5	Submit for Review

Item	Reference Paragraph	Action
Parts and Materials Qualification Status Lists	3.9	Submit for Review
Design Review Reports	3.6	Available for Review
Parts and Materials	3.9	Not Applicable (Covered in Design Review Reports)
Design Specifications	3.2	Not Applicable (Part of Engineering Program)
Parts and Materials Specifications	3.9	Not Applicable (Covered in Quality Control Program)
Parts and Materials Qualification Test Specifications	3.9	Not Applicable (Part of Engineering Program)
Test Specifications and Procedures	4.3	Not Applicable (Part of Engineering Program)
List of Suppliers and Subcontractors	2.6	Not Applicable (Covered in Quality Program)
Reliability Block Diagrams (As Updated)	3.2	Submit for Information
Reliability Prediction Models (As Updated)	3.3	Submit for Information
Failure Mode Analyses	3.4	Submit for information
Maintainability and Elimination of Human Error Reports	3.5	Not Applicable (Covered in Design Review Reports)
Failure and Corrective Action Summaries	3.7	Available for Information
Parts and Material Program Progress Reports	3.9	Not Applicable (Part of Engineering Program)
Approved Parts and Materials Lists	3.9	Available for Information
Reliability Assessment Models	4.4	Available for Information
Test Reports	4.3	Not Applicable (Part of Engineering Program)

Item	Reference Paragraph	Action
Reliability Manual	2.2	Submit for review
Audit Reports	2.8	Available for information

6.0 RELIABILITY DATA SYSTEM

6.1 General

In the Development Program aimed at qualifying an engine through PFRT, Reliability and Engineering data will be collected and made readily available for Project Management decisions such as: determining that all problems and failures have been satisfactorily resolved prior to a reactor or engine test; and determination of qualification status. In order to make these decisions, it is necessary to have evidence that hardware, processes, and operations meet established criteria and that problems, both actual and potential, have been resolved. A Reliability Data System will be used for collecting, processing, storing, rapid retrieval, and reporting of the data used for these evaluations. Reliability will develop and maintain such a system, which will meet the requirements described in the following.

6.2 Data Requirements

The information required for reliability evaluations will include the following and will be reported by the Reliability Data System:

1) History (by part number or name)

Number Built

Number Tested

Test Results

2) Documentation on "as-built" configurations

Part Number

Serial Number

Evidence of acceptability

3) Problem/Failure Report Summary

Description

Corrective Action

Effectiveness of Corrective Action

4) Qualification Status

5) Failure Mode, Effect, and Criticality Analysis Summary

6) Reliability Assessment

6.3 System Description

The Reliability Data System will supply the following:

Qualification history information will be maintained by part number and part name.

The data concerning the qualification requirements and the qualification status will be based upon comparison of pertinent development test results, proof test results, and qualification test results with qualification criteria. The development of this information requires the setting up of reporting forms and channels to obtain the pertinent development history relating to the qualification status. It will provide the summation of this history so as to give a summary of numbers tested, problems encountered, the test results, etc. It will list the corrective action taken on problems and indicate the proof or qualification

status for each part.

A log of the as-built configuration for each nuclear subsystem build will identify the actual parts by part name, part number, serial number, quantities, location in the reactor, and evidence of acceptance. There will be a tie-in with the qualification history such that it can be determined by computer that parts in a build conform to those qualified. This log is a continuation of the current reactor configuration log, but will be expanded to cover the entire nuclear subsystem.

Reliability assessments will provide a tabulation of all problem/failure reports and the status of their corrective action. It will print out on demand a summary of all unresolved problem failure reports to insure that all reported problems and failures have been resolved by removal of their causes. A summary will be included of the failure mode analysis results by coding failure modes by number, indicating their criticality and effect on the system, and indicating the status of any work done to assure that the failure modes will not recur. This will be tied in with the problem/failure reporting system, and inputs from design reviews and test results so as to maintain an updated failure mode analysis summary report. A typical outline of this portion of the system will be a tabulation by reactor subsystem of all failure modes which have not been resolved, with an indication whether they have been observed in testing programs.

The Reliability assessment model will be incorporated to combine the quantitative information from test results and the qualitative information from the failure mode analysis summaries to make an assesment in as quantitative a manner as possible of the reliability

of each subassembly of the nuclear subsystem.

The data system will present all outputs in a manner requiring a minimum of interpretation by personnel for whom they are intended so as to be easily used for decision making. Any decision making which can be made by the computer, for example, comparing actual data vs. criteria, will be incorporated. To the extent feasible, outputs will be coded with readily understood codes or abbreviations to economize on storage space.

The Reliability Data System will be coordinated with all user and source activities, including the customer.

6.4 Development Schedule

It is planned that the development of the system will be initiated in Contract Year 1967. Work will be initiated first on those portions of the system needed to accumulate pertinent data which is being generated during Contract Years 1967 and 1968. The system development will be completed prior to the NR-1 test, but provisions will be made for improving or updating the system due to change in requirements and for making further improvements, as indicated by use.

SECTION III - QUALITY PROGRAM PLAN

1.0 GENERAL

The Quality Control portion of the Product Assurance Program Plan described in this section is intended to provide complete quality control coverage from the design through manufacture, assembly, and shipping of finished parts. See Appendix A for a Glossary of Terms.

1.1 Relation to Reliability Requirements

This Quality Control program plan is intended to support the Reliability Program by assuring that the design requirements are achieved in the completed assemblies.

1.2 Relation to NASA Quality Publication, NPC-200-2

The Quality Control portion of the Product Assurance Program Plan is intended to be compatible with NASA Quality Publication NPC-200-2, as interpreted by WANL as applicable to the PFRT Development Program. The headings of this plan follow the section headings of NPC-200-2.

2.0 BASIC REQUIREMENTS

2.1 Purpose

Quality Control will maintain an effective and timely quality program applicable to the NERVA PFRT Development Program.

2.2 Quality Program Documentation

The following list summarizes the Quality Control documentation and the actions required for these items.

Item	Reference Paragraph	Action
Quality Control Program Plan	2.1	Submit for Approval
Quality Control Program Plan Revisions	2.1	Submit for Approval
Quality Control Manual	2.1	Submit for Review
Quality Inspection Procedures	7.3	Submit for Information
Result of special measuring and test equipment evaluations	9.0	Submit for Information

Item	Reference Paragraph	Action
End Item Configuration Log	14. 1. 3. 1	Submit for Information within 30 days of shipment
Reactor Assembly Process Outlines	7. 3	Available for Information
Procedures for certification of personnel performing special inspections	13. 2	Submit for Information
End Item Test and Inspection Procedures	7. 4. 2	Submit for Information starting with NE-6
List of Suppliers and Subcontractors	5. 9	Available for Information
Process Control Procedures (WANL Purchasing Department and Process Specifications)	4. 1	Submit for Review by the WANL Specifications Group
Progress Reports	14. 1. 1	Submit for Information
Corrective Action	14. 2	Available for Information
Inspection Records	5. 6	Available for Information

2.3 Change Control

Quality Control shall review changes to design and process documents to assure adequate quality provisions, configuration control, appropriate effectivity, and prompt removal of obsolete documents. Procurement documents that implement changes are reviewed by Quality Control, and new inspection plans are prepared as necessary. Reference: Sections III - 4.0 and III - 5.3

2.4 Quality Surveillance Codes

In order to insure that the appropriate level of quality control is applied to all hardware, a system of surveillance codes is used. This is described in QMP 5-3, "Quality Surveillance Codes."

3.0 MANAGEMENT

The Quality Control functions at WANL are the responsibility of WANL Quality Control, and the Quality Control functions at WAFF are the responsibility of the WAFF Quality Control organization. Over-all Quality Control coordination is the responsibility of the Product Assurance Manager. Reference: Figure I - 1, Section I. The responsibilities of these sections are delineated in QMP 3-1, "Quality Control Organization."

4.0 DESIGN AND DEVELOPMENT CONTROL

4.1 Drawing and Specification Review

Process, Purchasing Department, Equipment Specifications, and Engineering Drawings

are signed by Product Assurance prior to their release in accordance with QMP's 4-2 and 4-1, respectively.

4.2 Component Test

The amount of inspection planning for component test hardware is dependent on the surveillance code. All Code 1 and 2 hardware receives full quality control coverage, as defined in QMP 5-3. Hardware classified as Code 3 will be inspected in accordance with instructions from the cognizant test engineer.

Component test for the proof test programs will be conducted under the surveillance of Quality Control Inspection. Quality Control will perform special inspection and tests at the request of the cognizant Test Engineer.

4.3 Qualification and Requalification Tests

Components, subassemblies, or assemblies selected for qualification test shall be representative of items used in the reactor or engine. Items for qualification tests shall have been completely inspected to verify that they meet all drawing and specification requirements. The type of surveillance shall consist of either witnessing the test, and/or a review of the test documentation.

5.0 CONTROL OF CONTRACTOR-PROCURED MATERIAL

5.1 Function

The Quality Control organization exercises control over procured material by using five basic techniques, as follows:

- 1) Surveying suppliers' quality capabilities at their facility, as deemed necessary.

2) Reviewing and applying quality requirements to procurement documents prior to issuance.

3) Performing surveillance inspection at the supplier's facility during and/or after manufacture to assure that quality practices are adhered to and that positive indications of product acceptability are on record. Technical assistance and training are provided to suppliers, when necessary, to achieve desired reliability and quality levels.

4) Inspection of incoming materials

5) Quality Control Specification, WANL-QC-101, extends the quality program requirements to WANL suppliers.

5.2 Selection of Procurement Sources

Supplier surveys are performed by Quality Control, as deemed necessary. The results of the surveys are transmitted to Purchasing to assure that quality considerations are utilized as a basis for approving suppliers. Surveys performed on these suppliers will include, as a minimum, a comprehensive review of all pertinent quality and process procedures, facilities, equipment, and personnel.

No supplier currently disapproved by Quality Control shall be used as a procurement source without specific approval being obtained from Quality Control. The procedure used in performing the survey is QMP 5-1, "Supplier Quality Survey and Evaluation."

5.3 Procurement Documents

Procurement documents are reviewed by Quality Control prior to issuance. The review and subsequent application of quality requirements are as follows:

- 1) A thorough review is made of the documents to assure that the order is complete and meaningful.
- 2) A Procurement Quality Requirement (PQR), Form 59040, is completed and applied to the order per QMP 5-2, "Quality Requirements for Procurement Documents." Quality Control Specification, WANL-QC-101--in addition to imposing quality requirements on the supplier--provides the mechanics for communicating with the supplier regarding Process Approvals, Variation Requests, etc.
- 3) The need for source inspection is identified by the Procurement Quality Requirements.
- 4) The Quality Engineer verifies that the definition of certification, identification, preservation, and packaging requirements are noted on the documents.
- 5) Purchase orders will be audited to verify that all applicable information is transcribed from the Purchase Requisition.

5.4 Government Source Inspection

The need for Government source inspection has not been defined. If required, the PQR will state Government Source Inspection is mandatory.

5.5 Contractor Source Inspection

Source quality surveillance will be exercised by Quality Control in the supplier's facility when inspection upon receipt of the material or components at the designated shipping destination cannot evaluate all of the quality characteristics of the material.

5.6 Receiving Inspection

Receiving Inspection will be performed by Quality Control. The degree of inspection

is defined in the instructions prepared in accordance with QMP 7-2, "Inspection and Test Planning." When non-conforming materials are discovered at Receiving Inspection, they shall be placed in a hold area designated by Quality Control. No purchased material designated Quality Control Surveillance Code 1 or 2 shall be used prior to acceptance and release by Quality Control.

5.7 Identification

Quality Control will verify that material identification requirements are included in the procurement documents and will maintain the identification of material, single components, and assemblies through every step of fabrication--including procurement, receiving inspection, in-process, and final inspection. The procedure for assigning non-repeating serial or lot serial numbers is detailed in QMP 4-3, "Identification of Material, Detail Parts, Subassemblies, and Assemblies by Serial or Lot Serial Number."

5.8 Failure and Deficiency Feedback

Quality Control will initiate and maintain recurring defect history records of NSS components and assemblies. Information regarding recurring nonconformities will be identified to the Design, Manufacturing, and Purchasing activities. Details of the Quality Control corrective action program are found in Section III, Paragraphs 8.0 and 14.2.

5.9 Supplier's Rating and Preferred Source Lists

Quality Control is responsible for surveying and rating the quality capabilities of potential and current procurement sources. Surveys of suppliers' quality control and inspection systems will be undertaken at the discretion of Quality Control, or as requested by Purchasing.

The Supplier Rating and Preferred Source List is maintained by the Purchasing Department. Quality Control's input to Purchasing is furnished from information obtained by supplier survey and evaluation performed in accordance with QMP 5-1, "Supplier Quality Survey and Evaluation." In addition, product quality results are furnished by Inspection to Purchasing on incoming parts and/or materials.

5.10 Coordination of Contractor-Supplier Measuring and Test Equipment and Standards

When deemed necessary by Quality Control, contractor-supplier measuring and test equipment and standards for inspection tooling will be coordinated with the suppliers.

5.11 Technical Cognizance Over Other SNPO-C Suppliers

Quality Control will provide the following quality surveillance when the project work statement defines WANL Quality Control cognizance over the work being done by other SNPO-C contractors:

1) Review manufacturing drawings, quality control procedures, and inspection plans to assure that they contain adequate requirements for determining and controlling the quality of all purchased and/or manufactured parts.

2) Recommend changes, additional procedures, and inspection points.

3) Source surveillance and field inspection as stated in work statements.

5.12 AGC-Furnished Material

AGC-furnished material will be treated in accordance with the terms under which the material is furnished.

6.0 CONTROL OF GOVERNMENT-FURNISHED PROPERTY

6.1 Inspection of Government-Furnished Property

Quality Control will inspect Government-furnished property to detect damage in transit and completeness for its intended use. Control of Government-furnished property will be maintained to insure that damage or deterioration does not occur. The degree of Quality Control responsibilities is detailed in QMP 6-1, "Control of Government-Furnished Property."

6.2 Defective Government-Furnished Property

Quality Control will advise and request disposition instructions from the SNPO-C resident or any Government-designated representative as identified in the GFP agreement of such property found damaged, malfunctioning, or unsuitable for its intended use.

7.0 CONTROL OF CONTRACTOR-FABRICATED ARTICLES

7.1 General

The Quality Control program in the fabrication areas is designed to insure that drawing and specification requirements are met; thus providing maximum assurance that the quality inherent in the design is maintained.

7.2 Conformance Criteria

All applicable drawings, specifications, and inspection instructions are provided to insure documented criteria for determining conformance.

7.3 Inspection and Test Planning

Inspection and test plans for the fabrication areas are prepared as Quality Inspection Procedures (QIP's) or Inspection Instructions (II's), as defined in QMP 7-2, "Inspection and Test Planning." In the Reactor Assembly Laboratory (RAL), Inspection and Test Instructions are incorporated into the Reactor Assembly Process Outlines (RAPO's). Quality Control will input to the preparation of the End Item test and inspection plans per Paragraph 7.4.2.

7.4 Inspection and Test Performance

7.4.1 The results of inspections and tests performed in the fabrication areas are documented per the instructions of the inspection and test plans described in Paragraph 7.3, above. The requirement for certified inspectors is also established by those plans.

7.4.2 End Item Tests

Starting with PFRT, Quality Control will monitor end item tests and inspections as required by the Model Specification for the following:

- 1) Control Actuator Checkout
- 2) Instrumentation Checkout
- 3) Control System Checkout
- 4) Visual Inspection
- 5) Criticality and Physics Tests
- 6) Anti-Criticality System Checkout

7.5 Fabrication Controls

7.5.1 Production Tooling and Fabrication Equipment

Quality Control will inspect tools, jigs, and fixtures used for fabrication and assembly of hardware defined by Code 1 and 2 drawings. All others will be inspected as requested by the cognizant Engineering activity.

7.5.2 Material Control

Material and parts undergoing fabrication or assembly are controlled by identification. The basic document defining identification is QMP 4-3, "Identification of Material, Detail Parts, Subassemblies, and Assemblies by Serial or Lot Serial Numbers."

7.5.3 Control of Parts in Reactor Assembly

The release of parts from Stores to Reactor Assembly, and the subsequent control and usage is defined in QMP 7-4, "In-Process Inspection--Reactor Assembly."

7.5.4 Control of Cleanliness of Fabrication and Test Areas

Cleanliness requirements, compatible with the type of fabrication being performed, are monitored by Quality Control. Procedures are established which require periodic checks to assure that cleanliness requirements are met and maintained.

7.5.5 Process Control

Process control is the responsibility of the operating organization. Fabrication processes will be monitored by Quality Control to the extent necessary to ascertain compliance to the process specification. Any changes to a qualified process will require that the process undergo a requalification to verify that the change does not affect the end product.

8.0 NONCONFORMING MATERIAL

8.1 Material Review

Quality Control will provide for the review, control, and disposition of nonconforming material. Each nonconforming item shall be reviewed and a disposition made by personnel vested with this responsibility. The procedures followed by Quality Control when processing nonconforming material are:

- 1) QMP 5-5, "Receiving, In-Plant, and In-Process Inspection of Non-Fuel Components"
- 2) QMP 8-1, "Nonconforming Material Disposition"
- 3) QMP 8-2, "Variation Request"

8.2 Review Boards

8.2.1 Engineering Review Board (ERB)

ERB's are convened to act on all discrepant materials discovered by Inspection which require engineering decision for acceptance. As a minimum, the ERB consists of the cognizant Design and Quality Engineers. Representatives of other departments may participate in the ERB at the request of either permanent member of the ERB. Reliability will participate in the ERB only as arranged by Reliability Management with advance notice to Quality Control that Reliability participation is required in a specific instance. Reliability will review or audit documents dispositioned by the ERB as "Accept." All "Accept", "Reject", and "Limited Usage" dispositions made by the ERB include a statement justifying the disposition made. Starting with the PFRT, all discrepant materials discovered by Inspection will be processed through the Material Review Board (see Paragraph 8.2.2, below).

8.2.2 Material Review Board (MRB)

Nonconformances or repair procedures in components, subassemblies, and assemblies which, in the judgement of Quality Control, affect safety, function, procurement of required test data, schedule or interchangeability of the end item (see Paragraph 14.1.3, below) shall be brought to the attention of the SNPO-C and AGC residents for possible MRB action. In addition, the AGC and SNPO-C residents shall have the right to call for MRB action on discrepancies previously processed through ERB. This option must be exercised within two weeks after the transmittal to AGC and SNPO-C residents, by the Product Assurance office, of the document which indicates ERB disposition. The MRB consists of the members of the ERB, as defined in Paragraph 8.2.1, above, and the representatives of Reliability, SNPO-C, and AGC.

8.2.3 Subcontractor MRB

WANL subcontractors are not delegated the responsibility for MRB. All variations are reported and dispositioned as described in QMP 8-2, "Variation Request."

8.3 Control of Nonconforming Material

QMP's relating to Inspection and processing of discrepant materials and providing for segregation and positive identification of defective material are listed in Paragraph 8.1, above, and include the following: QMP 5-8, "Receiving Inspection;" QMP 7-1, "In-Process Inspection;" and QMP 7-4, "In-Process Inspection--Reactor Assembly."

Stickers and tags are utilized to identify discrepant material and are a means of control, in addition to controlled segregation.

9.0 INSPECTION, MEASURING, AND TEST EQUIPMENT

Quality Control will have the responsibility for verifying that properly calibrated equipment is used for the acceptance of all material subjected to inspection and control. The calibration of all inspection, measuring, and test equipment will be monitored by Quality Control to insure proper calibration and existence of current calibration stickers. The procedures followed by Quality Control to accomplish this are defined in the following:

QMP 9-2, "Design, Acquisition, Calibration, and Control of Inspection Tools and Gages"

QMP 9-3, "Calibration and Control of Measuring and Test Equipment"

These procedures establish responsibility for the acquisition, inspection, evaluation, maintenance, identification, preservation, calibration, and recording of tools, gages, and test equipment. Standards used to control accuracy of equipment are traceable to the National Bureau of Standards.

10.0 INSPECTION STAMPS

Inspection stamps are not utilized by WAFF due to the extreme limitations on the marking of products produced. Quality Control status and material identification are maintained from Receiving Inspection to the completion of the product by a system of traveler cards, individual forms, and tags. These documents require the signature of the Quality Control Representative performing or witnessing the inspection or test.

Inspection stamps are used at WANL to identify articles which have undergone in-process, partial inspection, functional test, assembly inspection, and end-item final inspection, as described in QMP 10-1, "Stamp Control." This procedure provides a system of control for

the issuance and withdrawal of Quality Control stamps.

11.0 PRESERVATION, PACKAGING, HANDLING, STORAGE, AND SHIPPING

11.1 Preservation, Packaging, Handling, Storage, and Shipping at WAFF

The basic manufacturing operations at the Westinghouse Astrofuel Facility consist of the mixing of raw materials preparatory to extrusion, thermal cycling, and machining.

The bulk of raw materials are preserved, packaged, and stored per the requirements of the Purchasing Specifications.

The quality of the extruded items is maintained throughout manufacture and shipping by the utilization of special trays, bins, carts, and shipping containers. The processing and handling instructions for these items are included in the Operations (AFF) and Quality Inspection Procedures. Identification is maintained by serial numbers starting with the extrusion process.

Quality Control is responsible for insuring that all NERVA materials or parts being shipped from the Westinghouse Astrofuel Facility have been subjected to, and have satisfactorily passed, all applicable inspections and tests. In addition, Quality Control is responsible for insuring that the necessary release and technical-reporting documents either accompany the shipments or are directed to the product recipient through normal transmittal channels.

11.2 Preservation, Packaging, Handling, Storage, and Shipping at WANL

Quality Control will review preservation, packaging, handling, storage, and shipping procedures generated by the cognizant engineering group for adequacy of coverage.

Quality Control will verify compliance with these requirements. The shipping and technical documents will be shipped with the end items, as directed by QMP 11-1.

12.0 STATISTICAL PLANNING, ANALYSIS, AND QUALITY CONTROL

Quality Control will formulate inspection plans for hardware and raw material items which lend themselves to sample inspection. Where possible, these plans will be as defined in MIL-STD-105, MIL-STD-414 or hand books H 106, H 107, H 108. Authorization of supplier's sampling plans shall have prior approval from Quality Control.

13.0 TRAINING AND CERTIFICATION OF PERSONNEL

13.1 Training

The prime responsibility for training inspection personnel rests with Quality Control. Engineering assistance is provided as required in training inspectors, particularly in complex areas such as automated-thickness measuring, radiography, ultrasonic, and other nondestructive testing.

Training of personnel in the areas of special process (soldering, brazing, welding, etc.) is the responsibility of the activity performing the operation.

13.2 Certification of Personnel

Quality Control is responsible for determining the need for qualification and certification of inspection personnel and will perform the following:

- 1) Test and certify, when required, inspection personnel for special inspection processes such as radiography, ultrasonics, and dye penetrant.

2) Test and certify, when required, production personnel for special processes such as welding, brazing, and soldering.

At the option of Quality Control, existing qualifications of inspection and production personnel may be accepted in lieu of requalification to particular requirements. Copies of all certification procedures will be transmitted to the AGC/SNPO-C residents for information.

14.0 DATA REPORTING AND CORRECTIVE ACTION

14.1 Data Reporting

14.1.1 Progress Report

The Progress Report will be submitted in accordance with Section I, Paragraph 3.4.

14.1.2 Quality Data

Quality Control Inspection and Test results are recorded as described in prior sections of this document. Pertinent Quality Control data will be reviewed and incorporated into recurring defect history cards where applicable.

14.1.3 End Item Documentation

14.1.3.1 NSS Documentation

End item documentation is prepared in accordance with QMP 14-1, which includes a listing of variations that affect interfacing or calibration.

14.1.3.2 Support Equipment Documentation

End item documentation is prepared in accordance with QMP 11-1. When WANL GSE interfaces with other GSE at the test site, interface documentation will accompany the GSE to the site, in addition to the normal documentation defined in QMP 11-1.

14.2 Corrective Action

14.2.1 Supplier Corrective Action

Quality Control will take prompt action to correct conditions at suppliers' plants which result, or might result, in substandard or defective materials, parts, assemblies, or services. The formal procedure defined in QMP 5-4, "Corrective Action at Suppliers," will be used when the quality problems are deemed critical by Quality Control. In all other cases where it is deemed necessary to take corrective action, a less formal procedure utilizing written and/or oral communications and Quality Control follow-up will be used.

14.2.2 Internal Corrective Action

The provisions for internal corrective action are defined in QMP 14-3. Quality Control corrective action recommendations are directed to the supervisor most directly concerned. The supervisor develops the plan to implement corrective action and communicates this to Quality Control. Quality Control insures appropriate corrective action follow-up is provided.

15.0 AUDIT OF QUALITY PROBLEM PERFORMANCE

15.1 Performance of Audits

The formal Quality Control audit will be the over-all responsibility of Reliability, as described in Section II, Paragraph 2.8. Quality Control will take corrective action relative to any Quality Control deficiencies revealed as a result of audits. Quality Control or Reliability, as appropriate, will review deficiency areas to insure that corrective action has been taken. Information relative to deficiencies found at suppliers will be distributed in accordance with Section III, Paragraph 5.8.

APPENDIX A - GLOSSARY OF TERMS

The following definitions apply to terms used in this publication:

Calibration

To determine the response of a test unit to an established standard.

Characteristic (Quality)

Any dimensional, visual, functional, mechanical, electrical, chemical, physical, or material feature or property; and any process-control element which describes and establishes the design, fabrication, and operating requirements of an article.

Component

A part, assembly, or combination of parts, subassemblies, or assemblies mounted together to perform a design function.

Development Test

Any Engineering test conducted as a source of engineering information to assist in making design decisions so that selections can be made of conceptual designs, component configurations, and materials prior to the Design Layout Stage.

Deviation

A specific authorization, granted before the fact, to depart from a particular requirement of specifications or related documents.

Diagnostic or Evaluation Test

Special test conducted to evaluate, interpret, or diagnose a condition after the part or component, subsystem or system has formally passed the Proof Test.

Discrepant Material

Raw material, parts, subassemblies, and assemblies which do not conform to the drawing or specification against which they were procured or manufactured.

Engineering Review Board (ERB)

A board composed of the cognizant Design and Quality Engineers who review the history and determine the disposition of discrepant or nonconforming materials.

Flight Assurance Test

A test, or series of tests, to demonstrate that an item of flight hardware meets specified criteria established to confirm that the specimen in question meets Model Specification requirements.

Formal Design Review

A formal review of a design to demonstrate to the Customer that model specification requirements are being met.

Informal Design Review

An in-house review of a portion of a design conducted by the cognizant Engineering group, Reliability, and other technical disciplines as required to determine that the design has an adequate probability of meeting the requirements in the Model Specification and to assist the designer in meeting the requirements.

Inspection

The examination, including testing, of contract work, articles, and services to determine conformance to contract requirements.

Inspection Instructions

Instructions which define the required inspection, or when sampling inspection is performed.

Interface

The junction points, or the points within or between systems or subsystems where matching or accommodation must be properly achieved in order to make their operation compatible with the successful operation of all other functional entities in the space vehicle and its ground support.

Materials Review Board (MRB)

A board, composed of cognizant Design and Quality Engineers, a representative of Reliability, and a representative of SNPO-C and AGC that reviews nonconformances in components, subassemblies, and assemblies which, in the judgement of Quality Control, affect the safety, function, procurement or required test data, schedule, or interchangeability of the end item.

NERVA Nuclear Subsystem (NSS)

The NERVA Nuclear Subsystem (NSS) is a hydrogen-cooled, graphite-moderated, intermediate neutron energy reactor with associated controls and safety equipment. The major components of the NSS are: reactor, reactivity control devices, power and temperature control systems, anti-criticality assembly, control and diagnostic instrumentation, neutron sources, and radiation dosimetry.

Part

One piece, or two or more pieces joined together, which are not normally subject to disassembly without destruction of designed use.

PFRT

A formal series of engine tests, including acceptance, check-out, cold flow, startup, transient endurance, shutdown, and cooldown, which demonstrate adequacy of the as-built design to meet, to the maximum extent possible, the Model Specification requirements.

Process Approval

Supplier, if required by procurement quality requirements, will submit to Quality Control for approval a writeup of the process to be followed prior to commencing operations.

Procurement Quality Requirements (PQR's)

A document prepared by Quality Control which establishes the quality requirements that will apply to all purchasing documents and in-house work orders that are related to materials, components, and services that are required in the fabrication of end items.

Proof Test

A component test that is required for the proof-of-design criteria of a designed part or component for insertion in a reactor test.

Qualification Test

Determination by a formal series of tests and examination of documents and processes that a part, component, subsystem, or system is capable of meeting the performance requirements prescribed in the Model Specification and considered as part of PFRT.

Qualified Process or Procedure

A process or procedure that has demonstrated, by a series of tests and examination of resultant information, that the prescribed process or procedure will produced within the performance requirements established by approved drawings, specifications, etc.

Quality Control Acceptance Test

Any test or inspection which is used to determine the acceptability of a fabricated part or system. Acceptance relates to hardware as opposed to design, and is determined by comparing acceptance tests or inspection data to the acceptance criteria defined by drawings, process specifications, etc.

Quality Methods and Procedures (QMP's)

Quality Control documents that establish the methods and procedures to be followed to maintain the quality of the end item.

Quality Surveillance Codes

Established designation based on usage that identifies the degree of surveillance to be exercised by Quality Control over various phases of design, procurement, testing, etc.

Reactor

A reactor consists of the core, reflector, structural support, and shield.

Requalification

Repetition of the qualification tests or procedures whenever changes to a design or qualified process or procedure are made, or whenever there is doubt, as indicated by inspection or test that the performance is not representative of the item originally qualified.

System

One of the principal functioning entities comprising the project hardware and related operational services within a project or flight mission. Ordinarily, a system is the first major subdivision of project work. Similarly, a subsystem is a functioning entity within a system. A system may also be a procedural entity which accomplishes a specific task, e.g., a quality system.

Variation Request (VR)

Document initiated by a supplier's activities that request deviations or waivers on an article which does not meet specified requirements.

Waiver

Granted use or acceptance of an article which does not meet specified requirements.

APPENDIX B - RELIABILITY EVALUATION PLAN

1.0 INTRODUCTION

A detailed Reliability Evaluation Plan (REP) will be established to evaluate the reliability status of the NERVA Nuclear Subsystem and its components as the program progresses through the NR and NE series tests. The evaluations will be utilized to determine the degree of conformance of the system to the model specification requirements.

The plan will include the following basic functions:

- a) An integrated test program
- b) Reliability assessments
- c) Reliability prediction models
- d) Reliability evaluations based on a), b), and c)

The REP as presented herein is a preliminary plan describing the intent and scope of the REP. Additional details will be developed early in Contract Year 1967.

2.0 TEST PROGRAM

2.1 Test Program Review

An integrated test plan concept will be utilized to provide information for reliability evaluations. The integrated test plan will include applicable development tests and all proof tests and qualification tests. These tests will be supported by engineering analyses to consider the effects of environments, interactions, and other factors which may not be feasible to include in testing.

To insure that all feasible tests are considered in the integrated test plan, Reliability will review and assist in all test planning as defined in Section II - 4.3 of the Reliability Program Plan and referenced RMP's.

2.2 Test Description

2.2.1 Subassembly Tests

Reliability will maintain a list of all planned tests on major subassemblies and on critical components. A typical list is shown in Table I. This list will be used to determine those tests applicable to Reliability assessments.

The plans for these tests will be evaluated in detail, through a Reliability review, to determine data which will be applicable for reliability evaluation--particularly in reference to specific failure modes as determined by the Failure Mode Analysis.

2.2.2 Reactor/Engine Tests

The reactor and engine tests called for in the contract work statement will supply information of direct use in reliability evaluations.

3.0 RELIABILITY ASSESSMENT

3.1 General

The Failure Mode Analysis will form the basis for a reliability assessment or prediction model since many of the non-reactor tests will be failure-mode oriented. For each subassembly and each critical component, the pertinent failure modes will be listed. An assessment of the probability of each failure mode occurring will be made analytically and verified to the

maximum extent possible by evaluation, test results, and operating experience. Problem-Failure Reports will be an important input to the assessment model as a means of adjusting the analytically determined reliability. Consideration will be given to those failure modes which are stress dependent and those which are time dependent. Estimates and/or categorizations of probability, or MTBF, as appropriate will be made and logged.

Reliability assessments for each failure mode will be made and combined analytically by a model which takes into account the interdependence of the failure modes. Provisions will be made for adjusting analytically to environmental conditions and interactions which cannot be tested.

4.0 RELIABILITY MODELS

A Reliability Model will be developed for the nuclear subsystem logic and parts relationship down to the subsystem level. This model will be used with the reliability assessment results to form a basis for the reliability evaluation. In addition, Reliability goals will be apportioned to each subsystem, based on complexity and criticality as determined through failure mode analyses. Where practical, reliability predictions and estimates will be used to supplement the above assessments so that meaningful comparison of objectives and status can be made.

Figure B-1 shows a preliminary reliability model for comparison of assessments and objectives down to the major subassembly level. A preliminary reliability apportionment model is shown in Figure B-2.

For each functional block in the reliability model, an assessment of reliability will be made based on results of tests and analysis.

5.0 RELIABILITY EVALUATION

Reliability evaluation of the nuclear subsystem and its components will include consideration of the following:

- 1) The assessed reliability status versus predictions and/or goals
- 2) The qualification status of the various subsystems
- 3) General reliability status in terms minimization of problems and failures, i. e., reliability growth.

Where assessed reliability indicates large variance with goals or predictions, a comprehensive evaluation will take place to determine what problem, if any, exists and to implement corrective action where required.

At the time of determination of the qualification status for the various subassemblies, the results of the reliability evaluation will be considered. In addition, the results of these reliability evaluations will be considered in design changes and in design reviews.

Reliability Evaluations, including the reliability assessments described above, will be scheduled to follow each total system test. This information will be updated, and periodic reports of status will be issued.

$$R_{A(N)} = R_{A(10)} \times R_{A(20)} \times R_{A(30)} \times R_{A(40)} \times R_{A(50)} \times R_{A(60)}$$

R_o = Reliability Objective
 R_a = Assessed Reliability

Figure B - 1 Preliminary Reliability Assessment Model
 (To Major Subassembly Level)

PRELIMINARY RELIABILITY APPORTIONMENT MODEL

(To Major Sub-Assembly Level)

Operational Mode _____

	Mission
Nuclear Subsystem, $R_O(N)$	_____
Reactor, $R_O(10) = (R_O(N))^{\text{_____}}$	_____
Reactivity Control, $R_O(20) = (R_O(N))^{\text{_____}}$	_____
Control System, $R_O(30) = (R_O(N))^{\text{_____}}$	_____
Anti-Criticality Assembly, $R_O(40) = (R_O(N))^{\text{_____}}$	_____
Instrumentation, $R_O(50) = (R_O(N))^{\text{_____}}$	_____
Neutron Source, $R_O(60) = (R_O(N))^{\text{_____}}$	_____

General Model

$$R_O(x) = (R_O(N))^{\frac{f(x)}{\text{_____}}}$$

$f(x)$ = Proportional Failure Rate for Subassembly x as
Determined from Failure Mode Analysis

FIGURE B - 2

TABLE I
TYPICAL TESTS TO BE USED FOR RELIABILITY ASSESSMENT

SUBASSEMBLY	TEST	PURPOSE OF TEST	TEST SCHEDULE		
			DEVELOPMENT	PROOF	QUALIFICATION
I. Core Elements	A. Fuel Element Strength At Temperature	Strength and Deformation of Fuel Elements under Loads & Behavior Thermal Gradients.			
	B. Fuel Element Coating Test	Determine Integrity of Coating at Reactor Temperatures.			
	C. Fuel Element Thermo-couple Installation	Evaluate Effects of Thermo-couple Installation in Fuel Element.			
II. Axial Support Structure	A. Mechanical Tests of Tie Rods and C.F.T.T.	Strength Evaluation at Ambient and Design Temperatures for Various Designs. Dynamic and Fatigue.			
	B. Plenum Feed Manifold	Qualification of Designs by Mechanical Integrity, Vibration and Leak Tests.			
	C. Supply Plenum	Develop Supply Plenum Capable of Reactor Operation.			
	D. Support Block Strength at Temperature	Measure Effect of Thermal Cycling, Thermal Gradient and Stress on Support Block			

SUBASSEMBLY	TEST	PURPOSE OF TEST	TEST SCHEDULE		
			DEVELOPMENT	PROOF	QUALIFICATION
II. Axial Support Structure (continued)	E. Cluster Development Testing	New Cluster Design Evaluation, Load, Gradient, etc.			
	F. Bundled Clusters	Friction and Failure of Bundled Elements at Ambient Temperature in Full Size Core.			
	G. Fuel Element-Support Interface Coating Friction and Wear Test	Determine Friction Forces and Coating Damage			
III. Shield	A. Shield Insert Development	Evaluate Thermal Shock Data and Vacuum Tests of Insert Material.			
	B. Shield Element Test	Evaluate Thermal and Vibration of Shield Elements.			
	C. Shield Assembly	Demonstrate Capability of Shield Assembly by Vibration Tests.			
IV. Drum Gang- ing Mechanism	A. Ganged Drum Drive Test	Evaluate Designs Under Environmental and Cycling Operation.			
V. Lateral Support System	A. Lateral Support Spring Tests	Evaluate Relaxation of Springs Under Reactor Temperature & Vibration Environments.			
	B. Seal Segment Tests	Evaluation of New Seal Segment Designs.			

SUBASSEMBLY	TEST	PURPOSE OF TEST	TEST SCHEDULE		
			DEVELOPMENT	PROOF	QUALIFICATION
V. Lateral Support System (continued)	C. Seal Retention Tests	Develop New Seal Retention Methods.			
	D. Lateral Support Plunger Test	Determine Flexural Strength.			
	E. Partial Core Dynamic Tests	Evaluate Major Design Changes in Lateral Support System by Partial Length Assembly Tests.			
VI. Outer Reflector Assembly	A. Reflector Thermal Distortion Tests	Evaluation of Thermal Steady and Transient Effects by Mechanical Tests of Outer Reflector Models.			
	B. Beryllium Properties	Provide Elastic and Plastic Strain Properties of Reflector Material.			
	C. Control Drum (Or Sleeve) Tests	Evaluate the Effect of Thermal Distortion in Control Sleeve.			
	D. Thermal Contact Resistance of Reflector Interface Material	Evaluation of Materials Used in Advanced Design, Al, Be, Gr, Pyro Combinations.			
VII. Seals	A. Reflector Seal Tests	Determine Leak Rates Under Reactor Conditions.			

RELIABILITY PROCEDURES
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<u>Number</u>	<u>Title</u>
RMP 1 - 1 A	Reliability Manual
RMP 2 - 1 A	Reliability Organization
RMP 3 - 1 B	Design Review Guidelines
RMP 3 - 2 B	Formal Design Review
RMP 3 - 3 B	Informal Design Review
RMP 3 - 5 B	Failure Mode Analysis
RMP 4 - 1 B	Procurement Reliability Requirements
RMP 6 - 1 A	Reliability Review of Test Plans
RMP 6 - 2	Reliability Approval of Layout Drawings
RMP 6 - 3	Engineering Design Changes
RMP 9 - 3	Equipment Logs
RMP 9 - 4	Reliability Data System
RMP 11 - 1 A	Corrective Action Recommendation System
RMP 11 - 2	Failure Trouble Reporting
RMP 14 - 1 A	Program Audit
RMP 15 - 1 A	Reliability Apportionment
RMP 15 - 2 A	Failure Rate Index

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	RMP No. 1-1 A <hr/> Effective Date 10/1/65 <hr/> Supersedes No. 1-1 Date 1/15/63	
Subject: RELIABILITY MANUAL		
<p>1.0 <u>PURPOSE</u></p> <p>1.1 To describe the use of the Reliability Manual and to define the responsibilities and procedures regarding the manual.</p> <p>2.0 <u>POLICY</u></p> <p>2.1 The Reliability Manual is a collection of Reliability Methods and Procedures (RMP's) defining specific methods and procedures for conducting reliability programs. The degree of implementation and the applicability of each RMP to a project will be governed by the Reliability Program Plan for that project.</p> <p>3.0 <u>PROCEDURES</u></p> <p>3.1 The Reliability Methods and Procedures will be issued as RMP's on WANL Form No. 1058. RMP's will be initiated by the Reliability organization. New and revised RMP's require the approval of the Reliability Manager, the Product Assurance Manager, and the Program Manager.</p> <p>3.2 RMP's will be issued whenever it is necessary to define methods, procedures or operating instructions required to conduct a Reliability Program in accordance with the policy statement of Section 2.0. RMP's will be revised and new RMP's will be added as required for efficient management of the Reliability Program. A new or revised RMP will be dated and become effective on the date it is distributed to holders of the Reliability Manuals.</p> <p>3.3 RMP's will be identified by two numbers separated by a dash. The first number will indicate the general subject heading from the Reliability Manual index. The second number will indicate the sequence in the particular subject section. Revisions will carry a letter following the second number. As an example:</p> <p style="margin-left: 40px;">RMP No. 3-1 indicates the first RMP in the Section, Reliability Assurance in Design.</p> <p style="margin-left: 40px;">RMP No. 3-1 A indicates the first revision of RMP 3-1.</p>		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

- 3.4 The Reliability organization will maintain a list of all individuals having copies of the Reliability Manual. Revisions or additions to the manual will be sent to all holders of the manual. Copies of RMP's, or complete manuals, will be forwarded to customer personnel through the Program Manager's office.

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	RMP No. 2 - 1 A
	Effective Date 7/25/66
	Supersedes No. 2 - 1 Date 9/10/65

Subject: RELIABILITY ORGANIZATION

1.0 PURPOSE

- 1.1 To describe the functional responsibilities of the WANL Reliability organization.

2.0 GENERAL

- 2.1 The functional responsibilities of the Reliability organization are shown diagrammatically as follows:

Approved: <i>F. W. Henning</i>	Approved: <i>N. A. Pollack</i>	Approved: <i>A. F. Fought</i>
Reliability Manager	Product Assurance Manager	Program Manager

Reliability Engineering
(Continued)

- f. Coordinate analyses of test failures and troubles.
- g. Analyze test results and designs to assess reliability status.
- h. Make and follow up corrective action recommendations.
- i. Collect and file reliability data.
- j. Assess and predict reliability by the use of mathematical models.
- k. Review of parts application.
- l. Maintain the qualification status list.

Statistics
(Continued)Quality Assurance
(Continued)

- c. Audit designs for adequate quality control provisions.
- d. Audit specifications for quality control provisions.
- e. Consult with designers on good quality control practice in design.
- f. Audit all Quality Control activities for adequacy of, and conformance to procedures and other requirements.
- g. Develop, control and maintain an integrated data system for storage and retrieval of data required for determining reliability and qualification status.

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	RMP No. 3 - 1 B Effective Date 7/25/66 Supersedes No. 3 - 1 A Date 10/1/65	
Subject: DESIGN REVIEW GUIDELINES		
<div style="margin-left: 40px;"> 1.0 <u>PURPOSE</u> 1.1 To define guidelines for conducting design reviews. </div> <div style="margin-left: 40px; margin-top: 20px;"> 2.0 <u>GENERAL</u> 2.1 A design review is a review to determine that all feasible actions have been taken to assure that the item being reviewed will meet its objectives. It is normally conducted by a design review board, including the disciplines necessary to thoroughly review the item. The design review procedures may vary considerably with the item being reviewed and the specific objectives of the reviews. 2.2 The specific objectives of design reviews may be one or more of the following: <ul style="list-style-type: none"> a. To review designs, current design and development activities, or operating procedures to ensure meeting the program objectives. b. To assess the reliability status and in particular the status of reliability deficiencies and corrective action recommendations. c. To impart the results of reliability analyses to design personnel. d. To review design changes since prior design reviews. e. To review the status of special problems or test failures. </div> <div style="margin-left: 40px; margin-top: 20px;"> 3.0 <u>PROCEDURES</u> 3.1 <u>Chairman</u> - A design review chairman should be appointed. He may be a representative of Engineering, Reliability, or Project Management. The design review chairman is responsible for the effective preparation and </div>		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

conduct of the review, and for reporting the results to the responsible engineering manager.

- 3.2 Design Review Board - A design review board should be appointed. It should include all the disciplines and talents necessary for a comprehensive review of the item. It should always include the designer, and the management of the cognizant design activity. In addition, it should include any others who may be able to contribute to the evaluation of the item. It should also include representatives of various groups who will use or handle the item. For example, in the case of the hardware design, it should include Manufacturing personnel, Quality Control personnel, etc. For a review of a test specification for example, the Test Operations personnel should be included. A Reliability engineer should serve as secretary of the design review. The design review board should never include more than twelve (12) personnel.
- 3.3 Scope of Design Review - To assure more thorough coverage, design reviews should be limited in scope. A reasonable guideline is to limit the scope to material requiring approximately one-half for complete review. For larger assemblies more than one review should be scheduled.
- 3.4 Preparation for Design Review - An effective design review requires preparation by all personnel involved in the review. An agenda should be prepared for the review. It should list the specific objectives of the review and define the documents which will be reviewed or which define the item being reviewed. This includes drawings, specifications, etc. In addition, a design review checklist is highly desirable. A previously conducted failure mode analysis makes an effective design review checklist since it, if properly conducted, indicates possible modes of failure along with the possible causes of failure, and the probable effect on total system performance. Participants should also be furnished with information on the time and place of the meeting and a list of all personnel participating.

The above documentation should be forwarded to all members of the design review board prior to the review meeting. The time permitted for prior review depends upon the scope of the review, complexity of the documentation, and familiarity of the board members with the design. In no case should the notice be less than three days. For most reviews a two week notice is desirable.

3.5 Design Review Procedure - The specific procedures for the design review will of necessity vary with the objectives of the review, the item being reviewed, and the scope of the design review. Following is a typical agenda which can be varied to suit the objectives of a specific review.

a. Introduction

This is a brief description by the chairman of the objectives of the review and a description of the procedures which will be followed.

b. Presentation of the Item to be Reviewed

This is a brief description of the design or other document being reviewed. It should be brief because the participants in the review should have familiarized themselves with the design prior to the review. In the presentation the designer should point out the objectives of the design, the general background information, test results, if appropriate, etc. In addition, the reasons for any major design decisions should also be spelled out at this point.

c. Review by the Board

The chairman should cover the various significant parts of the design or the document. If it is a specification, for example, it is desirable to proceed through the specification item by item, with a brief explanation by the designer and questions raised by the reviewers. In the case of a design, each failure mode from a failure mode analysis, can be discussed in terms of what assurance there is that the failure mode will not occur. In complex designs, this may have to be limited to the critical failure modes, that is, the failure modes which are critical to the system operation. If a failure mode analysis report is not available, a design review checklist can be utilized. A copy of a typical checklist is attached. The checklist provides a systematic means of proceeding through all pertinent aspects of the design and it can trigger further questions in the minds of the reviewers.

For each item considered on the checklist or agenda, there should be a conclusion or action item determined and this action or conclusion recorded by the secretary. The conclusion may be in a form of a recommendation for change, recommendation that the design is adequate, or it may be a commitment on the part of one of the participants and cognizant personnel.

d. Summary of Results

A summary of the results of the design review, including action items should be prepared by the assigned secretary. After a final review by the board, the report should be signed off by all board members and presented to the cognizant engineering manager(s) for implementation of whatever action is necessary to complete the review.

- 3.6 Design Review Follow-Up - The results of a design review can contribute to the overall project only if the recommendation and findings of the board are made known and are implemented. For this reason, the results of the design review should be documented. Where recommendations have been made, or specific corrective commitments have been made, follow-up should be provided to make sure that these are accomplished effectively. The Reliability organization provides the follow-up activity.

<p align="center">RELIABILITY METHODS AND PROCEDURES</p> <p>Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania</p>	RMP No. 3 - 2 B	
	Effective Date 7/25/66	
	Supersedes No. 3 - 2 A Date 9/15/65	
Subject: FORMAL DESIGN REVIEW		
<div> <div>1.0 <u>PURPOSE</u></div> <div>1.1 To describe the policy and procedures governing formal design reviews.</div> <div>2.0 <u>POLICY</u></div> <div>2.1 A design review is considered to be a formal design review when it is scheduled as a program milestone in the contract work statement. Customer representatives will normally participate in formal design reviews.</div> <div>3.0 <u>PROCEDURES</u></div> <div>3.1 The specific procedures for conducting a formal design review may vary with the subject of the review, and the degree of customer participation, and the objectives of the review. The general procedures spelled out in RMP3-1, "Design Review Guidelines", should be used to govern the conducting of a formal design review.</div> <div>3.2 All persons participating in a formal design review shall be notified of the review at least two weeks in advance of the review date. In addition, each participant should be furnished with the following at the time of notification.</div> <div> <div>a. Design review agenda, including objectives of the review.</div> <div>b. Appropriate drawings and specifications.</div> <div>c. Available failure mode analysis reports and design review checklists.</div> <div>d. List of participants.</div> <div>e. Time and place of the review.</div> </div> </div>		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

- 3.3 Preparation for the design review shall be the responsibility of the design review chairman, who is designated by the Project Manager. The Reliability organization shall assist in the preparation of formal design reviews. In the preparation for the review, Reliability will reference any pertinent results from other reviews and analysis which are unresolved.
- 3.4 A Reliability engineer shall be assigned to record pertinent comments and commitments arising in the review. He will establish a list of items for follow-up actions to be incorporated as a part of the review meeting minutes.

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	RMP No. 3 - 3 B	
	Effective Date 7/25/66	
	Supersedes No. 3 - 3 A Date 9/1/65	
Subject: INFORMAL DESIGN REVIEWS		
<div> 1.0 <u>PURPOSE</u> </div> <div> 1.1 To describe the procedures and responsibilities for conducting internal design reviews on an informal basis as a part of the continuing Reliability monitoring. </div> <div> 2.0 <u>POLICY</u> </div> <div> 2.1 Informal design reviews will be scheduled by Reliability as required to monitor design and development activities and to assist the responsible engineers in achieving high reliability. </div> <div> 2.2 Informal design reviews may also be held at the request of Engineering activities. </div> <div> 3.0 <u>PROCEDURES</u> </div> <div> 3.1 The Reliability organization will notify participants at least three days in advance of the review. The number of participants and their specialties shall be as required to meet the objectives of the conference. The participants shall be furnished with the following at the time of notification. </div> <div> <div>(a) Purpose of meeting.</div> <div>(b) Agenda.</div> <div>(c) Checklist, drawings, specifications as appropriate.</div> <div>(d) List of participants.</div> <div>(e) Time, place. </div> </div>		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

- 3.2 The scope of informal design reviews will normally be limited such that the review can be completed effectively in four hours. Effective completion should result in one or more of the following for each item on the agenda.
- (a) Statements as to the reliability status.
 - (b) Commitments from the participants as to corrective actions.
 - (c) Recommendations for corrective action when commitments cannot be obtained at the review meeting.
- 3.3 Reliability shall prepare a summary of the review results. Copies shall be furnished to participants, cognizant Engineering Management, Project Management personnel and to the Product Assurance Manager.
- 3.4 Follow up of corrective action recommendations shall be provided by the Reliability organization.

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	RMP No. 3 - 5 B	
	Effective Date 7/25/66	
	Supersedes No. 3 - 5 A	Date 10/1/65
Subject: FAILURE MODE EFFECT AND CRITICALITY ANALYSES		
<div> 1.0 <u>PURPOSE</u> </div> <div> 1.1 To describe the methods to be used in conducting failure mode, effect and criticality analyses (hereinafter called failure mode analyses) and to describe the uses of/and the policies governing failure mode analyses. </div> <div> 2.0 <u>POLICY</u> </div> <div> 2.1 Failure mode analyses will be conducted on all system designs critical to the achievement of the overall program objectives. This includes the reactor, the entire nuclear sub-system, ground test facilities systems, and flight systems. </div> <div> 2.2 It is the responsibility of the Reliability organization to ensure that adequate and effective failure mode analyses are conducted on all systems judged to be critical to the achievement of the NERVA program objectives. The Reliability organization will normally conduct failure mode analyses but other organizations such as design groups, may also initiate or conduct failure mode analyses. Where analyses are conducted by organizations other than Reliability, the procedures and methods for conducting the analysis shall be reviewed by Reliability for adequacy and to eliminate duplication. In addition, Reliability shall assist, in so far as possible, other activities performing failure mode analyses. Reliability shall review and approve the results of failure mode analyses conducted by other organizations and incorporate these analyses and their results in the overall systems failure mode analysis document. </div> <div> 2.3 No failure mode analysis shall be considered complete until full consideration of its results have been utilized in a design review or recommendations have been considered and a report issued by the cognizant design group. </div>		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

3.0 GENERAL

- 3.1 Failure mode analyses provide a systematic means to study the effects of failure of parts, components, subsystems, and systems. They include consideration of the item's failure modes, their effects, their likelihood of occurrence and their criticality as well as the causes of failure and recommendations for corrective actions.
- 3.2 Failure mode analyses may be conducted at any phase of a design, starting with several system conceptual designs. In the conceptual design phase, the details of the design may not be known and a failure mode analysis at this stage considers only the effects of a partial or complete loss of function for each major element ("Black Box") of design.
- 3.3 A final failure mode analysis will consider all the factors noted in 3.1, above, and is generally found more useful as an input to a final design review.
- 3.4 Failure mode analyses and their results can be used effectively in the following areas:
 - a. Provide input to configuration analyses, where a design selection is to be made.
 - b. Provide input to design reviews assuring that all critical failure modes are considered.
 - c. Provide significant input to safety evaluations.
 - d. Provide inputs to computer malfunction studies, and eventually to malfunction studies on a test article.
 - e. Provide guidance for development, proof and qualification test planning.
 - f. Provide a basis for total system's evaluation including the facilities necessary for test.
 - g. Develop requirements for further evaluation (such as stress analysis) or testing.
 - h. Provide one basis for review of non-conforming material.

4.0 PROCEDURE

- 4.1 The specific procedures for conducting failure mode analyses will vary with the end objective of the system being analyzed and the phase of the design at the time of the analysis. All failure mode analyses, however, shall include the following:
- a. Determination of the function for each part or subsystem in the system being considered.
 - b. Determination of all possible modes of failure.
 - c. Determination of their effects at the system level as well as at the level of the item being considered.
 - d. The criticality of each failure mode in terms of its effect on the system performance.
 - e. All possible causes of each failure mode, including, when feasible, proposed methods to eliminate or reduce the probability of the failure mode causes occurring.
 - f. An estimate of the probability of the failure mode occurring. This may be a categorization of probabilities in terms of high, low or nil, or may be quantitative if adequate data is available.
- 4.2 The following paragraphs in this section describe methods for conducting a failure mode analysis on the reactor, considering the effects of the failures on a flight mission. This is presented as a guideline which can be modified to the analysis of other systems such as the reactor test system, including the reactor facility control systems, propellant system, data acquisition system, etc.
- 4.3 In conducting the failure mode analysis, each part shall be described on a Failure Mode Analysis Work Sheet (WANL Form No. 1063) and the function of the part shall be described. A physical description shall then be made of all possible modes of failure. (A mode of failure is any occurrence which could cause a partial or complete loss of function for the part.) The analysis shall be based on the assumption that only one independent failure occurs.
- 4.4 The effect of each failure mode on engine performance shall be determined. In this portion of the analysis, consideration will be given to secondary failures which result from the primary failure.

- 4.5 Possible causes of each failure mode shall be listed. Methods to eliminate the failure mode causes or to reduce the probability of their occurrence will be indicated.
- 4.6 The results of the failure mode analysis shall be summarized on WANL Form No. 1064, Failure Mode Analysis Summary. This will be used to transmit the results of the failure mode analysis to other activities. It shall show the effects of a failure mode on engine thrust, the significant cause of each failure mode, and recommend methods to eliminate or prevent failure.
- 4.7 The "Disposition" column on WANL Form No. 1064 shall be used by Reliability Engineering to note the status of all failure mode causes. The following code shall be used:

P	-	Problem, i.e., there is a significant probability of the failure occurring.
NP	-	No Problem, i.e., it can be shown that the probability of the failure occurring is sufficiently low in the initial design or effect of the failure is not serious.
NP-R	-	No Problem - Removed by a design change, process specification or quality control specification.
A	-	Action required to determine status.

- 4.8 Modifications in design, process, or quality control specifications shall be reviewed to determine their effect on the failure mode analysis. The analysis of modifications shall determine the following.

- a. Effect on previously noted failure mode or causes.
- b. Any new failure modes or causes introduced by modification.

5.0 DOCUMENTATION

- 5.1 The results of the failure mode analysis shall be documented and a preliminary report made available to Design, Test Planning, Quality Control, Manufacturing, Test and other affected activities. A final report will be issued after results have been utilized in a design review or recommendations have been considered and reported on by the cognizant design group
- 5.2 Reliability Engineering shall review proposed formats for conducting and reporting failure mode analyses and shall review and approve the results of all failure mode analyses prior to issue of the final reports.

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	Effective Date 7/25/66	
	Supersedes No. 4 - 1 A	Date 9/15/65
Subject: PROCUREMENT RELIABILITY REQUIREMENTS		
<p>1.0 <u>PURPOSE</u></p> <p>1.1 To define the procedures for ensuring that reliability requirements are reflected in procurement documents.</p> <p>2.0 <u>GENERAL</u></p> <p>2.1 When materials or services are procured from outside suppliers, it is necessary to ensure that reliability requirements are reflected in the procurement documents. Where a supplier is required to supply parts or materials to an existing design specification, Quality Control ensures that his product conforms to design specification. When the supplier has a part in establishing the design specifications, Reliability Engineering surveillance is required.</p> <p>3.0 <u>PROCEDURES</u></p> <p>3.1 All E Specifications will be reviewed by Reliability Engineering to determine in which cases the supplier will perform design activities requiring reliability surveillance. In general, this will include any procurement in which the supplier does other than simply supply parts or materials to an existing design specification.</p> <p>3.2 On procurements requiring reliability surveillance, a Procurement Reliability Requirement (PRR), WANL Form No. 1071, shall be completed by Reliability Engineering indicating that WANL-RS-201, "Reliability Program Requirements for Suppliers", shall be made a part of the purchase order. Exceptions shall be noted. The program points at which design reviews will be conducted by WANL shall also be noted. Special requirements for reporting data to the WANL Reliability Data System shall also be described.</p> <p>3.3 Manufacturing Services will be responsible for incorporating the requirements of the PRR into the purchase requisition.</p>		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	RMP No.	6 - 1 A
	Effective Date	7/25/66
	Supersedes No. 6 - 1	Date 10/1/65

Subject: RELIABILITY REVIEW OF TEST PLANS

1.0 PURPOSE

- 1.1 To define policy, procedures and guidelines for Reliability review of test plans, specifications, and procedures. These documents are referred to herein by the general term "Test Plans".

2.0 POLICY

- 2.1 The following shall be reviewed by Reliability:

- a. Development test plans or specifications for major components, subsystems and systems.
- b. Reliability demonstration test plans.
- c. Qualification test plans.
- d. Proof test plans.
- e. Flight assurance test plans.
- f. Preliminary flight rating test plans.

- 2.2 An integrated test plan concept shall be followed wherever appropriate. Under this concept, tests shall be conducted wherever possible in a manner to maximize the amount of data yielded for reliability evaluation without compromising the basic test objectives, development, qualification, etc.

3.0 PROCEDURES

- 3.1 Review copies of formally issued test plans (Example: Reactor Test Plans) shall be forwarded to Reliability by the activity initiating the plan. This may be a draft copy distributed to all activities for review and comment. The review copy should normally be forwarded two weeks before comments are due.

Approved:	Approved:	Approved:
Reliability Manager	Product Assurance Manager	Program Manager

- 3.2 Reliability shall monitor and review, on a selective basis, experimental engineering test plans.
- 3.3 Reliability shall review test plans for the following:
 - a. Test objectives.
 - b. Environmental and performance conditions.
 - c. Proposed test time.
 - d. Adequacy to identify failure modes, design weaknesses, hardware defects, etc.
 - e. Number and arrangement of tests and test specimens.
 - f. Definition of failure.
 - g. Data, logging, and reporting requirements.
 - h. General adequacy to meet test objectives.
 - i. Possible modifications of the test plan to obtain more information on reliability, performance, and general adequacy of the design without compromising basic test objectives.
 - j. Human factors which may compromise test objectives.
- 3.4 Reliability shall forward to the originating activity, the results of the review. Where Reliability has no comments as the result of a review, or where Reliability judges the test to be sufficiently non-critical to warrant a review, a "No Comments" memo shall be forwarded to the originating activity.
- 3.5 The Reliability comments shall be constructive in nature so as to assist the author of the test plan consistent with the objectives of the review. Reliability shall provide follow-up of review comments and shall also provide any appropriate assistance to the author in incorporating the comments.
- 3.6 Reliability shall maintain a log of all test plans and specifications reviewed for each project. The log shall include:
 - a. Test plan (or specification) identification.
 - b. Date in and date out.
 - c. Reviewer.

- d. Brief summary of comments.
- e. Follow-up activities.

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">RMP No.</td> <td>6 - 2</td> </tr> <tr> <td>Effective Date</td> <td>7/25/66</td> </tr> <tr> <td>Supersedes No.</td> <td>Date</td> </tr> </table>	RMP No.	6 - 2	Effective Date	7/25/66	Supersedes No.	Date
RMP No.	6 - 2						
Effective Date	7/25/66						
Supersedes No.	Date						
Subject: RELIABILITY APPROVAL OF LAYOUT DRAWINGS							
<div style="margin-bottom: 20px;"> 1.0 <u>PURPOSE</u> 1.1 To describe the procedures for a reliability approval of Engineering layout drawings. </div> <div style="margin-bottom: 20px;"> 2.0 <u>POLICY</u> 2.1 The final layout design requires a reliability signature as a part of the layout drawing sign-off. The general purpose of the reliability approval is to signify that all appropriate reliability factors have been considered in the design. </div> <div> 3.0 <u>PROCEDURES</u> 3.1 At least three days prior to the sign-off meeting, a notification of the meeting and prints of the drawing to be signed off will be received. The drawing number, along with the date and location of the sign-off meeting and the cognizant Reliability Engineer assigned to the part of the design concerned, will be logged by Reliability Engineering. 3.2 The cognizant Reliability Engineer will review the drawing prior to the sign-off meeting making use of any prior reviews of the conceptual layouts, failure mode analysis or analysis of test and quality control data. In re-viewing the drawing, the Reliability Engineer should bear in mind that the reliability signature will have the following significance: <div style="margin-left: 40px;"> a. All appropriate reliability analyses have been completed. b. There are no known reliability deficiencies. </div> </div>							
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager					

- 3.3 In determining whether the appropriate reliability analyses have been completed, the objectives of the test program for which the particular design is intended, the stage of the development program and the state of the design will be considered.
- 3.4 In evaluating reliability deficiencies the following definition will be used. A reliability deficiency is defined as a characteristic or weakness which presents a high risk that the reliability objectives of the test will not be achieved.
- 3.5 In determining whether the quality of the article can be controlled, the design should be examined for completeness of dimensions and specifications, possibilities of misinterpretations, and particularly complex inspection problems. Questions in regard to controlling the quality of the article shall be referred to Quality Control.
- 3.6 Any comments or potential changes in the drawing which could be incorporated prior to the sign-off meeting should be forwarded to the responsible design engineer.
- 3.7 The cognizant Reliability Engineer attending the sign-off meeting shall present his comments for consideration at the meeting. He will also review the comments made and changes required by other attendees at the sign-off meeting to note the effect of these on the reliability of the design. If, based on the considerations of Sections 3.3, 3.4, and 3.5, above, the drawing is not signed-off, the Reliability Engineer should assist the responsible Design Engineer in establishing a program to achieve a design which can be signed off. In the event that a design cannot be signed off or a program cannot be developed to ensure the adequacy of the design, the Reliability Manager shall be notified with a statement of reasons why the design is not adequate. The Reliability Manager will contact the cognizant Design Manager to resolve the problem.
- 3.8 The results of the sign-off meeting shall be noted on the log described in Section 3.1.

<p style="text-align: center;">RELIABILITY METHODS AND PROCEDURES</p> <p>Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania</p>	RMP No. 6 - 3	
	Effective Date 7/25/66	
	Supersedes No.	Date
Subject: ENGINEERING DESIGN CHANGES		
<p>1.0 <u>PURPOSE</u></p> <p>1.1 To describe the procedures regarding a reliability approval of engineering design changes.</p> <p>2.0 <u>POLICY</u></p> <p>2.1 Engineering design changes (designated as Engineering Change Order - ECO) require a Product Assurance signature.</p> <p>3.0 <u>WANL PROCEDURES</u></p> <p>3.1 Quality Engineering coordinates and acts for the Product Assurance Department in regard to engineering design change (ECO) review and approval. (Ref. QMP 4-1).</p> <p> The review (blue) copy of the change is forwarded by Quality Engineering to Reliability for review at least 24 hours before the anticipated sign-off.</p> <p>3.2 The cognizant Reliability Engineer will review the ECO making use of any prior reviews of the layouts, failure mode analysis or analysis of test and quality control data. In reviewing the drawing, the Reliability Engineer should bear in mind that the reliability approval will have the following significance:</p> <p> a. All appropriate reliability requirements and analyses have been considered.</p> <p> b. There are no known reliability deficiencies.</p>		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

- 3.3 In determining whether the appropriate reliability requirements and analyses have been considered, the objectives of the test program for which the particular design is intended, the stage of the development program and the state of the design will all be considered.
- 3.4 In evaluating reliability deficiencies the following definition will be used. A reliability deficiency is defined as a characteristic or weakness which presents a high risk that the reliability objectives of the test will not be achieved.
- 3.6 Any comments or potential changes in the ECO which should be incorporated shall be forwarded to the responsible quality engineer, accompanied by the review (blue) copy of the ECO. In any event, the review copy of the ECO shall indicate the reliability disposition.
- 3.7 The responsible quality engineer shall ensure the incorporation of Reliability into the ECO comments prior to affixing his signature indicating the approval of the ECO by the Product Assurance Department.

<p style="text-align: center;">RELIABILITY METHODS AND PROCEDURES</p> <p style="text-align: center;">Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania</p>	RMP No. 9 - 3	
	Effective Date 12/13/65	
	Supersedes No. Date	
Subject: EQUIPMENT LOGS		
<p>1.0 <u>PURPOSE</u></p> <p>1.1 To define guidelines and procedures for maintaining equipment logs to document a continuous history of support equipment.</p> <p>2.0 <u>POLICY</u></p> <p>2.1 Equipment logs shall be maintained on all support equipment which can be functionally operated or tested independently of a higher system or assembly. Examples are remote disassembly equipment, facility control equipment, and check out equipment.</p> <p>2.2 The equipment log shall normally be initiated by the responsible activity at the time of acceptance of the equipment. On equipment where check out operations or tests prior to acceptance may be pertinent to later operations, prior history data shall be provided for inclusion in the equipment log.</p> <p>2.3 Equipment logs shall be the responsibility of the activity which is responsible for the equipment and its maintenance. Where maintenance is a separate responsibility, the operating and maintenance functions shall maintain a joint log. When equipment responsibility is transferred to another activity, the log and its attendant responsibility shall also be transferred.</p> <p>2.4 Reliability shall review equipment logs and shall monitor the current status of the logs on equipment falling within the scope of Paragraph 2.1.</p> <p>3.0 <u>PROCEDURES</u></p> <p>3.1 All activities responsible for equipment requiring logs in accordance with Paragraph 2.1, shall establish the format for the equipment logs and shall maintain the logs.</p> <p>3.2 Each equipment log shall include the following as appropriate for the particular equipment.</p>		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

- a. Equipment description, including Part No. and Serial No.
 - b. Date and time of entry.
 - c. Identification of operation covered by entry; e.g., test, inspection, shortage, shipping, etc.
 - d. Environmental description.
 - e. In the case of equipment being tested or inspected, the following should be included:
 - 1) Type of test or inspection.
 - 2) Characteristics being investigated.
 - 3) Parameter measurements where appropriate.
 - 4) Identification of instrumentation used.
 - 5) Failure and malfunction observations and failure report number (PFR, NMDR, QRDR) when applicable.
 - 6) Accumulated operating time, and/or number of cycles.
 - f. Variations from drawing specifications.
 - g. Repair and maintenance record, citing authorizations, starting and completion times.
 - h. Unusual or questionable occurrences involving equipment.
 - i. Quality Control stamp, if operation is under Quality Control surveillance.
- 3.3 The log shall be continuous, and account for all time including storage, shipping, "down time" for repairs, and other idle time.
- 3.4 Reliability Engineering shall monitor activities where equipment logs may be required and shall identify to the responsible management personnel the requirement for and the adequacy of equipment logs maintained in accordance with this RMP.

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	RMP No. 9 - 4
	Effective Date 7/25/66
	Supersedes No. Date
Subject: RELIABILITY DATA SYSTEM	
<div style="margin-left: 40px;"> 1.0 <u>PURPOSE</u> 1.1 To describe the policy, objectives and general outline of the Reliability Data System. </div> <div style="margin-left: 40px; margin-top: 20px;"> 2.0 <u>POLICY</u> 2.1 Quality Assurance will develop a Reliability Data System as described below. Quality Assurance will also control and maintain this system, coordinating input and output with source and user activities and with computer service activities. 2.2 The objective of the overall system is to provide a central storage and rapid retrieval system for data useful for evaluation of Reliability status. </div> <div style="margin-left: 40px; margin-top: 20px;"> 3.0 <u>DATA AND SYSTEM DESCRIPTION</u> 3.1 Qualification historical data will be maintained by part number and by part name. In this way, all history of a specific part will be readily retrieved as well as all data for a class of part such as tie rod which may have a variety of part numbers. 3.2 As much data as possible will be coded so that an output run will provide the source of information required. This data will then be available in the storage facilities of this system. Input to this system will include but is not limited to the following list: <div style="margin-left: 40px;"> 3.2.1 Reference Data <div style="margin-left: 40px;"> (1) Part Number (2) Revision Number </div> </div> </div>	

- (3) Part Name
- (4) Next Higher Assembly Number
- (5) Next Higher Assembly Name
- (6) Qualification Requirement

3.2.2 Test and Qualification Data

- (1) Number of Parts Built
- (2) Number of Parts Tested
- (3) Unique Serial Number of Lot Number
- (4) Test Specifications
- (5) Test Results
- (6) Qualification Status

3.2.3 Anomaly and Corrective Action Data

- (1) Drawing Non-Conformances
- (2) Specification Non-Conformances
- (3) Serial Number or Lot Number
- (4) Corrective Actions (effectivity, reference)

3.3 Sources for the above data are:

3.3.1 Reference Data

- (1) Parts Lists and Engineering Change Orders
- (2) Quality Control Records
- (3) Test Reports
- (4) Corrective Action Reports

3.3.2 Anomaly Data

- (1) Inspection Reports
- (2) Non-Destructive Testing Reports
- (3) Test Reports
- (4) Variation Requests
- (5) Non-Conforming Material Disposition Reports
- (6) Quality-Reliability Disposition Requests
- (7) Certifications
- (8) Problem Failure Reports

3.3.3 Corrective Action Data

- (1) Engineering Change Orders
- (2) Procedure Changes
- (3) New Specifications or Procedures

- 3.4 Reliability will develop forms to be provided to other activities such as WANL, WAFF, NTO and other contractors for furnishing the information to the system. In some cases, current forms may be redesigned for direct keypunch activities.

Reliability will also develop codes for the data system to allow coding of a large amount of information so as to limit amount of review of retrieved material required to answer specific questions or provide quick compilations.

- 3.5 Reliability will maintain an accurate record of the location of master files of source data and the responsible activity for each file. Files will be audited periodically to assure reference data is quickly available once the data system has retrieved the correct reference source.
- 3.6 Complete development of this system will allow certain compilation of data currently produced to be eliminated without any sacrifice of data availability. Reliability will be constantly on the look out for such cost saving opportunities.

- 3.7 Computerized lists of items actually comprising a reactor build will be maintained as a configuration log. This configuration log lists the part number, serial or lot number, part nomenclature and material release number for each piece of hardware. In addition, it lists an assembly level and location of certain parts in the build.
- 3.8 The above data brings data storage up-to-date to the point of actual testing or other end use of a nuclear subsystem. Qualification status of all parts are listed and the actual parts included in the build are parts of data system.
- 3.9 The system will also record any anomaly found during the staging for test, the actual test or in post-test analysis. This system is a closed loop - trouble/failure - corrective action record designed to provide information on the state of readiness of articles on test as regards previous troubles or failures. Data will normally be acquired from Quality-Reliability Disposition Reports or Failure/Trouble Reports. Corrective actions made informally or formally will be part of this record.
- 3.9.1 The output of this data will be developed to provide answers to the following:
- a. If the anomaly is procedural or personnel caused -
 - (1) That the error can be demonstrated and repeated.
 - (2) That no damage resulted elsewhere in the system.
 - (3) That procedures have been corrected, now work properly or personnel have been reinstructed.
 - b. If the anomaly is a hardware failure -
 - (1) That a fix is made and the equipment is fully requalified.
 - (2) That disturbed or affected equipment is revalidated.
 - (3) That the test which gave rise to the anomaly is successfully passed.
 - c. Anomalies which cannot be explained or repeated -
 - (1) That redundancies are build to "box-in" the area of the anomaly no matter what the cause may have been so that safety or mission will not be affected.
 - (2) That full qualification of such equipment is accomplished.

4.0 TRAINING

- 4.1 Reliability will provide training in the Reliability System to all personnel providing source information and using the system. Coordination with the computer facility providing service for this system is a prime responsibility of Reliability as is coordination with all other activities.

5.0 SYSTEM CHANGES

- 5.1 Reliability will make improvements to the system after it is established and in operation as dictated by changing requirements and improved technology.

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	RMP No. 11-1 A Effective Date 9/10/65 Supersedes No. 11-1 Date 1/21/63	
Subject: CORRECTIVE ACTION RECOMMENDATION SYSTEM		
<div style="margin-bottom: 10px;"> 1.0 <u>PURPOSE</u> 1.1 To describe the procedures for the use of corrective action recommendations. </div> <div style="margin-bottom: 10px;"> 2.0 <u>GENERAL</u> 2.1 The prompt detection of deficiencies which may compromise product reliability and the initiation and follow-up of corrective action are vital elements in achieving high reliability. A formal system of documentation and follow-up of recommended corrective action provides assurance that necessary action is taken. 2.2 It is the responsibility of the Reliability organization to analyze all activities and designs for their effect on reliability and to recommend changes or corrective action where necessary. </div> <div> 3.0 <u>PROCEDURE</u> 3.1 A Corrective Action Recommendation (CAR), WANL Form No. 1077, or memo similar in form, shall be completed whenever it is necessary to initiate an action to correct a condition which represents a threat to the reliability of the nuclear subsystem. Normally Corrective Action Recommendations will stem from design reviews, analysis of test data, failure mode analyses, program audits, or other reliability assessment activities conducted by the Reliability organization. Corrective Action Recommendations need not be issued where the department concerned is aware of the need for corrective action and is taking such action. 3.2 A serial number shall be assigned to each Corrective Action Recommendation. The CAR shall be addressed to the manager of the activity which should take the corrective action. The reliability deficiency shall be described in narrative form indicating when and where it was discovered, the nature of the deficiency, and its effect on reliability, performance, or quality. The recommended corrective action shall be described. The recommended action may be general in nature, such as a </div>		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

recommendation that a program be initiated to study possible methods of correcting a deficiency, or it may be more specific indicating the detailed action which should be taken. The Corrective Action Recommendation requests a reply by the addressee. The date by which the reply is required should be specified. This date should be ten days from the date of the CAR unless greater urgency is required for the particular problem.

- 3.3 The addressee shall reply to the CAR by the date noted indicating (a) whether or not he agrees with the need for corrective action and the recommended action, (b) what steps, including schedule, will be taken to correct the deficiency.
- 3.4 Corrective Action Recommendations involving design changes will be monitored, or followed-up, by Reliability Engineering to ensure that the appropriate action is taken. Corrective Action Recommendations involving manufacturing, shipping, handling, etc., will be monitored by Quality Assurance. Where the CAR does not clearly fit into either one of the above two classifications, the Manager of Reliability will designate the responsibility. The activity having follow-up responsibility shall review the status at least once each week.
- 3.5 A Corrective Action Recommendation file will be maintained by the Reliability organization. This will include copies of all CAR forms. Completed CAR's will have a statement appended by the person assigned follow-up responsibility indicating the corrective action which was taken. A log will be maintained showing the status of all CAR's.
- 3.6 Corrective actions will be included in the integrated data system for historical data storage.

CAR No.

Date

Subject

TO:

FROM: WANL Reliability

References: Part Name

Planning Part No.

Drawing No.

Other

1. An analysis by Reliability indicates that the following is a reliability deficiency requiring corrective action not presently planned or in progress.

2. Description of deficiency and effect on reliability:

3. It is recommended that the following corrective action be initiated:

4. You are requested to reply with your comments on the deficiency or your planned program by _____.

cc: Product Assurance Manager
Reliability Manager
Cognizant Manager

CAR File

CORRECTIVE ACTION RECOMMENDATION STATUS

Date _____

Serial Number	Date Issued	Action Dept.	Description	Status of Action Taken	Date Closed

- 3.4 A problem report shall be reported on the Problem or Failure Report form by any person in the project recognizing a problem as defined above.
- 3.5 Failure and Problem reports shall be forwarded by the initiators to the Reliability organization. The Reliability organization will screen the reports, investigate them where necessary, and forward copies of the reports to the Project Manager and/or persons he designates. The Reliability organization shall determine the need for corrective action in conjunction with the responsible organization and shall follow up to ensure that the corrective action is accomplished.
- 3.6 Problem Failure Report data shall be maintained in the Reliability Data System. A summary of Problem or Failure Reports shall be made periodically for all unresolved PFR's on the Project. The summary report shall contain, as a minimum, the PFR number, a brief description of the problem or failure, the cognizant engineering group, and a brief statement as to the status of required corrective action.

PRE PRINT NO. _____

PROBLEM OR FAILURE REPORT

☐ PROBLEM

PART NAME _____

☐ FAILURE

PART NO. _____ SERIAL NO. _____

This Section For Failures Only

Type of Test/Operation _____

Date of Failure _____ Time of Failure _____

Total Test Time Prior To Failure

Number of Cycles _____

Number of Hours _____

Description of Failure or Problem:

Reported By: _____

Phone No.: _____ Date: _____

This Section For Reliability Use Only

Reviewed By: _____ Date _____

Failure Anal. Req'd. ☐ Yes ☐ No

Corrective Action Req'd. ☐ Yes ☐ No

CAR No. _____

Action Completed _____ Date _____

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	RMP No. 14-1 A	
	Effective Date 9/15/65	
	Supersedes No. 14-1 Date 10/15/65	
Subject: PROGRAM AUDIT		
<p>1.0 <u>PURPOSE</u></p> <p>1.1 To provide a system for auditing all activities affecting the reliability and quality of the end product.</p> <p>2.0 <u>POLICY</u></p> <p>2.1 Program audits will be conducted to determine the adequacy of, and the compliance of all WANL activities, to procedures required by each program.</p> <p>3.0 <u>PROCEDURES</u></p> <p>3.1 An audit plan will be prepared for each function to be audited. The plan will be based on the contractual requirements and WANL procedures and methods applicable to the particular activity being audited. In addition, audits may be made on any subject without a formal plan when it is deemed advisable to do so in the interests of reliability. Each plan will include at least the following information for the auditor:</p> <ul style="list-style-type: none"> a) Subject of the audit b) List of characteristics to be audited c) Acceptable criteria for such characteristics d) Make-up of the audit team (if required) <p>3.2 Audits will be made without advance notice to the activity being audited with a minimum possible interference with the normal operation of the activity.</p> <p>3.3 Westinghouse Form No. 59287 or similar letter format will be used for both the audit plan and the audit report. If corrective action is required, the activity supervision will be requested by letter to provide such action and will be furnished a copy of the audit report. Such request will require a written answer.</p>		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

- 3.4 Subsequent audits on the same subject will pay particular attention to areas found requiring corrective action.

4.0 RESPONSIBILITIES

- 4.1 The Quality Assurance group of the Reliability organization will have the primary responsibility for the audit program.

AUDIT PLAN AND REPORT

WESTINGHOUSE ASTRONUCLEAR LABORATORY RELIABILITY

Subject of Audit:	Activity:
Date This Audit:	Supervisor:
Date Last Audit:	Persons Contacted:
Audit Characteristics/Criteria	Findings/Request for Corrective Action
Audit Conducted By:	Corrective Action Request Made - Date
Follow-Up Comments:	

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	RMP No. 15-1 A	
	Effective Date 9/15/65	
	Supersedes No. 15-1 Date 1/15/63	
Subject: RELIABILITY APPORTIONMENT		
<p>1.0 <u>PURPOSE</u></p> <p>1.1 To describe the methods used in apportioning reliability goals to the assemblies and components of a system.</p> <p>2.0 <u>GENERAL</u></p> <p>2.1 In order to determine the required contribution of each component to the overall reliability objectives of a system, the system objectives should be apportioned to the subsystems and then to the components of the subsystems. The apportioned reliability goals serve as a guide for the design and development program. The apportionment should be carried out to the lowest level of parts or components on which reliability can be assessed by testing or by analytical techniques.</p> <p>3.0 <u>PROCEDURES</u></p> <p>3.1 The apportionment of system reliability objectives to the components of a system is conducted by making a prediction of the proportion of the total system failure rate assignable to each component. The proportion of total system failure rate is defined as:</p> $f_c = \text{Component Proportional Failure Rate} = \frac{\text{Component Failure Rate}}{\text{System Failure Rate}}$ <p>also,</p> $f_{c1} + f_{c2} + f_{c3} + \text{-----} f_{cn} = 1.0$ <p>When failure rate data is available for the components or system under consideration, such data shall be used with suitable allowances for differences in environment or application. When failure rate data is not available, the component proportional failure rate shall be determined from the failure rate index (FRI) described in RMP 15-2 A. In this case,</p> $f_c = \frac{\text{Component FRI}}{\text{System FRI}}$		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

3.2 The reliability goal for a component of a system is calculated from:

$$R_c = R_s^{f_c}$$

where,

R_c = Component Reliability

R_s = System Reliability

It should be noted that the terms "component" and "system" are used for convenience. The method described herein is applicable for apportioning system reliability to sub-systems and component reliability to parts, etc.

- 3.3 The apportioned reliability goal for each assembly, component, or part shall be expressed in terms most appropriate for each case. Examples are mean time to failure, mean cycles to failure, number of failures per 10,000 tests, probability of success.
- 3.4 The reliability apportionment may be changed during the progress of the development program as more information on the factors governing apportionment becomes available. The product of the apportioned reliability must at all times equal the current reliability goal for the nuclear subsystem.
- 3.5 the apportioned reliability goals shall be shown in a reliability block diagram. The block diagram shows the reliability relationship of all parts. The reliability of any part, represented by a block, is the product of blocks feeding into the block in question. In so far as possible, the blocks should be arranged so that a failure occurring in one block may result in a failure of the next higher block, but not in blocks on the same level. Each block shall show the Planning Part No., part name, reliability goal. Where the block refers to more than one part of the same type, the quantity shall be shown in parentheses. An example of a block diagram is shown on page 3.

4.0 RESPONSIBILITY

- 4.1 Reliability Engineering shall be responsible for making the reliability apportionments.

Typical Reliability Block Diagram

RELIABILITY METHODS AND PROCEDURES Westinghouse Astronuclear Laboratory Post Office Box 10864 Pittsburgh 36, Pennsylvania	RMP No. 15-2 A <hr/> Effective Date 9/15/65 <hr/> Supersedes No. 15-2 Date 1/15/63	
Subject: FAILURE RATE INDEX		
<p>1.0 PURPOSE</p> <p>1.1 To describe the methods to be used in determining a potential Failure Rate Index for systems, assemblies and components.</p> <p>2.0 GENERAL</p> <p>2.1 An index of potential failure rate can be used to apportion the reliability goal for a system to the components of the system. (See RMP 15-1) Also, an analysis of failure potential can be used to predict the comparative inherent reliability of several designs when little or no test data is available.</p> <p>2.2 The major factors considered in a Failure Rate Index analysis are:</p> <ul style="list-style-type: none"> (a) Number of parts and significant causes of failure modes. (b) Operating environment. (c) Difficulty of removing failure mode causes. (d) Effect of failure on engine performance. <p>2.3 To determine a Failure Rate Index for a component consisting of several parts, the failure mode causes for each part should be known. This is derived from the failure mode analysis. The number of significant failure mode causes for each part is an indication of the degree of exposure of each part to possible failure. It follows that a summation of the failure mode causes for all the parts indicates the degree of exposure of the component to possible failure. Assuming that nothing is done to remove the failure mode cause, and that all components operate in the same environment, the degree of exposure would serve as a relative measure of failure rate. To adjust for the variation in operating environment the degree of exposure is multiplied by a severity of environment weighting factor. If the environment is severe with respect to the capability of the parts or materials, or is unknown, the weighting factor would be high. Also, since it is an objective</p>		
Approved: Reliability Manager	Approved: Product Assurance Manager	Approved: Program Manager

of a development program to remove all failure mode causes, the difficulty of removing the causes should be considered. Failure mode causes can be thought of as falling into either of two categories; (1) those removable by design and development effort and (2) those resulting from human error or flaws which are removeable by Quality Control effort. A weighting factor is used to adjust the difficulty of removing the failure modes by either of the two general types of effort. In addition, since the effect of all failures is not the same, a weighting factor is used to correct for the effect of each failure mode on engine performance. The above can be reduced to the following general statement which forms the basis of the method developed.

	FRI	=	(Q) (DOR) (E) (TE)
where	FRI	=	Failure Rate Index
	Q	=	Number of Failure Mode Causes (or number of exposures)
	DOR	=	Difficulty of Removal Factor
	E	=	Severity of Environmental Factor
	TE	=	Thrust Effect Factor

The Failure Rate Index for each part is obtained by a summation of the complexity indicies associated with each failure mode cause. The failure rate for higher level components or assemblies is a summation of indicies for all parts in the component or assembly.

3.0 PROCEDURE

3.1 The procedure for conducting a Failure Rate Index analysis is described below by referring to the steps necessary to fill in WANL Form No. 1074. In the following discussion, the word "item" is a general term applying to any subsystem, assembly, component, or part which constitutes a portion of the design being analyzed. A failure mode analysis is a prerequisite to the Failure Rate Index analysis.

- (a) List in Column 1 the Planning Parts Number. This provides the item's identity on the form.
- (b) Column 2 is a number to identify each M-O-F of an item. List only those that have a significant effect on engine thrust based on a failure mode analysis.
- (c) Enter in Column 3, on separate lines, each significant cause of a M-O-F from a failure mode analysis.
- (d) Column 4 is the quantity of the item that is susceptible to each M-O-F cause.
- (e) Enter in Columns 5 through 25, the environmental factors, a value from zero to one as follows where zero represents a minimum effect on reliability and one represents a maximum effect.

- (1) In Columns 5, 8, 11, 14, 16 and 18, are placed values to represent the resistance of the material concerned to the listed environment. All materials in the system are compared and a relative value, from zero to one, assigned to each. Factors that enter into the values are the relative knowledge of each material property and its standard deviation as a function of each environment, and its relative importance to the design of the item.
 - (2) In Columns 6, 9, 12, 15, 17 and 19, a value from zero to one is entered to describe the predictability of each environmental load or stress.
 - (3) In Columns 7, 10, and 13, values are entered to describe the cycling intensity of each listed environment.
 - (4) List in Column 20, the ratio of the temperature of the item and the temperature at which the material will fail.
 - (5) List in Column 21, a zero to one value to indicate severity of corrosive, erosive, or other atmospheric effects. This is for atmosphere such as salt spray, humidity, dust, etc. It also includes the effects of fluids on internal surfaces.
 - (6) List in Columns 22 and 23, the operating time effect values when within the system there is a difference of operation time between the components or items. Column 22 is the ratio of total item operation time to the total system operation time. Column 23 is an estimate of the predictability of the variation of an item's function with time, such as drift of a gyro, battery voltage, etc. A zero to one value is used.
 - (7) Columns 24 and 25 are for the use of any other effects that may be desired to be included.
- (f) Sum all the factors in Columns 5 through 25 and list in Column 26.
 - (g) Estimate the difficulty of removal of the M-O-F cause by considering design, testing, manufacturing, inspection, etc., to remove the cause. Use a value from zero to one, with zero denoting not difficult and one indicating extremely difficult or impossible, placing the value in either Column 27 or 28, as appropriate.
 - (h) Multiply Column 26 by either 27 or 28 and list in Column 29.
 - (i) Multiply Column 29 by 4 and enter in Column 30.

- (i) Select a weighting value from zero to one for each of Columns 31 through 38. The values should be relative to each other to describe their relative effect on the mission. Rate the most undesirable as one (1) and the others proportionately lower, based on the effect on the mission. Place each value in the column on the line below the column number. When using the form, place a checkmark in the appropriate columns opposite each cause, then sum the weighting value for each column that is checked and list in Column 39. Note: The value in Column 39 is the same for all causes of a given M-O-F, therefore, only one need be evaluated and its value used in Column 39 for all causes of the same M-O-F.

4.0 RESPONSIBILITY

- 4.1 Reliability shall conduct the Failure Rate Index determination for the purpose of apportioning reliability goals and as required for the assessment of reliability status.
- 4.2 Engineering personnel shall be encouraged to use the Failure Rate Index determination for comparing several designs on the basis of relative reliability potential. Any formal analyses included in reports to the customer shall be approved by Reliability.

SYSTEM _____

SUBSYSTEM _____

DATE _____

SYSTEM _____

SUBSYSTEM _____

DATE _____

DATE _____

PAGE .

[illegible]

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Ⓢ QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. <u>2 - 1</u> Rev. _____
	Effective Date <u>July 25, 1966</u>
	Supersedes No. <u>QMP(AL)2-1</u> Date <u>12/15/65</u>

SUBJECT: PREPARATION OF QUALITY METHODS AND PROCEDURES (QMP'S)

1.0 PURPOSE

To establish the procedure to be used for the preparation of Quality Methods and Procedures (QMP's).

2.0 APPLICABILITY

This QMP shall be followed when preparing, obtaining approval, distributing, and making changes to all other QMP's. It is applicable to WANL and WAFF QMP's.

3.0 REFERENCE

None

4.0 PROCEDURE

4.1 Form Paper, Document Identification and Approvals

4.1.1 Form Paper

All QMP's shall be written on the latest revisions of Ⓢ Form paper Nos. 59037 (first page) and 59515 (second page and thereafter). See Attachment A for sample paper.

4.1.2 Document Identification

The heading at the top right side of all pages shall be filled in with a two-part identification number. The first part of the number relates to a major heading used in NASA Spec. NPC 200-2, April, 1962 Edition; and the second part is an individual QMP number defining the particular QMP within that major heading. The Revision block shall be left blank for original issues (see paragraph 4.7, below, for definition of the change system).

APPROVALS:

WANL Q.C. Manager	WAFF Q. C. Manager	Product Assurance Mgr.	Program Manager

4.1.3 Approvals

Approval signatures for completed QMP's shall be obtained per the titles shown on the first page of the QMP (Form 59037). For QMP's applicable to both WAFF and WANL, the approval block shall contain spaces for the signatures of WANL Q. C. Manager, WAFF Q. C. Manager, Product Assurance Manager, and Program Manager along the bottom of the first page. See sample Appendix A, Page 1.

4.2 Numbering System within the QMP

The numbering system used within the QMP shall be the military system.

Example:

1.0

1.1

1.1.1

1.1.2

1.2

2.0

2.1, etc.

Items listed within a paragraph may be numbered with arabic numerals.

4.3 Subject Headings of QMP's

The subject heading of QMP's shall be filled in with a short descriptive title and shall be in capitals.

4.4 Major Headings to be used within the QMP

The major headings used within the QMP shall consist of: Purpose, Applicability, Reference, General, Procedure, and Responsibility used as stated below. These headings shall be in capitals and shall be underlined.

4.4.1 Purpose

The Purpose section is mandatory and shall contain a clear, concise statement explaining the purpose of the procedure.

4.4.2 Applicability

The Applicability section is optional and, when used, shall clearly define the areas or locations, such as WAFF or WANL, to which the QMP is applicable. This section should be eliminated only when the Purpose section indicates applicability.

4.4.3 Reference

The Reference section is mandatory and shall include listings of all applicable references, including any QMP's referenced in the procedure. Form numbers should not be used in this section; reference that section of the procedure to which the form number applies. If there are no references, the word None shall be inserted in this section.

4.4.4 General

This section is optional and may be used as a lead-in to the procedure itself. Historical or policy information relating to the QMP, or other general information may be included.

4.4.5 Procedure

This section is mandatory and shall include the body of the QMP.

4.4.6 Responsibility

This section is optional and may be used if it is advantageous to group responsibilities.

4.5 Sub-headings within the QMP

Each sub-paragraph (paragraphs other than those mentioned in paragraph 4.4, above) shall have a sub-heading. Each sub-heading shall be underlined.

4.6 Attachments

All forms, instructions for filling out the forms, charts, etc., shall be attached at the end of the QMP. Each page of the attachment shall be identified as follows:

1. Attachments shall be identified at the top of each page by using the word, "Attachment", followed by a capital letter starting with "A" for the first attachment, "B" for the second attachment, with each successive attachment carrying the next letter of the alphabet. An attachment may consist of more than one page.
2. QMP No., Revision (if applicable), and Effective Date shall be placed at the top right of each page of each attachment. (See example Attachment A.)
3. Page No. shall be inserted under the "Attachment" at the top of each page of the attachment (i.e., Page 1 of 5, Page 2 of 5, etc.). The first page of each attachment shall be Page No. 1.

Example: A QMP of 5 pages with Attachment A consisting of 1 page and Attachment B consisting of 3 pages shall be numbered as follows:

QMP Page 1	Page 1 of 5
Page 2	Page 2 of 5
Page 3	Page 3 of 5
Page 4	Page 4 of 5
Page 5	Page 5 of 5

Attachment A 1	Page 1 of 1 (at top of page under attachment A)
Attachment B 1	Page 1 of 3 (at top of page under attachment B)
2	Page 2 of 3 (at top of page under attachment B)
3	Page 3 of 3 (at top of page under attachment B)

Numbering of the pages of an attachment as described above shall be in addition to other page numbers which may apply when the attachment is used for other purposes than an attachment to a QMP.

4.7 QMP Change System

Changes made to existing QMP's may be made in one of two ways, as stated below.

4.7.1 Change System No. 1

The entire QMP may be rewritten and reissued. In such cases, the block heading at the top right side of the pages shall be completed, denoting the change and supersedure. The revision blank shall be filled in with capital letters, starting with A, to indicate the change. All changes within the QMP shall be indicated with brackets and an arrow (→) in the left margin.

4.7.2 Change System No. 2

In lieu of immediately rewriting the entire QMP, supplements may be issued. Supplements shall specify the QMP paragraph(s) to be changed and shall clearly define the changes. The normal QMP format shall be used, starting with the subject page, and each page of the supplement shall have "Supplement" (consecutively numbered, starting with 1) at the top of each page, outside the border. The heading block at the top right side of each page shall be filled in as stated in Paragraph 4.1.2, above. Supplements shall be page numbered individually as separate documents (do not continue the page numbering from the QMP). Each supplement shall be approved in the same manner as the QMP proper and shall be reproduced on colored paper to lessen the probability of their being overlooked when referring to the QMP. The number of supplements to any QMP shall be limited to three.

4.8 QMP Distribution

A master distribution list for QMP's shall be established and maintained by Product Assurance, subject to the approval of the Manager of Product Assurance. This list shall be altered, when necessary, to assure adequate dissemination of QMP information.

<p>Ⓢ QUALITY METHODS & PROCEDURES</p> <p>WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236</p>	QMP No. _____ Rev. _____		
	Effective Date _____		
	Supersedes: No. _____ Date _____		
SUBJECT:			
<p style="text-align: center;"><u>SAMPLE</u></p>			
APPROVALS:			
WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation

QMP No. _____ Rev. _____

Effective Date _____

SAMPLE

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 3 - 1 Rev. _____

Effective Date 7/25/66

Supersedes:

No. QMP(L) 3-1 Date 10/1/65

QMP(A) 3-1 10/1/65

SUBJECT: ORGANIZATION OF QUALITY CONTROL

1.0 PURPOSE

The purpose of this procedure is to present the organization of Quality Control and the function of each of its sections.

2.0 REFERENCE

None

3.0 GENERAL

3.1 Policy

It is the responsibility of Quality Control to provide a systematic program to insure conformance to design specifications during all phases of contract performance. The effective implementation of such a program necessitates specialized activities within the group. Quality Engineering, Product Control Engineering, Data Systems, Supplier Surveillance, Inspection and Reactor Assembly Inspection are individual but coordinate spheres of action which comprise Quality Control.

4.0 ORGANIZATION AT WANL

The organization structure of WANL Quality Control is presented by Attachment B, organization chart. The Manager of WANL Quality Control reports directly to the Manager of Product Assurance, who, in turn, has unimpeded access to the Project Manager. The Manager of WANL Quality Control in establishing and directing program policy has assigned specific responsibilities to the various sections. These responsibilities are as follows:

4.1 WANL Quality Engineering

4.1.1 Establish policies and procedures by means of QMP's for all phases of WANL Quality Control consistent with the WANL Product Assurance Program Plan by which the various sections operate to insure that a quality product is shipped to our customer.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

- 4.1.2 Plan inspections and test operations for reactor hardware and ground support equipment for most effective and efficient processing from procurement to assembly and test. Issue Quality Control Inspection Point Programs, Quality Inspection Procedures and Inspection Instructions consistent with the critical or complex nature of the part/assembly. Instructions define operations requiring quality surveillance, characteristics to be inspected, methods and equipment to be used, sampling plans and quality levels.
- 4.1.3 Review drawings and specifications to insure that necessary conformance limits, test methods, identification and quality requirements are included. Present data summarizing manufacturing and inspection problems on similar designs and recommend changes or additions when necessary. Assist/direct development of special test specifications or quality standards when necessary to define the article and implement their use.
- 4.1.4 Prepare procurement quality requirements for purchased items defining WANL Quality Requirements relative to source inspection, supplier's documentation, process qualification and personnel certification.
- 4.1.5 Review supplier's test, inspection and manufacturing plans prior to use to insure that all characteristics determined to influence quality are adequately controlled and inspected. When suppliers have design and build responsibility, review and approve all drawings prior to manufacture.
- 4.1.6 Design, develop or direct procurement of special measurement and analytical facilities required to evaluate product quality and provide inspection personnel with instructions in their use.
- 4.1.7 Act as chairman of Engineering and Material Review Boards providing technical disposition of nonconforming materials. Insure that the dispositions of the Review Board are clear to personnel required to implement them and that sufficient technical justification for dispositions exists and is documented.
- 4.1.8 Analyze nonconforming material documents, inspection records and Supplier Surveillance Trip Reports for potential or recurring problems and take appropriate corrective action to prevent their occurrence.
- 4.2 Supplier Surveillance
- 4.2.1 Implement WANL Supplier Quality Evaluation Program including survey of prospective suppliers to determine capabilities of their Quality Control systems. Assist Purchasing in maintaining supplier rating lists and approve Purchasing's bidder list for request for quotations.

- 4.2.2 Advise and instruct suppliers in the purpose and use of WANL Quality specifications and forms. Assist suppliers in interpretation of drawings, specifications and purchase order requirements. Assist suppliers in resolution of quality problems and, when required, advise cognizant WANL personnel of possible problem areas.
- 4.2.3 Provide source inspection for parts and materials including surveillance of manufacturing operations, process qualification, mechanical, electrical, nondestructive and all other inspections directed by WANL Purchase Order Requirements.
- 4.2.4 Initiate corrective action at WANL suppliers' as determined by analyzing nonconforming material documents, inspection records and audits of supplier's operations. Provide follow-up evaluation of supplier corrective actions to determine adequacy and effectivity. Take action in conjunction with Purchasing to issue work stoppage orders or remove supplier from approved supplier list if satisfactory corrective action is not made.
- 4.2.5 Provide periodic audits and resurveys at suppliers' facilities to insure that suppliers' Quality Control systems and contract performance have continued to meet WANL requirements.
- 4.3 Inspection Responsibilities
 - 4.3.1 Perform electrical, mechanical and nondestructive inspections and review supplier certifications and documentation to insure that WANL manufactured or procured materials, parts and assemblies fully comply with the requirements of applicable purchase orders, drawings, specifications or other established criteria. Submit sample materials for destructive tests and analytical evaluation to verify supplier's certifications. Document inspection results and maintain records of all data submitted by suppliers.
 - 4.3.2 Maintain the Quality Control Standards Laboratory which performs initial and periodic calibrations of standard gages and inspection tools used for Receiving, In-Process Inspections, Reactor Assembly and test areas. Inspect and control manufacturing tools, gages, jigs and fixtures used to determine conformance of reactor and ground support hardware.
 - 4.3.3 Perform detailed source inspections at supplier's facilities as requested by the Supplier Surveillance section. Provide surveillance inspections as required to monitor component test programs and WANL manufacturing operations.
 - 4.3.4 Identify, control and document nonconforming material. Implement Engineering and Material Review Board dispositions. Control release of parts to Reactor Assembly and approve packaging and shipment of materials to suppliers for further processing.

4.4 WANL Reactor Assembly Inspection Responsibilities

- 4.4.1 Perform visual examination of incoming components for damage and checks for conformance of parts to list of parts and latest drawings.
- 4.4.2 Maintain Reactor Assembly Inspection gages and equipment and implements gage calibration program.
- 4.4.3 Perform inspections of reactor subassemblies, final assemblies and instrumentation as required by RAPO's. Provide documentation of inspections. Distribute quantitative Engineering data required. Provide surveillance of assembly operations and practices requiring Quality Control verification or monitoring.
- 4.4.4 Identify documents and parts, control materials found to be nonconforming in the Reactor Assembly. Implement decisions of Engineering and Material Review Boards in disposition of nonconforming material.

5.0 ORGANIZATION AT WAFF

The organizational structure of the Astrofuel Quality Control Organization is presented by the attached organization chart (see Attachment A). The four major sections of the organization report directly to the Manager of Quality Control. The Manager of Quality Control reports directly to the WANL Manager of Product Assurance.

The Manager of Quality Control, in establishing and managing the program policy, has assigned the following certain specific responsibilities to his intra-organization sections.

5.1 Product Control Engineering

- 1. Review and approve drawings, specifications, requisitions, work orders, etc. to insure that all necessary quality requirements are defined and maintain complete Product Assurance files of these documents.
- 2. Prepare, revise, and/or continuously upgrade the Astrofuel Quality Inspection Procedures, and obtain the necessary approvals required for issuance of these documents. Approve final Quality Inspection Procedures.
- 3. Issue Procurement Quality Requirements (PQR) to suppliers of all fueled and unfueled elements.
- 4. Prepare applicable procedures and instructions for use by Quality Control personnel for verifying quality characteristics of final Astrofuel products.
- 5. Prepare instructions for any fueled hardware inspections or tests that are performed at WANL.

6. Transmit current Quality Inspection Procedures, Inspection Flow Outlines, and changes to them for inclusion in each issue of the NRX Process and Inspection Plan.
7. Provide Data Systems with the specific information necessary to initiate or modify system programs or reports utilized in fuel element release.
8. Coordinate with cognizant WANL engineering activities the evaluation and approval of Approval Request submittals of Astrofuel Processing Procedures (AFF's) and Y-12 Inspection and Processing Procedures.
9. Initiate, evaluate, and coordinate with AGC and SNPO, Astrofuel, and Y-12 sampling procedures as documented by Approval Requests.
10. Provide instruction to Inspection personnel, covering Quality Inspection Procedure changes and defect definition.
11. Evaluate processing data with Astrofuel Process Engineering, approve AFF process parameters and initiate MRT and Variation Request action in order to dispose of deviations from parameters.
12. Provide direct continuous quality liaison and surveillance for all WANL suppliers of fuel elements.
13. Evaluate inspection reports and originate Astrofuel Variation Requests on inspections performed on nonconforming fuel elements.
14. Maintain a control system and complete files of all Astrofuel and Y-12 Approval Requests and Variation Requests.
15. Analyze element Variation Requests submitted by Astrofuel and Y-12, disposition and coordinate meetings and signoff with WANL activities.
16. Coordinate, control, and document all Engineering Review Board and Material Review Board actions on Astrofuel fuel elements.
17. Resolve quality problems pertinent to final fuel elements with AGC and SNPO representatives whenever necessary.
18. Provide quality data input to Data Systems and issue periodic summary reports of Data System printouts.
19. Maintain complete files of all Astrofuel and Y-12 fuel element data packages for fueled and non-fueled elements.

20. Release for assembly all acceptable fueled and unfueled elements produced by Astrofuel or Y-12.
21. Issue periodic reports concerning the release status of elements and defining element reject rates and causes and projected yield factors.
22. Provide input for inclusion into the Astrofuel Quality Control section of the NERVA Nuclear Subsystem Quarterly Progress Report.
23. Define training needs of section personnel and administer all such required training programs.

5.2 Inspection

1. Perform and document all inspections and nondestructive tests, including applicable destructive tests. Release in-process raw materials and parts to the next point(s) of processing when they are determined acceptable.
2. Initiate proper documentation on nonconforming material and parts.
3. Maintain control and release of final materials and parts.
4. Establish and maintain identification of raw materials and parts by part number, serial or lot numbers.
5. Indicate in a positive manner the quality status of materials and parts at all points of inspection processing within the Astrofuel Facility.
6. Uniquely identify and, whenever possible, physically segregate all nonconforming materials or parts from those conforming materials or parts.
7. Inspect Government-furnished property to the extent practical to detect damage in transit and to determine that the property is complete, qualified for its intended end use, and of proper size, type, or grade.
8. Verify the accuracy and completeness of all inspection data accumulated.
9. Maintain records in a systematic manner which indicate the quality status of the materials or parts.
10. Perform applicable inspection operations and collect test data on raw material in order to assure compliance.

11. Issue daily internal inspection status reports.
12. Perform, or have performed by outside laboratories, the necessary periodic calibration of gages and standards.
13. Identify calibration status of gages and standards with labels or tags and maintain historical records of the calibrations.
14. Replace all worn standard gages and inspection equipment, and maintain all inspection tools, gages, jigs, and fixtures required to verify compliance of materials to drawing and specification requirements.
15. Continually monitor Astrofuel Inspection facilities for conformance to established cleanliness standards.
16. Maintain an up-to-date file of work orders, drawings, and specifications.
17. Provide Data Systems with all required input inspection data and source document formats.
18. Prepare applicable procedures and instructions for use by Quality Control personnel for verifying quality characteristics at receiving, in-process, final, and special inspection tests.
19. Provide input for inclusion into the Astrofuel Quality Control section of the NERVA Nuclear Subsystem Quarterly Progress Report.
20. Define training needs of section personnel and administer all such required training programs.
21. Submit input data to Product Control Engineering for the preparation and continuous upgrading of the Astrofuel Quality Inspection Procedures. Review and approve the final Quality Inspection Procedures.

5.3

Data Systems

1. Define and implement the design, development, installation, and management of scientific and management information systems for the Astrofuel Program.
2. Perform the analysis, translation, and conversion of fuel specification and drawing requirements into computer system logic, computation and decision making routines that are completely capable of: 1) detecting errors and noncompliance in production and inspection; 2) analyzing and reporting the qualitative content of unique fuel units; and 3) reporting the ultimate disposition and utilization of fuel material.

3. Modify existing information systems to reflect the changes in specification, or the need for additional analysis or reports.
4. Perform advanced planning of information system networks that will provide information for use in determining specification requirements, evolution trends, and aid in the development of automatic process control devices. Recommend what automatic data acquisition equipment should be designed and procured to enable rapid reduction and analysis.
5. Provide computer data reports on fuel development, production, and release to WANL activities.
6. Investigate, evaluate and implement new computer languages and equipment that will permit greater utilization and effect significant cost reductions.
7. Design and implement "on line" real time data analysis and feedback devices for inspection and quality engineering that will assist in the inspection and control of fuel material.
8. Assist in the development and maintenance of manual and automatic data acquisition systems.
9. Define and direct computer programming efforts necessary for overall requirements.
10. Determine how data error, transmission malfunction, and equivocal information errors occur. Implement methods of detection so that these inadvertent data errors can be detected, aborted, and reported.
11. Responsible for the accuracy and completeness of data processing and computer analysis so that reports conform to the stated quality, reliability and engineering requirements.
12. Coordinate with LASL, Y-12, and the AGC and SNPO activities on cognizant information programs.
13. Assist Quality Engineering with system logic, as required, to solve unexplained and unresolved problems that occur during fuel element production.

14. Provide for the storage, updating, and retrieval of all data produced and reduced pertaining to Astrofuel products.
15. Prepare applicable procedures and instructions for use by Quality Control personnel for verifying quality characteristics at receiving, in-process, final, and special inspection tests.
16. Provide input for inclusion into the Astrofuel Quality Control section of the NERVA Nuclear Subsystem Quarterly Progress Report.
17. Define training needs of section personnel and administer all such required training programs.
18. Submit input data to Product Control Engineering for the preparation and continuous upgrading of the Astrofuel Quality Inspection Procedures. Review and approve the final Quality Inspection Procedures.

5.4 Quality Engineering

1. Coordinate the Quality Operation with the Reliability effort to effectively support the Reliability Program.
2. Resolve in-process quality problems with other Astrofuel activities, AGC and SNPO, as required, including disposition of non-conforming materials and parts.
3. Report periodically to management the status, quality levels, and quality trends of materials and parts, as requested.
4. Review and comment on all WANL drawings and specifications relating to the Astrofuel products.
5. Design the non-standard inspection and test equipment used at the Astrofuel Facility.
6. Coordinate the engineering liaison effort with LASL and Y-12 to obtain knowledge of new equipment and techniques.
7. Develop non-destructive techniques and equipment and prepare instruction manuals necessary for performance of Astrofuel Inspection Operations.

8. Establish accuracy and precision of all equipment.
9. Arrange for periodic audits of all Quality Control operations to assure compliance with established procedures and to discover inadequacies in the quality operation.
10. Provide personnel, as required, for special quality studies to assure quality products.
11. Provide necessary instructions and procedures to assure compliance with established cleanliness standards within the Astrofuel Facility.
12. Establish and maintain all statistical sampling plans used at the Astrofuel Facility for raw materials, in-process inspection, destructive test evaluation and special engineering studies. Select samples per the approved Astrofuel plans, and submit all special plans to AGC and SNPO for review. Also, specify or approve all sampling plans used by each raw material supplier.
13. Analyze discrepancies in purchased raw materials, and coordinate efforts to obtain disposition of discrepant materials.
14. Review all NERVA purchase orders placed against suppliers and apply procurement quality requirements to those orders.
15. Release raw materials by review of all inspection and test data, including suppliers raw material certification, in order to assure compliance with applicable specifications.
16. Provide source inspection on parts and materials as directed by the procurement quality requirements within the purchase order. Provide supplier surveillance coverage and technical assistance in the quality areas to the supplier, as required.
17. Survey and rate suppliers, initially and thereafter, on the basis of surveys and performance.
18. Prepare and implement training programs for operation of non-destructive test equipment.

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation

QMP No. 3 - 1 Rev. _____

Effective Date 7/25/66

19. Monitor and approve procedures, techniques and results of subcontractor laboratories.
20. Provide Data Systems with all requisite Quality Engineering information to permit formulation of precise and accurate computer calculations and decision making functions.
21. Perform engineering review of inspection results to define those areas and required improvements in the Quality Control operations leading to increased precision and accuracy of reported data.
22. Prepare applicable procedures and instructions for use by Quality Control personnel for verifying quality characteristics at receiving, in-process and special inspection tests.
23. Provide input for inclusion into the Astrofuel Quality Control section of the NERVA Nuclear Subsystem Quarterly Progress Report.
24. Define training needs of section personnel and administer all such required training programs.
25. Submit input data to Product Control Engineering for the preparation of the Astrofuel Quality Inspection Procedures. Review and approve the final Quality Inspection Procedures.

ASTROFUEL QUALITY CONTROL ORGANIZATION

QMP No. 3 - 1
Effective Date 7/25/66

ORGANIZATION CHART

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 4 - 1 Rev.

Effective Date 7/25/66

Supersedes
No. QMP(AL)4-1 Date 11/15/65

SUBJECT: DRAWING REVIEW

1.0 PURPOSE

The purpose of this procedure is to provide an effective system for review of drawings and associated changes.

2.0 REFERENCE

WANL Drafting Manual (Drawing Code definition).

3.0 GENERAL

3.1 Policy

It is the responsibility of Quality Control to review engineering drawings to ensure that the characteristics which determine the quality of the items have been incorporated into the drawings. Code 1 and Code 2 drawings shall be signed off by Quality Control. Code 3 drawings shall be signed off by Quality Control if requested by the Cognizant Design Engineer. Code 4 drawings will not be signed off by Quality Control.

3.2 Scope

This procedure shall apply to the review by Quality Control of Engineering Drawings and associated drawing changes.

4.0 PROCEDURE

4.1 Drawing Review and Sign-Off

Engineering drawings shall be reviewed and signed off by Quality Control for Product Assurance. WAFF Quality Control shall review and sign off drawings pertaining to fuel elements, fueled graphite parts and other coated graphite parts processed at WAFF. WANL Quality Control shall review and sign off drawings pertaining to all other parts. The drawing review and sign-off shall be in accordance with the following.

APPROVALS:

WANL Q.C. Manager	WAFF Q.C. Manager	Product Assurance Mgr.	Program Manager

4.1.1 The drawing review shall ensure that the drawings contain the necessary conformance limits, effective methods for identification of the article, material and process specifications which detail adequate inspection and test methods and all other necessary characteristics determined to influence quality. This review shall include the coordination within Product Assurance.

4.1.2 The drawings shall be signed off by Quality Control following the drawing review and resolution of all characteristics determined to influence quality and coordination within Product Assurance in accordance with the drawing Codes as defined in the WANL Drafting Manual.

<u>Drawing Code</u>	<u>Q. C. Sign-off</u>
1	Mandatory
2	Mandatory
3	Only as requested by Cognizant Engineer
4	Not Required

4.2 Drawing Change Control

Changes to Engineering Drawings are made by Engineering Change Orders (ECO's). ECO's shall be reviewed and signed off by Quality Control in the same manner as drawings are reviewed and signed off as described in Paragraph 4.1.

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 4-2 Rev.

Effective Date 7/25/66

Supersedes

No. QMP(AL)4-2 Date 11/15/65

SUBJECT: SPECIFICATION REVIEW

1.0 PURPOSE

The purpose of this procedure is to provide an effective system for review of specifications and associated changes.

2.0 REFERENCE

None

3.0 GENERAL

3.1 Policy

It is the responsibility of Quality Control to review specifications to insure that the characteristics which determine the quality of the material and the system have been incorporated into the specification and to provide a criteria to judge conformance to these characteristics.

3.2 Scope

This procedure shall apply to Purchasing Department, Process, and Equipment Specifications.

4.0 PROCEDURE

4.1 Specification Review and Sign-Off

All specifications (Purchasing Department - PDS; Process - PS; and Equipment - E) shall be reviewed and signed-off by Quality Control for Product Assurance. WAFF Quality Control shall review and sign-off specifications pertaining to fuel elements, fueled graphite parts, and other coated graphite parts processed at WAFF. WANL Quality Control shall review and sign off specifications pertaining to all other

APPROVALS:

WANL Q.C. Manager	WAFF Q.C. Manager	Product Assurance Mgr.	Program Manager

parts. The specification review will insure the specifications contain the necessary conformance limits, processes, testing, and all other characteristics determined to influence quality. This review shall include the coordination within Product Assurance.

4.2 Specification Change Control

Changes to specifications are made by Engineering Change Orders (ECO's). ECO's shall be reviewed and signed off by Quality Control in the same manner as specifications are reviewed and signed off as described in Paragraph 4.1.

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 4-3 Rev.

Effective Date July 25, 1966

Supersedes
No. QMP(L)4-3 Date 12-15-65

SUBJECT: IDENTIFICATION OF MATERIAL, DETAIL PARTS, SUBASSEMBLIES, AND
ASSEMBLIES BY SERIAL OR LOT SERIAL NUMBERS

1.0 PURPOSE

To establish a procedure for assigning non-repeating individual or lot serial numbers to material, detail parts, subassemblies, and assemblies for complete traceability and control.

2.0 APPLICABILITY

The following procedure shall be applicable to individual or lot serial number identification of all material, detail parts, subassemblies manufactured or purchased by WANL, WAFF, or applicable subcontractors. Government-Furnished Property (GFP) is an exception since it is identified in accordance with Government regulations.

3.0 REFERENCE

QMP No. 5-3, Quality Surveillance Codes

4.0 GENERAL

4.1 Policy for WANL Serial Number Implementation

Material Control at WANL is responsible for establishing and assigning serial numbers on purchase requisitions, IWR's, and work orders. The requirement for identifying parts, subassemblies, and assemblies by individual or lot serial numbers shall be indicated on the drawing. When a serial number is required, the drawing shall also specify the place on the part where the serial number shall be applied, and the manner in which it shall be applied. Expendable-type standard hardware, such as nuts, bolts, washers, rivets, fasteners, etc., not defined by WANL drawings do not require WANL serialization unless specified on the ordering document. These parts may be defined by Military drawing or specifications (such as AN or MS drawings) or by standard catalog numbers.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

4.2 Policy for WAFF Serial Number Implementation

WAFF Inspection is responsible for establishing and assigning serial and lot numbers for all raw materials and components requiring control. The responsibility for establishing and assigning particular serial of serial and/or lot numbers may be delegated by Inspection to other departments with their agreement. The ultimate responsibility for the adequacy of such deligated responsibility rests with Inspection.

4.3 Definitions

4.3.1 Lot

A group of materials or parts of the same design (Part Number, Drawing/Revision, Specification, etc.) consisting of homogeneous groups of materials or parts, produced under essentially the same conditions of manufacture and time.

4.3.2 Lot Serial Number

A unique number assigned to a lot for the purpose of identification.

4.3.3 Serial Number

A unique number assigned to a distinguishable part for the purpose of identification.

5.0 PROCEDURE FOR SERIALIZATION AT WANL

5.1 Assignment of Serial Numbers

Individual or lot serial numbers, when so indicated by the drawing requirements, shall be pre-assigned in non-repeating consecutive sequence by Material Control on the purchase requisitions, IWR's and work orders. Material Control shall originate and maintain a log showing serial and lot serial numbers assigned against purchase requisition, work order, or IWR numbers and part numbers. When appropriate and approved by Material Control, suppliers' serial numbers may be used in lieu of WANL-assigned numbers.

5.1.1 Addition of Parts to Orders

When serial-numbered parts are added to an existing order, Material Control shall assign new serial numbers, as required. These numbers shall be placed on the Request for Change Notice, which shall be transcribed on the Change Notice by Purchasing. When lot serial-numbered parts are added to an existing order, new lot serial numbers shall be assigned to the additional parts. All additions of parts to orders shall be noted by Material Control in the logbook.

Ⓢ QUALITY METHODS & PROCEDURESQMP No. 4-3

Rev. _____

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric CorporationEffective Date July 25, 1966**5.1.2 Deletion of Parts from Orders**

When serial-numbered parts are to be deleted from an existing order, Material Control shall note on the Request for Change Notice the quantity of parts that are to be cancelled and shall request that Purchasing advise, on the Change Notice, the particular serial numbers that are to be voided. The buyer in the Purchasing Department shall coordinate with the WANL supplier to determine which serial numbers shall be voided. When lot serial-numbered parts are to be voided from an existing order, Material Control shall note on the Request for Change Notice the quantity of parts that are to be voided and the lot serial numbers involved. All voided serial numbers for cancelled parts on order shall be noted by Material Control in the logbook and are not to be reassigned.

5.1.3 Repair or Replacement of Parts Returned to Supplier

When parts are returned to the supplier for repair or replacement, the serial number will remain unchanged if the parts are repaired and subsequently returned to WANL. If the supplier chooses to scrap the rejected parts and replace with new parts, the WANL buyer must be contacted in order to provide a new serial number. The WANL buyer shall obtain the serial numbers from Material Control. In no instance will a rejected part serial number be assigned to a replacement part.

5.2 Multiple Part Raw Material Identification

5.2.1 WANL-purchased raw material which will be in the form of bars, sheet, plate stock, and castings or forgings which will be processed into multiple detail parts shall be identified by the manufacturer's heat number, furnace run, batch number, melt number, etc. (WANL serial numbers are not required for raw material procurement except when specified by drawing.)

5.2.2 Supplier-furnished raw material to be processed into multiple parts shall be traceable to the manufacturer's heat number, furnace run, batch number, melt number, etc. Shipping documentation of detail parts manufactured from this raw material will carry reference to the raw material identification.

5.3 Single Part Raw Material Identification

Individual castings, forgings, etc., which will be manufactured or processed, such that each will make a single detail part, will be assigned a WANL serial number at the raw material source as described in paragraph 5.4.1, below. This number will remain with the part through all subsequent operations, regardless of where performed. If the number is removed by machining or processing, it will be replaced as soon as possible by the supplier performing the operation.

5.4 Method of Serial or Lot Identification

5.4.1 Individual Part Serial Numbers Numbering System

Serial numbers shall consist of a letter "A" prefix followed by consecutive numbers, starting with "1". This method shall be followed until the numbers reach "99999," after which the letter prefix shall be changed to "B", again starting with the number "1". This shall be continued through the alphabet and thereafter, if required, "AA, AB, AC" etc., and "BA, BB, BC" etc. shall be used as a prefix. The letters "I", "O", "Q", "L", and "X" shall not be used.

Examples:

P/R 30314	P/N 909E421HO1
130 pieces	S/N A21 through A150

P/R 41679	P/N 945C967HO1A
200 pieces	S/N A151 through A350

5.4.2 Lot Serial Numbers

5.4.2.1 Numbering System

Lot serial numbers shall be assigned in the same manner and series as individual serial numbers, except that the prefix letter "L" shall be a part of each lot serial number.

Examples:

P/R 30642	P/N 936J654HO1B
10,000 pieces (10 lots)	Lot S/N LA1 through LA10

P/R 41637	P/N 945C852HO2C
5,000 pieces (5 lots)	Lot S/N LA11 through LA15

5.4.2.2 Assignment of Numbers

Assignment of lot serial numbers shall not violate the rule that the parts within a lot shall not be mixed with respect to raw material, batch, heat, furnace, or melt number. The assignment of a series of lot serial numbers will be coordinated with the supplier by WANL Purchasing in order to determine an objective lot size consistent with raw material lots, manufacturing process, shipping schedule, and order size.

5.5 Effects of Changes Involving Existing Parts that have been Previously Serialized

5.5.1 Individual and Lot Serial Numbers (not involving multiple part changes)

Drawing or part number changes which require modification and/or re-identification shall have no effect on individual or lot serial numbers. The original serial number assigned shall be retained and shall not be obliterated or altered.

5.5.2 Individual Serial Numbers (changes involving multiple part numbers)

One individual serialized part reworked or modified and re-identified into two or more new part numbers shall have a new serial number assigned for each piece. The new serial numbers are to be assigned and recorded in the logbook by Material Control.

5.5.3 Lot Serial Numbers (changes involving multiple part numbers)

All parts previously lot serialized which are subsequently divided, segregated, reworked, modified, and/or re-identified into two or more new parts shall retain the original lot serial number.

6.0 PROCEDURE FOR SERIALIZATION AT WAFF

6.1 Assignment of Serial or Lot Numbers at Receiving Inspection

Lot or serial numbers shall be assigned by In-Process Inspection to all raw materials and components received at Receiving Inspection, with the exception of materials or parts in Quality Surveillance Class 3 or 4 (see QMP No. 5-3). The lot and serial numbers shall consist of a two-letter supplier code, assigned by In-Process Inspection, followed by consecutive numbers starting with "1", to a maximum of four digits. A master log shall be established by In-Process Inspection, consisting of a log sheet(s) for each supplier. Serial and lot numbers shall be assigned consecutively, as required, for all materials and parts received, continuing from P.O. to P.O. Each log sheet shall have, as a minimum, the following headings:

WAFF Lot/Serial Numbers

WAFF P. O. Number

WAFF Design Requirement (Part Number, Drawing/Revision, Specification, etc.)

Part Name

Quantity (Applicable to Lot Numbers only)

Supplier Name

Supplier Lot Number

Supplier Certification Number

Container Identification Numbers (see paragraph 6.1.1, below)

6.1.1 Container Identification Numbers

In addition to lot numbers, container numbers shall be assigned to all lots of material requiring individual container control through pre-processing. The container numbers shall be consecutive numbers, starting with "1" for each lot of material. If the supplier has assigned container identification numbers, those numbers shall be utilized, rather than assigning new numbers.

6.2 Serial and Lot Numbers Assigned During Manufacture at WAFF

Because of its classified and changeable nature, the information required for this paragraph will not be distributed with the Quality Control Manual. Concerned individuals may refer to WAFF Quality Engineering to obtain this information.

6.3 Recording of Assigned Serial and Lot Numbers

In addition to the master log required by paragraph 6.1, above, each Quality Control form, tag, etc., shall have provisions for recording serial and lot numbers, as required, to assure identification and traceability.

7.0 IMPLEMENTATION BY WANL AND WAFF SUPPLIERS

WANL Quality Control Representatives during visits to suppliers shall assure that subcontractors correctly mark raw material, detail parts, subassemblies, and assemblies with the required raw material, serial, or lot serial numbers. The serial numbers shall be marked on the parts at the earliest possible point of manufacture, and these numbers shall be maintained. If serial numbers are removed by manufacturing operations, they shall immediately be replaced as originally required. All documentation originated by the WANL suppliers shall reference the actual serial number or lot serial number involved. The terminology "all affected" shall never be used. If the documentation is intended to apply to the entire order, then the numbers will be listed in the following manner: "serial number A150 through A950". Shipping documents which accompany each shipment of parts shall reference the raw material identification numbers and shall correlate such numbers with the actual serial or lot serial numbers manufactured from each lot of raw material.

8.0 SYSTEM FOR ASSURING NON-DUPPLICATION OF SERIAL AND LOT SERIAL NUMBERS AT WANL

The Serial and Lot Serial Numbers assigned by Material Control are reviewed by Quality Control to assure that duplication does not exist. Upon receipt of the material and parts at WANL, Quality Control will verify that no serial or lot serial numbers have been used by the supplier which were not assigned and that there is no duplication of numbers.

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 4-4 Rev. _____

Effective Date 7/25/66

Supersedes
No. QMP(A)4-3 Date 10/1/65

SUBJECT: CHANGE CONTROL

1.0 PURPOSE

To establish a Quality Control paperwork control system that will insure: (1) control of all documentation affecting the quality program, and (2) incorporation of all the changes thereto.

2.0 APPLICABILITY

This procedure is applicable to the entire WAFF Quality Control paperwork control system.

3.0 REFERENCE

QMP No. 7-2, Inspection and Test Planning
QMP No. 7-1, In-Process Inspection
QMP No. 5-8, Receiving Inspection

4.0 GENERAL

The Quality Control paperwork control system is basically dependent upon the Work Orders and Work Order Change Notices processed by WANL to WAFF. In particular, the following basic conditions must exist in order for Quality Control to effectively control the quality paperwork system at WAFF:

1. Work Order Change Notices shall have a positively stated effectivity, preferably in terms of serial or lot numbers. Effectivity stated in terms such as "introduce change at earliest point possible" shall specify disposition of parts on which the change has not been made.
2. Drawings and specifications in the required revision must be available to Quality Control at WAFF when listed as a requirement on the Work Order or Work Order Change Notices.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

3. Ample time between the placing of the Work Order or the Work Order Change Notice and the implementation in Operations must be available to Quality Control to allow preparation of procedures and forms.
4. All Work Orders and Change Notices to them shall be approved by Product Control Engineering prior to being issued by Program Control at WANL.

5.0 PROCEDURE

5.1 In-Process Change Control

When Change Notices have been initiated by WANL Program Control, they will notify WAFF Product Control Engineering. The cognizant Product Control Engineer will review the Change Notice and designate on the Change Notice the applicable QIP number and revision which will define the in-process inspection change. Copies of all drawings, Engineering Change Notices (ECO's), Work Orders and Work Order Change Notices will be forwarded to In-Process Inspection, Data Systems and Quality Engineering immediately upon receipt at WAFF. The application of the correct revision documents within In-Process Inspection is the responsibility of the Supervisor of In-Process Inspection.

5.2 Purchased Material Change Control

QIP's, II's, and forms shall be prepared, as required, for each issue of raw material drawings and specifications (see QMP No. 7-2). Upon receipt of the raw materials, Quality Engineering shall perform, or have performed, the inspections and tests required by the applicable QMP's and II's (see QMP No. 5-8). The control of raw materials to assure proper usage is based on no raw material being available for use without an ACCEPT tag.

Ⓜ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 5-1 Rev.

Effective Date 7/25/66

Supersedes:
No. QMP(L) 5-1 Date 10-1-65
QMP(A) 5-1 10-1-65

SUBJECT: SUPPLIER QUALITY SURVEY AND EVALUATION

1.0 PURPOSE

To define the procedure for conducting a supplier survey and the evaluation of supplier quality capability.

2.0 APPLICABILITY

This procedure shall be applicable to all WANL and WAFF suppliers of raw materials, finished parts, and assemblies.

3.0 REFERENCES

None

4.0 GENERAL

4.1 Policy at WANL

4.1.1 It is the responsibility of WANL Quality Control to evaluate the quality capabilities of potential and current procurement sources. The evaluation will normally be the result of a survey conducted by WANL Quality Control, Purchasing, and Manufacturing Engineering Representatives at suppliers' plants.

4.1.2 Commercial and/or Off-the Shelf Items

When commercial or off-the-shelf items are to be procured and WANL has no previous quality record of the supplier, a survey of the supplier's facilities and quality control inspection system will not necessarily be required. In these cases, WANL Quality Engineering shall insure that a thorough inspection of the item is performed to determine conformance to procurement requirements.

4.1.3 WANL Specification and/or Drawing Items

When WANL specification and/or drawing items are to be procured, surveys and re-surveys may be performed:

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

- 4.1.3.1 Prior to the placement of a purchase order for items altered or manufactured to WANL specifications or drawings.
- 4.1.3.2 When a supplier has failed to maintain a suitable quality level.
- 4.1.3.3 When a supplier has moved his facility.
- 4.1.3.4 When requested by Purchasing.
- 4.1.3.5 When a major change is made in a supplier's organization.

4.2 Policy at WAFF

The WAFF Quality Engineering Section is responsible for surveying and rating the quality capabilities of potential and current procurement sources, as required. When agreed upon by the Manager of Product Assurance, the responsibility for performing particular surveys may be delegated to the Supplier Surveillance Section of the WANL Quality Control organization. Surveys of supplier's quality control and inspection systems may be undertaken at the discretion of Quality Control, or as requested by Purchasing or Process Engineering.

5.0 PROCEDURE

5.1 Notification to Supplier

Notification of intended survey shall be the responsibility of the Purchasing Department Representative of the survey team. Arrangements should be made such that adequate time is provided for thorough investigation of all factors influencing quality.

5.2 General Plant Tour

- 5.2.1 A general plant tour may be made to acquaint the survey team with the plant layout, processing equipment, shop systems, types of products, and general management attitude toward quality control.
- 5.2.2 The Quality Control Representative shall take this opportunity to evaluate housekeeping, machine maintenance and capabilities, availability of processing data, such as furnace charts and logbooks, the route card or traveler system (with particular attention to sign-off of inspection operations) and material handling.
- 5.2.3 A detailed inquiry into quality control areas during this general tour is not required.

5.3 Detailed Plant Survey

The Quality Control Representative, in the company of the supplier's responsible

quality control management representative, or his authorized representative, shall make a detailed tour of all quality control facilities, including manufacturing and inspection areas, shop offices, and engineering offices. The Supplier Survey Form 59065 shall be used for notes and to indicate preliminary answers to questions on the form. The Quality Representative shall indicate "Not Applicable" whenever necessary to questions which are not pertinent to the supplier.

5.4 Quality Control Area Survey

As outlined in the supplier survey form, the following areas of quality control shall be covered.

5.4.1 Quality Control organization and procedures

5.4.2 Inspection plans and practices (receiving, in-process, and final)

5.4.3 Adequacy of inspection and test equipment

5.4.4 Tool and gage control

5.4.5 Quality Control records

5.4.6 Identification and control of raw materials

5.4.7 Methods of indicating inspection status

5.4.8 Control of non-conforming material

5.4.9 Process control and follow-up

5.4.10 Drawing and change control

5.4.11 Availability and adequacy of written procedures covering area operations

5.5 Quality Control Representative Responsibilities

5.5.1 The Quality Control Representative shall obtain, if possible, a copy of the supplier's quality control manual, or other procedures for further study and evaluation at WANL.

5.5.2 When exit conferences are held, the Quality Control Representative should not commit himself either verbally or otherwise as to his evaluation or intent to approve or disapprove the supplier.

5.6 Forms to be Completed

5.6.1 Supplier Survey Form 59065

This form shall be completed by the Quality Control Representative at the time of the survey, as stated in paragraph 5.3, above. It is a self-explanatory form used to assist the surveyor in supplying detailed information about the suppliers Quality Control organization and practices. The completed form is used to assist the surveyor in making an evaluation of the supplier which is recorded on the Supplier Evaluation Form 59053.

5.6.2 Supplier Evaluation Form 59053

This form shall be completed within one day after completion of the survey by the Quality Control Representative and Manufacturing or Process Engineering Representative who made the detailed survey. When possible, the two parties should complete the form together. If this is not practicable, each representative will fill out the complete form except for the Area of Evaluation and Final Evaluation assigned to the other.

5.6.2.1 Area of Evaluation - Ratings of Excellent, Satisfactory, and Unsatisfactory are listed on the form for each item under evaluation in determining and to aid the recipient in understanding the supplier's over-all status.

The evaluator shall review the detailed Supplier Quality Survey form to assist in determining the status of each item under evaluation. He shall then place an "X" in the most appropriate column.

5.6.2.2 Comments - A statement by the evaluator must be entered in the Comment block for each Unsatisfactory rating. A clarifying statement must also be entered when an over-all status of Conditionally Approved or Disapproved is indicated.

5.6.2.3 Disposition - Only one status block (Approve/Disapprove) shall be selected to indicate the status of the supplier.

5.6.2.3.1 Approval - Selection of this disposition indicates that the supplier has met all necessary quality requirements and, upon approval by Manufacturing Engineering and Purchasing, the supplier will be added to the Evaluated Suppliers List as "Approved".

5.6.2.3.2 Disapproval - A disapproval evaluation shall eliminate a potential supplier from further purchasing consideration for a particular job unless positive corrective action has been taken to remedy the causes for disapproval. It is recognized that, although a prospective supplier may be ruled out for one type of product, he may be very capable in producing other items for which the quality requirements are less stringent or different. In the event that this situation is evident, it should be so noted on the Survey Evaluation Sheet, and an approval given to the supplier for the products which he is capable of producing to WANL or WAFF requirements.

5.6.2.4 Signatures— The form shall be signed and dated by the person performing the survey and his immediate supervisor.

5.7 Distribution of Forms

5.7.1 Supplier Survey Form 59065

This form is for Quality Control use only.

5.7.2 Supplier Evaluation Form 59053

A copy of the complete form shall be forwarded to the Purchasing buyer, who requested the survey. The original shall be kept in the Quality Control files.

ATTACHMENT A

Effective Date 7/25/66

Supplier File _____

WESTINGHOUSE ELECTRIC CORPORATION
ASTRONUCLEAR LABORATORY
PITTSBURGH 36, PENNSYLVANIA

QUALITY CONTROL SUPPLIER SURVEY

Effective Date 7/25/66

Date _____

Supplier: _____

Location: _____

Prepared by: _____

Supplier Personnel Contacted: _____

RELIABILITY/QUALITY ASSURANCE ORGANIZATION:

(Describe organization and function under this heading only when a supplier has engineering design cognizance over the material that will be supplied to WANL.)

QUALITY CONTROL ORGANIZATION AND POLICIES:

1. Quality Control Organization:

a. Q. C. Supervisor: _____

b. Reports to: _____

c. Does Q. C. report to manufacturing department

☐
yes

☐
no

Effective Date 7/25/662. Q. C. Personnel:

- a. Supervisory _____
- b. Q. C. Engineers _____
- c. Technicians/Inspectors _____
- d. Clerical _____
- e. Other _____

Total _____

	yes	no
3. Does supplier have a Q. C. Manual?	☐	☐
4. Is supplier familiar with WANL-QC-101?	☐	☐
5. Is supplier served by U.S. Government Source Inspection?	☐	☐
a. Resident ☐ Itinerant ☐		
b. Government Agency _____		
c. Area office _____		

RECEIVING INSPECTION:

1. Is Receiving Inspection performed on:

Raw Material? (Check test reports, coding, etc.)	☐	☐
Semi-finished Parts?	☐	☐
Finished Parts or Assemblies?	☐	☐

Comment on effectiveness and documentation _____

2. Are any applicable items not inspected?☐ ☐

a. Describe: _____

Conformance
In Practice

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Conformance
in Practice

3. Is a copy of the Purchase Order and WANL Drawing used as basis for inspection yes ☐ no ☐
- a. If not, what is? _____
4. Is a Test Report of chemical and physical properties properties secured on raw materials ☐ ☐
- a. Exceptions: _____
5. Is a Certificate of Conformance only secured on raw material? ☐ ☐
- a. Exceptions: _____
6. Is raw material identified? ☐ ☐
- a. How?
- ☐ Heat number - applied by _____
- ☐ Material spec. - applied by _____
- ☐ Color code - applied by _____
- ☐ Other: _____
7. Are property checks regularly performed to verify raw material? ☐ ☐
- a. If so, what?
- Hardness ☐
- Chemical ☐
- Tensile ☐
- Other _____
- b. If performed by other state laboratory name _____

Effective Date 7/25/66

Conformance
in Practice

c. Frequency of periodic checks:

- ☐ Sample of each lot
- ☐ Spot check of one sample per _____
- ☐ Not specified
- ☐ Other _____

8. Are test reports and certifications filed? ☐ yes ☐ no

How? _____

9. What degree of receiving inspection is performed on purchased items?

- ☐ Spot check
- ☐ Sampling per _____ plan.
- ☐ 100%
- ☐ Other: _____

Exceptions: _____

10. Is accepted material identified by the inspector? ☐ yes ☐ no

a. How? _____

11. Are receiving inspection records filed? ☐ yes ☐ no

a. How? _____

12. How are rejected parts

- a. reported? _____
- b. identified? _____
- c. disposed of? _____

13. Does supplier source inspect material ☐ yes ☐ no

Describe: _____

Conformance
in Practice14. Is supplier performance rated and recorded? ☐ yes ☐ no15. General Comments (Receiving Inspection):

_____**IN-PROCESS INSPECTION:**1. Is in-process inspection performed? ☐ yes ☐ no☐ by inspector☐ by _____2. Is inspection coverage available on all shifts? ☐ yes ☐ no3. Does inspector have the authority to stop
manufacturing due to low quality? ☐ yes ☐ no

a. How?

☐ Directly☐ Through Q. C. Supervisor☐ Through Shop Supervisor4. Are inspection operations preplanned and included
in the manufacturing sequence? ☐ yes ☐ no

a. How?

☐ Route card☐ Separate inspection instructions☐ Operation sheet☐ Inspect each operation☐ Other: _____

b. Type of in-process inspection performed:

☐ First piece☐ Patrol spot check☐ 100%☐ Sample per _

Other: _____

Conformance
in Practice5. Are in-process inspection results indicated? ☐ yes ☐ no

How?

- ☐ Inspection report
- ☐ Inspector sign-off on operation sheet
- ☐ Part is marked, stamped or tagged
- ☐ Other _____

6. Are in-process inspection records filed? ☐ yes ☐ no

How? _____

7. Are statistical control charts used? ☐ yes ☐ no

a. Type: _____

8. Are inspection instructions available in work area? ☐ yes ☐ no

Where? _____

9. Are procedures established for drawing and specification change control? ☐ yes ☐ no

a. How does inspector know he has latest drawing change? _____

b. Who accomplishes changes in shop? _____

10. General Comments (In-process inspection):

FINAL INSPECTION1. Is Final Inspection performed ☐ yes ☐ no

a. Type of final inspection

- ☐ 100% ☐ Spot Check
- ☐ Sample per _____
- ☐ Other: _____

b Exception: _____

2. Are final inspection operations specified on the operation sheet or route card? ☐ yes ☐ no
3. Are results of final inspection recorded? ☐ yes ☐ no
- by, ☐ Inspection Report ☐ Inspector sign-off on operation record
- ☐ Other _____

- 4 Are final inspection records filed? ☐ yes ☐ no
How?

- 5 Is inspection carried out on all over packaging and marking for fire resistance? ☐ yes ☐ no

a Description _____

b. General Comments (Final Inspection)

[illegible]

1. Is discrepant material identified? ☐ yes ☐ no

a. How?

- ☐ Stamp on part ☐ Stamp on paper work
- ☐ Other: _____

2. Is discrepancy statistically significant? ☐ yes ☐ no

a. How?

- ☐ ARP cannot lock, it controlled by ☐ yes ☐ no
☐ this locked?

☐ Other: _____

Conformance
in Practice3. Is a rejection report written by the inspector? ☐ yes ☐ no

a. Form used: _____

4. Are procedures established for determining disposition? ☐ yes ☐ no

a. How?

☐ Material review board (consist of): _____☐ Engineering review☐ Other: _____

b. Forms used to document: _____

5. Are rejection reports filed with other inspection records? ☐ yes ☐ no6. Are rejection records analyzed to establish quality "problem areas"? ☐ yes ☐ no

7. General Comments: (Discrepant Material Control)

INSPECTION EQUIPMENT:1. Does the supplier have an inspection or gage lab? ☐ yes ☐ no

a. If so, is it:

☐ Temperature controlled? _____ + _____ °F-Recorded?☐ Humidity controlled? _____ + _____ %-Recorded?

b. This lab environment could be described as:

☐ Ultra clean☐ Not clean☐ Clean☐ Somewhat cleaner than shop

Conformance
in Practice

c. If not, where does supplier calibrate his inspection tools?

Describe _____

2. General inspection equipment in plant.

(Cross out items not applicable to this survey)

Supplier list attached (obtain if available)

Listed below

Equipment	Remarks (kind/size/condition, etc.)	yes	no
Micrometer	_____	☒	☐
Vernier Caliper	_____	☐	☐
Height Gage	_____	☐	☐
Height Gage Std. (Pla-check, Hite set, etc.)	_____	☐	☐
Cylindrical Plug and Ring	_____	☐	☐
Thread Plug and Ring	_____	☐	☐
Snap Gages	_____	☐	☐
Electro Limit Gages	_____	☐	☐
Gage Blocks	_____	☐	☐
Super Micrometer	_____	☐	☐
Master Measuring Machine	_____	☐	☐
Surface Finish Analyzer	_____	☐	☐
Optical Flats	_____	☐	☐
Optical Comparator	_____	☐	☐
Dial Bore Gages	_____	☐	☐
Surface Plates	_____	☐	☐
Dial Indicators	_____	☐	☐
Air Gages	_____	☐	☐
_____	_____	☐	☐
_____	_____	☐	☐

Effective Date 7/25/66

Non-Destructive Inspection Equipment:

Equipment list attached

Listed below

<u>Equipment</u>	<u>Remarks</u>	yes	no
Hardness (Metal) _____		☐	☐
Hardness (other) _____		☐	☐
Tensile _____		☐	☐
Impact _____		☐	☐
Pressure Gages _____		☐	☐
Chem/Spectro Analysis _____		☐	☐
_____		☐	☐
_____		☐	☐
_____		☐	☐
Voltmeter _____		☐	☐
Ammeter _____		☐	☐
Ohmmeter _____		☐	☐
Insulation Tester _____		☐	☐
Continuity Tester _____		☐	☐
Oscilloscope _____		☐	☐
_____		☐	☐
_____		☐	☐
_____		☐	☐
_____		☐	☐
_____		☐	☐
_____		☐	☐

Non-Destructive Inspection Equipment & Certification

a. Liquid Penetrant

Qualified to:

Certified by:

Turco, Dy-Chk

☐

Magnaflux, Spotcheck

☐

Met-L-Check, Met-L-Check

☐

Other (Dye Penetrant) _____

☐

Zyglo (Type)

ZL-1b

☐

ZL-2

☐

ZL-22

☐

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b. Ultrasonics

Qualified to:

Certified by:

Type Instrument	☐	_____	_____
Reflectoscope (Sperry)	☐	_____	_____
Sonoray (Branson)	☐	_____	_____
Echoscope (Curtis Wright)	☐	_____	_____
Imerscope (Curtis Wright)	☐	_____	_____
Other _____	☐	_____	_____
Contact Immersion	☐	_____	_____

c X-ray

Type Machine _____	☐	_____	_____
KV _____ Focal Spot _____ MM	☐	_____	_____
Gamma Sources - Cobalted	☐	_____	_____
Iridium 192	☐	_____	_____
Cesium 137	☐	_____	_____
Other _____	☐	_____	_____

d. Magnetic Particle

AC DC Wet Dry	☐	_____	_____
------------------------	--------------------------	-------	-------

e. Eddy Current

Radac (Budd)	☐	_____	_____
Magnatest (Magnaflux)	☐	_____	_____

f. Other

_____	☐	_____	_____
-------	--------------------------	-------	-------

7. Does supplier have available all of the inspection equipment applicable to the job for which surveyed? ☐ yes ☐ no

a. If not, list services that would be purchased and from whom:

<u>Service</u>	<u>Source</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

6 General Comments (Inspection Equipment)

Effective Date 7/25/66

TOOL, GAGE AND INSTRUMENTATION CONTROLConformance
In Practice

1. Applied to:

- ☐ Mechanical Inspection Tools
- ☐ Electrical Inspection Tools
- ☐ Non-destructive Inspection Tools

Inspection Department				Production Department			
Company owned tools		Personally owned tools		Company owned tools		Personally owned tools	
yes	no	yes	no	yes	no	yes	no

2. Is a written procedure in effect for scheduled equipment calibration? ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
3. Does it cover receiving in-process and final inspection tools? ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
4. Are tool record cards maintained? ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
5. Do tool record cards show:
- a. Date of last calibration? ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
- b. Date of next calibration due? ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
- c. Results of calibration? ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
- d. Corrective action? ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
- e. _____ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
- f. _____ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
6. What procedure is used to certify that calibration is "current"? _____
- _____
- _____

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SUPPLIER EVALUATION
W form 59053C

ATTACHMENT B

QMP No. 5-1 Rev. _____
Effective Date 7/25/66
DATE _____

TO: PURCHASING DEPARTMENT REPRESENTATIVE _____

VENDOR _____

ADDRESS _____

NOTE: All areas must be completely defined. Use attachment if necessary.

BASIS OF EVALUATION - VENDOR CAPABILITY

1. General type of work (Precision Machining, Welding, Forging, etc.) or specific part (Core Support Plate, etc.) - _____
2. Approximate size and weight - _____
3. Material or general types of material - _____
4. Special Products - _____

AREA OF EVALUATION	EXCELLENT	SATISFACTORY	UNSATISFACTORY
<u>Quality Control</u>			
1. Quality Control organization and procedures	E	S	U
2. Inspection plans and practices (receiving, in-process and final)	-	-	-
3. Adequacy of inspection and test equipment	-	-	-
4. Tool and gage control	-	-	-
5. Quality Control records	-	-	-
6. Identification and control of raw materials	-	-	-
7. Methods of indicating inspection status	-	-	-
8. Control of non-conforming material	-	-	-
9. Process control and follow up	-	-	-
10. Drawing and change control	-	-	-
<u>Manufacturing</u>			
1. Production scheduling, control and reporting capabilities	-	-	-
2. Engineering/planning for tool design and mfg., if applicable	-	-	-
3. General condition of facilities (orderliness, layout, etc.)	-	-	-
4. Condition of equipment applicable to WANL work	-	-	-
5. Adaptability of equipment to WANL work	-	-	-
6. Experience with tolerances for WANL type work	-	-	-
7. Interest and general attitude toward WANL work	-	-	-
8. Adaptability of personnel to WANL work	-	-	-
9. Number of production employees	-	-	-
10. Current number of shifts and hours per shift	-	-	-
11. Past experience with similar type parts and material	yes	no	
12. Can vendor perform all required operations	yes	no	
If no, list operations to be sub-contracted _____			

COMMENTS:

	Approved	Disapproved	Surveyed by - Date	Approved by - Date
Quality Control				
Manufacturing				

⑦ QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. <u>5-2</u> Rev. _____
	Effective Date <u>7/25/66</u>
	Supersedes: No. <u>QMP(L) 5-2</u> Date <u>10-1-65</u> <u>QMP(A) 5-2</u> <u>10-1-65</u>

SUBJECT: QUALITY REQUIREMENTS FOR PROCUREMENT DOCUMENTS

1.0 PURPOSE

To establish the procedure for providing Quality Requirements on Purchase Requisitions, Purchase Requisition Change Notices, Work Orders, and Work Order Change Notices and to insure that the requirements are clearly conveyed to the subsequent supplier.

2.0 REFERENCE

QMP 5-1, "Supplier Quality Survey and Evaluation"

QMP 5-3, "Quality Surveillance Codes"

3.0 GENERAL

3.1 Policy

It is the responsibility of Quality Control to define and/or review the Quality Requirements applicable to procurement documents. Their issuance is monitored to insure that the quality requirements are clearly conveyed to the responsible recipients.

3.2 Scope

This procedure shall apply to all Purchase Requisitions and Purchase Requisition Change Notices for materials, components, or services. It shall also apply to all Work Orders and Work Order Change Notices related to materials, components, or services that are required to manufacture, repair, assemble, test, handle, monitor, or safeguard the reactor or reactor components.

APPROVALS:

WANL Q.C. Mgr.	WAFF Q.C. Mgr.	Product Assurance Mgr.	Program Manager

4.0 PROCEDURE

4.1 Requisitioner

In addition to the pertinent ordering information, it shall be the responsibility of the requisitioner to apply the proper surveillance class to Purchase Requisitions as defined in QMP 5-3 so that reactor specification grade materials, components, or services can be readily identified. Surveillance classes need not be applied to Purchase Requisition Change Notices unless the surveillance class is changed and so noted on the Purchase Requisition. The surveillance class on the original Purchase Requisition shall otherwise remain applicable.

4.2 Quality Control

4.2.1 It is the responsibility of Quality Control to review all drawings, specifications, special instructions, and all information related to the applicable Purchase Requisitions, Purchase Requisition Change Notices, Work Orders, and Work Order Change Notices to insure that the quality requirements are adequate and clearly stated.

4.2.2 When required, Procurement Quality Requirements (PQR, Form 59040) shall be prepared for WANL Purchase Requisitions or Purchase Requisition Change Notices by a Quality Engineer. The PQR shall be referenced on, become part of, and be included with the applicable Purchase Requisition or Purchase Requisition Change Notice. A PQR or revision may also be generated for the following reasons:

4.2.2.1 A specific request from the requisitioner and/or other interested persons.

4.2.2.2 Changes in design, ordering requirements, manufacturing methods, quality requirements, etc.

4.2.3 When fueled or unfueled elements are procured from suppliers with funds supplied directly by SNPO, Program Control will issue a Program Control Memorandum (PCM) to SNPO and the supplier listing all applicable drawings and specifications. Upon receipt of the PCM, WAFF Product Control Engineering will issue a PQR. Copies of the PQR will be forwarded to the supplier by Program Control and will become a part of the procurement definition.

- 4.2.4 When Quality Control authorizes a shipment to NRDS from a supplier (Drop Ship) without WANL inspection, NRDS Quality Control will be requested to inspect the part when received with an Inspection Request Letter. A copy of the Purchase Requisition, PQR, and ECO (if applicable) and all other significant documents shall be included. A note shall also be affixed to the requisition to inform Purchasing to forward a copy of the resulting Purchase Order to NRDS Quality Control.
- 4.2.5 Quality Control will sign and date all Purchase Requisitions, Purchase Requisition Change Notices, Work Orders, and Work Order Change Notices to indicate that all quality requirements are included and are adequate and clear. WANL Work Orders and Work Order Change Notices which are issued to the Astrofuel Facility (WAFF) will be approved by WAFF Product Control Engineering. The applicable Quality Inspection Procedure (QIP) which will be applied at WAFF will be displayed on the Work Order or Change Notice.
- 4.2.6 Procurement documents that are not adequate shall be returned for applicable information.
- 4.2.7 A sample of the Procurement Quality Requirement (PQR), Form 59040, and instructions for completing them are shown as Attachments B through G.
- 4.2.8 Audits shall be performed by Quality Control to insure that all drawings, specifications, revisions, special instructions, and quality requirements (including Procurement Quality Requirements--PQR) referenced on an Approved Purchase Requisition and Purchase Requisition Change Notices are also referenced on and become part of the final Purchase Order and Purchase Order Change Notice.
- 4.3 Purchasing
- 4.3.1 In all procurement actions excepting those concerning SNPO element funding (Ref. 4.2.3, above), it is the responsibility of Purchasing to insure that all drawings, specifications, revisions, special instructions, and quality requirements (including Procurement Quality Requirements--PQR's) are referenced on and become part of the Purchase Order. Purchase Requisition Change Notices are not to be processed without a Quality Control signature.
- 4.3.2 The PQR is a three-page form with the last two pages, Attachments 1 and 2, consisting of an explanation/amplification of page one. Attachment 1 may be used for listing the specific raw material certifications/certified test reports required. A copy of the PQR shall be filled out for each PR, utilizing Attachment 1, as desired. The PQR shall be attached to the PR,

and the PR shall be signed to denote Quality Engineering approval. The PR and PQR shall be sent to Purchasing, where copies of the PQR shall be made, as required, for the Purchase Order (PO). The masters of the PQR and Attachment 1 shall be returned to Quality Engineering for filing.

4.4

Flow Chart

The Procurement Procedure for Purchase Requisitions, Purchase Requisition Change Notices, Work Orders, and Work Order Change Notices is illustrated by the Flow Chart shown on Attachment A.

PROCUREMENT PROCEDURE

ATTACHMENT B

QMP No. 5-2 Rev. _____

Effective Date 7/25/66

INSTRUCTIONS FOR FILLING OUT THE PQR

<u>Block</u>	<u>Data Required</u>
(1) Part No.....	Part number or other identification as stated on the PR.
(2) Part Name	Part name as stated on the PR.
(3) PRM.....	Fill in block to indicate the document that authorizes the purchase.
(4) Requirements designated by.....	This block may be completed to allow applying the PQR to a later drawing revision.
(5) Q.C. Spec.....	Check if required; fill in revision of WANL-QC-101; check blocks to denote whether or not WANL-QC-101 is applicable in its entirety and, if not, list the paragraphs that are requirements.
(6) Bidder shall furnish.....	Check block to denote that the supplier shall submit an inspection plan or procedure. This shall be required if, in the opinion of the Quality Engineer, the parts being ordered are of a critical nature and a review of the inspection plan is justified. Note that this point applies only to bid packages.
(7) Supplier shall submit a.....	Same as paragraph 3, above, except this point applies to orders only.
(8) Manufacturing Process Outline.....	Check block to denote that the supplier shall submit a Manufacturing Process Outline if, in the opinion of the Quality Engineer, the parts being ordered are of a critical nature and "hold" or "release points" are justified. "Hold" or "release points" may also be required if inspection or testing of particular characteristics can be performed or verified <u>only</u> during the manufacturing cycle.
(9) Non-destructive Testing Procedures.....	Check block to denote that non-destructive testing procedures are required for review if, in the opinion of the Quality Engineer, it is necessary to assure that the supplier's procedures are adequate to verify quality of the parts.

INSTRUCTIONS FOR FILLING OUT THE PQR (cont.)

<u>Block</u>	<u>Data Required</u>
(10) Processing procedures required.....	Check block to denote that processing procedures are required for review if, in the opinion of the Quality Engineer, it is necessary to assure that the supplier's procedures are adequate. The necessity for reviewing the procedures may be justified by the critical nature of the parts, or the expected difficulty in performing the operation.
(11) Statement of Conformity....	Check block if, in the opinion of the Quality Engineer, a Statement of Conformity is desirable. When the Supplier's Quality Certificate and Shipping Release Form (No. 59036) is used, a Statement of Conformity is not necessary.
(12) First Piece Inspection Required.....	Check block if, in the opinion of the Quality Engineer, first piece inspection is desirable to assure that a manufacturing process is capable of producing a desired quantity. State the quantity required to be inspected and the point at which the inspection shall be performed (see Paragraph 9 of Attachment 2).
(13) WANL source inspection.....	Check if source inspection is desired before shipment and list "Hold" or "Release Points" where source inspection is also required.
(14) Others (Specify)	List requirements which have not been covered in points 1 through 10.

Westinghouse Electric Corporation

ASTRONUCLEAR LABORATORY
P.O. Box 10864, Pittsburgh, Pa. 15236

QMP No. 5-2 Rev. _____

Effective Date 7/25/66

NOTE: Not complete without Attachment No. 1 and Attachment No. 2

PART NO.—CONSISTING OF DWG. NO.
ITEM OR ASS'Y. NO. AND REV.

PART NAME:

WANL INTERNAL USE ONLY

☐ PRM ☐ _____

Requirements designated by an "X" below are supplemental to or amplify the quality requirements called for in the specified procurement documents.

☐ This PQR is identical to previous PQR, for Revision _____ of above Part Number. It is issued only for upgrading to above revision.

No.

1. ☐ Q.C. Spec. WANL 101—Rev. _____ is applicable ☐ entirely ☐ following paragraphs _____
2. ☐ Submittals as required by Attachment No. 1: Materials will not be accepted at WANL unless accompanied by all reports and certifications designated on Attachment No. 1.
3. ☐ Bidder shall furnish his proposed inspection plan and/or procedure, showing principal gaging methods to be used and documentation that would result, with bid package, for WANL Q.C. evaluation.
4. ☐ Supplier shall submit a detailed inspection plan and/or procedure for all dimensional characteristics on all parts, assemblies, etc., for WANL Q.C. approval, 10 days prior to manufacturing. When necessary to define an inspection plan and/or procedure, sketches or drawings of tools, gages, etc., shall be submitted for WANL approval. Inspection plans and/or procedures shall be submitted on Approval Request, WANL Form 59003. If continuation sheets are necessary, Approval Request Continuation Sheet, WANL Form 59182, shall be used.
5. ☐ Manufacturing Process Outline—Required 10 days prior to manufacturing for review and incorporation of "Hold or Release Points". (Points in processing cycle where WANL inspection is required prior to further processing) Manufacturing Process Outline to be issued on Approval Request, WANL Form 59008. If continuation sheets are necessary, Approval Request Continuation Sheet, WANL Form 59182, shall be used.
6. ☐ Nondestructive testing procedures—Required 10 days prior to use for WANL approval.
 - ☐ Ultrasonic ☐ Radiograph ☐ Liquid Penetrant
 - ☐ Others (specify) _____
7. ☐ Processing procedures required—Required 10 days prior to use for WANL approval.
 - ☐ Welding ☐ Heat Treating ☐ Plating or Cladding
 - ☐ Brazing ☐ Others (specify) _____
8. ☐ Statement of Conformity: The Statement of Conformity must accompany all shipments of materials, parts, assemblies, etc.
9. ☐ First Piece Inspection required. Quantity required: _____
Inspection Phase _____
10. ☐ WANL source inspection required prior to shipment, also at following "Hold or Release Points" _____
11. ☐ Others (specify) _____

PREPARED BY QUALITY ENGINEER

DATE

PART NAME:

WANL INTERNAL USE ONLY

☐ PRM ☐

DRAWING
ITEM NO.

SPECIFICATION

PARA. NO.

**RAW MATERIAL CERTIFICATIONS/
CERTIFIED TEST REPORTS REQUIRED**

COPIES REQUIRED

Westinghouse Electric Corporation

ASTRONUCLEAR LABORATORY
P O. Box 10864, Pittsburgh, Pa. 15236

QMP No. 5-2 Rev. _____
Effective Date 7/25/66

All paragraphs are considered self-explanatory, except the following which are supplemented by the conditions and explanations as outlined.

Whenever a box is checked, the paragraph following the box applies.

2—SUBMITTALS AS REQUIRED BY ATTACHMENT NO. 1:

ACTUAL CHEMICAL AND PHYSICAL REPORT

Certified reports shall be supplied containing all information regarding actual chemical and physical properties in accordance with applicable specifications. In the event that this information cannot be obtained from mill, supplier shall submit test bars, wafers, strips, etc., to a laboratory for a chemical and physical analysis report. All testing and analyzing laboratories require prior approval by WANL. In the event material is received in separate lots by supplier, individual reports shall be submitted. If material is shipped to WANL in separate lots, but was manufactured from same heat, melt or batch, reports shall be submitted on initial shipment and report referenced on all applicable shipments thereafter.

Actual chemical and physical reports shall include as minimum requirements the following:

- A) WANL Purchase Order Number.
- B) WANL Part Number and Part Name.
- C) Material—Type Designation and Applicable Specifications.
- D) Quantity per shipment as received, i.e., 1—4" Diameter Bar x 12' long, C R S. Type 304. Must have Part No. or Lot No. as applicable.
- E) Heat, melt or batch number applicable to raw material used.
- F) Chemical analysis of each heat, melt or batch showing actual percentage of each element. When so designated by WANL, where aluminum alloys are being used, percentage range may be specified.
- G) Physical analysis of heat, melt or batch showing actual mechanical properties.
- H) Shall be signed by an authorized company representative.

CERTIFICATE OF COMPLIANCE

Certification will be supplied stating that all material specification requirements have been complied with and that substantiating data to verify compliance is on file and available to WANL. Actual Test Reports are not required. In the event material is received in separate lots by supplier, individual Certificates of Compliance shall be submitted. If material is shipped to WANL in separate lots but was manufactured from one lot received by supplier, Certificate of Compliance shall be issued on initial shipment and referenced on all applicable shipments thereafter.

Certificates of Compliance shall include, as minimum requirements, the following:

- A) WANL Purchase Order Number.
- B) WANL Part Number and Part Name.
- C) Material—Type Designation and applicable specifications.
- D) Quantity per shipment as received, i.e., 1 1/8" x 48" x 96" aluminum Type 2024ST4. Must have Part Number or Lot Number as applicable.
- E) Shall be signed by an authorized company representative.

CERTIFIED TEST REPORTS

These reports are specification requirements (Government, WANL, etc.) and are found classified and listed on Attachment No. 1

4—DETAILED INSPECTION PLAN AND/OR PROCEDURE

All dimensional characteristics on the drawing must be accounted for showing a method of their inspection. Parts will be identified with the inspection plan and/or procedure by means of part number and/or serial number when applicable. For clarity, drawing characteristics location should be noted. Sampling will not be permitted without prior approval from WANL. The gaging equipment used for an inspection should ensure accurate, reproducible and meaningful inspection data. Care should be exercised when selecting this equipment to ensure it will not damage the inspected parts. The following is a listing of mandatory gaging equipment for various tolerance limits, however, consideration will be given to alternate methods.

GROUP I—DIMENSIONS WITH A TOLERANCE OF LESS THAN $\pm .0005"$

- 1) Suitable air, electronic or mechanical gage. (Specify type and give detailed particulars)

GROUP II—DIMENSIONS WITH A TOLERANCE OVER $\pm .0005"$ TO $\pm .002"$

- 1) Gage blocks.
- 2) Dial Indicators graduated in increments of .0001".
- 3) Height Gages with appropriate indicators.
- 4) Comparator Gages
 - Electronic, graduated in increments of .0001".
 - Electrolimit, graduated in increments of .0001".
 - Dial, graduated in increments of .0001".
 - Optical, graduated in increments of .0001".
- 5) Gage standards—linear.
- 6) Hite and Check Sets.
 - Optical
 - Micrometer Head
- 7) Supermike.
- 8) Standard measuring machine.
- 9) Internal measuring machine.
- 10) Toolmaker microscope, graduated in increments of .0001".
- 11) Precision squares.
- 12) Dial Bore Gage, graduated in increments of .0001".
- 13) Air gages.
- 14) Optical comparator with overlay charts—50X min.

GROUP III—DIMENSIONS WITH TOLERANCES OVER $\pm .002"$ TO $.005"$.

- 1) Dial indicators, graduated in increments of $.001"$.
- 2) Inside micrometer.
- 3) Depth micrometer.
- 4) Outside micrometer.
- 5) Intrimik.
- 6) Optical comparator with overlay chart—20X min.

QMP No. 5-2 Rev. Effective Date 7/25/66GROUP IV—DIMENSIONS WITH TOLERANCES OVER $\pm .005"$ TO $.015"$.

- 1) Vernier calipers.
- 2) Vernier height gage.
- 3) Small hole gage with applicable Comparison Gage.
- 4) Telescope gage with appropriate Comparison Gage.
- 5) Optical comparator with overlay 10X chart.

GROUP V—DIMENSIONS WITH TOLERANCES OF $\pm .015"$ AND GREATER.

- 1) Steel rule or scale to the nearest fraction or decimal.
- 2) Steel tape nearest fraction or decimal.
- 3) Radius gage.

GROUP VI—ANGULAR DIMENSIONS WITH TOLERANCES OF FIVE (5) MINUTES.

- 1) Optical Dividing head.
- 2) Sine bar and plate.
- 3) Optical comparator.
- 4) Vernier bevel protractor (for tolerances of 15 minutes).
- 5) Auto—collimator.
- 6) Rotary Index Table.

GROUP VII—SURFACE ROUGHNESS.

- 1) Less than 125 microinches—Electric tracer type surface roughness measuring instrument.
- 2) 125 to 500 microinches—Surface roughness comparison standards.
- 3) Greater than 500 microinches—Scratch depth gage.

GROUP VIII—MATERIAL HARDNESS

- 1) Hardness tester.

GROUP IX—DECIMAL TOLERANCES CONTOURS AND RADII

- 1) Impression compound and optical comparator.

8- STATEMENT OF CONFORMITY

This document shall verify that all requirements of WANL Purchase Order and the Procurement Quality Requirements have been accomplished. WANL Form 59036 (Suppliers Quality Certificate and Shipping Release) will be adequate if WANL Source Inspection is performed and P.Q.R. calls for Statement of Conformity.

If WANL Source Inspection is not required and Statement of Conformity is required, the supplier may use WANL Form 59036 or his form, providing the supplier certifies that the requirements of WANL Purchase Order and Procurement Quality Requirements have been accomplished.

9- FIRST PIECE INSPECTION REQUIRED

When so designated, First Piece Inspection will be performed. It will be necessary to inspect the part and/or assembly 100%, to determine whether manufacturing methods processes, tooling, etc., are producing adequately. A complete Inspection Log, logging all dimensions, will be required and entitled "First Piece Inspection Log". It shall be mandatory to perform all dimensional "First Piece Inspections" in the presence of WANL Supplier Surveillance personnel. All destructive test or try-out "First Piece Inspections" must be performed at WANL or designated laboratory. Supplier will be notified of acceptance or rejection. First Piece Inspection in no way relieves the supplier of his responsibilities for continuous quality on production parts and/or assemblies. Quantity of parts and/or assemblies required will be predicated upon the various phases of inspection, testing (including destructive testing), dimensional, tryout, etc., as necessary. These qualities will be so noted and designated as to what phase they will be subjected. Production will not proceed until First Piece Inspections have been completed and approved in all phases, unless written information has been received from WANL to the contrary.

GENERAL

- A) The supplier is not permitted to deviate from any of the requirements unless written permission is received from WANL.
- B) In addition to the requirements of WANL Purchase Order, "Terms and Conditions", Article 12—Paragraph (d), prior approval must be obtained from WANL if the supplier proposes to subcontract work on parts and/or assemblies on this order in the following categories:
 - 1) Welding
 - 2) Brazing
 - 3) Heat Treatment
 - 4) Hard Facing
 - 5) Laboratory Testing Analysis
 - 6) Non-Destructive Testing
 - 7) Special Inspection Operations

Supplier's request for approval of subcontractors should include sufficient information on the subcontractors facility and capabilities to justify the supplier's request for approval and enable WANL to properly evaluate the subcontractor. A WANL approved evaluation of a supplier's subcontractor does not relieve supplier's responsibility for subcontractor's quality requirements.

- C) It is emphasized that the supplier is solely responsible for the quality of his product and that any participation by the purchaser, including Receiving Inspection and Source Inspection, is for the purpose of verifying conformance to contractual quality requirements and in no way relieves the supplier of his responsibility.

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 5-3 Rev.

Effective Date July 25, 1966

Supersedes
No. QMP(AL)5-3 Date 12-15-65

SUBJECT: QUALITY SURVEILLANCE CODES

1.0 PURPOSE

To define the procurement Quality Surveillance Codes, establish related responsibilities and identify the degree of surveillance to be exercised by Quality Control over various phases of design, procurement, testing, etc. as may be required.

2.0 REFERENCE

QMP No. 4-1, Drawing Review
QMP No. 5-2, Quality Requirements for Procurement Documents
QMP No. 8-1, Nonconforming Material Disposition
QMP No. 8-2, Variation Requests
Divisional Procedure No. 300GO, "Engineering Drawing Codes"

3.0 GENERAL

The quality surveillance exercised on a given item, from the initial design stage through delivery and end use depends largely upon the status of the design and the quality confidence level desired. The degree of surveillance required establishes the procedures and controls necessary to monitor the various activities through design, procurement, receiving inspection, testing and shipping. This degree of Quality Control surveillance should be commensurate with the applicable contract quality plan objectives. This procedure shall apply to all purchase requisitions and orders, purchase requisition and order change notices, work orders and work order change notices as referenced in QMP No. 5-2.

4.0 PROCEDURE

4.1 Quality Surveillance Codes

As defined in the referenced WANL Divisional Procedure, all WANL drawings are prepared in accordance with the characteristics of a series of drawing codes, (Code 1 through Code 4) designed to depict drafting practices and drawing quality commensurate with the end use and/or contract requirements. These codes are shown in the title block on each drawing.

APPROVALS:

WANL Q.C. Manager	WAFF Q. C. Manager	Product Assurance Mgr.	Program Manager

The assignment of Quality Control Surveillance Codes shall be consistent with the Drawing Code designations. Under no circumstances will the assignment of Surveillance Codes be less than the designated drawing code. For example, Quality Surveillance Codes 1 or 2 may be specified for a Code 2 drawing, but Surveillance Codes 3 or 4 are not permitted.

Where items are not covered by WANL drawings, the degree of Quality Control coverage shall be determined by evaluating the end use requirements, the interface objectives, the quality level desired and selected in accordance with the following Quality Surveillance Code descriptions:

4.1.1 Surveillance - Code 1 and Code 2

Includes all items designated and ordered for engineering and contractual development tests and all related support equipment which could affect the quality of the test effort, the test system reliability and the results of the test program. It also includes all items described by drawings and/or specifications as well as all articles to be delivered to customer and/or test sites where reliability and quality are to be maintained at the highest levels.

Typical Examples -

Drawing Code 1

End Item Control Systems
Shipping Containers
Interface Control Assemblies
Test Articles (top assembly)
Test Article Backup and Raw
Material Items
Liquid Metal Pumps
Space Radiators
Reactor Hardware (including backup
and experimental parts)
High Pressure Piping
High Temperature Facilities
Test Car and Piping Assembly
Turbo-generator Hardware
Instrumentation for Reactor and other
Test Article Diagnostic Data

Drawing Code 2

Test Car Assembly
Electronic Checkout Systems
Instrumentation (diagnostic data)
Critical Assembly and Disassembly
tools, fixtures and non-
reactor/test articles.
Test fixtures and test hardware
having safety and reliability
consideration
Lifting and handling fixtures
Test Facility Pressure Vessels
Reactor Pressure Vessels
Ground Support Nuclear Instru-
mentation and Radiation
Safety Devices
Customer End Items

Degree of Surveillance - The type and degree of Quality Control Coverage shall be the same for both Surveillance Codes 1 and 2. Items falling under these codes shall receive full Quality Control coverage as determined by the cognizant Quality Engineer.

⑧ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation

QMP No. 5-3 Rev. _____

Effective Date July 25, 1966

All drawings designated as Codes 1 and 2 shall be reviewed and signed by Quality Control in accordance with referenced procedure QMP No. 4-1.

Deviation and waiver requests shall be submitted for disposition in accordance with referenced procedure QMP No. 8-2.

Nonconforming parts will be submitted to the Engineering Review Board for disposition in accordance with referenced procedure, QMP No. 8-1.

Nonconformities on End Item assemblies will be submitted to full Material Review Board for disposition.

4.1.2 Surveillance Code 3

Includes all hardware, raw materials and assemblies designated for development and experimental engineering tests and evaluation. Also includes all related instrumentation, support equipment, hardware and non-critical assembly and disassembly tools intended for use at WANL which are procured to commercial specifications, where the reliability and quality of such items can have a direct affect on the evaluation results.

Typical Examples -

Capital equipment such as Instrumentation and measuring devices.	Facility tools and safety monitoring devices.
Gauges (non-interfacing)	Mock ups
Non-critical Assembly and Disassembly tools.	ASME Coded Pressure Vessels
Component Containers	Impregnated graphite
	Neutron moderators

Degree of Surveillance - The requisitioner will be responsible for defining in the ordering documents the desired Quality Control coverage. The cognizant Quality Engineer will review all Code 3 procurements to ensure that the degree of quality control specified can be provided and is consistent with the objectives of the test program. Quality Control procedures and documents will be initiated where necessary.

Drawings designated as Code 3 will be reviewed and signed by Quality Control when requested by the cognizant design engineer in accordance with referenced procedure QMP No. 4-1.

Where Quality Control procedures and documents are implemented, deviations, waivers and nonconforming parts shall be dispositioned in accordance with referenced procedures, QMP No. 8-1 and QMP No. 8-2.

4.1.3 Surveillance Code 4

Limited to standard items or supplies for facility maintenance and services where the quality of such items will not affect the performance or reliability of the products being supplied to WANL customers. The requisitioner will be responsible for making this determination.

Degree of Surveillance - Quality Control input will not be provided. Code 4 drawings will not be reviewed or signed by Quality Control.

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 5 - 4 Rev. _____

Effective Date 7/25/66

Supersedes

No. QMP(L) 5-4 Date 10/1/65

QMP(A) 14-3 10/1/65

SUBJECT:

CORRECTIVE ACTION AT SUPPLIERS

1.0 PURPOSE

To establish a procedure for obtaining corrective action for all external discrepancies and deficiencies.

2.0 APPLICABILITY

This procedure shall be followed whenever, in the estimation of the cognizant Quality Control organization, corrective action for external discrepancies and deficiencies is necessary.

3.0 REFERENCE

QMP 8-2, Variation Request

4.0 GENERAL

4.1 Policy

It is the responsibility of Supplier Surveillance at WANL and Quality Engineering at WAFF to take prompt action to correct conditions at suppliers' plants which have resulted or might result in substandard or defective materials, parts, assemblies or services. Initiation of corrective action for fuel element suppliers is, however, an exception and shall be the responsibility of Product Control Engineering at WAFF. Disregard or unsatisfactory resolution of Request for Corrective Action (RCA) shall be cause for removal of a supplier from the approved procurement sources list.

5.0 PROCEDURE

5.1 The RCA shall be initiated whenever, in the estimation of the cognizant Quality Control organization, the following unsatisfactory conditions are found to exist and require formal corrective action.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

- 5.1.1 Supplier Quality Control written systems or procedures are inadequate to meet the requirements of WANL and WAFF drawings, specifications or other Quality Control requirements specified in the Purchase Order.
- 5.1.2 Supplier Manufacturing or Quality Control practices are detrimental to the quality of raw material or hardware produced for WANL and WAFF.
- 5.1.3 Supplier inspection results are found to be incomplete or incorrect as determined by Quality Control representatives.
- 5.1.4 Supplier hardware or raw material is found to be outside of drawing and specification limits (not previously authorized by Variation Request - see QMP 8-2) as determined by Westinghouse Receiving Inspection or subsequent use.
- 5.2 Preparation and Use of Request for Corrective Action (Ⓢ Form No. 59072)
 - 5.2.1 Originating the RCA
 - 5.2.1.1 The WANL Supplier Surveillance representative or the Quality Engineer at WAFF will complete the top portion of the RCA as follows:
 - 5.2.1.1.1 The date shall be the date on which the RCA is originated.
 - 5.2.1.1.2 The RCA shall specifically describe the deficiency with regard to drawing numbers, items, characteristics, specification sections, serial numbers, as applicable.
 - 5.2.1.1.3 Consequence of noncompliance should be briefly stated to supplier if not obvious.
 - 5.2.1.2 The WANL Supplier Surveillance Supervisor at Large or the Quality Engineering Supervisor at WAFF shall maintain a log and assign a number to each RCA. The numbering system shall be consecutive, beginning with number one and progress numerically, regardless of purchase order number, for each supplier involved. In addition, he shall countersign the RCA in the space provided.
 - 5.2.1.3 Four copies of the form will be sent to the cognizant buyer along with a cover letter signed by the initiating Engineer's Supervisor. The buyer shall forward three copies of the RCA to the involved supplier's Quality Control Manager for his reply.

5.2.2 Supplier Responsibilities

5.2.2.1 The supplier's Quality Control Manager shall complete the second part of the form. It should be noted that the expected completion date is required.

5.2.2.2 The supplier shall return two copies to the cognizant buyer who, in turn, will forward one copy of the RCA to the initiating Engineer's Supervisor.

5.3 Corrective Action Follow Up

5.3.1 Upon receipt of the RCA with the supplier's proposed corrective action from the cognizant buyer, the cognizant supervisor shall indicate his comments as to acceptance or rejection of the proposed corrective action. If the proposed corrective action is not acceptable, the RCA is returned to the cognizant buyer to be sent back to the supplier, stating that his corrective action has not been accepted by WANL and WAFF. In the event that an RCA is not acceptable, the procedures as outlined in Paragraphs 4.2.1.3, 4.2.2.1 and 4.2.2.2 will be followed.

5.3.2 Upon receipt of an acceptable proposed corrective action, the cognizant Quality Control Supervisor will notify the Westinghouse Quality Control representative who will follow through to verify suppliers compliance.

5.3.3 Unsatisfactory performance of the proposed corrective action shall be cause for the initiation of another RCA or eventual removal from the WANL and WAFF Evaluated Suppliers List.

(W)

REQUEST FOR CORRECTIVE ACTION

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh 36, Pennsylvania

Number _____
Previous RCA No. _____

To:

Supplier and Address

Purchase Order No.

A quality investigation has shown the following deficiency which affects or can affect the quality of our product. Corrective action must be initiated.

Consequence of uncorrected deficiency:

Concurred:	Q. C. Supervisor	Date	Initiated by:	Q. C. Rep.	Date
------------	------------------	------	---------------	------------	------

To be completed by supplier within 5 working days after receipt.
Supplier's Corrective Action:

Corrective action will be completed by (date) _____.

Signature of Supplier Representative

Title

Date

Quality Control Follow-up Comments:

⑦ QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. <u>5 - 5</u> Rev. _____ Effective Date <u>7/25/66</u> Supersedes: No. <u>QMP(L) 5-5</u> Date <u>1/20/66</u>		
SUBJECT: RECEIVING, IN-PLANT, AND IN-PROCESS INSPECTION OF NON-FUEL COMPONENTS			
<div style="margin-bottom: 10px;"> 1.0 PURPOSE To establish the procedures to be used in Inspection. </div> <div style="margin-bottom: 10px;"> 2.0 APPLICABILITY This procedure shall be applicable to (1) all inspections performed by the Quality Control organization without regard to the location within the plant in which the inspection is being performed (Reactor Assembly excepted), (2) WANL Purchase Orders and Work Orders for all Quality Surveillance Codes 1 and 2 and, when specified by the cognizant engineer, Code 3, and (3) all Government Furnished Property and Customer Furnished Property. </div> <div style="margin-bottom: 10px;"> 3.0 REFERENCES QMP No. 5-3, Quality Surveillance Codes QMP No. 7-2, Inspection and Test Planning QMP No. 8-1, Nonconforming Material Disposition QMP No. 8-4, Preliminary Review and Disposition of Rejected Material </div> <div style="margin-bottom: 10px;"> 4.0 GENERAL <div style="margin-left: 20px;"> 4.1 Policy <p>It is the responsibility of WANL Quality Control to provide adequate and effective control over WANL procured and WANL manufactured material, including rework. Quality Control Inspection is charged with the responsibility for verifying all design requirements that are criteria for acceptance or rejection of material in Quality Surveillance Codes 1 and 2 and when specified by the cognizant engineer, Code 3. Final acceptance of procured material shall take place at Receiving Inspection. No portions of lots awaiting receiving inspection shall be released prior to verification of their compliance.</p> </div> </div> <div style="margin-bottom: 10px;"> 5.0 PROCEDURE <div style="margin-left: 20px;"> 5.1 Receipt of Material by the Receiving Organization <p>Upon receipt of material by the Receiving organization, the following shall be performed:</p> </div> </div>			
APPROVALS:
WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

1. Remove excess packaging
2. Count the number of items received and verify accuracy of count on shipping papers.
3. Verify that the Purchase Order number is correct.

The material, with a copy of the shipping papers and all certifications accompanying the material, shall be transferred to pre-inspection stores.

5.2 Inspection Priority Assignment

Program Control shall establish the priority of Inspection of material based on the schedule and other factors which relate to the material need.

5.3 Preparation of Inspection Folder

While the material is in Pre-Inspection Stores, Inspection will prepare an inspection folder for the material which will contain, as a minimum, the following:

A copy of the Purchase Order
A copy of the Receiving Report
A copy of the drawing
A copy of any applicable specification
A copy of all applicable Approval Requests (AR's)
A copy of all applicable Variation Requests (VR's)
Any other data pertinent to this inspection
The Inspection Instruction (II) or Quality Inspection Procedure (QIP) prepared by Quality Engineering for this material (see QMP No. 7-2).

5.4 Inspection of Material

When material as indicated by the priority list is to be inspected, the Inspection section, using the applicable II's or QIP's, shall perform the inspection. The results of the inspection will be documented on an Inspection Data Sheet, Ⓢ Form 59070 (see Attachment for sample form and detailed instructions for completing the form). The material shall then be divided into accept and reject categories. A Receiving Inspection Report, Ⓢ Form 59049 and 59372, shall be prepared for the material. This report summarizes the inspection results (see Attachment for sample forms and detailed instructions for completing the forms).

5.5 Release of Acceptable Material

All material which is found acceptable by Inspection, shall be released to Stores, accompanied by the copy of the RIR designated, "With Accepted Material".

5.6 Review and Dispositioning of Rejected Material

Material which has been rejected by Inspection shall be processed through the Preliminary Review (PR). The RIR, a sheet describing the defects (either the Inspection Data Sheet or a plain, reproducible mat) and the rejected material shall be presented to the PR as described in QMP No. 8-4.

5.7 Disposition of the RIR and the Inspection Data Sheet

The RIR and Disposition Data Sheet shall be reproduced and distributed on an established distribution retained by Inspection.

RIR No. (1)

P. O./W.O. No. (2)

Last P. O./W.O. C/N (3)

Ref. P. O./W.O. No. (4)

Qty.

NMDR No. (5)

(9) Type of Inspection ☐ Rec. Insp. ☐ Mach. Shop ☐ Reactor Assy. ☐ Other _____

(10) No.	(11) Characteristic	(12) AQL	(13) Acc.	(14) Rej.	(15) Stamp	(16) Code	(17) Defects/Remarks
-------------	------------------------	-------------	--------------	--------------	---------------	--------------	-------------------------

Attachment B

Westinghouse Astronuclear Laboratory
 Westinghouse Electric Corporation
 P.O.Box 10864, Pittsburgh, Pa. 15236

RECEIVING INSPECTION REPORT

QUALITY CONTROL DEPARTMENT

RIR No. _____

Supplier Name _____

P.O./W.O. No. _____

Last P.O./W.O./C.N. _____

Ref. P.O./W.O. No. _____

Source Insp. Performed ☐ Yes ☐ No.		Ship.Rel.No.		Certs. Recd. ☐ Yes ☐ No		Rec. Report No.		Order Comp. ☐ Yes ☐ No		Type of Insp: ☐ Rec.Insp. ☐ Mach. Shop ☐ Reactor Assy. ☐ Other			
P. O. Item	Part No.	Rev.	Part Name	Serial/Lot No.	Qty. Recd.	AQL	Qty. Insp.	Qty. Acc.	Qty. Rej.	VR	NMDR		
Insp. Signature				Date		Stamp		Insp. Supv. Signature				Date	

PR Disposition/Comments

Discrepancy Code

☐ One ☐ Two ☐ Three

Mfg. Eng. Signature

Date

Q. C. Signature

Date

① QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. <u>5 - 6</u> Rev. _____
	Effective Date <u>7/25/66</u>
	Supersedes: No. <u>QMP(L) 5-6</u> Date <u>2/21/66</u>

SUBJECT: APPROVAL REQUESTS

1.0 PURPOSE

To define the procedure to be used for the function, preparation and processing of Approval Request (AR), ① Form 59008.

2.0 APPLICABILITY

This procedure shall be applicable to all Purchase Orders and Inter-Work Requisitions (IWR), ① Form 59251, initiated at WANL for materials, parts or assemblies in Quality Surveillance Codes 1, 2 and 3 (see QMP 5-3). It shall also be applicable to all Program Control Memorandums (PCM) directing the procurement of fueled and unfueled elements from suppliers and to all WANL Work Orders to WAFF which require the submittal for WANL approval of process procedures.

3.0 REFERENCE

QMP No. 5-3, Quality Surveillance Codes
WANL-QC-101, WANL Quality Control Requirements for Suppliers

4.0 GENERAL

The Approval Request form shall be initiated by the supplier when specific approval of suppliers' drawings, x-rays, manufacturing, inspection and test procedures, etc., is required by Purchase Order, Product Specification, Drawing or referenced procedure, WANL-QC-101. The Approval Request shall only be initiated by Westinghouse Astronuclear Laboratory at Large, Pennsylvania in "emergencies" as noted in Paragraph 5.2. The supplier should never utilize, on parts or materials, any documents or procedures which are required to be submitted and approved, without first obtaining such approvals. To do so could result in considerable rework costs at the supplier's expense. In addition, WANL Supplier Surveillance will not honor suppliers' requests for source inspection unless all specified submittals are in evidence and are at least conditionally approved.

APPROVALS:

WANL Q.C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

5.0 PROCEDURE

5.1 Preparation of Approval Requests

The supplier shall receive Approval Request forms, Ⓢ Form 59008 (hereafter referred to as an AR) and Ⓢ Form No. 59182 (Continuation Sheet), from Purchasing or Quality Control. See Attachments "A" and "B" for sample forms and detailed instructions for completing forms. The Supplier shall review and apply the appropriate security classification to each AR as required, submitting the AR per established security practices.

5.2 Submittal of AR

After completing the AR, the supplier shall retain the last copy and shall submit the ditto master with reproducible attachments (as needed).

5.2.1 Submittals of AR's at WANL

The supplier shall forward the AR and attachments to the cognizant buyer in WANL Purchasing. In lieu of the actual submission of the AR, where simplicity will permit, "emergency" AR's may be phoned verbatim by the supplier to the cognizant buyer in WANL Purchasing who will fill out the form.

NOTE: All information stated on the AR, including that required for AR Continuation Sheets and Attachments, must be phoned in verbatim. The supplier shall immediately follow up the phone call with a TWX to the buyer stating verbatim the information on the AR, AR Continuation Sheets and Attachments. The TWX shall be retained on file by the buyer. The buyer shall sign "emergency" AR's with his own name and date the AR in block (12). He shall also note on the AR the name of the supplier representative who phoned in the information. The AR shall then be processed in the normal fashion as stated below.

5.2.2 Submittal of AR at WAFF

Approval Requests will be submitted by three sources to WAFF Product Control Engineering:

- (1) Suppliers of components procured through the WANL Purchasing Department will submit AR's as outlined in 5.2.1, above.
- (2) Suppliers of fueled and unfueled elements who are receiving procurement direction through WANL Program Control Memorandums (PCM) will forward AR's directly to the Supervisor of WAFF Product Control Engineering.

(3) AR's initiated by WAFF Process Engineering to obtain approval of process procedures will be forwarded to the Supervisor of WAFF Product Control Engineering.

Upon receipt by Product Control Engineering, each AR will be forwarded to the cognizant Quality Engineer for review and processing.

5.3 Review by WANL Purchasing

At WANL, upon receipt of the AR, the cognizant buyer will review the AR for legibility, completeness and appropriate supplement numbers (if applicable). The buyer shall correct AR's as required when coordinated with and agreed to by the supplier. In addition, the buyer shall be responsible for obtaining the cognizant Manufacturing Engineer's disposition prior to forwarding the ditto master, continuation sheet and attachments as received to Quality Engineering.

5.4 Review and Processing by Quality Control

Upon receipt, Quality Control will apply an AR reference number, make entry into the AR log, review for accuracy and completeness, establish necessary routing and forward for technical dispositions.

5.5 Establishing Technical Disposition

Approval Requests must be reviewed and dispositioned by Manufacturing and Quality Control Engineers when processed by WANL Quality Engineering, and by WANL Design and Quality Control Engineers when processed by WAFF Product Control Engineering. The AR package may be submitted, if required, to any cognizant technical activity for review and comment.

All reviewers will establish technical disposition by applying comments and checkmark in "Approved", "Conditionally Approved", or "Disapproved" along with signature and date in the applicable AR blocks (see Attachments "A" and "B"). The cognizant Quality Engineer, after considering the other dispositions and his own technical decisions, shall establish "final" disposition in the applicable AR block (see Block (16), Attachment "B").

NOTE: The most limiting disposition shall be used.

"Conditionally Approved" Approval Requests require submittal of supplements indicating that comments are incorporated so that an unconditional approval can be given. Supplements of conditionally approved AR's stating that the conditions have been satisfied may be approved by the WANL Quality Control Supplier Surveillance Representative in lieu of the cognizant Quality Engineer.

No other approval signatures are required. AR supplement numbers will be assigned by WANL Quality Engineering. After such approval, the dispositioned AR supplement shall be submitted for appropriate processing and distribution per para. 5.6.

5.6 Distribution of Approval Requests

The distribution of Approval Requests dispositioned by WANL Quality Engineering will be made by WANL Purchasing. The final distribution of Approval Requests dispositioned by WAFF Product Control Engineering will be made by WANL Program Control. All original, master copies of Approval Requests will be filed in the Product Assurance central records vault at WANL.

5.6.1 WANL Purchasing Processing and Distribution

The completed ditto master along with all continuation sheets and attachments shall be sent to WANL Purchasing by Quality Engineering.

5.6.1.1 Upon receipt of the final dispositioned AR, Purchasing will sign the ditto master in the appropriate block, generate the required number of copies and distribute in accordance with an established distribution list.

NOTE: Attachments are to be forwarded with all copies.

5.6.1.2 WANL disposition of "emergency" AR's may be phoned to the supplier by the cognizant WANL Buyer, stating verbatim the WANL disposition and the Comments/Conditional Approval information. The buyer shall immediately follow up the phone call with a TWX to the supplier with a copy to the Supplier Surveillance section of WANL Quality Control stating verbatim the WANL disposition and the Comments/Conditional Approval information. This "emergency" action does not relieve the requirement for processing the AR in the normal manner as stated below.

5.6.2 Distribution of WAFF Approval Requests

The completed ditto master and all continuation sheets and attachments shall be forwarded to the Product Assurance central records vault at WANL. The vault custodian will make preliminary distribution copies for SNPO-C and AGC quality representatives and forward the original, master copies to Program Control for reproduction and standard internal and supplier distribution.

5.7 Action Required by the Supplier Upon Receipt of the AR

The supplier shall review the AR upon receipt, noting the disposition and shall process the AR forms as stated below.

5.7.1 Final Disposition - APPROVED

Final approval indicates acceptance of the AR and authorizes production as requested by the supplier.

5.7.2 Final Disposition - DISAPPROVED

Disapproval indicates a refusal of the suppliers' submittals due to the specific inadequacies. The supplier must then alter the documents as required and resubmit for approval on a supplement to the original Approval Request.

5.7.3 Final Disposition - CONDITIONALLY APPROVED

If Final Disposition is Conditionally Approved, the supplier is granted authorization to proceed, provided dispositioning comments are incorporated. The supplier will be required to submit an amendment to the original AR listing the dispositioning comments and stating that he will incorporate them in the original AR. Failure to incorporate such comments may lead to the subsequent rejection of the material or parts.

5.8 Corrections or Additions to the AR

Corrections or additions to the AR shall be made by supplementing the AR and submitting it in the normal manner except that the Supplier's Reference No. and Westinghouse AR No. shall be the original No's. with a dash and then consecutive numbers starting with one (1) for each supplement for each AR.

EXAMPLE:

Original AR	AR No. 1234
First Supplement	AR No. 1234-1
Second Supplement	AR No. 1234-2

1.0 APPROVAL REQUEST - (W) Form 59008

1.1 Use

This form shall accompany all quality submittals by the supplier required by purchase order, product specifications, drawings and this specification for approval to process and inspect material. Examples include process outlines, process specifications, sampling plans, inspection procedures (such as radiography, ultrasonic testing, eddy current testing) and repair/rework procedures.

1.2 Instructions for Completion

- 1) AR No. - Preprinted on form.
- 2) Amendment No. - This block is used when an AR is amended. The supplier's serial number from previous AR will be inserted and the appropriate amendment number will follow.
- 3) WANL Reference No. - To be inserted by Quality Control when received.
- 4) Drawing No. - Number of drawing that is applicable to AR.
- 5) Item/Group/Ass'y. - Item, Group, Ass'y. No. of part.
- 6) Revision - Revision of Drawing.
- 7) Part Name
- 8) Show applicable purchase order number, specifying the need for this request.
- 9) Check applicable block per purchase order requirement.
- 10) Self-explanatory
- 11) Apply the controlling document for which the AR is being submitted.
- 12) Self-explanatory
- 13) Describe Request - Specify in detail the subject matter for which approval is being requested.
- 14) This block to be completed by (W) .
- 15) This block to be completed by (W)
- 16) This block to be completed by (W). Final Disposition - Self-explanatory; however, if Final Disposition is conditionally approved, the supplier is granted authorization to proceed, provided dispositioning comments are incorporated. The supplier will be required to submit an amendment to the original AR listing the dispositioning comments and stating that he will incorporate the comments in the original AR. Failure to incorporate such comments may lead to subsequent rejection of the material or parts.
- 17) To be completed by WANL Purchasing Agent, when AR processed by WANL Quality Engineering.

2.0 APPROVAL REQUEST CONTINUATION SHEET - (W) Form 59182

2.1 Use

This form shall be used in the event that a continuation sheet is required when using Approval Request, (W) Form 59008.

2.2 Instructions for Completion

- 1) Supplier Serial No. - This number to be duplicate of preprinted supplier serial number on Approval Request, Ⓜ Form 59008.
- 2) Amendment No. - To be duplicate of amendment number on Approval Request.
- 3) WANL Reference No. - To be inserted by WANL when received.
- 4) Drawing No. - Number of drawing that is applicable to AR.
- 5) Item/Group/Ass'y. - Item, group, assembly number of part.
- 6) Revision- Revision of drawing.
- 7) Purchase Order No. - WANL Purchase Order number with supplier.
- 8) Self-explanatory
- 9) Continue Description of Request - Continuation of "Describe Request" from Approval Request, Ⓜ Form 59008.
- 10) Self-explanatory

WESTINGHOUSE ASTRONUCLEAR LAB.
WESTINGHOUSE ELECTRIC CORPORATION
P.O. BOX 10864, PITTSBURGH, PA. 15236

APPROVAL REQUEST

PAGE 1 OF

WESTINGHOUSE FORM 59008 B

SUPPLIER AND ADDRESS

REQUIREMENTS

SUPPLIER AUTHORIZED SIGNATURE

TITLE

DATE

AMENDMENT NO.

(2)

WANL REFERENCE NO.

(3)

DRAWING NO.

(4)

ITEM/GROUP, ASSY.

(5)

REVISION

(6)

PART NAME

(7)

PURCHASE ORDER NO.

(8)

TYPE OF REQUEST

☐ INSP. PLAN

(9)

☐ INSP. PROCEDURE☐ TOOL OR GAGE DESIGN☐ OTHER (DESCRIBE)☐ MFG. PROCEDURE

DESCRIBE REQUEST IN DETAIL: INCLUDE TITLE, NUMBER AND REVISION TO ALL ATTACHMENTS

(13)

REQ.	WANL DISPOSITION			WANL COMMENTS
	DESIGN ENGINEER	DATE	APPROVED	(15)
			COND. APP.	
			DISAPPROVED	
	RELIABILITY	DATE	APPROVED	
			COND. APP.	
			DISAPPROVED	
	QUALITY CONTROL	DATE	APPROVED	
			COND. APP.	
			DISAPPROVED	
	MANUFACTURING ENGINEER	DATE	APPROVED	
			COND. APP.	
			DISAPPROVED	
	MATERIALS	DATE	APPROVED	
			COND. APP.	
			DISAPPROVED	
	OTHER	DATE	APPROVED	
			COND. APP.	
			DISAPPROVED	

FINAL DISPOSITION: (16) ☐ APPROVED ☐ CONDITIONALLY APPROVED ☐ DISAPPROVED

NOTE TO SUPPLIER: CONDITIONAL APPROVAL GRANTS AUTHORIZATION TO PROCEED PROVIDED WANL COMMENTS ARE INCORPORATED AND AN AMENDMENT TO THIS APPROVAL REQUEST IS SUBMITTED STATING THE SAME SO THAT AN UNCONDITIONAL APPROVAL CAN BE OBTAINED.

THIS FORM IS AN OFFICIAL DOCUMENT WHEN SIGNED BY THE PURCHASING AGENT AND NEED NOT BE FOLLOWED BY A CHANGE NOTICE TO THE PURCHASE ORDER.

AUTHORIZED BY

(17)

PURCHASING AGENT

DATE

WESTINGHOUSE ASTRONUCLEAR LAB.
WESTINGHOUSE ELECTRIC CORPORATION
P.O. BOX 10864, PITTSBURGH 36, PA.

QMP No. 5-6
Effective Date 7/25/66

SUPPLIER AND ADDRESS (8)	AMENDMENT NO. (2)		SUPPLIER SERIAL NO. (1)
	DRAWING NO. (4)		WANL REFERENCE NO. (3)
	ITEM / GROUP / ASSY. (5)		REVISION (6)
	PURCHASE ORDER NO. (7)		

CONTINUE DESCRIPTION OF REQUEST IN DETAIL

(9)

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 5 - 7 Rev.

Effective Date July 25, 1966

Supersedes
No. QMP(AL)5-7 Date 3/15/66

SUBJECT: SURVEILLANCE INSPECTION REPORT AND SHIPPING RELEASE

1.0 PURPOSE

The purpose of this procedure is to provide an effective method for reporting inspection operations performed at suppliers' facilities and for releasing of material for shipment.

2.0 APPLICABILITY

This procedure shall be applicable to inspection operations performed by WANL/WAFF Quality Control at suppliers' facilities.

3.0 REFERENCE

None

4.0 PROCEDURE

All inspections performed by WANL and WAFF Quality Control at suppliers' facilities shall be reported on a Surveillance Inspection Report and Shipping Release, Ⓢ Form No. 59609.

4.1 Originating the Surveillance Inspection Report and Shipping Release (SIR & SR) Ⓢ Form No. 59609

The Quality Control Representative shall prepare the form and return it to WANL or WAFF Quality Control. (see Attachment A for sample form and detailed instructions for filling out the form.)

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

4.2 Recording and Distribution of the Surveillance Inspection Report and Shipping Release.

When this SIR & SR is used to release material for shipment, one copy of the form must accompany the shipment.

All other distribution will be made in accordance with a standard distribution list maintained in WANL and WAFF Quality Control.

4.3 Revisions and Amendments

If after a Surveillance Inspection Report and Shipping Release has been issued it becomes necessary to add to, change or correct the information contained on the release, a supplement shall be issued. The supplement will carry the original number followed by a dash and the supplement number. All supplements will contain a statement in the comments block saying why the supplement is being issued.

Instructions for Filling Out the Surveillance Inspection Report
and Shipping Release

BLOCK	DATA REQUIRED
(1) Supplier and Address	Name and Address of the Supplier where the inspection is being performed.
(2) Dwg. No. Group Rev. Part Name/Description	Insert the complete drawing number including group and revision followed by name of the part as shown on drawing or a description of material on the Purchase Order.
(3) Purchase Order Number	The Purchase Order pertaining to the items in Block 2 on which inspection is being performed.
(4) Applicable Change Notice	Any Change Notices to the Purchase Order in Block 3 that apply to the parts in Block 2.
(5) Quantity on Order	The total number of the parts listed in Block 2 that are on this Purchase Order (Block 3).
(6) Quantity Submitted	The number of parts of those in Block 5 submitted for this inspection.
(7) Quantity Inspected	The number of parts of those in Block 6 that the WANL/WAFF Representative actually inspected.
(8) Quantity Accepted	The number of those parts found acceptable for shipment.
(9) Applicable VR Nos.	In the spaces below, list the numbers of any VR's which are applicable to the parts on this purchase order. If additional space is needed, use the Comments (Block 22).
(10) Status	The current status of the VR's in Block 9. Use the following: Approved, Disapproved, Conditionally Approved, or open.
(11) Serial Nos.	List the serial numbers of those parts in Block 8. Use comments (Block 22) if additional space is required.
(12) Specification and Revision	The numbers of any process or equipment specifications - WANL/WAFF or military which apply to the parts (Block 2) being inspected.
(13) Hold Point	Check only if this inspection is as a result of a designated hold point and specify the description of the hold point.
(14) Final Inspection	Check only if this inspection is performed as the final act prior to shipping the parts.
(15) Others (Specify)	Check only if this is other than those specified in Blocks 13 or 14. State what the action is.
(16) Shipped to WANL/ WAFF	Check only if the parts on this report are being shipped to WANL/WAFF.
(17) Shipped to Other	Check only if the parts on this report are being shipped to a destination other than WANL/WAFF.
(18) Quality Control Shipping Release	List below the Quality Control Shipping Release number used to ship raw material from WANL/WAFF.

(19) Material Consigned to P. O. No.	If these parts are to be sent to another supplier for further processing, list the P. O. number on which the work will be done.
(20) Consigned to Supplier	List the name of the supplier to whom the parts are being sent.
(21) Supplier's Address	The address of the supplier listed in Block 20.
(22) Comments	Use this space as extra space for any other block and/or to list any pertinent facts for which no block has been provided.
(23) WANL Quality Control Representative	The Quality Control Representative will sign in this block.
(24) Date	The date this action took place.
(25) Attachments	Check if additional information is included with this report. Define in the space provided the nature of the attachments and the number of pages.

4.2 Definitions

Receiving Inspection:

- 1) the process of determining acceptability or unacceptability of purchased materials, and
- 2) the control and dispositioning of raw materials through pre-processing operations, such as cross-blending and sifting of a raw material up to, but not including the formation of Dry Carbon Ingredients (DCI).

5.0 PROCEDURE

5.1 Receipt and Filing of Purchase Orders, Purchase Order Change Notices, and Supplier Test Reports and Certifications

A copy of each purchase order (and change notice) placed by WAFF shall be supplied to Quality Engineering by WAFF Purchasing. Upon receipt, Quality Engineering shall establish a file for each purchase order for the purpose of accumulating all documents applicable to that order. Purchasing shall also forward to Quality Engineering, upon receipt, a copy of each supplier test report and certification, which shall be retained in the applicable purchase order file.

5.2 Receipt and Inspection of Purchased Material (Except Fuel, Tools, and Gages)

5.2.1 Receipt of Purchased Raw Material

Upon receipt of purchased material (including samples), Receiving shall remove all excess packaging; determine that the materials are being received against the proper purchase order; verify quantities; and make a cursory examination for shipping damage. The material then shall be delivered to a Receiving Inspection area, accompanied by the purchase order receiver and all test reports and certifications which were received with the material. In-Process Inspection shall:

1. Assign lot numbers to the materials, per QMP No. 4-3.
2. Assign container numbers, per QMP No. 4-3. If the supplier has assigned container numbers, those numbers shall be recorded rather than assigning new numbers.
3. Fill out HOLD--AWAITING INSPECTION, or RESTRICTED USE tags (see Attachment A), as directed by the applicable QIP and attach to each container.

4. Fill out blocks 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13 and 14 of a Receiving Inspection Release, Ⓜ Form 59558 (see Attachment B), for each lot of material.

NOTE: A Receiving Inspection Release form shall contain only one purchase order number, one supplier lot number, and one WAFF lot number.

The Receiving Inspection Release, accompanied by all test reports and certifications which accompanied the material and the purchase order receiver shall be delivered to the cognizant Quality Control Engineer. In-Process Inspection shall then place the materials in an area designated for materials awaiting inspection, or in an area for pre-processing--as directed by the QIP.

5.2.2 Inspection of Purchased Raw Material

Upon receipt of the Receiving Inspection Release form, the test reports, certifications, and the purchase order receiver, Quality Engineering shall:

1. Evaluate the supplier's test reports and certifications to assure that the supplier data indicates conformance to the purchase order requirements. Any apparent discrepancies shall be resolved prior to inspection and pre-processing of the raw materials. A separate RIR, initiated by the cognizant Quality Engineer, may be used for this purpose if desired.
2. Initiate inspection, including sampling if required, of the raw materials, per the procedure established by the applicable Quality Inspection Procedure (QIP) (see QMP No. 7-2). Quality Engineering shall evaluate the results of the inspections performed to determine conformance to the purchase order requirements. The materials shall be dispositioned as stated in paragraph 5.3, below.

5.2.2.1 Inspection and Testing of Raw Material Samples

Samples received prior to, or with the lot shipment, shall be assigned lot and container numbers by In-Process Inspection, as stated in paragraph 5.2.1, above. In-Process Inspection shall also tag, isolate materials, fill out and deliver an RIR with test reports, certifications, and the purchase order receiver to Quality Engineering, as stated in paragraph 5.2.1, above. The lot shipment, upon receipt, shall be assigned lot and container numbers by In-Process Inspection, applying the same lot numbers as were assigned to the representative samples. The container numbers for the lot shipment shall be continued in numerical order from the container numbers applied to the sample containers. If the supplier has assigned container numbers, those numbers shall be recorded, rather than assigning new numbers. The lot of material shall be tagged and isolated by In-Process Inspection, as stated in paragraph 5.2.1, above.

Upon receipt of the RIR form, the supplier test reports, certifications, and the purchase order receiver, Quality Engineering shall perform the actions stated in points 1 and 2 in paragraph 5.2.2, above. The materials shall be dispositioned as stated in paragraph 5.3, below.

5.3 Dispositioning Materials at Receiving Inspection

Quality Engineering shall review the inspection data required by the applicable QIP, upon receipt. When discrepancies are noted, the requirement and the actual condition shall be noted in blocks 11 and 12, respectively, of the RIR. All material that fully meets requirements may be immediately dispositioned as "Accept" in block 15 of the RIR by the Quality Engineer. The cognizant Quality and Process Engineers shall evaluate all discrepant material and reach a mutually agreed-upon disposition. The disposition shall be written in block 15 of the RIR, utilizing the Disposition Codes shown in block 17. Materials shall be returned to the supplier for REWORK/REPLACEMENT whenever the combination of schedule date and rework/replacement time allow this approach. The dispositions available for use are defined as follows:

1. Accept

This disposition shall be used when the material fully meets the requirements or when, in the estimation of the Quality and Process Engineers, the material can be utilized in the manufacture of any elements such that the elements will meet WANL requirements.

2. Conditionally Acceptable

This disposition is available for use when the production schedule makes it advisable for use when the production schedule makes it advisable to release material prior to having obtained all inspection data. This disposition cannot be used for accepting known discrepant material. When Operations requests release of material for which inspection data is lacking, Quality Engineering shall contact Process Engineering and reach agreement on whether or not this disposition shall be utilized. A Process Engineering Signature, in addition to the Quality Engineering signature, shall be obtained in block 21 of the RIR, indicating concurrence with the disposition and acceptance of the risk involved, as stated on the RIR.

3. Accept, Restricted Use

This disposition shall be used when, in the estimation of the Quality and Process Engineers, the material cannot be accepted for all uses but can be accepted for some restricted use. The particular restriction shall be stated in block 16 of the RIR. This disposition requires a signature by Process Engineering, as well as Quality Engineering, indicating concurrence with the disposition.

4. Rework

This disposition shall be used when, in the estimation of the Quality and Process Engineers, the discrepant material is capable of being reworked to the purchase order requirements, whether by WAFF or by the supplier. Rework instructions, as required, shall be stated in block 18 of the RIR. This disposition shall be agreed upon by the supplier, and the contact shall be made through the Purchasing Department. This disposition requires a signature by Process Engineering, as well as Quality Engineering, indicating concurrence with the disposition.

5. Scrap

This disposition shall be used when, in the estimation of the Quality and Process Engineers: (1) the material cannot be reworked to the purchase order requirements, or does not justify the time and expense of rework, and (2) the material has no other applications. The supplier shall be contacted, via Purchasing, to obtain concurrence for scrap dispositions. This disposition requires a signature by Process Engineering, as well as Quality Engineering, indicating concurrence with the disposition.

6. Other

This disposition may be used whenever the five dispositions defined above do not adequately define the desired processing/actions. When this disposition is used, it shall be explained in block 18 of the RIR. This disposition requires a signature by Process Engineering, as well as Quality Engineering, indicating concurrence with the disposition.

5.4 RIR Distribution Following Dispositioning

Following Engineering dispositioning, sufficient copies shall be made from the master and distributed by Quality Engineering to fill the distribution established by Quality Engineering.

5.5 Actions Required Following Distribution of the RIR

The actions required following distribution of the RIR are stated below, headed as: (1) the department receiving the copy, and (2) the type of disposition.

5.5.1 Quality Engineering (All Dispositions)

Quality Engineering shall review all RIR's and prepare Requests for Corrective Action (RCA's) as deemed necessary (see QMP No. 5-4). In addition, requests for "L" order shall be prepared and submitted to Purchasing when the RIR disposition requires that the material be returned to the supplier.

5.5.2 Receiving Inspection

5.5.2.1 Accept, Conditionally Acceptable, Accept for Restricted Use

The In-Process Inspector at Receiving Inspection shall fill out ACCEPT tags and apply to all lot containers (see Attachment A for sample tag). The material shall then be released to Operations.

5.5.2.2 Rework, Scrap

The In-Process Inspector at Receiving Inspection shall fill out REJECT tags and apply to all lot containers (see Attachment A for sample tag). The material shall then be directed to the cognizant department for reworking or scrapping.

5.5.3 Purchasing (All Dispositions)

Purchasing shall: (1) transmit all Requests for Corrective Action submitted to Quality Engineering to the cognizant supplier; (2) process all "L" orders submitted by Quality Engineering to assure that the material is returned to the supplier; (3) backcharge the suppliers as required; and (4) initiate, through the supplier, replacement of lots and material that have been dispositioned as SCRAP.

5.6 Receipt and Inspection of Purchased Tools and Gages

Tools and Gages shall be received by Receiving in the same manner as described in paragraph 5.2.1, above. Receiving Inspection of the tools and gages shall be performed per the procedure established in QMP No. 9-2.

5.7 Receipt and Inspection of Purchased Fuel

Fuel shall be received, inspected, and controlled in the same manner as stated in paragraphs 5.1 through 5.5, with the following exceptions:

1. Accountability shall perform the receiving function and shall assign lot and container numbers in a manner acceptable to Quality Engineering.
2. Accountability shall store and control the fuel. This is necessary because of the hazards involved.

NOTE: All tags shall be applied by the In-Process Inspector to the innermost metal containers to assure that the tag will not become separated from the material.

5.8 Materials Unsuitable for Core Use

All materials which are ordered for other than core use shall be tagged by In-Process Inspection with a NOT FOR CORE USE tag and released to the concerned department.

5.9 Pre-Processing of Materials

Materials requiring pre-processing operations (cross-blending, sifting, etc.) prior to combining with other raw materials shall be controlled through the pre-processing operations by the use of the standard tags (see Attachment A) and data recording forms.

☐ HOLD - AWAITING INSPECTION ☐ REJECT

material

p.o. no.	lot no.	container no.
----------	---------	---------------

inspector signature and date

westinghouse form 59559

ACCEPT

material

p.o. no.	lot no.	container no.
----------	---------	---------------

inspector signature and date

westinghouse form 59560

RESTRICTED USE

restricted to:	p.o. no.
----------------	----------

material	lot no.	container no.
----------	---------	---------------

inspector signature and date

westinghouse form 59561

NOT FOR CORE USE

material

serial/lot no.	p.o. no.	dwg./spec.no.and rev.
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inspector signature and date

westinghouse form 59562

Page 1 of 1

Ⓢ QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. <u>6 - 1</u> Rev. <u> </u>
	Effective Date <u>7/25/66</u>
	Supersedes No. <u>QMP(A)6-1</u> Date <u>10/1/65</u> <u>QMP(L)6-1</u> <u>10/1/65</u>

SUBJECT: CONTROL OF GOVERNMENT FURNISHED PROPERTY

1.0 PURPOSE

To establish the responsibilities of Quality Control relating to the inspection and control of Government Furnished Property (GFP).

2.0 REFERENCE

QMP 5-5, Receiving, In Plant and In-Process Inspection of Non-Fuel Components
 QMP 8-1, Nonconforming Material Disposition
 QMP 7-2, Inspection and Test Planning
 QMP 8-3, Dispositioning Discrepant Materials and Parts Discovered at
 In-Process Inspection
 QMP 5-8, Receiving Inspection
 Article 21, Government Property, Contract NP-1

3.0 GENERAL

3.1 Policy

It is the responsibility of Quality Control to inspect GFP to the extent practical to detect damage in transit and to determine that the property is complete, qualified for the intended end-use, and of proper type, size, grade, and is identified with the correct Government Property Identification Number. Quality Control is further responsible for controlling the GFP, while in the Quality Control areas, to ensure that damage or deterioration does not occur. Periodic re-inspections will be performed at established intervals as required to ensure that quality is maintained.

3.2 Scope

This procedure is applicable to all GFP received by WANL or WAFF.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

3.3 Definition of GFP

GFP is defined as property described in the schedule or specifications which shall be delivered to the Sub-contractor (WANL) by the Government or Aerojet-General, together with such related data and information as the Sub-contractor may request and as may reasonably be required for the intended use of such property (see Article 21, Government Property, Contract NP-1).

4.0 PROCEDURE

4.1 Inspection of GFP

Upon receipt of GFP, Inspection will inspect the material to established Inspection Instructions (II) per QMP 7-2 which will utilize the Contractual Documents by which the material was shipped to WANL or WAFF. The results of WANL inspection will be recorded on the Receiving Inspection Report (RIR), Ⓢ Form 59049, per QMP 5-5 and the RIR shall be processed in the normal manner. The results of WAFF inspection will be recorded on RIR, Ⓢ Form 59558 per QMP 5-8 and distributed as follows:

- 1 copy to WAFF In-Process Inspection
- 1 copy to WANL Property Control Section, Accounting Department

4.1.1 Defective GFP at WANL

When it is determined by WANL Inspection personnel that GFP is defective, a Nonconforming Material Disposition Request, (NMDR) Ⓢ Form 59250, QMP 8-1, will be completed and the material forwarded to the Engineering Review Board (ERB) storage area to await disposition. The local representative will be advised of the damage or malfunction of the Government furnished material and disposition will be requested. A Material Review Board (MRB) meeting will be convened and the NMDR will be completed in the normal manner except that the MRB, with the Government representative, will make a recommended technical disposition. When the technical disposition has been completed, Program Control will enter the material disposition on the NMDR and will request concurrence, through the Program Manager from the cognizant Government Installation. The NMDR and material will be processed in the required manner upon a reply from the cognizant Government Installation.

4.1.2 Defective GFP at WAFF

When it is determined by Quality Control Inspection that GFP is defective, a Material Review Tag (MRT), Form 59355 (QMP 8-3) shall be filled out. The property shall be segregated and Quality Engineering, with the assistance of other departments, shall make a recommended disposition. The master copy of the MRT shall be retained by Quality Control, and three copies shall be sent

to the Property Control - Accounting at WANL. This section will retain one copy of the MRT, and two copies will be sent to the cognizant Government Installation, advising them of the discrepant property and requesting: (1) concurrence with the Quality Engineering recommended disposition, or (2) other disposition. Upon receipt of disposition through the Program Manager, from the cognizant Government Installation, the MRT master shall be completed--documenting the Government-supplied disposition--and the MRT shall be distributed as follows:

- 1 copy to WAFF In-Process Inspection
- 1 copy to WANL Property Control Section, Accounting Department
- 1 copy with GFP when dispositioned other than "Accept As Is"

The disposition of GFP shall be as directed by the cognizant Government representative.

4.2 Storage and Control of GFP at WANL

It is the responsibility of Program Control (NERVA Stores) to package, store, protect and control all GFP while at WANL in such a manner that quality is maintained.

4.3 Storage and Control of GFP at WAFF

It is the responsibility of the department retaining the GFP to package, store, protect, and control the GFP while at WAFF in such a manner that quality is maintained.

4.4 Re-Inspection of GFP

GFP shall be re-inspected at established intervals as required to insure that quality is maintained. Inspection Instructions per QMP 7-2 will specify the re-inspection requirements. The re-inspection will be documented in the same manner as noted in paragraph 4.1, above. Defective GFP found during re-inspection will be processed as stated in paragraph 4.1.1 and 4.1.2, above.

Ⓢ QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. <u>7 - 1</u> Rev. <u> </u>
	Effective Date <u>7/25/66</u>
	Supersedes No. <u>QMP(A)7-1</u> Date <u>10/1/65</u>

SUBJECT: IN-PROCESS INSPECTION

1.0 PURPOSE
 To establish the procedure and associated records to be utilized in In-Process Inspection.

2.0 APPLICABILITY
 This procedure is applicable to all In-Process Inspections performed at WAFF.

3.0 REFERENCES

 QMP No. 4-3, Identification of Material Detail Parts, Subassemblies, and Assemblies by Serial or Lot Numbers
 QMP No. 4-4, Change Control
 QMP No. 7-2, Inspection and Test Planning
 QMP No. 8-3, Dispositioning Discrepant Materials and Parts Discovered at In-Process Inspection
 QMP No. 9-2, Design, Acquisition, Calibration, and Control of Inspection Tools and Gages
 QMP No. 9-3, Calibration and Control of Measuring and Test Equipment
 QMP No. 14-3, Corrective Action

4.0 GENERAL
 4.1 Policy
 Quality Engineering and Product Control Engineering are responsible for establishing the In-Process Inspections (including testing) required for all In-Process operations to assure that the work order requirements (drawings, specs., etc.) are met. In-Process Inspection is responsible for performing the In-Process Inspections, per the Quality Inspection Procedures (QIP's) and Inspection Instructions (II's) established by Quality Engineering and Product Control Engineering.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

5.0 PROCEDURE

5.1 Performing In-Process Inspections

Following the instructions prepared by Quality Engineering and Product Control Engineering (flow charts or tabulations, QIP's, II's), In-Process Inspection shall perform the required inspections and tests--documenting the results on the forms specified by the applicable QIP or II (See QMP No. 7-2).

5.2 Assigning Serial and Lot Numbers

In-Process Inspection shall assign or verify assignment of serial or lot numbers as specified by the applicable QIP. The responsibility for applying the serial numbers to the product and recording the serial and lot numbers applied is specified in the applicable QIP (see QMP No. 4-3).

5.3 Verification of the Tools, Gages, and Test Equipment Calibrations

Immediately prior to performing inspections, In-Process Inspection shall verify that all tools, gages, and test equipment to be utilized in performing the inspection have not exceeded the calibration due date. This can be done by checking the date noted in the "due" blank on the calibration sticker (see QMP Nos. 9-2 and 9-3). This requirement for verifying that the tools, gages, and test equipment have not exceeded the calibration due date supplements any special calibration requirements specified in the applicable QIP.

5.4 Processing Discrepant Materials and Parts Discovered at In-Process Inspection

All discrepant materials and parts discovered at In-Process Inspection shall be isolated, reported, dispositioned, and processed per QMP No. 8-3.

5.4.1 Corrective Action

Corrective action for discrepancies discovered at In-Process Inspection shall be initiated per QMP No. 14-3.

5.5 Documentation Effectivity

As stated in QMP No. 4-4, the application of the correct revision documents within In-Process Inspection is the responsibility of the Supervisor of In-Process Inspection.

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 7 - 2 Rev. _____

Effective Date 7/25/66

Supersedes:

No. QMP(L) 7-2 Date 1/15/66

QMP(A) 7-2 10/1/65

SUBJECT:

INSPECTION AND TEST PLANNING

1.0 PURPOSE

To establish the procedure to be followed when preparing, distributing, and controlling inspection and test plans.

2.0 APPLICABILITY

This procedure is applicable to all inspection and test plans prepared by Quality Engineering or Product Control Engineering.

3.0 REFERENCE

None

4.0 GENERAL

4.1 Policy

4.1.1 Quality Engineering at WANL is responsible for preparing, distributing, and controlling all inspection and test plans to assure that drawing and/or specification requirements are met. These inspection and test plans shall be prepared as required for all phases of fabrication, processing, assembly and testing within WANL and for those inspections and tests performed or witnessed by WANL Supplier Surveillance at supplier facilities.

4.1.2 Product Control Engineering at WAFF is responsible for preparing all inspection and test instructions, with the exception of specialized inspection and test instructions which, by their nature, can most easily be prepared by Quality Engineering. The Quality Inspection Procedure approach may be utilized by In-Process Inspection and Data Systems for defining their internal operations. Product Control Engineering shall be responsible for the distribution and control of all inspection and test instructions.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

5.0 PROCEDURE

5.1 Types of Inspection and Test Plans

Inspection and test instructions shall be one of three types:

1. Flow charts or tabulations showing the overall inspection and test planning for a work order.
2. Quality Inspection Procedures (QIP's)
3. Inspection Instructions

5.2 Quality Control Flow Charts or Tabulations

Quality Control flow charts or tabulations shall be prepared for each work order that is sufficiently complex to justify this approach. Considering the work order requirements (drawings, specifications, etc.), and the production sequence of operations, the points requiring Quality Control and Inspection coverage shall be established. The points shall be identified as QIP numbers (see below) and shall be listed in chart or tabular form. These QIP numbers shall be cross-referenced to the work order requirements and the production operation numbers--thus constituting the overall inspection and test planning for an order.

5.3 Quality Inspection Procedures and Inspection Instructions

All inspection and test plans shall be prepared as Quality Inspection Procedures (QIP's) or Inspection Instructions (II's). A QIP shall be written when detailed inspection procedures are required to guarantee conformance of complex parts or processes to drawing or specification. An II shall be written when instructions are needed to define the required inspection or when sampling inspection is performed. Inspection Instructions will not be prepared for simple parts, material and assemblies which can be inspected to drawing requirements.

5.3.1 Quality Inspection Procedure

5.3.1.1 Format

- 5.3.1.1.1 The first page shall be typed on Ⓜ Form 59272 (Attachment A) and subsequent pages typed on Ⓜ Form 59273 (Attachment B) paper.

5.3.1.2 QIP Identification Numbering at WANL

A numbering identification system for QIP's used at WANL shall be established by WANL Quality Engineering. The letter "L" shall be applied in parentheses behind "QIP" indicating that it is a WANL document.

5.3.1.3 QIP Identification Numbering at WAFF

A numbering identification system for QIP's shall be established by Product Control Engineering at WAFF. The letter "A" shall be applied in parenthesis behind "QIP", indicating that it is a WAFF document.

5.3.1.4 Major Headings within the QIP

The following major headings should be used when applicable:

1. Purpose
2. Applicability
3. Reference
4. Required Inspection Forms
5. Equipment
6. Procedure
7. Reporting

5.3.1.5 Numbering System within the QIP

The numbering system within the QIP shall be the military system. Each number representing a paragraph shall not be indented from the previous paragraph except at the beginning of each new section. Example:

- 1.0
 - 1.1
 - 1.1.1, etc.

Lists of items within a paragraph may be consecutively numbered with Arabic numerals.

5.3.1.6 QIP Attachments

All sample forms, instructions for filling out the forms, distribution lists, flow charts, etc., shall be attached at the end of the QIP's. Each page of the attachment shall be identified as follows:

1. Attachment (capital letters, starting with "A") at the top of each page.
2. QIP Number, Revision, and Effective Date at the top of each page.
3. Page Number (continuing from the QIP) at the bottom right of each page.

5.3.2 QIP Approvals

Prior to the signing of the QIP, it shall be distributed to each section of Quality Control for comments by the supervisors. Disagreements shall be brought to the attention of the Quality Control Manager for resolution. Approval signatures shall then be obtained per the titles shown on the QIP subject page.

5.3.3 QIP Change System

Changes made to existing QIP's may be made in one of two ways, as stated below.

5.3.3.1 Change System No. 1

The entire QIP may be rewritten and reissued. In such cases, the block heading at the top right side of the pages shall be completed, denoting the change and supersedure. The revision blank shall be filled in with capital letters, starting with "A", to indicate the change. All changes within the QIP shall be indicated with brackets and an arrow (→) in the left margin.

5.3.3.2 Change System No. 2

In lieu of immediately rewriting the entire QIP, supplements may be issued. The supplements shall specify the QIP paragraph(s) to be changed and shall clearly define the change. The normal QIP format shall be used, starting with the subject page; and each page of the supplement shall have "Supplement" (consecutively numbered, starting with 1) at the top of each page, outside the border. The heading block at the top right side of the pages shall be filled in as stated in paragraph 5.3.1.6, above. Supplements shall be page numbered individually as separate documents (do not continue the page numbering from the QIP). Each supplement shall be approved in the same manner as the QIP proper. The number of supplements to any QIP shall be limited to a maximum of three before the QIP shall be completely revised.

5.3.4 QIP Content

Each QIP shall include the following:

1. Identification of the article to be inspected or tested (e.g., part number, applicable specification, system involved, and nomenclature).
2. Objectives of the inspection or test.
3. Measuring and test equipment to be used specifying range, accuracy and type.
4. Detailed operations to be performed by the test operator, including operational checks or calibration of the test equipment.
5. Conditions that must be maintained during inspection and test including ambient or environmental and precautions to be observed to prevent damage to personnel, test items, instruments involved. Safety precaution required if applicable.
6. Criteria for passing or failing the test or for determining conformance or rejection of the article including reference to inspection standards.

7. Sampling plans to be used if applicable.

8. The recording forms required and instructions for filling out the form.

5.4 Inspection Instruction Procedures

5.4.1 Initiation

Each II shall be prepared using W Form 59060 and 59392 (Attachments C and D). The instructions for filling out this form are included as Attachment E.

5.5 QIP and II Distribution

The QIP and II Distribution shall be determined by WANL Quality Engineering and WAFF Product Control Engineering. Each shall maintain and periodically issue a "Table of Contents" of QIP's and II's.

5.6 Actions Required by In-Process Inspection Upon Receipt of the Special Inspection Instruction

Upon receipt of the special Inspection Instruction, In-Process Inspection shall stamp the top of the applicable Enriched Element Follow Sheets with the following stamp--to assure that the need for a special inspection shall be recognized by the inspector:

See II No. _____

The identification numbers of the special inspection instructions shall be noted in the blanks. The applicable inspection cards shall also be stamped in the same manner, on the border, to assure that Quality Control personnel reviewing the inspection data will realize that special inspections were required. If the applicable inspection card has not been originated at the time the special inspection instruction is issued, In-Process Inspection shall follow-up and stamp the card when it is originated.

**CONFIDENTIAL
RESTRICTED DATA**
Atomic Energy Act - 1954

7/25/66
Group - 1
Excluded from Automatic Downgrading
and Declassification

W QUALITY INSPECTION PROCEDURE WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P.O. Box 10864, Pittsburgh, Pennsylvania 15236		QIP No. _____ Rev. _____ Effective Date _____ Supersedes _____
<p>SAMPLE COPY ONLY UNCLASSIFIED</p>		
Prepared by:	Approved by:	Approved by:
Quality Control Engineer	Quality Control Supervisor	Manager of Quality Control

**CONFIDENTIAL
RESTRICTED DATA**
Atomic Energy Act - 1954

INFORMATION CATEGORY

Confidential Restricted Data

Page ____ of ____

Authorized Classifier

Date

Ⓜ QUALITY INSPECTION PROCEDURE

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation

QIP No. () _____ Rev. _____

Effective Date _____

WESTINGHOUSE ASTRONUCLEAR LABORATORY

INSPECTION INSTRUCTION

QUALITY CONTROL

QMP No. 7 - 2

PART NO.

Effective Date 7/25/66

ISSUE NO.

PART NAME OR MATERIAL

SPECIFICATIONS

P294506 ☐P294517 ☐

OTHER_

[illegible]

ADDITIONAL INSTRUCTIONS OR COMMENTS

QUALITY ENGINEER

DATE _____

SHEET _____ OF _____

WESTINGHOUSE ASTRONUCLEAR LABORATORY

INSPECTION INSTRUCTIONS CONTINUATION SHEET

QUALITY CONTROL

$\text{C} \rightarrow \text{N}_2 \rightarrow 2$

PART NO Effective Date 7/25/66

ISSUE NO

[illegible]

INITIALS

DATE _____

SHEET

OF

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation

QMP (L) No. 7-2 Rev. _____

Effective Date _____

INSTRUCTIONS FOR FILLING OUT
THE INSPECTION INSTRUCTION (II) Ⓢ Form No. 59060A

Block	Data Required
1. Part Number	Part Number of part for which the II is written.
2. Issue Number	Consecutive numbers starting with one (1) for each part number; the issue number may be changed as a result of changes in gaging or when upgrading (revision or part) is required.
3. Part Name of Material	Part Name; name, type, grade, etc. of raw material.
4. Specifications	Specifications applying to the part number.
5. Number	Consecutive numbers starting with one (1) for each characteristic listed in Block 6.
6. Characteristics	Characteristics to be inspected.
7. Code	Code letter(s) indicating type (class) of characteristic.
8. Inspection Methods and Tools	Specified if special tooling is available.
9. Tool Number	Number of tool/gage to be utilized by inspector.
10. AQL	AQL to be used by inspector when sampling inspecting.
11. Additional Instructions or Comments	Indicate whether or not the II applies to source-inspected material only; miscellaneous comments.

Ⓢ QUALITY METHODS & PROCEDURES

QMP No. 7 - 4 Rev.

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

Effective Date 7/25/66

Supersedes:
No. QMP(L) 7-4 Date 10/1/65

SUBJECT: IN-PROCESS INSPECTION - REACTOR ASSEMBLY

1.0 PURPOSE

To define In-Process Inspection in Reactor Assembly.

2.0 REFERENCE

QMP No. 8-1, Nonconforming Material Disposition

3.0 GENERAL

3.1 Policy

3.1.1 It is the responsibility of WANL Quality Control to provide adequate and effective control over material received and processed in Reactor Assembly.

3.1.2 It is the responsibility of WANL Quality Engineering to define in Reactor Assembly Process Outlines (RAPO) the points at which inspections will be performed in Reactor Assembly to assure conformance to quality requirements.

4.0 PROCEDURE

4.1 Material Released from NERVA Stores to Reactor Assembly

All material released from NERVA Stores to Reactor Assembly must be accompanied by a Material Release (MR), Ⓢ Form 59188. The MR will list all Variation Requests (VR), Ⓢ Form 59005, Nonconforming Material Disposition Requests (NMDR), Ⓢ Form 59050 and Engineering Change Orders (ECO), Ⓢ Form 59162 that are pertinent to the material being released. In the Reactor Assembly Storage area, WANL Quality Control will determine that the material agrees with the List of Parts (LOP) for the reactor to which the material is assigned. Material which does not agree with the LOP will be handled in the following manner:

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

4.1.1 Returned to NERVA Stores for replacement with correct part by issuing an amended MR.

4.1.2 Accept by an ECO which allows substitution of the released part for the part called for on the LOP.

4.2 WANL Quality Control will examine all material for handling damage. Material which is found to be damaged will be handled in the following manner:

4.2.1 Reject using an Unusable Material Tag, Ⓜ Form 59539, when obviously unusable.

4.2.2 Request disposition by an NMDR through ERB as described in QMP No. 8-1.

4.3 Material Released from Reactor Assembly Storage Area to the Assembly Floor

When material is released to the assembly floor, it will be under constant surveillance of WANL Quality Control for damage. In addition, for all material, definite inspections called for in the Reactor Assembly Process Outline (RAPO) will be performed.

4.3.1 Verification of Material (Non-Fuel)

Reactor Assembly will prepare a Route Card and Inspection Record, Ⓜ Form 59157, which will contain all of the steps shown on the RAPO. The Inspector will signify his acceptance of the inspection step by stamping and dating the appropriate line on the Route Card.

4.3.2 Verification of Fuel Elements

Fuel elements are released to Reactor Analysis on a Phase I and II Release from WAFF Quality Control. Reactor Analysis releases elements to Assembly and positions them in the reactor by means of an Element Placement and Orificing Directive (EPOD). The EPOD contains a listing of inspections to be performed on elements after orificing. The Inspector will signify his acceptance of these operations by stamping the EPOD in the space provided for each inspection step.

4.3.3 Discrepancies During Assembly

Material which is found to be discrepant on the assembly floor will be dispositioned in the following manner:

4.2.3.1 Unusable Material Tag

Material which has been damaged or has failed and is obviously unusable or a subassembly which requires an obvious repair to meet drawing requirements will be disposed of by the use of an Unusable Material Tag, Ⓢ Form 59539.

4.2.3.2 Nonconforming Material Disposition Request

Material which cannot be dispositioned by the use of an Unusable Material Tag will be dispositioned by ERB or MRB action on an NMDR in accordance with QMP No. 8-1

4.4 Maintenance of Records and Documentation

Records of Route Cards and EPOD's will be maintained by Reactor Assembly.

Records of all NMDR's and of any special inspection data (i.e. core periphery measurements) will be maintained by WANL Quality Control.

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 7 - 5 Rev.

Effective Date 7/5/66

Supersedes:
No. QMP (L) 7-5 Date 12/15/66

SUBJECT: NONDESTRUCTIVE TESTING PROCEDURE

1.0 PURPOSE

To establish the procedure and associated records for Nondestructive Testing.

2.0 REFERENCES

WANL PS 294584	Certification for Nondestructive Testing
QMP No. 4 - 1	Drawing Review
QMP No. 5 - 5	Receiving Inspection at WANL
QMP No. 5 - 8	Receiving Inspection at WAFF
QMP No. 7 - 2	Inspection and Test Planning
QMP No. 8 - 1	Nonconforming Material Disposition
QMP No. 8 - 3	Dispositioning Discrepant Materials and Parts Discovered at In-Process Inspection
QMP No. 13-1	Nondestructive Certification Procedure
MIL STD 271	Nondestructive Testing Requirements for Metals

3.0 GENERAL

3.1 Policy

- 3.1.1 Nondestructive inspection shall be conducted on raw materials, parts, components, and assemblies to insure that those articles conform to applicable drawings and specifications.
- 3.1.2 Nondestructive testing shall also be performed for engineering investigation, establishing standards, and to verify the quality of subcontractor performance.
- 3.1.3 Only personnel certified to WANL PS 294584 or QMP No. 13-1 are authorized to perform Nondestructive Testing Inspection.

3.2 Scope

This procedure shall be applicable to all Nondestructive Testing.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

4.0 PROCEDURE

4.1 Nondestructive Test Requirements

4.1.1 Quality Engineering

Nondestructive testing requirements are specified on the applicable part drawing and in the referenced specifications. Quality Engineering reviews these requirements in accordance with QMP No. 4-1. If due to the nature of the part, additional inspection is required, Quality Engineering will issue Inspection Instructions, Ⓢ Form 59060, as defined in QMP No. 7-2. The Inspection Instructions, when issued, shall state the specification(s) and Acceptance Quality Levels (AQL's) to be used for Nondestructive Testing, otherwise the inspection information specified on the drawing shall be used for the Non-destructive testing.

4.1.2 Receiving and In-Process Inspection at WANL

Upon receipt of the materials and the Receiving Report, Ⓢ Form 22972 at Receiving and In-Process Inspection, the Inspector shall refer to the drawing or to the Inspection Instructions to determine if nondestructive testing is required. If required, the Inspector shall send the Inspection packet, indicating the numbers of parts to be inspected to the nondestructive testing inspector.

4.1.3 Nondestructive Testing Inspection at WANL

4.1.3.1 Upon receipt of the material and the inspection packet, the nondestructive testing inspector shall record the material identification and testing technique in the appropriate log book. The testing shall be performed to a recorded technique approved by the Inspection Supervisor or his designated representative.

4.1.3.2 The testing technique shall comply with MIL STD 271 or other applicable or designated specifications.

4.1.3.3 Acceptances and rejections shall be based on applicable existing material standards, WANL Process Specifications and/or drawings. Where no acceptance standard exists, Quality Engineering shall be consulted to develop appropriate acceptance standards.

4.1.3.4 A detailed Nondestructive Testing Inspection Report shall be completed by the Inspector who will affix his stamp upon completion.

4.1.3.4.1 For Liquid Penetrant Inspection, Ⓢ Form 59230 (Attachment "A")

4.1.3.4.2 For Radiographic Inspection, Ⓢ Form 31622 (Attachment "B")

4.1.3.4.3 For Ultrasonic Inspection, Ⓢ Form 59313 (Attachment "C")

4.1.3.5 A file of inspection reports shall be maintained by Inspection.

4.1.3.6 The nondestructive testing inspector shall affix the appropriate stamp markings and tags to the materials as required by QMP No. 5-5.

4.2 Disposition of Materials at WANL

Upon completion of the Nondestructive Testing Report, it and the Inspection packet shall be forwarded to Receiving and In-Process Inspection for disposition. For rejected or unacceptable materials, Inspection shall initiate a Nonconforming Material Disposition Request (NMDR), Ⓢ Form 59050, per QMP No. 8-1).

4.3 Nondestructive Testing to be Performed at Facilities Outside WANL

When nondestructive testing is required outside of the WANL facility, a Purchase Order Requisition shall be prepared. The inspection requirements must be completely and clearly defined. The requirements of QMP No. 13-1 and this procedure shall be included as part of the Purchase Order. Upon receipt of the nondestructive testing information, the results shall be recorded and filed by Inspection per 4.1.3.4, above. Material disposition shall be made per 4.2, above.

4.4 Nondestructive Testing per Request of ERB/MRB at WANL

When the ERB/MRB requires that nondestructive testing be repeated or that special nondestructive testing be performed, instructions shall be placed on the NMDR form and Laboratory Work Request, Ⓢ Form 33872, designating special procedures and acceptance standard criteria, as required, and a copy of the NMDR and Laboratory Work Request shall be sent to Receiving and In-Process Inspection. Receiving and In-Process Inspection shall process this request in the same manner as stated in paragraph 4.1.3.4, above.

4.5 "Special" Nondestructive Testing at WANL

When "special" nondestructive testing is required for engineering investigation, establishing standards or other reasons, the individual responsible for the testing shall prepare a Laboratory Work Request, Ⓢ Form 33872, and submit it to Inspection per QMP No. 5-5. The testing shall be performed and the results recorded and filed per 4.1.3.4, above. Any and all supplementary tests performed regardless of the initiator must also be recorded and filed.

4.6

Nondestructive Testing at WAFF

Nondestructive testing performed at WAFF will be accomplished in accordance with detailed QIP's prepared as required in QMP 7-2. Recording of results and disposition of material or parts will be defined in applicable QIP's.

W

Number _____

LIQUID PENETRANT INSPECTION REPORT

W form 59230A

QMP No. 7-5

ATTACHMENT "A"

RIR No.	NMDR No.	Quantity in Lot
P. O. No.	Lot Serial No.	
Drawing No.	Part Name	Quantity Inspected
Supplier	Specification	Quantity Rejected
		Quantity Accepted

Specification used for Inspection

Surface Preparation

Penetrant: Type _____ Time _____

Method of Applying

Method of Removing

Remover: Type _____ Time _____

Method of Applying

Method of Removing

Drying: Method _____ Time _____

Developer: Type _____ Time _____

Method of Applying _____ Sensitivity: Heavy Coat ☐ Normal Coat ☐ Light Coat ☐

EVALUATION

Quantity Inspected	AQL	Qty. Acc.	Qty. Rej.	Remarks
Disposition:				

Processor

Inspector

Date

WESTINGHOUSE FORM 31622 B

QMP No. 7 - 5

WELDMENTS ☐

Page 1 of

PRIME SELLER		DRAWING NO.	DATE	PROJECT
SUPPLIER		PART NO.	WESTINGHOUSE P. O. NO.	
COMPONENT		SERIAL NO.	WESTINGHOUSE S. O. NO.	
STAGE OF MANUFACTURING		HEAT NO.	SELLER S. O. NO.	
SPEC. NO.	STANDARD	TYPE OF MATERIAL	DATE RADIOGRAPHED	NO. OF FILMS

[illegible]

SELLER REVIEWER		DATE		WESTINGHOUSE REVIEWER		DATE	
-----------------	--	------	--	-----------------------	--	------	--

ORIGINATOR - RETAIN LAST PINK COPY - FORWARD THREE COPIES TO WESTINGHOUSE

No. 39851

ATTACHMENT "C"
ULTRASONIC TEST REPORT

QMP No. 7 - 5

Date _____

No. _____

Inspector _____

Part No.:	EQUIPMENT				
Part Name:	Reflectoscope	☐	Sonoray	☐	
Specification:	Transducer:	Quartz	☐	L. S.	☐
				Ba	☐
				Z	☐
Purchase Order:	Frequency	0.5	☐	1.0	☐
				2.25	☐
				5.0	☐
				10.0	☐
Reference Reports:	Size:	3/8	☐	1/2	☐
				3/4	☐
				1	☐
				1-1/8	☐
	Other _____				

CALIBRATION

Angle:	0°	☐	30°	☐	45°	☐	90°	☐	_____°
Mode:	Longitudinal	☐	Shear	☐	Surface	☐	Lamb	☐	
Indication Amplitude: _____									
Reference Block: _____									
Remarks: (Gate, Reject, etc.) _____									

PROCEDURE

Contact	☐	Immersion	☐	Water Path	_____"
Couplant:	Water	☐	Glycerine	☐	0.1 _____
Wedge:	Angle	°	Material - Lucite	☐	Water
Monitoring:	Visual	☐	Auto Alarm	☐	Recorder
					☐

EVALUATION

No.	Size	Direction	Location	REMARKS

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 8 - 1 Rev.

Effective Date July 25, 1966

Supersedes:
No. QMP(L) 8-1 Date 10/1/65

SUBJECT: NONCONFORMING MATERIAL DISPOSITION

1.0 PURPOSE

To establish a method of processing nonconforming material.

2.0 REFERENCE

QMP No. 5-5 Receiving, In Plant and In-Process Inspection of Non-Fuel Components

QMP No. 7-1 In-Process Inspection

QMP No. 8-3 Dispositioning Discrepant Materials and Parts Discovered at In-Process Inspection

QMP No. 8-4 Preliminary Review and Disposition of Rejected Material

3.0 PROCEDURE

3.1 Review and Disposition of Nonconforming Parts/Material

When Quality Control determines that parts/material do not meet the requirements as specified on the purchase order, work order, drawings, specifications, etc., the parts/material will be rejected.

3.1.1 WANL Review and Disposition

WANL Program Control, in conjunction with Manufacturing Engineering and Quality Control will make disposition of the parts/material on the receiving inspection document to route the parts to Terminal Stores, rework to drawing/specification requirements, return parts/material to the supplier or submit the parts/material on an NMDR to the ERB/MRB for disposition, per QMP No. 8-3, "Preliminary Review and Disposition of Rejected Material".

3.1.2 WAFF Review and Disposition

WAFF Quality Control will submit the parts and materials on an NMDR for ERB action when the concurrence of WANL Design activities is required to determine final dispositioning.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

3.2 Originating the Nonconforming Material Disposition Request (NMDR),
Form 59050.

When material is found to be nonconforming and the disposition in 3.1 of this procedure is to submit parts/material to ERB/MRB, an NMDR will be filled out by the cognizant Inspector. The Nonconforming Material Disposition Request Continuation Sheets, Form 59582 and 59583, will be used when additional space is needed (see Attachment A for sample forms and detailed instructions for filling out the forms). Quality Control is responsible for having the correct Security Classification on each NMDR.

NOTE: The numbers representing the characteristics inspected on the particular part should be noted with the drawing or specification characteristics in the appropriate block of the NMDR for correlation purposes.

The cognizant Inspector will give the NMDR to the Inspection Supervisor or Foreman who will review it for accuracy and completeness, signing the NMDR in the appropriate block. The NMDR will be assigned a numerically consecutive number by the Inspection Supervisor or his designated representative. This number is obtained from a master NMDR log book maintained by Quality Control. The NMDR will be delivered to the ERB Area with the material.

At WANL, all materials delivered to the ERB Area will be marked with the red rejection tags or Brady Labels on each piece. When the size of the parts prohibits red tagging of each part and/or when a lot size of more than 25 pieces is being considered, the container will be red tagged. At WAFF, all parts and materials being held for ERB will be moved to a designated portion of the Inspection Area until dispositioned. Administrative control of these parts and materials will be maintained.

For those NMDR's written in the WANL Reactor Assembly Area, the NMDR number will be assigned from a special block of numbers assigned to this area. Each of these numbers will be preceded by the letter "R" to further denote Reactor Assembly Inspection. Material on NMDR in Reactor Assembly will not be taken to the ERB Area but will be held in the Assembly Area until disposition. For those NMDR's written at WAFF, the number will be assigned from a special block of numbers assigned to this location. Each of these numbers will be preceded by the letter "A" to further denote WAFF inspection.

All material on NMDR in the WANL Assembly Area will be tagged with a Hold label on each piece. The NMDR number will be written on the Hold label. The Inspector will state the location at which the discrepancy was discovered in the Actual Conditions (block 23) of the NMDR.

3.3 Preparation for Engineering Review Board (ERB) Review

Upon receipt of the material and NMDR Form in the ERB Area at WANL, the Quality Engineer will review the document for compliance with the instructions of 3.2. At WAFF, Product Control Engineering will be advised of pending NMDR actions by the Inspection Foreman. The cognizant Quality Control Engineer will arrange for the ERB to convene and will make available drawings, previous NMDR's, applicable VR's, the purchase order file or work order file, and all other pertinent inspection data required by the ERB. The Engineering Review Board will be, as a minimum, the cognizant Design engineer for the part and the cognizant Quality Engineer for the affected parts.

For those NMDR's written in WANL Reactor Assembly, the Supervisor of Assembly Inspection will arrange for the ERB/MRB meeting and make available all pertinent data for the meeting.

3.4 Engineering Review Board Meeting

When the ERB meeting convenes, the Quality Control member of the board will coordinate the meeting, consolidate the comments, and complete the filling out of the NMDR. The Review Board will consider the condition of the parts or material, and will arrive at a technical evaluation. The decision of the board must be unanimous.

Reliability will participate in the ERB only as arranged by Reliability Management with advance notice to Quality Control that Reliability participation is required in a specific instance. Starting with NR-3, Reliability will review all documents dispositioned by the ERB as "Accept".

NOTE: All dispositions must be supported by comments in the "ERB/MRB Comments" block, justifying the disposition of the parts/material. The justification will be based on a technical evaluation of the deviated conditions, their effect on the integrity of the final assembly, and what the board considered in arriving at the decisions. No NMDR will be signed off by Quality Control unless the justification statement is included and appears adequate.

3.5 ERB Evaluation and Disposition

The evaluation of discrepant parts/material reported on the NMDR shall be made and dispositioned as follows:

3.5.1 "ACCEPT" (A)

This disposition shall indicate acceptance for usage in all reactors or other applications requiring the part number.

3.5.2 "REJECT" (R)

This disposition shall indicate that the part is not acceptable for usage in any reactor or other application requiring the part number.

3.5.3 "RE-INSPECTION" (I)

When the ERB/MRB disposition cannot be completed due to lack of inspection data or if 100% inspection is requested by ERB/MRB, NO ERB/MRB disposition will be made. The ERB/MRB requested re-inspection will be requested in writing by the Quality Control ERB Representative stating specifically the information required. The NMDR, the re-inspection instructions and all the parts will be returned to Inspection. The NMDR will be adjusted or rewritten to include the information requested. The original NMDR number will be used.

When re-inspection is required to new acceptance standards as defined by the ERB disposition, the new inspection acceptance standards will be outlined in the "ERB/MRB Comments" block. The NMDR will be marked to indicate that a supplement is required to document the results of the re-inspection. Following inspection, a supplement to the original NMDR will be prepared showing the results of the re-inspection. The NMDR supplement will show the inspection performed and will reference the previous NMDR number in the drawing and specification drawing block of the form. The result of the inspection will be shown in the "Actual Condition" block.

Re-inspection of all parts/material is required after completion of rework or repair required by the NMDR disposition. The document ordering the rework or repair will state positively that re-inspection is required. At WANL, the ordering document identification number will be entered on the NMDR by Program Control--see 3.7. At WAFF, the rework ticket will be attached to the follower record which accompanies the part back to the area where the rework will be performed. At the completion of the rework, the rework tag is returned to Inspection with the parts with a notation that the rework has been completed. The extent of the re-inspection, unless specified by the ERB/MRB, will be as determined by the Quality Control Engineer to insure compliance of the parts to the rework/repair instructions on the NMDR.

3.5.4 "LIMITED USAGE" (LU)

When the ERB/MRB cannot accept discrepant parts for usage in all reactors or other applications requiring that part number, but can accept the parts for particular reactors or other specific applications, they shall make a disposition of "Limited Use" and shall also state in the "ERB/MRB Comments" block the reactor numbers or other specific applications for which the part is acceptable.

(Example: NRX-A4, NRX-A5, component tests, etc.)

After technical disposition has been established by ERB, the NMDR may be reviewed by Program Control. Program Control will evaluate the effect of the limitation and may request a re-evaluation of the parts. Any change in ERB disposition must be reflected by a supplement to the NMDR.

At WANL, when the ERB disposition shows "Limited Use", the Quality Control ERB Representative will attach the limited-use tag to the parts/material. The parts/material will be delivered to Termination Stores. At WAFF, when the ERB disposition shows "Limited Use", Product Control Engineering and Data Systems will maintain release of the part.

3.5.5 Disposition in Reactor Assembly

ERB/MRB dispositions in the WANL Assembly Area will differ from those listed above in that the disposition limited usage (LU) as described in 3.5.4 will not be used. They will further differ in that the ERB/MRB will define repair/rework where practical. When this is to be done, the Quality Engineer will mark an "R" in block 26 on the NMDR and the procedure for repair/rework will be detailed in the ERB/MRB Comments (block 29) on the NMDR; he will further indicate that a supplement is required. These parts will be marked with a yellow rework label and NMDR number.

3.6 Identification of Parts/Material (After ERB Disposition)

At WANL, all parts/material when received in the ERB Area are identified individually or on the container with red rejection tags. After the ERB Disposition, Quality Control will remove the red rejection tag from the accepted parts only and replace with green acceptance tags, indicating on the green tag the NMDR number that accepted the parts. When lots are dispositioned partially as "accepted" and "rejected", the accepted pieces will be placed in a separate container; and the container will be identified with a green acceptance tag. All rejected material retained at WANL in the Terminal Stores Area will be red tagged at all times. "Return to the Supplier" materials will remain red tagged until the material is returned to the supplier. No rejected red-tagged material is to enter the NERVA Stores Accepted Material Storeroom. All "Return to Supplier" material being held for L-Orders and terminal-stores designated material will be segregated and stored outside the NERVA Accepted Materials Storeroom.

All parts/material for ERB/MRB in the WANL Assembly Area are identified individually with a Hold label. After the ERB/MRB disposition, Quality Control will remove the hold label from the part/material and replace it with either a green acceptance label, a red rejection label or a yellow rework label as directed by the ERB/MRB disposition.

At WAFF, all parts/materials are controlled administratively. After the ERB disposition copies of the NMDR are forwarded to Product Control Engineering for implementation into the control procedure used to regulate the release of all parts. All NMDR's pertaining to elements are submitted to Data Systems for inclusion in the computer generated data package.

3.7 Program Control Disposition (After WANL ERB Disposition) Other than Reactor Assembly

When the technical disposition has been completed and the Quality Control Representative has completed filling out the NMDR, Program Control will enter the material disposition in the appropriate place on the NMDR. The identifying number of the document ordering the rework/repair must be entered on the NMDR or supplement.

Repair or rework disposition on parts that have been dispositioned "reject" by the ERB/MRB.

Repair - When parts can be made usable by deviating from the drawing/specification requirements. Welding, re-heat treatments, thermal processes, etc. shall be considered as repairs.

Rework - When parts can be brought to exact drawing/specification requirements by re-machining or refinishing without causing some other discrepancy relative to tolerances or processing methods.

A disposition to "repair" must have the approval of the ERB/MRB. This approval will be accomplished by processing a supplement to the NMDR with the approved repair procedure specified in the "ERB/MRB Comments" block. Re-inspection requirements will also be specified. The re-inspection results will be documented by an NMDR supplement, as covered in paragraph 3.5.3, for re-inspection of parts to new acceptance standards other than by the drawings or specifications designated.

A disposition to "rework" does not need the ERB/MRB's approval. The re-inspection after the rework must be documented on a supplement to the NMDR.

3.8 Identification of Parts/Material after ERB/MRB Directed Rework/Repair

At WANL after parts/material have been reworked/repared per ERB/MRB instructions (NMDR or supplement), Program Control will identify the parts/material with the NMDR or supplement prior to submitting the parts/material to Inspection. The Work Order directing the repair/rework will reference the

NMDR number. Quality Control will maintain copies of open rework/repair NMDR's and supplements in their Inspection work files for redundancy.

At WAFF repair will be accomplished by rework tag per 3.5.3, above.

4.0 DISTRIBUTION OF THE COMPLETED NMDR

WANL Quality Control will distribute reproduced copies of the NMDR in accordance with a standard distribution list. The NMDR master will be retained by Quality Control.

Distribution of NMDR's which originate in the Reactor Assembly area will be reproduced on pink paper and distributed in accordance with a standard distribution list.

5.0 RELEASE OF PARTS TO A SUPPLIER FOR REWORK OR REPLACEMENT AFTER ERB ACTION AT WANL

When the material disposition on the NMDR requires that the parts/material be released to a supplier, the Inspector at Stores will note the NMDR number and indicate "for WANL internal use ONLY" under "Remarks/Contingencies" on the Quality Control Material Release Form, (QCMR), Form 59034, QMP No. 3-9, and will remove the copy of the NMDR from the parts and destroy it. The ACMR will be further processed as stated in QMP No. 3-9.

5.1 Purchasing's Responsibility

Purchasing shall extract pertinent information from the NMDR (never send a copy of the NMDR to the supplier) to advise the supplier of receipt of the material with discrepancies. Any cost negotiations with suppliers are the responsibility of Purchasing.

5.2 WANL Supplier Surveillance Responsibility

Supplier Surveillance shall process a Request for Corrective Action (RCA), Form 59072, to the supplier for action to prevent re-occurrence of discrepancies on future parts - as deemed necessary.

6.0 VERIFICATION OF REWORK/REPAIR/RE-INSPECTION AFTER ERB ACTION

Defective parts which are reworked/repared/re-inspected per ERB/MRB approved procedures following NMDR action, shall be re-inspected as required to verify that the parts/material conform to established requirements. The verification of satisfactory rework will be done by Quality Control. Supplements to the NMDR will be used to state the condition of the reworked parts.

6.1 All Parts/Material "Accept"

If all rework/repair/re-inspection has been accomplished per NMDR and the parts/material are acceptable, the Quality Control Supervisor or Foreman will sign the NMDR supplement. Parts/material will be sent directly to NERVA Stores Accepted Material Storeroom. Such parts/material at WAFF will be placed in storage pending release.

6.2 All Parts/Material "Reject"

If all rework/repair/re-inspection has been accomplished and the parts/material found to be nonconforming, the parts/material will be submitted for review and disposition as described in 3.1.

6.3 Mixed "Accept" and "Reject" Parts/Material

If all rework/repair/re-inspection has been accomplished and the parts/material are found to be mixed with acceptable and nonconforming parts/material, two NMDR supplements will be used. One will cover the "Accept" parts/material in accordance with 6.1 and the other will cover the "Reject" parts/material in accordance with 6.2. Both supplements will reference each other for ease in determining that all reworked/repared/re-inspected parts/material have been disposed of.

NONCONFORMING MATERIAL DISPOSITION REQUEST

WANL QUALITY CONTROL

(1) NO. _____

SHEET _____ OF _____

(2) ☐ RECEIVING INSPECTION ☐ IN PROCESS INSPECTION ☐ REACTOR ASS'Y INSPECTION ☐ OTHER INSPECTION

(3) PART NAME/DESCRIPTION	(4) SUPPLIER	(5) RIR	(6) QTY. ON RIR	(7) QTY. INSP.	(8) QTY. REJ.	(9) QTY. ACPT.	(10) QTY. THIS NMDR
(11) P.O. NO. C/N		(12) W.O. NO. C/N	(13) APPLICABLE V-R'S		(14) PREVIOUS NMDR'S		(15) APPLICABLE E.C.O.'S
(16) REACTOR NO.		(17) M.R.	(18) ☐ DISCREPANCY ☐ FAILURE	(19) INSPECTOR DATE		(20) SUPERVISOR DATE	

(21) REQUIREMENTS ☐ P.O./DWG./SPEC. ☐ PRIOR NMDR DISPOSITION	(22) DWG. ZONE	(23) ACTUAL CONDITIONS	(24) PART NO.	(25) SERIAL NO.	(26) DISP.

ATTACHMENT A

(27) DWG./SPEC. STATUS ☐ NO CHANGE ☐ CHANGE TO BE MADE E.C.O. NO.

(28) DISPOSITION SYMBOLS: A - ACCEPT; R - REJECT; I - REINSPECT; LU - LIMITED USE

(29) ERB/MRB COMMENTS

(30)

☐ ERB
☐ MRB
☐ INFO

(31) REVIEW BOARD SIGNATURES

EMERG. _____

O.C. _____

(32)

DATE

QMP No. 8-1
Effective Date 7/25/66

Page 1 of 1

(11)

(32) MATERIAL DISPOSITION (FOR PROGRAM CONTROL USE ONLY)

**NONCONFORMING MATERIAL DISPOSITION REQ
CONTINUATION SHEET A
WANL QUALITY CONTROL**

SHEET _____ OF _____

ATTACHMENT B

QMP No. 8 - 1
Effective Date 7/25/66

Page 1 of 1

(1) NO.

(33)

NONCONFORMING MATERIAL DISPOSITION REQUEST
CONTINUATION SHEET B
WANL QUALITY CONTROL

(1) NO. _____

SHEET _____ OF _____

(29) ERB/MRB COMMENTS

ATTACHMENT C

Page 1 of 1

QMP No. 8 - 1

Effective Date 7/25/66

(33)

ON (1)

Instructions for filling out the Nonconforming Material Disposition Request		QMP No. 8 - 1
Block	Filled in By - Date Required	Effective Date 7/25/66
(1) No.	Inspection Supervisor - Consecutive numbers. (two locations)	
(2)	Inspector - Check appropriate block	
(3) Part Name/Description	Inspector - Part name shown on the drawing or description if no drawing.	
(4) Supplier Name	Inspector - Supplier's name.	
(5) RIR	Inspector - Receiving Inspection Report applying to material or parts.	
(6) Quantity on RIR	Inspector - Total quantity of parts from RIR.	
(7) Quantity Inspected	Inspector - No. parts inspected from RIR.	
(8) Quantity Rejected	Inspector - No. parts nonconforming from RIR.	
(9) Quantity Accepted	Inspector - No. parts acceptable from RIR.	
(10) Quantity this NMDR	Inspector - No. parts to be dispositioned by this NMDR.	
(11) Purchase Order/CN	Inspector - P.O. No. and current change notice (ex: 59-NZ-48974, if applicable)	
(12) Work Order/CN	Inspector - Work Order No. and change notice, if applicable.	
(13) Applicable VR's	Inspector - No's of previously written approved VR's pertaining to any parts of the same part number and the same serial/lot numbers in question, on the same Purchase Order or Work Order.	
(14) Previous NMDR's	Inspector - Previous NMDR's.	
(15) Applicable ECO's	Inspector - No's of ECO's written against part numbers involved since the last Revision to the P/N drawing.	
(16) Reactor No.	Inspector - Number of the reactor in which the part is being assembled. Only to be filled in if block 2 Reactor Assy. Inspection block is filled in.	
(17) Material Release	Inspector - Material Release Number. Only to be filled in if block 2 Reactor Assy. Inspection block or other inspection block is filled in.	
(18)	Inspector - Discrepancy or failure block to be filled in as applicable.	
(19) Inspector/Date	Inspector - Signature and date of Inspector preparing the NMDR.	
(20) Supervisor	Inspection Supervisor - After review of NMDR, and date.	
(21) Requirements	Inspector - Fill in appropriate block. List nonconforming characteristics identifying each numerically per QMP (L) 8-1, paragraph 3.1.	
(22) Drawing Zone	Inspector - Zone on drawing where nonconforming characteristic can be found.	
(23) Actual Conditions	Inspector - Actual discrepant conditions of parts as grouped in Col. 25.	
(24) Part Number/Revision	Inspector - Part No. and Revision shown on P.O./W.O. or drawing.	
(25) Serial Number	Inspector - Serial Number or other individual part identification. Parts having identical discrepancies shall be grouped.	
(26) Disposition	Quality Control ERB Representative - show disposition using symbols shown in Block 28.	
(27) Dwg/Spec Status	Quality Control ERB Representative - Fill in applicable blocks. If drawing change is to be made, Engineering to provide ECO No. when drawing change block is filled in. Characteristics requiring drawing change shall be specified in Block (29).	
(28) Disposition Symbols	Information to be used by ERB/MRB.	
(29) ERB/MRB Comments	ERB/MRB - Consolidated comments of ERB/MRB with technical justification.	
(30)	Inspection Supervisor - Appropriate block to be filled in as applicable.	
(31) Review Board Signature	Engineering, Quality Control - Signature and date of signing, denoting verification and approval of technical disposition. Other signatures may be added as deemed necessary by ERB. When Block (17) is filled in, signature of customer representative required.	
(32) Material Disposition	Program Control - Provide disposition of material in accordance with ERB technical disposition.	
(33)	Inspector/Quality Control ERB Representative - Provide security classification as applicable (two locations). Information category information to be included in space at top of the form.	

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 8-2 Rev.

Effective Date 7/15/90

Supersedes:
No. QMP(A)8-2 Date 5/11/65
QMP(L)8-2

SUBJECT:

VARIATION REQUEST

1.0 PURPOSE

To define the procedure to be followed by suppliers when requesting approval of design changes before manufacture or acceptance of variant material after manufacture.

2.0 REFERENCE

QMP 5-3 Quality Surveillance Codes

3.0 APPLICABILITY

This procedure shall be applicable to all Purchase Orders and Inter-Work Requisitions (IWR) W Form 59251, for materials or parts in Surveillance Codes 1, 2 or 3 (see QMP 5-3). This procedure will also be applicable to fueled and unfueled elements procured through funds supplied directly by SNPO and directed by Program Control Memorandums (PCM). For such element procurements, Program Control personnel will act in the place of Purchasing personnel as detailed below

4.0 GENERAL

4.1 Policy

The Variation Request shall be initiated by supplier activities for requesting deviations or waivers (see Paragraph 4.0 below, for definitions). The Variation Request shall not be initiated internally except in "emergencies", as noted in Paragraph 6.2 below. Under no circumstances shall a Variation Request be initiated in lieu of an Engineering Change Order (ECO).

5.0 DEFINITIONS

5.1 Variation

Any departure from purchase order, specifications or drawing requirements.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

5.2 Deviation

A specific authorization, granted before the fact, to depart from a particular requirement of specifications or related documents.

5.3 Waiver

Granted use or acceptance of an article which does not meet specified requirements.

6.0 PROCEDURE

6.1 Originating a Variation Request

The supplier may initiate a Variation Request, Ⓢ Form No. 59005, (hereafter referred to as a VR) of the Deviation or Waiver Type as stated below. The Variation Request - Continuation Sheet, Ⓢ Form 59409, shall be used when additional space is required (see Attachments "A" and "B" for sample forms and detailed instructions for completing forms). The supplier shall review and provide the security classification to each VR as required, submitting the VR's per established security practices.

6.1.1 Deviation Type

The supplier may initiate a VR prior to production if he is not capable of meeting drawing, specification or purchase order requirements. Such a request will be of the Deviation Type as defined in Paragraph 5.2, above. This type of VR must provide an exceptionally sound statement of justification before it will be considered. A deviation type VR may be written against only one part number for any particular purchase order number.

6.1.2 Waiver Type

When the supplier's inspection reveals departure from drawing, specification or purchase order requirements, the supplier may initiate a VR of the Waiver Type, as defined in Paragraph 5.3, above. This type of VR is applicable when variant parts (see Paragraph 5.1, above) are discovered either before or after authorized repair. If the supplier's recommended disposition in block (18) of the VR is Repair, he shall submit a procedure as an attachment specifically denoting the method that will be followed in repairing the parts in question. A Waiver Type VR shall be written against only one part number for any particular purchase order with the following exception: more than one part number may be listed on a VR if the part names are identical.

6.2 Submitting the VR

After filling out the VR, the supplier shall retain the last copy and shall submit the ditto master and one carbon copy of each (with reproducible attachments, as needed) to the cognizant buyer in the Purchasing Department. In lieu of the actual submission of the VR, "emergency" VR's may be phoned verbatim by the supplier to the cognizant buyer in the Purchasing Department who will fill out the form.

NOTE: All information stated on the VR, including that required for VR Continuation Sheets and Attachments, must be phoned in verbatim. The supplier shall immediately follow up the phone call with a TWX to the buyer stating verbatim the information on the VR, VR Continuation Sheets and Attachments. The TWX shall be retained on file by the buyer. The buyer shall sign "emergency" VR's with his own name and date the VR in block (19). He shall also note on the VR the name of the supplier representative who phoned in the information. The VR shall then be processed as stated below.

6.3 VR Review by Purchasing

The cognizant buyer will review the VR to verify that the part number/revision, block (9), quantity of parts on order, block (11) and serial/lot numbers, block (14) are correct and complete, changing as required when coordinated with and agreed to by the supplier. He shall then send the VR (master and carbon copy), VR Continuation Sheet and Attachments as received, to the cognizant Quality Engineer.

6.4 Review of the VR by Quality Engineer

Upon receipt, the Quality Engineer will review the VR for accuracy, completeness and legibility and will assign the WANL VR number in block (1). Any inadequacies shall be corrected by the reviewer as required when coordinated with and agreed to by the supplier. The supplier contact shall be made by the cognizant buyer and the phone call shall be followed up by a TWX from the supplier in the same manner as noted in paragraph 5.2, above.

Blocks (1) and (2) of a VR Work Sheet, Ⓜ Form 59410, shall be filled in and the Work Sheet shall be attached to the VR, VR Continuation Sheet and Attachments, making up a VR package. (See Attachment "C" for sample form and detailed instructions for completing the form). The carbon copy shall be retained at Quality Control as a temporary copy until disposition is established on the VR. The VR package shall then be submitted to the Engineering Review Board for disposition.

6.5 Establishing Disposition by Engineering Review Board (ERB)

The Engineering Review Board will be the cognizant Design and Quality Engineer for the affected parts.

NOTE: The VR package may be submitted to the cognizant Manufacturing, Materials or Reactor Analysis Engineers for review for comments to aid the required signers in arriving at a decision. The reviewers shall document their position by a check, signature and date in the applicable blanks of the VR Work Sheet in the same manner as the Design and Quality Engineers.

To establish technical disposition, the VR package shall be reviewed by the Engineering Review Board, who will check Approved, Conditionally Approved, (requiring conditional requirements) Disapproved or Grouping (G) Accepted (WAFF Only). When a "G" (Grouping) disposition is made to designate acceptance of the part to a lower quality assembly level, the "G" will be followed by the numerical designation of that assembly. (Example: G-4 indicates acceptance to NRX-A4 level only.) The Engineer will sign and date in the applicable blanks of the VR Work Sheet. For Deviation Type VR's, the Design Engineer shall also check the applicable blank of the VR Work Sheet to denote whether or not there will be a drawing change made to represent the variation stated on the VR. If there is to be a drawing change made, the Design Engineer shall fill in the ECO No. blank with the ECO No. that will be used. Parts shall be evaluated for useability in any application requiring the part number referenced in Block (19).

NOTE: All dispositions must be supported by comments in the "Comments" block of the Work Sheet, justifying the disposition of the parts/material. The justification will be based on a technical evaluation of the deviated conditions, their effect on the integrity of the final assembly, and what the ERB considered in arriving at the decisions. No VR will be signed off by the Quality Engineer unless the justification statement is included and appears adequate.

After technical disposition has been established by the ERB, the VR package shall be submitted to Program Control. They shall evaluate the VR to assure that an excess of parts has not been assigned to a project. Program Control may not change the technical disposition established by the ERB. If Program Control concurs with the useability of parts, the appropriate block shall be checked. If schedule requirements do not allow for the use of parts on the programs as specified, Program Control may request re-evaluation of parts for other projects. If the ERB finds that the parts are unusable for the projects specified by Program Control, they shall be dispositioned "Disapproved".

Considering (1) the disposition, conditional requirements and useability established by the Design Engineer, (2) Program Control's approval or disapproval as stated above, (3) and his own decision, the Quality Engineer shall establish disposition as Approved, Conditionally Approved or Disapproved in block (17) of the VR. The most limiting disposition must be used. If Conditional Approval is an assigned disposition, the conditions the supplier shall meet will be stated in block (21) of the VR. The "restricted to", block (22), shall be completed to denote useability of the parts. Copying the VR Work Sheet for Deviation Type VR's, the Quality Engineer shall check block (4) of the VR in the same manner as the VR Work Sheet, to indicate whether or not a drawing change will be made. He shall also fill in the ECO No. of the drawing change to be made, per the VR Work Sheet, if required. The Quality Engineer shall sign and date in block (23) of the VR as an authorized representative of the ERB and Program Control. The masters of the VR, VR Continuation Sheet and Attachments shall be sent to Purchasing for signature.

NOTE: Reliability shall have the right to Disapprove any Conditionally Approved or Approved VR's within 24 hours after the receipt of their copy of the VR on normal distribution. In such cases, Reliability shall be responsible for (1) immediately coordinating the change in disposition through Purchasing to the supplier (2) noting all concerned parties and requesting from WANL Quality Control, in writing, that a supplement stating the change in disposition be supplied to Purchasing for distribution in the normal manner.

6.6 Establishing Disposition by a Review Board (RB) at WAFF

When the VR is initiated by a supplier of WAFF materials or parts against an order originated by WAFF Operations, the VR package shall be reviewed by the cognizant WAFF Process and Quality Engineers, who will perform processing and dispositioning functions per 6.5, above. The Program Control sign off on the Work Sheet shall not be used.

6.7 Distribution of the VR, VR Continuation Sheet and Attachments

After approval of the VR's as noted above, Purchasing will distribute the VR, VR Continuation Sheet and Attachments in accordance with a standard distribution list. The VR Work Sheet shall be retained in Quality Control and distributed by an established distribution list.

NOTE: "Emergency" VR's may be phoned to the supplier by the cognizant buyer, stating verbatim the disposition and the Comments/Conditional Approval information. The buyer shall immediately follow up the phone call with a TWX to the supplier with a copy to the Supplier Surveillance section of WANL Quality Control stating verbatim the disposition and the Comments/Conditional Approval information. This "emergency" action does not relieve the requirement for processing the VR in the normal manner as stated below.

6.8 Action Required by the Supplier Upon Receipt of the VR

The supplier shall review the VR upon receipt, noting WANL disposition in block (17) of the VR, and shall process the VR forms as stated below. Conditional Approval by WANL of the VR or any portion of the VR requires that the VR Forms be processed as stated in Paragraph 6.8.3, below.

6.8.1 Disposition - APPROVED

Approval indicates acceptance of the VR and authorizes repair, rework or other actions as requested by the supplier.

NOTE: All (G) Groupings are to be approved to the level indicated (see 6.5, above).

6.8.2 Disposition - DISAPPROVED

Disapproval indicates a refusal of the supplier's request and the supplier must then meet the requirements that existed at the time the disapproved VR was completed by the supplier.

6.8.3 Disposition - CONDITIONALLY APPROVED

Conditional Approval authorizes repair or other actions as requested by the supplier, with the conditions as noted in the Comments/Conditional Approval block (21) of the VR. When the WANL Disposition is Conditionally Approved, blocks (17) and (21), it is required that the supplier review the recommended Disposition for acceptability.

6.8.3.1 Supplier Acceptance of Conditional Approval

When a conditionally approved VR is acceptable, the supplier shall fulfill the requirements specified in block (21), inspect to insure compliance and prepare and process a supplement to the VR as follows:

The Supplier's Reference No. and the WANL VR No. shall be supplemented on VR form (see paragraph 6.8, below). The supplier shall note across blocks (13) through (16) of the VR that the conditional requirements are acceptable. The remainder of the form does not have to be completed. An authorized representative of the supplier shall sign and date in block (19) of the VR. The supplier shall retain the last copy of the VR form and shall submit the ditto master and one carbon copy to the cognizant buyer. The buyer shall forward the VR to the cognizant Quality Engineer who shall approve and sign the VR. Supplements of conditionally approved VR's stating that the conditions have been satisfied may be approved by a WANL Quality Control Supplier Surveillance Representative in lieu of the cognizant Quality Engineer. The VR supplement shall be distributed in accordance with Paragraph 6.7, above.

6.8.3.2 Conditional Approval Unacceptable to Supplier

When a conditionally approved VR is unacceptable, the supplier shall prepare and process a supplement to the VR in the same manner as is stated in Paragraph 6.8.3.1, above, except that the notation across blocks (13) through (16) shall state that the conditions are unacceptable. This action cancels the entire VR. The VR Supplement will be disapproved and signed by WANL or WAFF Quality Engineering and distributed in accordance with Paragraph 6.7.

6.9 Corrections or Additions to the VR

Corrections or additions to the VR shall be made by supplementing the VR and submitting it in the normal manner. The supplement shall consist of a VR Form completed in the normal manner except that the Supplier's Reference No. and the WANL VR No. shall be the original No's. with a dash and then consecutive numbers starting with one (1) for each supplement for each VR.

EXAMPLE:

Original VR	WANL VR No. 1234
First Supplement	WANL VR No. 1234-1
Second Supplement	WANL VR No. 1234-2

The corrections or additional information shall be written across blocks (13) through (16) of the VR or an attachment may be made to the VR Supplement if the information is extensive.

05457

Westinghouse Electric Corporation
ASTRONUCLEAR LABORATORY
P. O. BOX 10864, PITTSBURGH, PA., 15236

SUPPLIER'S REFERENCE NO.

(3) DEVIATION		ASTRONUCLEAR LABORATORY		(1) WANL VR NO.	(2) PAGE
(4) ECO NO.		P.O. BOX 10864, PITTSBURGH, PA., 15236		OF	
(5) SUPPLIER INITIATING REQUEST - ADDRESS		(6) DATE	(7) P.O. NO.	(8) ATTACHMENTS	(9) PART NO.
				☐ YES ☐ NO	REV.
		(10) QUANTITY AFFECTED	(11) QUANTITY ON ORDER	(12) PART NAME	
(13) REQUIREMENTS PER P.O./DWG./SPEC. (LIST PART NO'S. SEPARATELY AND IN NUMERICAL ORDER, IF MORE THAN ONE.)	(14) SERIAL/LOT NO'S.	(15) PREVIOUS VR'S.	(16) STATEMENT OF CONDITION	(17) WANL DISP.	
(18) RECOMMENDED DISPOSITION & CORRECTIVE ACTION TAKEN BY SUPPLIER TO PREVENT RECURRENCE			(19) SUPPLIER AUTHORIZED REPRESENTATIVE AND DATE		
			(20) WANL QUALITY CONTROL REPRESENTATIVE SIGNATURE AND DATE		
FOR WANL USE ONLY BELOW THIS LINE					
(21) CONDITIONAL REQUIREMENTS/COMMENTS			(22) RESTRICTED TO:		
			(23) AUTHORIZATION OF DISPOSITION SHOWN IN BLOCK (17) A - APPROVED; D - DISAPPROVED; CA - CONDITIONALLY APPROVED		
			WANL QUALITY ENGINEER SIGNATURE AND DATE		

NOTE TO SUPPLIER: SUPPLEMENT TO VR REQUIRED INDICATING ACCEPTABILITY OR UNACCEPTABILITY OF CONDITIONAL APPROVAL

THIS FORM IS AN OFFICIAL DOCUMENT WHEN SIGNED BY THE PURCHASING AGENT AND NEED NOT BE FOLLOWED BY A CHANGE NOTICE TO THE P.O.

AUTHORIZED BY _____ PURCHASING AGENT _____ DATE _____

VARIATION REQUEST
FORM 59005 D

INSTRUCTIONS FOR FILLING OUT THE VARIATION REQUEST

Ⓢ FORM 59005D

BLOCK	FILLED IN BY - DATA REQUIRED
(1) WANL VR No.	WANL Quality Engineering Technician - Consecutive number which will be assigned upon receipt of Variation Request from the supplier.
(2) Page of	Originator of Variation Request - Number as required, including supplements.
(3) Deviation Waiver	Originator of Variation Request - Check one, refer to definitions.
(4) ECO No. - No Dwg. Change	WANL Design Engineer - For Deviation Type VR's check block to show whether or not there will be a drawing change and complete ECO No. block if drawing change is to be made.
(5) Supplier Initiating Request-Address	Originator of Variation Request - Supplier's name and address.
(6) Date	Originator of Variation Request - Date Variation Request is filled out.
(7) P. O. No.	Originator of Variation Request - Purchase Order Number pertaining to parts in question.
(8) Attachments	Originator of Variation Request - Check "Yes" or "No" to denote that attachments accompany the Variation Request. (Attachments must be on reproducible "masters," preferably "ditto.")
(9) Part No. - Rev.	Originator of Variation Request - Part Number & applicable revision of the materials or parts in question, per purchase order. DO NOT list multiple part numbers (See Block 15).
(10) Quantity Affected	Originator of Variation Request - Quantity of material or parts for which the Variation Request is being written.
(11) Quantity on Order	Originator of Variation Request - Quantity of material or parts of the part no. in question required by the P. O.
(12) Part Name	Originator of Variation Request - Name of part in question.
(13) Requirements per P. O. / Dwg./Spec.	Originator of Variation Request - Specific Requirements of Purchase Order, Drawing or Specification. If more than one requirement is questionable, itemize them, e.g., A, B, C, and then list applicable drawing or specification pertaining to each requirement. Dimensions/characteristics on the drawing must be "located" in such a manner that they cannot be confused with like or similar dimensions/characteristics. A sketch (reproducible) is recommended to ensure complete understanding. More than one part number may be listed on a Waiver Type VR if the part names are identical. Correlate part numbers with serial numbers.
(14) Serial/Lot No's.	Originator of Variation Requests - Serial No's. or Lot No. of the parts in question, correlated with information in blocks (13) and (16). Serial numbers shall be listed individually as necessary to meet the requirement of block (15).
(15) Previous VR's	Originator of Variation Request - VR numbers of previously written approved or conditionally approved Variation Requests pertaining to any parts of the same part number and the same serial/lot numbers as in question, for the same purchase order.
(16) Statement of Condition	Originator of Variation Requests - Actual condition of materials or parts.
(17) WANL Disposition	WANL Quality Engineer - Final WANL Disposition (see paragraph 5.5 of Procedure). Use abbreviation shown in block (23).
(18) Recommended Disposition & Corrective Action . . .	Originator of Variation Request - Recommended disposition (repair, rework, accept as is, etc.) Specific meaningful corrective action that will be taken to prevent recurrence of such defects. Corrective action is not applicable to Deviation Type VR's.
(19) Supplier Authorized Rep. - Date	Duly authorized Supplier Representative (preferably Quality Representative) - Signature and date of signing, authorizing submission of the VR.
(20) WANL QC Representative Signature - Date	WANL Quality Control Supplier Surveillance Representative - Signature and date indicating that the VR has been checked for accuracy and completeness. This block is required to be completed only when a WANL Quality Control Supplier Surveillance Representative is available.
(21) Conditional Requirements/Comments	WANL Quality Engineer - Summarize comments from VR Work Sheet, Ⓢ Form 59410, that comprise conditional approval. May also include special instructions, etc., which do not necessarily comprise conditional approval.
(22) Restricted to	WANL Quality Engineer - Projects to which the material or parts are restricted in use, summarize from the VR Work Sheet, Ⓢ Form 59410 (see paragraph 5.5 of the procedure).
(23) Authorization of Disposition Shown in Block (17)	WANL Quality Engineer - Signature and date authorizing WANL Disposition in Block (17).

Westinghouse Electric Corporation

ASTRONUCLEAR LABORATORY

P.O. Box 10864, Pittsburgh, Pa. 15236

QMP No. 8 - 2

Effective Date

(1) SUPPLIERS REFERENCE NO

2) NAME / R NO

(3) PAGE

OF

ATTACHMENT B

Page 1 of 2

[illegible]

FOR WANL USE ONLY BELOW THIS LINE

(9) CONDITIONAL REQUIREMENTS/COMMENTS

INSTRUCTIONS FOR FILLING OUT THE VARIATION REQUEST –
CONTINUATION SHEET – (W)Form 59409 A

BLOCK	FILLED IN BY – DATA REQUIRED
(1) Supplier's Reference No.	Same as Block (1) for Variation Request, (W)Form 59005B.
(2) WANL VR No.	Same as Block (2) for Variation Request, (W)Form 59005B.
(3) Page of	Same as Block (3) for Variation Request, (W)Form 59005B.
(4) Requirements per P.O./Dwg./Spec.	Same as Block (15) for Variation Request, (W)Form 59005B.
(5) Serial/Lot No's.	Same as Block (16) for Variation Request, (W)Form 59005B.
(6) Previous VR's	Same as Block (17) for Variation Request, (W)Form 59005B.
(7) Statement of Condition	Same as Block (18) for Variation Request, (W)Form 59005B.
(8) WANL Disposition	Same as Block (19) for Variation Request, (W)Form 59005B.
(9) Conditional Requirements/Comments	Same as Block (23) for Variation Request, (W)Form 59005B.

WESTINGHOUSE ASTRONUCLEAR LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. Box 10864, Pittsburgh, Pa., 15236

VARIATION REQUEST
WORK SHEET

(1) Supplier's Reference No. _____
(2) WANL VR No. _____

DISPOSITION		COMMENTS/CONDITIONAL REQUIREMENTS	
(3) DESIGN	Date	Useable for Project Numbers	
☐ Approved ☐ Conditionally Approved ☐ Disapproved			
DEVIATION TYPE VR		Can The Same Discrepancies Be Accepted On Similar Parts For The Same Reactor?	
☐ Dwg. Change, ECO No. _____ ☐ No Dwg. Change		☐ Yes ☐ No	
(4) PROGRAM CONTROL	Date		
ASSIGNMENTS OF PARTS APPROVED			
(5) QUALITY CONTROL	Date		
☐ Approved ☐ Conditionally Approved ☐ Disapproved			
(6) Manf. Eng./React. Analysis	Date		
☐ Approved ☐ Conditionally Approved ☐ Disapproved			
(7) MATERIALS	Date		
☐ Approved ☐ Conditionally Approved ☐ Disapproved			

INSTRUCTIONS FOR FILLING OUT THE VARIATION REQUEST –
WORK SHEET, W Form 59410.

BLOCK	FILLED IN BY – DATA REQUIRED
(1) Supplier's Reference Number	WANL Quality Engineering Technician – Copy from applicable Variation Request, W Form 59005.
(2) WANL VR Number	WANL Quality Engineering Technician – Copy from applicable Variation Request, W Form 59005.
(3) Design – Date	Cognizant Design Engineer – Check disposition of Approved, Conditionally Approved (requiring conditional requirements) or Disapproved; for Deviation Type VR, check to denote whether or not there will be a design change and if so, fill in ECO No.; state useability (see paragraph 5.5 of procedure); sign and date.
(4) Program Control – Date	Cognizant Program Control Representative – See Paragraph 5.5 of procedure.
(5) Quality Control – Date	Cognizant Quality Engineer – Check disposition of Approved, Conditionally Approved (requiring conditional requirements) or Disapproved; sign and date.
(6) Manufacturing Engineering/ Reactor Analysis	Cognizant Manufacturing Engineering or Reactor Analysis Representative – Check disposition of Approved, Conditionally Approved (requiring conditional requirements) or Disapproved; sign and date.
(7) Materials – Date	Cognizant Materials Representative – Check disposition of Approved, Conditionally Approved (requiring conditional requirements) or Disapproved; sign and date.

QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. <u>8-3</u> Rev. _____
	Effective Date <u>7/25/66</u>
	Supersedes: No. <u>QMP(A) 8-1</u> Date <u>10-1-65</u>

SUBJECT: DISPOSITIONING DISCREPANT MATERIALS AND PARTS DISCOVERED AT IN-PROCESS INSPECTION

1.0 PURPOSE

To establish a procedure for obtaining disposition of discrepant parts (and materials) discovered at In-Process Inspection by Material Review Tag (MRT).

2.0 APPLICABILITY

This procedure shall be followed in resolving discrepancies reported on NERVA parts, discovered at WAFF In-Process Inspection. This procedure does not cover use of the Fuel Element Loss Ticket, Rework Ticket, or Non-Conforming Material Disposition (NMDR). QIP's prepared as in QMP 7-2 will define in detail those characteristics that will be dispositioned by MRT when discrepant.

3.0 REFERENCE

QMP No. 7-1, In Process Inspection

QMP No. 8-1, Nonconforming Material Disposition

4.0 PROCEDURE

4.1 Filling Out the Material Review Tag (MRT), Form 59355

When discrepant parts, which require MRT disposition, are discovered at In-Process Inspection, they shall be moved, whenever possible, to an isolated area set aside for discrepant parts under the control of Quality Control. An MRT shall be filled out by the In-Process Inspector, as stated in Attachment A. Only one part with several types of defects, or several parts with one type of defect shall be recorded on a single MRT. Inspection shall then notify the cognizant Process and Quality Engineers that the MRT is ready to be dispositioned.

APPROVALS:

WANL Q.C. Mgr.	WAFF Q.C. Mgr.	Product Assurance Mgr.	Program Manager

4.2 Engineering Disposition

The cognizant Quality and Process Engineers shall go to the In-Process Inspection area and evaluate the discrepancies reported on the MRT against the requirements. They shall make final dispositions and sub-dispositions, if required, in Blocks 17 and 18 of the MRT. No parts shall be moved or processed prior to the signing of the MRT by Quality Engineering. The final dispositions and the combinations of final and sub-dispositions available for use are defined as follows:

4.2.1 A - Accept (No sub-dispositions may be used with this final disposition): This disposition may be used when the discrepancy falls outside the limitations established by Process Engineering, but remains within the WANL requirements.

4.2.2 R - Reject: This disposition shall be used in combination with any of the sub-dispositions, as explained below:

1. RW - Rework: Shall be used when, in the estimation of Process and Quality Engineers, the part is capable of being reworked to WANL requirements.
2. RI - Reinspect: Shall be used when the Process and Quality Engineers desire further information, not available on the MRT.
3. S - Scrap: Shall be used when, in the estimation of the Process and Quality Engineers: 1) the part cannot be reworked to WANL requirements, or does not justify the time and expense of rework; 2) the part will obviously not be accepted for use by WANL in its present condition; and 3) the part has no other application.
4. HS - Hold and Store: Shall be used when, in the estimation of the Process and Quality Engineers, the part: 1) cannot be reworked to WANL requirements, or does not justify the time and expense of rework; 2) the part will obviously not be accepted for use by WANL in its present condition, but it is anticipated that the part may eventually be accepted for use in some reactor application for special test, etc.

4.2.3 NMDR - Submit NMDR (No sub-dispositions may be used with this final disposition): Shall be used when: 1) the part does not meet WANL requirements; and 2) the part cannot be reworked to WANL requirements, or does not justify the time and expense of rework; but, in the opinion of the Process and Quality Engineers, will be accepted by WANL when submitted on an NMDR.

4.2.4 A(R) - (No sub-dispositions may be used with this final disposition): Shall be used when the part is acceptable for restricted use. The restriction shall be stated in block 25 of the MRT.

4.2.5 Usage of the "See Comments" Check Box

The "See Comments" check box in block 24 of the MRT shall be checked when instructions for rework, reinspection, etc., have been placed in the "Comments" block (No. 21) by the Process and Quality Engineers.

4.3 MRT Distribution Following Engineering Disposition

Following the establishment of engineering disposition, the four (4) copies of the MRT shall be distributed by In-Process Inspection to the recipients on the bottom of the copies.

4.4 Actions Required Following Distribution of the Dispositioned MRT

The actions required following distribution of the dispositioned MRT are stated below, headed as: 1) the department section receiving the copy, and 2) the type of disposition.

4.4.1 Quality Engineering

4.4.1.1 NMDR - Quality Engineering shall report the discrepancy to WANL via NMDR whenever the MRT has a final disposition of NMDR. Process the MRT thereafter per paragraph 4.4.1.5, below.

4.4.1.2 R - (All sub-dispositions) - No action required except to process per paragraph 4.4.1.5, below.

4.4.1.3 A - No action required except to process per paragraph 4.4.1.5, below.

4.4.1.4 A(R) - No action required except to process per paragraph 4.4.1.5, below.

4.4.1.5 Key Punching and Filing the MRT

One copy of the dispositioned MRT shall be submitted to Data Systems for key punching the computer card. This copy shall be returned to Product Control Engineering, stamped "VERIFIED", to indicate that the computer card has been punched, after which the MRT shall be filed by MRT number.

4.4.2 In-Process Inspection

4.4.2.1 NMDR - The element shall be released to Operations for further processing, and the MRT shall be filed by MRT number.

4.4.2.2 R - RW - A REWORK Ticket shall be filled out by In-Process Inspection, noting the rework to be accomplished per the MRT. The REWORK Ticket and the part shall be released to Operations for rework, and the MRT shall be filed by MRT number.

4.4.2.3 R - RI - Inspection shall move the part to the Inspection area; inspect the part per the MRT instructions; and return the part to the area set aside for discrepant parts.

4.4.2.4 R - S - Inspection shall originate a Fuel Element Loss Ticket and deliver the tagged part to Accountability for scrapping or reassignment. The MRT shall be filed by MRT number.

4.4.2.5 R - HS - Inspection shall deliver the part to Accountability and the MRT shall be filed by MRT number.

NOTE: A part dispositioned as "R - HS" may be released for use only when a new MRT has been written, approving of the desired use. The MRT releasing the part shall be cross-referenced with the first MRT.

4.4.2.6 A(R) - The part shall be released to Operations for further processing, and the MRT shall be filed by MRT number.

CRD STAMP

ASTROFUEL FACILITY
P.O. BOX 217, CHESWICK, PA. 15024

MRT No. 10362

[illegible]

ENGINEERING DISPOSITION

(21) COMMENTS	CRD STAMP	(23) FINAL DISPOSITION CODE FOR BLOCK (17) A - ACCEPT A(R) - ACCEPT FOR RESTRICTED USE R - REJECT VR - SUBMIT VR, NO.	
		(24) SUB-DISPOSITION CODE FOR BLOCK (18) RI - REINSPECT RW - REWORK S - SCRAP HS - HOLD & STORE ☐ SEE COMMENTS	
		(25) RESTRICTED TO:	(26) PREV. MRT. NO.
		(27) Q.C. ENG. SIGNATURE AND DATE	(28) NEXT MRT. NO.
	(22) PROCESS ENG. SIGNATURE AND DATE		

Effective Date 7/25/66

INSTRUCTIONS FOR FILLING OUT THE MATERIAL REVIEW TAG

<u>Block</u>	<u>Filled in by</u>	<u>Data Required</u>
1) Part Name	In-Process Inspector	Part name of the discrepant parts.
2) Drawing Number and Revision	In-Process Inspector	Drawing number and revision of the discrepant parts.
3) Specification Number and Revision	In-Process Inspector	Specification number and revision applying to the discrepant parts.
4) W. O. Number and Change Notices	In-Process Inspector	Work Order Number and Change Notices to which the parts are being manufactured.
5) QIP/II Number and Revision	In-Process Inspector	Quality Inspection Procedure or Inspection Instruction number, including revision, to which the parts are being inspected.
6) Operation	In-Process Inspector	Operation name or number, where discrepancy occurred.
7) Material Location	In-Process Inspector	Area designation where material is being held, awaiting MRT disposition.
8) Lot Quantity	In-Process Inspector	Quantity of parts constituting the lot in question. Leave blank when discrepancies are against individual parts.
9) Quantity Inspected	In-Process Inspector	Quantity of parts inspected in the lot. Leave blank when discrepancies are against individual parts.
10) Quantity Accepted	In-Process Inspector	Quantity of parts accepted from the lot. Leave blank when discrepancies are against individual parts.
11) Quantity Rejected	In-Process Inspector	Quantity of parts rejected from the lot. Leave blank when discrepancies are against individual parts.

INSTRUCTIONS FOR FILLING OUT

THE MATERIAL REVIEW TAG (cont.)

ATTACHMENT A

QMP No. 8-3 Rev. _____

Effective Date 7/25/66

<u>Block</u>	<u>Filled in by</u>	<u>Data Required</u>
12) Date	In-Process Inspector	Date MRT is filled out.
13) Item Number	In-Process Inspector	Consecutive numbers, starting with one (1) to indicate discrepancies being documented.
14) W. O., Drawing, Specification Requirements	In-Process Inspector	Requirements which the parts have not met (see procedure).
15) Serial/Lot Numbers	In-Process Inspector	Serial and/or lot numbers of the discrepant parts.
16) Actual Condition	In-Process Inspector	Statement defining the discrepancy.
17) Final Disposition	Quality Engineer	A disposition code, using code designations shown in block 23, representing disposition agreed upon by the Process and Quality Engineers (see procedure).
18) Sub-disposition	Quality Engineer	Complete this block only when final disposition is REJECT. Use sub-disposition code letters shown in block 24, representing disposition agreed upon by the Process and Quality Engineers (see procedure).
19) Inspector Signature and Date	In-Process Inspector	Signature and date of In-Process Inspector filling out the MRT.
20) Inspection Foreman Signature and Date	Inspection Foreman	Signature and date, indicating that the MRT has been checked for accuracy and completeness.
21) Comments	Quality Engineer	Re-inspection or rework instructions; special information, etc.
22) Process Engineer Signature and Date	Process Engineer	Signature and date, indicating approval of dispositions assigned in blocks 17 and 18.

INSTRUCTIONS FOR FILLING OUT
THE MATERIAL REVIEW TAG (cont.)

ATTACHMENT A

QMP No. 8-3 Rev. _____

Effective Date 7/25/66

<u>Block</u>	<u>Filled in by</u>	<u>Data Required</u>
23) Final Disposition Code		This block illustrates the final dispositions available for use. See the procedure for an explanation of the VR number blank.
24) Sub-disposition Code		This block illustrates the sub-dispositions available for use only with a final disposition of REJECT. The "See Comments" check box shall be checked by the Quality Engineer when comments have been written in block 2.
25) Restricted To:	Quality Engineer	Restrictions in part usage agreed upon by the Process and Quality Engineers.
26) Previous MRT		See Procedure.
27) Q.C. Engineer Signature and Date	Quality Engineer	Signature and date, indicating approval of dispositions assigned in blocks 17 and 18.
28) Next MRT		See Procedure

① QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. <u>8 - 4</u> Rev. _____
	Effective Date <u>7/25/00</u>
	Supersedes: No. _____ Date _____

SUBJECT: PRELIMINARY REVIEW AND DISPOSITION OF REJECTED MATERIAL

1.0 PURPOSE

To provide a review system for rejected material for the purpose of initiating rework or replacement.

2.0 APPLICABILITY

This procedure is applicable to:

1. All material rejected by Inspection at WANL without regard to the location within the plant in which the inspection is being performed, but not to include Reactor Assembly Inspection.
2. WANL Purchase Orders (P.O.'s) for all Quality Surveillance Codes 1 and 2, and when specified by the cognizant engineer, Code 3.
3. All Government Furnished Property and Customer Furnished Property.

3.0 REFERENCE

QMP No. 4-3, Identification of Material, Detail Parts, Subassemblies and Assemblies by Serial or Lot Serial Numbers.

QMP No. 5-3, Quality Surveillance Codes

QMP No. 5-5, Inspection at WANL

QMP No. 8-1, Nonconforming Material Disposition

4.0 GENERAL

The preliminary review of rejected materials prior to ERB action is intended to provide a fast, relatively low cost method for dispositioning rejected materials. Members of the Preliminary Review (PR) function are not authorized to accept rejected material that does not meet drawing or specification requirements. This is a function of the Engineering Review Board (ERB).

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

5.0 PROCEDURE

5.1 Preparation for PR Action

The Inspection Foreman shall place the rejected material to be presented to PR, with the applicable RIR and defect sheet and other related paperwork in the assigned inspection area. (See QMP No. 5-5 for exceptions to PR action and a description of the inspection system). The Inspection Foreman shall notify the Project Control Supervisor (Program Control) of the need for PR action. The Program Control Supervisor shall then notify the designated Manufacturing Engineering representative that a PR action is required.

The minimum PR representatives are as follows:

1. The Inspection Foreman
2. The designated Manufacturing Engineering Representative

The Inspection Foreman shall act as Chairman of the PR. The Inspection and Manufacturing Engineering representatives shall have the technical decision-making authority. In addition, the Manufacturing Engineering representative shall represent the Program Control on matters relating to schedule.

5.2 PR Action

The PR shall review the discrepant material and arrive at an optimum disposition. Some of the factors to be considered in arriving at this decision are as follows:

1. Feasibility of rework
2. Cost of rework versus other alternatives
3. Location where the rework shall be performed
4. Scheduler requirements, including availability of possible replacements (existing or to be manufactured).

5.2.1 PR Dispositions

The dispositions available to the PR are as follows:

1. Rework (allows replacement or scrap, at Program Control option).
This disposition shall be used when the material is, in the estimation of the PR members, capable of being reworked to meet requirements.
2. Return to Inspection for Additional Inspection - This decision is applicable when the PR desires additional inspection of the material.
3. Submit to ERB - This decision may be used when the PR feels that accepting the material in the present condition may be the optimum answer.
4. Reject - This decision may be used when the material cannot be used for that part number, assigned, in its present condition and rework is not considered acceptable to the PR members.

5.3 RIR Distribution

Following PR action, the RIR shall be reproduced and distributed by Inspection on a distribution retained by Inspection. Copies of the Inspection Data Sheet, or other document describing the defect, shall be attached to the RIR copies being distributed.

5.4 Actions Following PR Dispositioning

The actions required by Inspection following PR dispositioning are stated below. In all cases, the snap-out copy of the RIR, designated "With Rejected Material" shall accompany the material.

1. Rework

Inspection shall move material to the established "Hold" area, under the control of Program Control.

2. Return to Inspection for Additional Inspection

The material shall be returned to Inspection with a copy of the RIR, for additional inspection. Results of the inspection shall be documented on an RIR Supplement (see Para. 5.6, below) which shall be processed for disposition in the same manner as the RIR original.

3. Submit to ERB

Inspection shall prepare and submit a Nonconforming Material Disposition Request (NMDR) per QMP No. 8-1.

4. Reject

Inspection shall move material to terminal stores, under the control of Program Control.

5.5 Inspection of Reworked and Replacement Materials

Reworked and replacement materials shall be inspected/reinspected in the normal manner, per QMP No. 5-5, with the following exceptions:

1. Reworked materials shall only be inspected for the characteristics reworked.
2. The results of the inspection/reinspection shall be documented on an RIR Supplement (see Para. 5.6, below).

Note: If replacement items are ordered on a new Purchase Order Number, an RIR original shall be used, rather than the RIR Supplement.

5.6 Supplementing the RIR

RIR Supplements shall be prepared by using the RIR Supplement Form. The Supplement form is filled out, processed, reproduced and distributed in the same manner as the RIR original with the following exception:

The RIR No. shall be the original RIR No. followed by a dashed-consecutive number starting with one (1).

Ⓜ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 9-2 Rev.

Effective Date 7/1/66

Supersedes:

No. QMP(L) 9-2 Date 10-1-65

QMP(A) 9-2 10-1-65

SUBJECT: DESIGN, ACQUISITION, CALIBRATION AND CONTROL OF INSPECTION
TOOLS AND GAGES

1.0 PURPOSE

To establish the responsibility and procedure for designing, acquiring, calibrating, and controlling inspection tools and gages.

2.0 APPLICABILITY

This procedure is applicable to all inspection tools and gages used within Quality Control, including authorized personal gages.

3.0 REFERENCE

None

4.0 GENERAL

4.1 Policy

The design and acquisition of special inspection tools and gages is the joint responsibility of Quality Engineering and Inspection. Inspection is responsible for the acquisition of standard inspection tools and gages and the storing, maintaining, preserving, and repairing, as required, of all inspection tools and gages.

5.0 PROCEDURE

5.1 Design and Acquisition of Tools and Gages

Drawings and specifications shall be reviewed by Quality Engineering to determine the need for special inspection tools and gages (see Paragraph 4.1, above). The need for standard tools and gages shall be determined by Inspection.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

5.2 Identification and Control of Tools and Gages

5.2.1 WANL Tools and Gages

A Gage Custody Record Card, Form 59525, and a Gage Inspection Record Card, Form 28521, shall be filled out for all WANL tools and gages received (see Attachments A and B). Each tool and gage shall be assigned an identification number. For plant inventory purposes, a further identification number may be assigned to tools and gages by the Property Control section of Accounting. The assigned numbers shall be marked on the tools and gages, preferably in a permanent manner. When the gage design forbids any markings on the gage, the identification numbers shall be marked on the gage container. The Gage Custody Record Card and the Gage Inspection Record Card shall be filed after calibration, as stated in Paragraph 5.3.3, below.

5.2.2 WAFF Tools and Gages

5.2.2.1 Tools and gages received at WAFF shall be sent with the applicable design drawings, etc., to Inspection at WANL. Identification and control shall be the same as Paragraph 5.2.1, except the Gage Custody Record Card shall be omitted, and an extra copy of the Gage Inspection Record Card provided.

5.2.2.2 Each tool and gage found satisfactory shall be tagged with a calibration sticker (Attachment A), preserved (Paragraph 5.4), and returned to WAFF with one copy of the Gage Inspection Record Card. The cards shall be filed at WAFF and WANL in a tickler file by due date for next calibration.

5.3 Initial Calibration/Evaluation of Tools and Gages

All tools and gages, including standards, shall be initially calibrated/evaluated. Primary standards and other gages requiring calibrations beyond the capabilities of the gage laboratory shall be initially calibrated by a commercial laboratory. Such calibrations shall be certified traceable to the National Bureau of Standards. The calibration performed at WANL shall consist of a comparison of the accuracy in accordance with standard practices; and all calibrations shall be traceable to the National Bureau of Standards. The calibrations shall be performed in a dust-free area with the temperature and humidity maintained, respectively, at 68 degrees $\pm$ 2°F, and maximum 50% relative humidity. The extent of the initial calibration/evaluation shall be as stated below:

5.3.1 Calibration of Standard (Commercial) Tools and Gages

Calibrate each standard tool and gage through the full range of measurement.

5.3.2 Calibration and Evaluation of Special Inspection Tools and Gages

Conduct a complete calibration and evaluation of each special inspection tool and gage to determine conformance to the design drawings.

Automated-type tools or gages shall be evaluated under operational type conditions. The equipment shall be evaluated against specific parameters established by Quality Engineering. The parameters shall be consistent with the specified product tolerance to be examined by the tool or gage.

5.3.3 Calibration Records and Tags

The results of the initial calibration of each tool and gage shall be recorded on the Gage Inspection Record Card. Each tool and gage found to be satisfactory by calibration and evaluation shall be tagged with a label indicating the date of calibration and the next due date for calibration (see Attachment A). If the gage design forbids placing the label on the tool or gage, it may be placed on the tool or gage container. The Gage Inspection Record Cards shall be filed in a tickle file by the due date for the next calibration. The due date is based on the calibration frequency shown in Paragraph 5.12, below, and is indicated on the card by the month/day slide tab on the top of the card. The Gage Custody Record Card shall be filed by type of gage, and within the type category, by identification number.

5.4 Tool and Gage Preservation and Storage

Following the calibration and evaluation, each tool or gage shall be dip-coated in liquidified ethylcellulose (Seal Peel). The equipment shall be stored in appropriate areas and containers.

5.5 Issuance and Return of Tools and Gages from Storage at WANL

When WANL tools and gages are withdrawn from storage for use, the cognizant Gage Control Inspector shall:

5.5.1 Withdraw the applicable Gage Custody Record Card.

5.5.2 Fill out the "date out", "inspector", and "location" blocks on the card.

5.5.3 Refile the card in the original file and in the same order, except that the "out" edge shall be upward.

- 5.5.4 Give the tool or gage to the requesting individual.

When tools and gages are returned, the "date returned" and "remarks" blocks on the Gage Custody Record Card shall be filled out. The "remarks" block is intended to be used for noting obvious defects, such as broken or nicked tools and gages.

- 5.6 Issuance of Tools and Gages from Storage at WAFF

WAFF Inspectors desiring tools and gages shall request them from the cognizant Inspection individual controlling the tools and gages. No formal release paperwork is required.

- 5.7 Tool and Gage Recall and Recalibration at WANL

- 5.7.1 The cognizant Gage Control Inspector shall review daily the Gage Inspection Record Cards in the tickle file, and withdraw the cards for the tools and gages which are due for recalibration. The withdrawn cards shall be checked against the applicable Gage Custody Record Card; and if it is determined that the tools have been taken out of Storage, they shall be recalled for recalibration.

- 5.7.2 Tools and gages returned as a result of being recalled shall be checked in as stated in Paragraph 5.5, above. Tools and gages that have not been used since the last calibration, but are recalled from Storage for updating calibration shall not be recalibrated, but a new label shall be applied.

- 5.7.3 The Gage Inspection Record and Gage Custody Record Cards for the acceptable tools and gages shall be refiled, as stated in Paragraph 5.2, above. Unacceptable tools and gages shall be repaired, as stated in Paragraph 5.6, above.

- 5.8 Tool and Gage Recall and Recalibration at WAFF

- 5.8.1 The cognizant Inspection individual controlling tools and gages shall review--daily--the Gage Inspection Record Card file and withdraw the cards for the tools and gages requiring recalibration. The tools and gages shall be accumulated and sent, with the Gage Inspection Record Cards, to WANL Quality Control and Inspection for recalibration.

NOTE: The duplicate Gage Inspection Record Card retained at WANL by Quality Control and Inspection is controlled in their tickler system and is a double check.

5.8.2 Upon receipt, WANL Quality Control and Inspection shall:

5.8.2.1 Recalibrate the tools and gages in the same manner in which the WANL tools and gages are recalibrated.

5.8.2.2 Record the results of the recalibration on both copies of the Gage Inspection Record Card, and re-file the WANL copy in the tickler file.

5.8.2.3 Re-tag and preserve the acceptable tools and gages.

5.8.2.4 Return the acceptable tools and gages, with the WAFF copy of the Gage Inspection Record Card to WAFF.

5.8.2.5 Repair the defective tools and gages as stated in Paragraph 5.9.

5.9 Tool and Gage Repair

When practical, repairs of tools and gages will be performed at WANL. If it is not practical to perform repairs at WANL, arrangements shall be made for having the repairs performed outside WANL. Upon completion of repair, each tool and gage shall be recalibrated in the normal manner (see Paragraph 5.3, above) and put back in use. The repairs performed shall be noted on the Gage Inspection Record Card.

5.10 Inactive Tools and Gages at WANL

Any tool or gage which is not withdrawn from storage for use within two calibration intervals may be considered inactive. In such cases, the Gage Inspection Record Card and the Gage Custody Record Card shall be marked to show that the tool or gage has been placed in an inactive status. The Gage Inspection Record Cards shall be filed in an inactive file, categorized by type of gage, and, within the type category, by identification number.

The Gage Custody Record Cards shall be refiled in the original file in the same manner. Tools, gages, and the applicable cards shall be returned to an active status when the gage is requested for use.

5.11 Personally Owned Inspection Tools and Gages

Personally owned inspection tools and gages, authorized by the Supervisor of Inspection for use within WANL or WAFF shall be subject to identification, calibration, and control per this procedure.

5.12

Calibration Frequency Schedule

Following is the frequency schedule for periodic calibrations. This schedule may be altered dependent upon the frequency of use and the history of wear. In the frequency column, "day" shall be considered to mean working days.

EQUIPMENT

FREQUENCY

Micrometer	15 days
Vernier Calipers	30 days
Vernier Height Gage	30 days
Micrometers, Inside	30 days
Micrometers, Depth	30 days
Dial Indicators .001-.0001	60 days
Dial Indicators .001	90 days
Electrolimit Masters	60 days
Airlimit Masters	60 days
Plug Gages	15 days
Ring Gages	15 days
Thread Plug Gages	15 days
Thread Ring Gages	15 days
Gage Blocks (working & secondary)	6 months
Gage Blocks (master)	12 months
Vernier Bevel Protractor	6 months
Sine Bar and Plate	1 year
Optical Comparator	6 months
Profilometer	6 months
Brush Surface Analyzer	6 months
Scratch Depth Gage	6 months
Rockwell Hardness Tester	1 month

Effective Date 7/25/66

ATTACHMENT A

[illegible]

Effective Date 7/25/66

ATTACHMENT B

[illegible]

GAGE INSPECTION RECORD WESTINGHOUSE FORM 28521 A

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 9-3

Rev. _____

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No. QMP(L)9-3

Date 10-1-65

QMP(A)9-1

10-1-65

SUBJECT: CALIBRATION AND CONTROL OF MEASURING AND TEST EQUIPMENT

1.0 PURPOSE

1.1 To establish a procedure for the calibration and control of measuring and test equipment utilized by Quality Control.

1.2 To establish responsibility for the design and acquisition of test equipment.

2.0 APPLICABILITY

This procedure is applicable to WANL and WAFF measuring and test equipment, including Government-Furnished Property.

3.0 REFERENCES

None

4.0 GENERAL

4.1 Definitions

Test Equipment - All electrical/electronic devices, flow and pressure-indicating devices, and standard weights utilized in any function to measure, monitor, test, or inspect.

Calibration - A comparison of test equipment or standards with standards of a higher echelon of accuracy, traceable to National Bureau of Standards for the purpose of establishing stated design accuracy.

Reference Standards - Standards of the highest accuracy order in a calibration system which establish the basic accuracy values for that system.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

Transfer Standards - Designated measuring equipment used in a calibration system as a medium for transferring the basic value of reference standards to lower echelon transfer standards or measuring and test equipment.

Interim Standard - An instrument used as a standard until an authorized standard is established.

5.0 PROCEDURE AT WANL

5.1 Responsibility for Calibrations

The Instrument Standards Laboratory is responsible for performing all calibrations, maintenance, and adjustments on test equipment and standards as shown in Attachment "A". WANL Quality Control will verify such evaluations prior to affixing their approval stamp to the calibration label.

5.2 Calibration Facility and Standards

5.2.1 Calibration Facility

The Instrument Standards Laboratory shall be environmentally controlled to the extent necessary to assure continued measurements or required accuracy, giving due consideration to temperature, humidity, vibration, cleanliness, and other factors affecting precision measurements.

5.2.2 Standards

Standards used for calibration of test equipment shall be traceable to the National Bureau of Standards, as shown in Attachment "A". Within state-of-the-art limitations, the standards used shall have a tolerance no greater than 10% of the allowable tolerance for the equipment being calibrated.

5.3 Initial and Periodic Calibrations

All acquisitioned test equipment and standards shall be initially calibrated to verify design accuracy. It will be the responsibility of WANL Receiving to submit all test equipment and standards, when received at WANL, to Receiving Inspection for final acceptance and inspection, who, in turn, will submit all test equipment and standards to the Instrument Standards Laboratory for calibration prior to release to user. Test equipment and standards shall be further calibrated at periodic intervals established on the basis of stability, purpose, and degree of usage. These intervals shall be established by the Instrument Standards Laboratory.

Test equipment and standards shall also be calibrated after maintenance and repair. Intervals shall be shortened, as required, to assure continued accuracy as evidenced

by the results of previous calibrations provide definite indications that such action will not adversely affect the accuracy of the system. Calibration intervals or periods in use at WANL at present are as in Attachment "B".

5.4 Calibration Procedures

Written procedures for calibration shall be established by the Instrument Standards Laboratory. These procedures may be written by the Instrument Standards Laboratory, or may be a reproduction of published standard calibration practices. All calibration procedures shall require that calibrations be performed by comparison with higher accuracy level standards.

5.5 Records

A record card shall be completed by the Instrument Standards Laboratory for each standard or item of test equipment existing within WANL. The WANL Identification No., the Government-Furnished Equipment No., or the Manufacturer's Serial No. shall be recorded on each card. The name of the manufacturer of the standard or of the item of test equipment shall also be recorded on the record card. The record card shall be kept up to date and shall reflect the history of maintenance and calibrations performed and the reason for the calibration (normal or repair). Each calibration performed shall be recorded on the Standards Laboratory Calibration Report, Westinghouse Form 59381 (see Attachment "C").

5.6 Calibration Labeling

Standards and test equipment shall be labeled to indicate the date of last calibration, by whom it was calibrated, and when the next calibration is due. When the size or functional characteristics limit the application of labels, an identifying code shall be applied to the item or reflect serviceability and due date for next calibration.

5.7 Recall for Calibration

It will be the responsibility of the work area supervisor, or test equipment custodian assigned by the cognizant work area supervisor, to submit equipment or standards for calibration when the calibration date falls due. Also, the work area supervisor shall be responsible for submitting for calibration any test equipment item or standard that has not previously been calibrated. The Instrument Standards Laboratory shall maintain a tickler file to assure the calibration schedule is complied with.

6.0 PROCEDURE AT WAFF

6.1 Design and Acquisition of Test Equipment

The design and acquisition of test equipment used at WAFF is the responsibility of

Quality Engineering. Quality Engineering may obtain assistance in designing test equipment from other departments within WAFF or WANL, Large, Pa., or from other companies. The ultimate responsibility for the design of test equipment, however, rests with Quality Engineering.

6.2 Gage Inspection Record Card

A Gage Inspection Record Card, Form 28521 (see Attachment "D"), shall be filled out by Quality Engineering for each standard or item of test equipment obtained for use within WAFF.

6.3 Calibrations

All test equipment shall be calibrated initially and periodically in accordance with established procedures.

6.3.1 Initial Calibrations

All test equipment shall be initially calibrated to: (1) verify design accuracy, (2) assure compatibility of the test equipment with the product being tested, and (3) to assure ease of operation. The calibrations shall be performed per established procedures and shall be documented on Form 59381 and 59381-1 (see Attachment "C"), or a satisfactory substitute. Upon acceptance after initial calibration, the test equipment shall be labeled as stated in Paragraph 6.5, below.

6.3.2 Periodic Calibrations

All test equipment shall be calibrated at periodic intervals, per established procedures, after initial calibration to assure continued accuracy. The present intervals in use are shown in Attachment "B". These intervals shall be shortened, as required, to assure continued accuracy as evidenced by the results of preceding calibrations, and may be lengthened only when the results of previous calibrations provide definite indications that such action will not adversely affect the accuracy of the system. Periodic calibration results shall be recorded on Forms 59381 and 59381-1 (see Attachment "C"), or a satisfactory substitute. Upon acceptance after periodic calibration, the test equipment shall be labeled as stated in Paragraph 6.5, below.

6.3.3 Calibration after Repair or Rework

Test equipment shall be calibrated after repair or rework, as stated in Paragraph 6.3.1, above.

6.3.4 Recall for Calibration

A positive recall system for periodic recalibration shall be established by Quality

Engineering, utilizing the Gage Inspection Record Card.

6.4 Calibration Facilities

At the option of Quality Engineering, test equipment may be initially and/or periodically calibrated at any of the following locations:

1. Test Equipment Manufacturer's Facility--by test equipment
2. WAFF--by WAFF, WANL, or test equipment manufacturer's personnel
3. WANL--by WANL personnel

6.5 Test Equipment Calibration Labels

Standards and single function test equipment shall be labeled to indicate the date of last calibration, by whom it was calibrated, and when the next calibration is due. When the size or functional characteristics limit the application of labels, an identifying code shall be applied to the item to indicate a due date for next calibration. Multiple function, automated test equipment shall be labeled as calibrated in accordance with the specific established procedures giving detailed, step wise instructions for calibration of the entire system.

7.0 UNCALIBRATED TEST EQUIPMENT OR STANDARDS

Any test equipment item that has not been calibrated or has passed due date for recalibration shall not be utilized for data acquisition. Data taken from any such item will be considered invalid.

8.0 PERSONAL, BORROWED, OR RENTED TEST EQUIPMENT

In instances where the use of personally owned test equipment is specifically authorized by the work area supervisor, or test equipment is borrowed or rented, the applicable requirements and procedures stated above shall apply.

ATTACHMENT A

Effective Date 7/25/66

ATTACHMENT BTEST EQUIPMENT CALIBRATION PERIODS

<u>FUNCTION</u>	<u>SERVICE PERIOD MOS.</u>
Accelerometers	6
Amplifiers, AC	6
" Bridge	6
" DC	6
" Linear	6
" Log	6
" Non-Overload	6
" Oscilloscope	6
" Pulse	3
" R.F.	3
Analyzers	-
Attenuators A.F.	6
" R.F.	6
" DC	12
Barometers	6
Bridges DC	12
" Impedance	6
" Conductivity	6
" Strain	6
" Mueller	12
Calibrators, Meter	12
" Pneumatic	12
" Accelerometer	
Capacitor, Precision Fixed	12
" Decade	6

ATTACHMENT B

<u>FUNCTION</u>	<u>SERVICE PERIOD MOS</u>
Cathetometer	12
Standard Cells	12
Comparators	12
Controllers, Indicating	6
" Recording	6
Counters, Frequency	3
Radiation	3
Detectors, Distance	---
NiH	12
Leak	6
Radiation	3
Electrometers	3
Extensometer	12
Filters Active	6
Filters Passive	12
Gages - Precision Bourdon Tube	12
Gages - Test " "	12
Gages - Pressure	12
Gages - Vacuum	3
Temperature Gages	12
Generators, Audio	6
" R. F.	6
" Pulse	6
" Square Wave	6
" Time Mark	6
Hygrometer	6

ATTACHMENT B

<u>FUNCTION</u>	<u>SERVICE PERIOD MOS.</u>
Indicators Fixed	12
" Variable	6
" Resistance	6
" Strain	6
" Temperature	6
Meters - Electronic	3
" Electrical	3
" Anemometer	3
" Count Rate	3
Frequency Meters	6
Magnetic Field Meters	3
Megohmmeter	3
PH Meter	3
Radiation Meter	3
Vibration Meter	6
Digital Meter	2
Manometers	12
Measuring Microscopes	6
Oscilloscopes	3
Potentiometers	12
Power Supplies Precision	3

ATTACHMENT B

<u>FUNCTION</u>	<u>SERVICE PERIOD MOS.</u>
Pyrometers - Optical	12
Pyrometers - Thermocouple	6
Recorders, Movement Type	3
" Electromechanical	6
" Oscillograph	3
" Filled System	12
" Bourdon Tube	12
Regulators, AC	6
Resistors, Fixed	12
Resistors, Variable	6
Shunts	12
Switching Units	12
Tube Tester	12
Transistor Tester	12
Dead Weight Pressure Tester	12
Transformer (Current) Precision	12
Transformer Potential Precision	12
Voltage Dividers	12

ATTACHMENT C

QMP No. 9-3 Rev. _____

STANDARDS LABORATORY CALIBRATION REPORT

Effective Date 7/2/88

SECTION A

STANDARDS LABORATORY
 2. SUBMITTING ACTIVITY
 3. TEST INSTRUMENT
 (ITEM CALIBRATED)
 4. MANUFACTURER
 5. MODEL NUMBER
 6. SERIAL NUMBER

7. REASON FOR SUBMISSION

CERTIFICATION ☐ 1
 CALIBRATION ☐ 2
 CROSSCHECK ☐ 3
 OPERATIONAL FAILURE ☐ 4

8. DATE OF LAST SERVICING

CERTIFICATION ☐ 1
 CALIBRATION ☐ 2
 CROSSCHECK ☐ 3

SECTION B

CALIBRATION PROCEDURE
 2. CALIBRATION TECHNICIAN
 3. TEST DATE

4. TEMPERATURE -°F

5. RELATIVE HUMIDITY

SECTION C

1. TEST INSTRUMENT EVIDENCE

GOOD CONDITION ☐ 1
 SEVERE ENVIRONMENT ☐ 2
 PHYSICAL MISHANDLING ☐ 3
 AGE AND LONG SERVICE ☐ 4
 OVERLOAD ☐ 5

2. TEST INSTRUMENT FOUND

OUTSIDE ADJUSTMENT TOLERANCE ☐ 1
 WITHIN ACCEPTANCE TOLERANCE ☐ 2
 OUTSIDE ACCEPTANCE TOLERANCE ☐ 3

3. TEST INSTRUMENT RETURNED

OUTSIDE ADJUSTMENT TOLERANCE ☐ 1
 WITHIN ACCEPTANCE TOLERANCE ☐ 2
 OUTSIDE ACCEPTANCE TOLERANCE ☐ 3

4. CERTIFICATED OR REPORTED VALUE, IF FIXED STANDARD

5. MAN-HOURS TO CALIBRATE

6. MAN-HOURS TO ADJUST OR REPAIR

CALIBRATION EQUIPMENT (LIST ALL EQUIPMENT USED IN THIS CALIBRATION)

SECTION D

MANUFACTURER	MODEL NO.	SERIAL NO.	RECALL DATE	MANUFACTURER	MODEL NO.	SERIAL NO.	RECALL DATE

REMARKS

SECTION E

(2)

(3)

(4)

CORRECTED
VALUE OF
COLUMN
(5) —

ALGEBRAIC
ERROR
(6)

(7)

(8)

READING
AFTER
ADJUSTMENT
(9)

ATTACHMENT C

QMP No. 9-3 Rev.

Effective Date 7/25/66

① QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. <u>9 - 4</u> Rev. _____
	Effective Date <u>7/25/66</u>
	Supersedes: No. <u>QMP(L) 9-4</u> Date <u>2/21/66</u>

SUBJECT: STANDARD INSPECTION TOOLS, GAGES AND EQUIPMENT

1.0 PURPOSE

This procedure establishes inspection tools, gages and equipment that are considered as standard and details the proper measuring instrument to be used to determine accuracy of dimensions for specific tolerances.

2.0 REFERENCE

MIL-STD-120

3.0 GENERAL

3.1 Policy

3.1.1 It shall be the responsibility of Quality Engineering to establish the Standard Inspection Tools, Gages and Equipment designations and the specific minimum tolerances that will be measured by designated types of inspection equipment.

3.1.2 It shall be the individual responsibility of each inspector to determine the most appropriate piece of inspection equipment to be used to determine the accuracy of a dimension per a specific tolerance consistent with the standards established herein. The Inspection tooling accuracy will be within 10% of the part tolerance where the state-of-the-art permits such accuracy.

3.2 Scope

This Standard Inspection Procedure shall apply to Receiving Inspection, In-Process Inspection and Final Inspection, and in Field Inspection to be used by inspectors and Supplier Surveillance representatives.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

4.0 PROCEDURE

- 4.1 This procedure shall be used as a guide in the selection of inspection equipment to be used when referred to by the applicable Inspection Instruction Sheet.
- 4.2 The Standard Inspection Tool Groups listed below shall be used as a guide in the selection of the proper instrument to determine most accurately the measurements of dimensions for the tolerances as required by applicable drawings and specifications:

Group I

Dimensions with a tolerance less than $\pm .0005$.

- A. Suitable air, electronic or mechanical gage. (Specially designed)

Group II

Dimensions with tolerances of $\pm .0005$ to $\pm .002$.

- A. Gage Blocks
- B. Dial Indicators graduated in .0001
- C. Height Gage with appropriate dial indicators.
- D. Comparator Gages
 - 1. Electronic, graduated in increments of .0001
 - 2. Electrolimit, graduated in increments of .0001
 - 3. Dia., graduated in increments of .0001
 - 4. Optical, graduated in increments of .0001
- E. Gage Standards
 - 1. Linear Dimensions
- F. Hite and Chek Sets (used with suitable Comparison Standard)
 - 1. Optical
 - 2. Micrometer Head
- G. Supermike
- H. Standard Measuring Machine
- I. Internal Measuring Machine
- J. Toolmakers microscope graduated in increments of .0001
- K. Precision Squares
- L. Dial Bore Gage, graduated in increments of .0001
- M. Air Gages
- N. Optical Comparator with Overlay Charts

GROUP III

Dimensions with tolerances of $\pm .002$ to $\pm .005$ "

- A. Dial Indicators graduated in .001 increments
- B. Inside Micrometer
- C. Depth Micrometer
- D. Outside Micrometer
- E. Intramik

GROUP IV

Dimensions with tolerances of $\pm .005$ to $\pm .015$

- A. Vernier Calipers
- B. Vernier Height Gage
- C. Small Hole Gage with applicable comparison gage
- D. Telescope gage with appropriate comparison gage
- E. Optical Comparator with Overlay 1-X chart

GROUP V

Dimensions with tolerances of $\pm .015$ and greater.

- A. Steel Rule or Scale to nearest fraction or decimal
- B. Steel Tape to nearest fraction or decimal
- C. Radius Gage

GROUP VI

Angular dimensions with tolerances of 5 min. of a degree and greater.

- A. Optical Dividing Head
- B. Sine Bar and Plate
- C. Optical Comparator
- D. Vernier Bevel Protractor (For tolerances of 15 min. of a degree)
- E. Auto-Collimator
- F. Rotary Index Table

GROUP VII

Surface Roughness

- A. Less than 125 microinches - Electric tracer type surface roughness measuring instrument.
- B. 125 to 500 microinches - Surface roughness comparison standards
- C. Greater than 500 microinches - Scratch depth gage.

GROUP VIII

Decimal tolerances, contours and radii

A. Impression compound and optical comparator

4.3 Electrical/Electronic Test Equipment

4.3.1 The Standard Electrical/Electronic Test Equipment tabulated below shall be used as a guide in the selection of the proper instrument to determine most accurately the parameters of the components to be tested:

COMPONENT			INSTRUMENT	
Name	Measured Parameter	Tolerance in Percent	General Type	Catalog Accuracy
Resistor	Resistance	± 1	Bridge, Resistance	$\pm .1\% + 1$ Dial Div.
		± 5	Bridge, Resistance	$\pm .1\% + 1$ Dial Div.
		± 10	Multimeter	1.5% F. S.
Capacitors	Capacitance	± 1 and greater	Bridge, Capacitance Bridge, Impedance	$\pm .2\% + 1$ Dial Div.
Inductors	Inductance	± 1 and greater	Bridge, Impedance John Fluke Model 710 B or equal.	$\pm .3\% + 1$ Dial Div.
Transistors	Shorts Opens Alpha Beta D. C. A. C. Saturation Leakage	Applicable Data Sheets	Transistor Analyzer Triplett Model 3490-A or Equal.	$\pm 2\%$ on Each Meter
Diodes	Forward Res. Backward Res. Leakage	Applicable Data Sheets	Transistor Analyzer Triplett Model 3490 A or Equal	$\pm 2\%$ on Each Meter
Electron Tubes	Shorts Opens Trans- Conductance	Applicable Data Sheets	Tube Tester Hickok Model 539-C or Equal	Tester Charts and Data

- 4.3.2 All other Electrical/Electronic Test Equipment used for acceptance and performance testing, shall have accuracies of at least one-fifth the measurement tolerances specified on the applicable drawings and specifications. Only the upper 50% of full scale shall be used for final meter measurements. If the above is not possible due to the state-of-the-art limitations, approval of the substitute instrumentation accuracy is required from Quality Engineering.
- 4.3.3 All Electrical/Electronic Test Equipment shall bear an up-to-date calibration sticker as required per QMP No. 9-3.

Ⓜ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 10 - 1 Rev.

Effective Date 7/25/66

Supersedes:
No. QMP(L) 10-1 Date 10/1/65

SUBJECT: STAMP CONTROL

1.0 PURPOSE

To provide a system of control for the issuance, use and withdrawal of Quality Control Stamps.

2.0 REFERENCE

None

3.0 GENERAL

3.1 Policy

3.1.1 It is the responsibility of WANL Quality Control to establish and maintain an inspection stamp control system to identify articles that have undergone in-process, partial inspection, final subassembly inspection, functional testing and end-item final inspection.

3.1.2 Each WANL Quality Control stamp will be traceable to the individual responsible for its use. Stamp impressions indicating that inspections have been performed will be applied to all WANL Quality Control inspection forms and tags, and will also be affixed to the inspected articles unless this is impractical due to physical limitations or will result in a compromise of quality. Stamp impressions will be placed as close as possible to the part number of an article.

3.2 Scope

This procedure is applicable to all stamps used by WANL Quality Control personnel to validate documentation, inspection or test results.

APPROVALS:

WANL Q.C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

4.0 PROCEDURAL RESPONSIBILITIES

4.1 Quality Control Supervisor

Upon determining that a qualified employee's duties require his possession of a stamp, the cognizant Quality Control Supervisor will initiate a request memorandum to the WANL Inspection Supervisor. When a stamp is to be withdrawn due to transfer, disqualification, or termination, the Quality Control Supervisor will provide for its return to the Inspection Supervisor. As soon as possible after receiving notification of a lost stamp, the Quality Control Supervisor will submit a written report of the loss. The report will include the stamp number, type of stamp, the holder's name, and the circumstances relating to its loss.

4.2 Employee

The employee will confirm the issuance of a stamp by affixing his signature to the Employee Stamp Receipt (ⓈForm 1066), see Attachment A. He will be responsible for all stamps issued to him and will keep them in a secure place at all times. Since the stamp is an indication of the employee's authority, it will not be duplicated, loaned, or used by any person other than the person to whom it is assigned. The employee will notify his Supervisor immediately upon loss of a stamp to preclude its unauthorized use.

4.3 WANL Inspection Supervisor

WANL Inspection Supervisor will be responsible for the assignment, storage and issuance of all stamps. Issuance will be recorded on the Employee Stamp Receipt. Copies of this form will be maintained by the WANL Inspection Supervisor until such time as the stamp is withdrawn due to employee transfer or termination. Upon withdrawal of any stamp, it will be retained by the WANL Inspection Supervisor and may be issued to another employee after a lapse of two (2) years.

5.0 TYPES AND USE OF STAMPS

The following types of stamps are used at WANL. Stamp impressions will be affixed to a part or record in such a manner that the impression will be clear and easy to read. Steel stamp impressions may be used on parts when drawing, metal thickness, finish and size of part permit.

A. Final Acceptance

5/16"

Rubber and steel stamps comprise a regular set issued to each inspector to denote acceptance of material.

B. Defective

5/16"

Rubber and steel stamp issued to each inspector. Impression indicates material or parts are not to drawing or specification requirement.

C. Radiograph

1/2"

Rubber stamp issued to qualified personnel; the use of which denotes acceptance of the material as satisfactorily meeting all radiography requirements.

D. Ultrasonic

1/2"

Rubber stamp issued to qualified personnel; the use of which denotes acceptance of the material as satisfactorily meeting all Ultrasonic Test requirements.

E. Liquid Penetrant

1/2"

Rubber stamp issued to qualified personnel; the use of which denotes acceptance of the material as satisfactorily meeting all Liquid Penetrant requirements.

F. Eddy Current

1/2"

Rubber stamp issued to qualified personnel; the use of which denotes acceptance of the material as satisfactorily meeting all Eddy Current test requirements.

ATTACHMENT "A"

EMPLOYEE STAMP RECEIPT

(Ⓢ Form No. 59066)

Employee Stamp Receipt

I hereby acknowledge receipt of, and accept full responsibility
for, the Quality Control stamps shown below.

Stamp Impression(s) _____

Received by _____ Date _____

Issued by _____ Date _____

Ⓢ Form 59066

DISTRIBUTION

Original	WANL Inspection Supervisor Stamp Control Alphabetical File
First Carbon	WANL Inspection Supervisor Stamp Control Numerical File
Second Carbon	Retained by Employee

Ⓢ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 11-1 Rev.

Effective Date 7/25/66

Supersedes:
No. QMP(L) 11-1 Date 1-20-66

SUBJECT: SHIPMENTS OF MATERIAL AND END ITEMS

1.0 PURPOSE

To provide adequate and effective control over all shipments of material and end items.

2.0 APPLICABILITY

This procedure shall be applicable to shipments of:

- 2.1 Raw materials to suppliers for further processing.
- 2.2 Subassemblies to suppliers for completion of assemblies.
- 2.3 Completed items of Ground Support Equipment being sent to NRDS.
- 2.4 Completed instrumentation being sent to NRDS.
- 2.5 Completed reactors being shipped to NRDS or other test sites.
- 2.6 Any other material covered by the contracts between WANL and the Customer.

3.0 REFERENCE

None

4.0 PROCEDURE

All raw material, assemblies, or components covered by paragraph 2.0, above, shipped from the WANL plant will be released by Quality Control on a Quality Control Shipping Release, Form No. 59610 and Quality Control Shipping Release Continuation Sheet, Form No. 59611.

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

4.1 Originating the Quality Control Shipping Release, Form 59610

When equipment, subassemblies, or raw material, as covered in paragraph 2, above, is designated for shipment from the WANL facility, Quality Control will review the "L" order and determine that all articles presented for shipment are listed on the "L" order and that they have been accepted and are acceptable for use. It is a requirement that all "L" orders state the packaging requirements for the articles being shipped. The Inspector will ascertain that these requirements are met.

After the successful conclusion of the above, the Inspector will initiate a Quality Control Shipping Release, Form 59610, and, when necessary, a Continuation Sheet, Form 59611.

4.2 Recording and Distribution of the Quality Control Shipping Release

WANL Quality Control shall maintain a log of QCSR numbers and will make distribution in accordance with a standard distribution list.

4.3 Revisions and Amendments

If, after a Quality Control Shipping Release has been issued, it becomes necessary to add to, change, or correct the information contained on the Release, a supplement shall be issued. The supplement will carry the original number, following by a dash and the supplement number. All supplements will contain a statement in the comments block saying why the supplement is being issued.

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① QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. <u>11 - 2</u> Rev. <u> </u>
	Effective Date <u>7/25/60</u>
	Supersedes: No. <u>QMP(A) 11-1</u> Date <u>10/1/65</u>

SUBJECT: PRODUCT SHIPMENTS

1.0 PURPOSE

To establish the procedure to be followed in making product shipments.

2.0 APPLICABILITY

This procedure is applicable to all shipments of NERVA materials or parts from WAFF to other locations.

3.0 REFERENCES

WANL-QC-101, WANL Quality Requirements for Suppliers

4.0 GENERAL

4.1 Policy

Product Control Engineering is responsible for insuring that all NERVA materials or parts being shipped from WAFF have been subjected to , and have satisfactorily passed, all applicable inspections and tests, with the exception of approved discrepancies. In addition, Product Control Engineering is responsible for insuring that the necessary release and technical-reporting documents either accompany the shipments or are directed to the product recipient through normal transmittal channels.

5.0 PROCEDURE

5.1 Shipping of Fuel Elements

Prior to shipment of fuel elements for any usage (including scrap), Product Control

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

Engineering shall review the documents listed below and all Material Review Tags and Variation Requests referenced on those documents to assure that the Work Order requirements have been met. (Note that pending VR's are acceptable, but must be listed on the Fuel Element Release List to assure WANL Quality Engineering follow-up.)

- 1 - Process Certification Record
- 2 - First Machining Results*
- 3 - As Surface Prepared Inspection Results*
- 4 - Final Inspection Results*
- 5 - All other data records relating to quality characteristics that are a basis of acceptance or rejection.

*Indicates more than one document, the usage of which is dependent upon the type of element being manufactured.

A Fuel Element Release List, Form 59557 (see Attachment A) shall be made for the elements to be shipped. The release numbers are consecutive numbers starting with one (1).

5.2 Shipping of Support Blocks and Insulating Cups

Prior to shipment of support blocks and insulating cups for any usage (excluding scrap), Product Control Engineering shall review the data recorded on the documents specified by the Astrofuel Facility (AFF) Procedure No. 1091 and the Quality Inspection Procedure (QIP) No. 34, to assure that the work order requirements have been met. A Supplier's Quality Certificate and Shipping Release (SQCSR) shall be filled out per WANL-QC-101 and shall be sent, together with the technical data specified by WANL, to the product recipient. These documents may accompany the product shipment, or may be delivered through normal transmittal channels.

Astrofuel Facility

C/N:

VR's
Pending

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① QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. <u>13-1</u> Rev. _____
	Effective Date <u>7/25/60</u>
	Supersedes: No. <u>QMP(L)13-1</u> Date <u>12/15/65</u>

SUBJECT: NONDESTRUCTIVE CERTIFICATION PROCEDURE

1.0 PURPOSE

To establish a procedure for qualifying personnel, procedures and equipment for Nondestructive Testing.

2.0 APPLICABILITY

This procedure is applicable to all standard Liquid Penetrant, Radiographic and Ultrasonic Testing. Qualification of special Nondestructive Test Procedures such as Beta Backscatter, Gamma Counting and Eddy Current will be specified by detailed QIP's prepared as required in QMP No. 7-2.

3.0 REFERENCE

WANL PS 294584 Certification for Nondestructive Testing
 QMP No. 7-2 Inspection and Test Planning

4.0 GENERAL

4.1 Personnel may qualify in any one or all of the following types of Nondestructive Testing:

4.1.1 Liquid Penetrant Inspection

4.1.1.1 Solvent Hand Wipe

4.1.1.2 Direct Water Wash

4.1.1.3 Post Emulsification

4.1.2 Radiographic Inspection

4.1.2.1 Film Processor

4.1.2.2 Radiographer Class B

4.1.2.3 Radiographer Class A

4.1.2.4 Radiographic Interpreter

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

4.1.3 Ultrasonic Inspection

4.1.3.1 Ultrasonic Operator (contact)

4.1.3.2 Ultrasonic Operator (immersion)

4.1.3.3 Ultrasonic Inspector

4.2 Procedures and equipment used by personnel at the time of certification shall meet the approval of the Nondestructive Test (NDT) Examiner(s).

4.3 Personnel, procedures and equipment shall be qualified and certified by an authorized NDT Examiner.

4.4 Personnel application shall be initiated by processing Part A of Ⓢ Form 59257 per WANL PS 294584.

5.0 REQUIREMENTS

5.1 Personnel

Prior to applying for certification in Nondestructive Testing, personnel shall have had the following minimum preparation.

5.1.1 Familiarization with the requirements of:

5.1.1.1 This procedure, QMP No. 13-1 and QMP No. 7-5 or equivalent

5.1.1.2 WANL PS 294584 and applicable Process Specifications

5.1.1.3 Applicable Nondestructive Test Theory

5.1.2 Training for certification.

5.1.3 Sufficient on-the-job experience in the performance of specific nondestructive testing to have developed proficiency.

5.1.4 Knowledge of safety aspects and controls for protection of personnel and equipment. (For radiography, personnel must have Industrial Hygiene Indoctrination).

5.2 Personnel with Prior NDT Experience and/or Certification

Personnel with prior NDT experience and/or certification may be certified per this procedure for any of the various types of Nondestructive Testing if review of prior NDT experience and/or certification in each type of Nondestructive Testing is determined to be equivalent to the requirements of this procedure by the NDT Examiner.

5.3 Vision

All personnel qualifying shall be required to pass a vision test in accordance with the requirements of WANL PS 294584 and recorded in Part B, Ⓢ Form 59257.

5.4 Proficiency

Personnel, except those certified by the procedure of Section 5.2 shall be required to pass a written, oral and operational proficiency test for each type and class of Nondestructive Testing as indicated in outline in Section 6.0, Test Samples and Examinations. Constant proficiency to the requirements of this procedure and all associated procedures and related specifications must be exhibited by the certified individual. Should monitoring reveal deficiencies, said certification shall be revoked until corrective action is achieved to the complete satisfaction of the NDT Examiner.

5.5 Equipment of Material Requirements

Personnel shall possess an adequate knowledge of materials and equipment used for the applicable type and class of Nondestructive Testing. Equivalent equipment and materials as used on the job shall be available and used during certification.

5.6 Certification

Upon successful completion of the required certification tests, Part C of the Nondestructive Testing Certification, Ⓢ Form 59257 will be completed. This certification and all other papers relating to the certification will be retained in the Quality Control files. A Nondestructive Testing Certification Card, Ⓢ Form 59258 will be completed and given to the applicant. Personnel so certified shall keep their Nondestructive Testing Certification Card available while performing any Nondestructive Testing or Inspection requiring this certification.

5.7 Recertification

Recertification requirements, including frequency, shall be in accordance with WANL PS 294584.

6.0 TEST SAMPLES AND EXAMINATIONS

6.1 The NDT Examiner shall obtain appropriate defective and/or representative samples requiring inspection in order to administer operation proficiency tests.

6.2 Examinations

The NDT Examiner shall prepare written and oral examinations.

6.3 Examination Requirements for Nondestructive Testing

To successfully pass the required tests, personnel are required to have a knowledge of surface finish and cleaning procedures and any other necessary or specified preparation of material or parts subject to the applicable Nondestructive Test. The respective type and class are as follows:

6.3.1 Penetrant Inspection

The individual shall be knowledgeable as to:

- 6.3.1.1 Brand Name and Specific Type (number or letter designation if applicable) of all Penetrant Materials used in this certification.
- 6.3.1.2 Detail Method of drying times and temperature of parts or materials.
- 6.3.1.3 Penetrant application, dwell or soak times, temperatures.
- 6.3.1.4 Method of penetrant removal
- 6.3.1.5 Method of developing and development dwell time.
- 6.3.1.6 Interpretation of penetrant indications to applicable specifications or standards.
- 6.3.1.7 Method of post-test cleaning
- 6.3.1.8 Theory of penetrant inspection
 - 6.3.1.8.1 Advantages and applications
 - 6.3.1.8.2 Disadvantages and limitations
- 6.3.1.9 Diagnosing and correcting faulty techniques.
- 6.3.1.10 Requirements of all applicable penetrant specifications and standards.

6.3.2 Radiographic Inspection

6.3.2.1 Film Processor

The individual shall be knowledgeable as to:

- 6.3.2.1.1 Various types of X-ray and Photographic film and processes.

6.3.2.1.2 Various chemicals and solutions used in developing Radiographic film, and be able to mix to supplier specifications.

6.3.2.1.3 Loading cassetts, sorting and handling film under dark room conditions.

6.3.2.1.4 Maintenance and operation of automatic film processor.

6.3.2.2 Radiographer - Class B

The individual shall be certified as a Film Processor and be knowledgeable as to the:

6.3.2.2.1 Operations and safety measures used in performing Radiographic Inspection.

6.3.2.2.2 Process of masking and filtering.

6.3.2.2.3 Methods of marking and identifying film for material being inspected.

6.3.2.2.4 Sensitivity level required.

6.3.2.2.5 Keeping of all records associated with the acceptance and/or rejection of Radiographed material.

6.3.2.3 Radiographer - Class A

The individual shall be certified as a Radiographer - Class B and be knowledgeable to:

6.3.2.3.1 Set up and radiograph parts, materials, etc.

6.3.2.3.2 Instruct Radiographer, Class B, in proper technique.

6.3.2.3.3 Diagnose and correct faulty radiographic methods and film processing techniques.

6.3.2.3.4 Interpret film

6.3.2.3.5 Develop a radiographic procedure of the Operational Test to be performed. This procedure shall contain as a minimum the information contained in Figure 1, attached.

6.3.2.4 Radiographic Interpreter

The individual shall be certified as a Radiographer - Class A and be knowledgeable to:

6.3.2.4.1 Instruct personnel in other classifications as to proper Radiographic procedures.

6.3.2.4.2 Interpret film and make disposition as to acceptance or rejection of the material involved.

6.3.2.4.3 Scheduling materials through Radiographic Inspection.

6.3.2.4.4 Interpretation to the requirements of all applicable radiographic specifications and standards.

6.3.3 Ultrasonic Inspection

6.3.3.1 Ultrasonic Operator (contact)

The individual shall be knowledgeable as to:

6.3.3.1.1 Contact methods and safety measures used in performing ultrasonic testing.

6.3.3.1.2 Using contact scanning techniques and demonstrate using these techniques with proficiency.

6.3.3.2 Ultrasonic Operator (immersion)

The individual shall be knowledgeable as to:

6.3.3.2.1 Immersion methods and safety measures used in performing ultrasonic testing.

6.3.3.2.2 Using Immersion techniques and demonstrate using these techniques with proficiency.

6.3.3.3 Ultrasonic Operators (Contact and Immersion)

In addition to above, all ultrasonic operators shall be knowledgeable as to:

6.3.3.3.1 Methods of marking and maintaining identity of material being inspected.

6.3.3.3.2 Calibration standards required and their use.

6.3.3.3.3 Records keeping associated with the acceptance or rejection of ultrasonic tested material.

6.3.3.4 Ultrasonic Inspector

The individual shall be knowledgeable as to:

6.3.3.4.1 Set up and testing parts in all classifications.

6.3.3.4.2 Instruction of Ultrasonic Operators in proper Ultrasonic Techniques.

6.3.3.4.3 Diagnosing and correcting scanning techniques.

6.3.3.4.4 Interpretation of signals and relation to acceptance standards.

6.3.3.4.5 Maintaining Ultrasonic Instruments at peak efficiency and calibration.

6.3.3.4.6 Developing the Ultrasonic procedure of the Operational Test to be performed. This procedure shall contain as a minimum the information contained in Figure 2 attached.

6.3.3.4.7 Performance of the Operational Test to the submitted procedure.

6.3.3.4.8 Requirements of all applicable Ultrasonic specifications and standards.

6.3.3.4.9 Identifying and correcting faulty ultrasonic methods and techniques.

6.3.3.4.10 Theory of Ultrasonic Inspection

1. Advantages and applications
2. Disadvantages and limitations

FIGURE 1

RADIOGRAPHIC CERTIFICATION PROCEDURE

View and/or Thickness

KV
MA
SFD
MASK
FILTER.
EXP
FILM
SCREEN F.
SCREEN B.
FS.
DEV.
PENETRAMETER.

FIGURE 2

ULTRASONIC TEST PROCEDURE CERTIFICATION

1. Equipment Used _____
2. Material _____ Size _____
3. Manufacturing Stage _____
4. Surface Finish _____
5. Surface(s) to be Tested _____
6. Couplant _____
7. Method (Contact) (Immersion)
8. Transducer (Size) _____ (Type) _____
9. Test Frequency _____
10. Recording (Visual) Recorder Auto Alarm
11. Special Search Units (Wedges, Shoes, Saddles, etc.) if used (Contact) _____

12. Rotating, Revolving and/or Feeding Mechanisms if used (Immersion) _____

13. Calibration Standard Used _____
14. Sketch of Scanning Technique:-

Ⓜ QUALITY METHODS & PROCEDURES

WESTINGHOUSE ASTRONUCLEAR LABORATORY
Westinghouse Electric Corporation
P. O. Box 10864 Pittsburgh, Pennsylvania 15236

QMP No. 14 - 1 Rev.

Effective Date 7/25/66

Supersedes:
No. Date

SUBJECT: END ITEM REPORTS

1.0 PURPOSE

To establish a procedure for the preparation and issuing of End Item Reports.

2.0 APPLICABILITY

This procedure shall apply to the preparation and issuing of End Item Reports for the NERVA Reactor and those items contained with it for shipment to NRDS for test.

3.0 REFERENCE

None

4.0 PROCEDURE

4.1 Format

The format of the End Item Report will be as follows:

1. Index

A listing of the sections of the report and what they are.

2. Introduction

A brief narrative description of the report and its purpose.

3. Configuration Log

A description of the reactor, listing the parts and subassemblies. As assembled part numbers, serial numbers, location and material release numbers are shown.

4. Narrative of significant problem areas encountered during assembly of reactor.

5. A narrative statement confirming compliance with the interface control drawing or the ICOR approved for any deviation from the interface control drawing.

APPROVALS:

WAML Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

4.2 Processing and Distribution

4.2.1 Whenever and wherever feasible the data contained in the report will be processed and printed by electronic data processing equipment.

4.2.2 The complete End Item Report will be issued within 30 days following completion of assembly and shipment of the reactor from WANL.

Ⓢ QUALITY METHODS & PROCEDURES WESTINGHOUSE ASTRONUCLEAR LABORATORY Westinghouse Electric Corporation P. O. Box 10864 Pittsburgh, Pennsylvania 15236	QMP No. 14-3 Rev. _____
	Effective Date <u>7/25/66</u>
	Supersedes No. <u>QMP(A)14-3</u> Date <u>10-1-65</u>

SUBJECT: INTERNAL CORRECTIVE ACTION

1.0 PURPOSE

To establish a procedure for obtaining corrective action for all internal discrepancies and deficiencies, which affect quality of a product.

2.0 APPLICABILITY

This procedure shall be followed whenever, in the estimation of Quality Control, corrective action for internal discrepancies and deficiencies at WANL and WAFF is necessary.

3.0 GENERAL

3.1 Policy

Quality Engineering is responsible for obtaining statements of corrective action, as deemed necessary, when internal discrepancies or deficiencies are discovered. Quality Engineering is also responsible for judging the adequacy of submitted corrective action statements and for following up those statements to assure implementation.

4.0 PROCEDURE

4.1 Corrective Action for In-Process Discrepancies and Deficiencies

4.1.1 Initiation of the In-Process Corrective Action Form 59563

Quality Engineering shall review all documents describing internal (WANL or WAFF caused) discrepancies and deficiencies to determine the need for corrective action. An In-Process Corrective Action form (see Attachment A) shall be filled out in triplicate by Quality Engineering for each discrepancy and deficiency which, in the

APPROVALS:

WANL Q. C. Mgr.	WAFF Q. C. Mgr.	Product Assurance Mgr.	Program Manager

estimation of Quality Engineering, is serious enough to justify corrective action. Two copies of the In-Process Corrective Action form shall be sent to the supervisor of the department in which the discrepancy or deficiency occurred, and one copy shall be retained by Quality Engineering in a weekly tickle file.

4.1.2 Corrective Action by the Responsible Department

Upon receipt of the two copies of the In-Process Corrective Action form, the department in which the discrepancy or deficiency occurred shall evaluate the discrepancy and determine the corrective action required to assure that the discrepancy or deficiency will not be repeated. The department shall state on the two copies of the In-Process Corrective Action form the corrective action that will be taken. One copy of the form shall be retained by the department stating the corrective action that will be taken, and the second copy shall be returned to Quality Engineering. The department stating the corrective action shall be responsible for implementing, or assuring implementation of the corrective action.

4.1.3 Quality Engineering Follow-Up

Quality Engineering shall review the returned copy of the In-Process Corrective Action form to assure that the corrective action statement is adequate. The returned copy shall then be filed in a weekly tickle file for follow-up to assure that the stated corrective action is implemented. After corrective action is implemented, the form shall be signed by Quality Engineering, noting satisfactory implementation, and the copy shall be retained as a permanent record.

QUALITY CONTROL
IN-PROCESS CORRECTIVE ACTION

To: _____ (1) No. _____
_____ (2) Date _____
_____ (3) Ref. _____

- (4) In the estimation of Quality Control, the above-referenced discrepancy or deficiency is considered serious enough to justify formal corrective action to prevent further occurrence. Please state, in the space below, the corrective action that you will initiate to prevent recurrence. Your answer is requested by _____.

Q.C. Manager's Signature Date

- (5) Corrective action that will be taken:

- (6) Satisfactory corrective action implemented

☐ Yes ☐ No

Q.C. Representative Signature Date

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