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PROTOTYPICAL ROD CONSOLIDATION
DEMONSTRATION PROJECT
PHASE III FINAL REPORT
VOLUME I OF IV
COLD CHECKOUT TEST REPORT
BOOK 4 OF 9

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MASTER

DOE PROTOTYPICAL ROD CONSOLIDATION PROJECT PHASE III FINAL REPORT
PREFACE

The Phase III Final Report for the Prototypical Rod Consolidation Demonstration Project is divided into four volumes as described below:

- Volume I - Cold Checkout Test Report (9 books)
- Volume II - Design Description (2 books)
- Volume III - Drawings (Supplied separately per contract as
blueline copies, reproducible mylars
Set included and 35mm aperture cards)
- Volume IV - Operations and Maintenance Manual (5 books)

Each book of Volumes I, II, and IV contain the Table of Contents for all books of the volume.

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ROD SIDE TRANSFER, ROD COMPACTION SYSTEM,

AND ROD LOADING SYSTEM

(WBS 1.3.2.3, 1.3.2.4)

TEST RESULTS AND ANALYSIS REPORT

1.0 INTRODUCTION

This appendix addresses the System Operational Testing (SOT) performed on the Side Transfer, Rod Compaction, and Rod Loading Systems (Ref. SOT Test Procedure 9315-TP-207). It provides an overview of the function of the equipment, procedures used during testing, results obtained, and conclusions and recommendations. The purpose of the SOT was to verify that the as-built condition of these systems met or exceeded their associated performance requirements. The primary objectives of this testing were as follows:

- Verification of system mechanical operation under unloaded and loaded conditions.
- Verification of system part-programs with the equipment under unloaded and loaded conditions.
- Verification of system interfaces.

In all cases, the Side Transfer, Rod Compaction, and Rod Loading Systems have been judged acceptable and released for normal Integrated System Testing (IST).

2.0 EQUIPMENT FUNCTION

The Side Transfer (Ref. Dwg. 9315-M-2301), Rod Compaction System (Ref. Dwg. 9315-M-2305), Rod Loading System (Ref. Dwgs. 9315-M-2408, 9315-M-2411, and 9315-M-2418) and Consolidation Table (Ref. Dwg. 9315-S-2404), along with the Rod Extraction System, comprise the Rod Consolidation System for the facility. These systems are the equipment needed to reconfigure the spent fuel rods and load them into canisters. The Side Transfer System gathers the rods after they have been extracted from the fuel assemblies (one row at a time from multiple assemblies) and transfers them to the Compaction System. Once these fuel rods are transferred, the Compaction System compresses the fuel rods into a tight array and transfers a predetermined number, based on fuel type and manufacturer, of these rods into the Rod Loading System hopper. This transfer sequence reconfigures the fuel rods into a desired geometry (square, round, etc.). The Rod Loading System maintains the fuel rod bundle configuration during hopper loading operations and loads them into a fuel canister of like geometry. The Consolidation Table provides the structural support for all of these systems.

2.1 SIDE TRANSFER SYSTEM

The Side Transfer System is designed to gather all fuel rods extracted from the fuel assemblies and contain them during horizontal transfer operations to the Compaction System. This mechanism consists of a carriage mounted on linear guide rails through two linear ball bearings, enabling it to be positioned horizontally. The positioning of the carriage is accomplished by a roller screw powered by a servo-drive motor. This drive motor is provided with an integral resolver which provides for the closed loop control of both the speed and position of the side transfer carriage. Mounted to this carriage is a finger module. This module is a structural steel member to which is mounted four sets of fingers. These fingers are steel plate weldments which are notched to provide a 0.625 inch slot above the Consolidation Table rails. The fuel rods are gathered in this slot, restricting vertical movement during side transfer operations. All of these components in turn are mounted to a welded steel support frame bolted to the Consolidation Table.

2.2 ROD COMPACTION SYSTEM

The Rod Compaction System is designed to perform three specific functions as follows:

- Compact all fuel rods from up to two complete rod extraction operations.
- Load a predetermined number of fuel rods, for reconfiguration, into the loading system.
- Constrain all fuel rods during compaction and loading operations.

This system consists of a rake assembly and gate assembly. The rake assembly is a pivoting plate mounted to a carriage through two pins. This arrangement enables the rake to be pivoted up during side transfer operations and down during rod compaction and loading operations. This pivot action is accomplished through a drive screw powered by a 27 volt DC drive motor. This drive system is mounted on the rake carriage and is attached to the rake through a rocker arm and clevis arrangement. The rake carriage is a structural steel plate mounted on two guide rails through four linear ball bearings. This carriage is driven horizontally by a roller screw powered by a servo-motor to compact the rods against the gate or transfer the rods to the loading system. The gate assembly is a steel plate mounted to the same structural support frame as the rake assembly.

This assembly is supported on cam rollers which ride in angled slots machined into the support frame. The drive system for the gate is identical in design to the rake drive system. Each of these systems is supported above the fuel rods from a welded plate structure.

2.3 ROD LOADING SYSTEM

The Rod Loading System consists of a slip sheet assembly, rod elevation drive assembly, and rod pusher drive assembly. Each of these systems operates in a predefined sequence to load the fuel rods into a hopper of a predetermined geometry and then load this reconfigured fuel rod bundle into a fuel canister of like geometry. The slip sheet assembly consists of two plates with a 0.625 inch x 8.50 inch machined step which creates a slot when a second plate is bolted on top. These plates are mounted to linear guide rails bolted to the Compaction System support frame on a 96.0 inch center line. This enables the slip sheets to be positioned over the hopper providing the necessary constraints for the fuel rods during the loading of each row of rods. Positioning of these slip sheets is provided by two roller screws (one for each slip sheet), coupled through beveled gears to a common drive shaft. This drive shaft in turn is powered by a servo-drive motor with an integral resolver which provides for the closed loop control of both the speed and position of the slip sheets.

The slip sheets deposit the fuel rods, one row at a time, onto the hopper support during loading operations. After each reconfigured row of rods is loaded into the hopper, the hopper support is lowered a predefined distance, based on the diameter of the fuel rod. These operations are accomplished by the fuel rod elevation drive system. This system consists of a welded plate carriage supported by four round way bearings. These round way bearings ride on guide rails bolted to a structural steel weldment mounted to the cell floor. This arrangement enables the carriage to be driven, via a roller screw, in the vertical direction for positioning of the hopper support. The roller screw is powered by a servo-drive motor with an integral resolver which provides for closed loop control of both the speed and position of the bottom support.

When all of the fuel rods from two PWR or four BWR fuel assemblies have been loaded into the Rod Loading System hopper, they are positioned (via the elevation drive system) in line with the fuel canister. Once in position, the reconfigured fuel rod bundle is pushed into the fuel canister by the rod pusher drive system. This system consists of a carriage supported by four round way bearings. These bearings ride on guide rails bolted to a removable strongback

mounted on the Consolidation Table. The carriage is driven the full length of the fuel rod bundle for canister loading operations by a roller screw powered by a servo-drive motor. This motor is equipped with an integral resolver which provides for the closed loop control of both the speed and position of the rod pusher carriage.

3.0 TEST PROCEDURE

The record copy of the test procedure (Document No. 9315-TP-207) is provided as Attachment 1. This procedure defines the requirements and step-by-step instructions for qualifying the Side Transfer, Rod Compaction, and Rod Loading Systems for Integrated System Testing. This testing has been divided into the following sections:

- Drive System Verification - This section verified the proper operation and machine/Control System interface for each of the drive systems.
- Sensor Verification - This section verified the proper operation and correct Control System response to all of the sensors.
- Interlock Verification - This section verified the correct machine response to all of the software interlocks designed into the system.
- SINGLE Mode and AUTO Mode Verification - This section verified the proper sequence of operation and Control System part-program interfaces.
- System Fault Test - This section verified the proper operation of the equipment and Control System under failure conditions.
- Loading System Force Test - This test verified the rod pusher and elevation drive system operations under design loads.
- Fuel Rod Process Operational Test - This test verified process operations under simulated conditions.

The test results and data for each of these test sections are contained within the record copy (Ref. Attachment 1) of the test procedure. Each test step has been signed by appropriate personnel as required for final disposition of this SOT. Section 4.0 of this volume provides a typical format for the test procedures and includes an explanation and reference as to the location of the

test data included in the various sections of the test procedure.

Two processes were implemented for making all necessary changes to the official test procedures and/or equipment. The first of these processes is called a Temporary Procedure Change Notice (TPCN). The TPCNs were used to make changes to the test procedures. During this test procedure, 25 TPCNs were issued as follows:

- TPCN #2 was issued to delete test criteria that were either obsolete or could not be verified as written.
- TPCNs #5, 6, 8, 12, 14, 16, 17, 18, 20, and 21 were issued to correct errors in the test procedure.
- TPCNs #1, 3, 4, 7, 9, 10, 11, 13, 15, 19, 23, 24, and 25 were issued to update the test procedure step.
- TPCN #22 was voided.

Each TPCN identified the change, reason for change, and final disposition for approval of the test results. A copy of each TPCN is included in Attachment 1.

The second process is an Exception/Repair Log (ERL). The ERLs were used to document fixes to the equipment to meet acceptance criteria or to justify acceptance of the test results that did not meet the acceptance criteria. For this test, 22 ERLs were issued as follows:

- ERLs #2, 3, 5, 14, 15, and 19 were issued to accept test results which did not meet the acceptance criteria.
- ERLs #1, 4, 6, 7, 8, 9, 10, 11, 12, 13, 16, 17, 18, 20, 21, and 22 were issued to implement fixes to the equipment in order to meet the acceptance criteria.

Each of these ERLs identified a problem encountered during testing, the proposed solution to the problem, and the final disposition (accept as is or fix) to close out the ERL. A copy of each ERL is included in Attachment 1.

If a change to the acceptance criteria was required, a Test Acceptance Criteria (TAC) Change Notice (TCN) was issued against the TAC document. A TPCN would then be issued to reflect changes to the procedure. For this procedure, three TCNs were issued against the TAC. The TCNs issued against the TAC documents can be found in the Test Section of the QA Records Package, which is a Phase III deliverable.

4.0 TEST RESULTS

The design and operating parameters for the Side Transfer, Rod Compaction System, Rod Loading System, and Consolidation Table are dependent on both the type of fuel being processed and manufacturer of the fuel. However, due to the restructuring of the test program, only those sections required to qualify this equipment for processing W 17x17 fuel assemblies were performed (Ref. TPCN #1). The following sections provide a discussion of the results obtained during this SOT.

Prior to initiating this test, a list of prerequisites had to be satisfied (Ref. Section 2.0 of Attachment 1). These prerequisites identified all of the requirements for initiating this test sequence and served as an informal Operational Readiness Review (ORR). As a result of this informal ORR, it was determined that all of the requirements except one had been satisfied. The QA/QC data package had not been completed (Ref. ERL #15 and TPCN #5). Based on an evaluation of the system by the test conductor and a review of the subsequent prerequisites by the review committee, it was determined that the system assembly was complete and that the lack of an assembled QA/QC data package would not affect the operation of the equipment or the validity of the test results. Therefore, testing of the Side Transfer, Rod Compaction System, Rod Loading System, and Consolidation Table was initiated.

4.1 DRIVE SYSTEM VERIFICATION

This test sequence consisted of operating each drive system (one at a time) through its full programmed range of motion. The purpose of this test sequence was to verify that each of the drive systems functioned as designed. The primary objective was to demonstrate the positioning accuracy and repeatability of these drive systems in meeting their requirements. Secondary operating parameters of torque and travel time were also to be evaluated. However, the power monitor used to measure the drive system torque came under suspect when testing other systems. The manufacturer of this device was contacted about the problem. As a result of this inquiry, it was learned that the power monitor would not work on brushless pulse width modulated motors. Since these are the types of motors being used in this design, all torque data collected would be invalid. Further conversation revealed that no instrumentation exists at this time which could be used for this purpose. An engineering evaluation was conducted as a result of this new information to determine the importance of measuring this parameter. It was decided that since the drive systems were conservatively sized, and since they were being tested under loaded

conditions (Ref. Sections 8.5.9 and 8.5.10 of the test procedure), and simulated conditions (Ref. Sections 8.5.11, 8.5.13, and 8.5.15 of the test procedure), any problems with the drive systems would be flushed out during these test sequences. Therefore, the criteria to measure the motor torques were eliminated from the test procedure (Ref. TPCN #2).

The test sequences for verifying the operation of each of the drive systems for the Side Transfer System, Rod Compaction System, and Rod Loading System were identical. Each drive system was placed in the HAND mode of operation and operated from control set point to set point in each direction of travel. During all of these operations, both the distance traveled and the elapsed time to complete the move were measured and recorded in the test procedure (Ref. Attachment 1). This was done a minimum of three consecutive times to establish repeatability. The results of this testing for each of the drive systems are as follows:

○ Side Transfer Drive System (M-108A)

RESULTS: The travel distance measured for this system was 65.13 to 65.19 inches. This distance was less than the expected travel distance of 68.00 to 68.06 inches. Based on an engineering evaluation of this result, it was determined that even with the reduced length of travel, the Side Transfer System was capable of performing its design function of positioning the side transfer clear of the pull heads during extraction operations and side transferring the extracted fuel rods to the Compaction System (Ref. ERL #2). Therefore, this test result was judged acceptable. The criterion of a travel time of less than 60 seconds was met.

○ Rake Carriage Drive System (M-109A)

RESULTS: The travel distance measured for this system was 33.13 inches. This distance was less than the expected travel distance of 35.00 to 35.06 inches. Based on an engineering evaluation of this result, it was determined that even with the reduced length of travel, the rake carriage drive was capable of performing its design function (Ref. ERL #2) as follows:

- Position the rake to pick up fuel rods from the Side Transfer System.

- Provide sufficient length of travel to contain all fuel rods from a minimum of two complete extraction operations.

Therefore, this test result was judged acceptable. The time of travel for this system was meaningless and was not measured.

- Rake Drive System (M-109B)

RESULTS: TPCN #3 was issued to measure the clearance between the rake and the table rails in the open and closed positions instead of travel length as required in the test procedure. These are much more meaningful parameters for verifying that the rake would meet its design function. Based on the results of this test, the rake was judged acceptable. The rake travel time of less than 3 seconds was met.

- Gate Drive System (M-109C)

RESULTS: The travel distance measured for this system was 0.69 inch. This distance is within the acceptable range of travel for the gate. In addition, TPCN #7 was written to add an acceptance criterion of 0.0 to 0.125 inch for the clearance between the gate and table rails when the gate is in the closed position. This is a critical parameter to ensure that rods are not accidentally dropped into the Rod Loading System hopper. In all test runs the gate met all test acceptance criteria for distance traveled, gate to table clearances, and elapsed time of travel. Based on these results, the gate was judged acceptable.

- Slip Sheet Drive System (M-110)

RESULTS: The travel distances measured for this system were 8.43 inches for the east slip sheet and 8.47 inches for the west slip sheet. Neither of these slip sheets met the acceptance criterion of a travel distance of between 8.50 to 8.56 inches. Based on an engineering evaluation of these results, it was determined that a travel distance of greater than 8.45 inches (Ref. TPCN #14) was sufficient for loading W 17x17 fuel rods into the hopper.

Therefore, the slip sheet retract set point was reset to provide a travel length of 8.46 to 8.47 inches. All other test criteria were met.

○ Hopper Elevation Drive System (M-111)

RESULTS: This test sequence verified the travel distance of the hopper bottom support for all 26 set point positions. In each case the travel distance met the test acceptance criteria.

○ Rod Loader Drive System (M-112)

RESULTS: The test acceptance criteria for both the travel distance and travel time for the Rod Loader System drive were not met. The measured distance of travel for the rod loader was 196.625 inches, which was 3/8 inch greater than the acceptance criterion. Based on an engineering evaluation of this result, it was determined that the additional length of travel had no affect on the performance of the system and was acceptable (Ref. TPCN #14).

Several test runs were made in an attempt to achieve the travel time for the system. In each test the velocity of the drive system was incrementally increased and the travel time measured. As a result of these test runs, a minimum travel time of 322 seconds was achieved. Even though the drive motor was capable of delivering greater velocities, the roller screw started to oscillate at higher speeds, causing the drive system to become unstable. Several design approaches were evaluated to speed up the drive system. All of them dealt with the same basic design solution which was to provide a carrier for the screw. However, each approach would significantly reduce the travel length or require major design modifications to the rod pusher drive system. Since the added time of travel for the Rod Loading System drive would only increase the process time by 3.7 minutes (222 seconds) per 16 hour day and a fix would require extensive modifications, the system was judged acceptable as presently designed (Ref. TPCN #15).

4.2 SENSOR VERIFICATION

This test sequence consisted of actuating each sensor to verify that they performed their intended function. The purpose of this test sequence was to verify that the equipment properly responded to the sensor signal and/or that the proper signals were registered at the Control System. Each test was repeated a minimum of three times to ensure consistency.

The first sensors to be tested were the drive system limit switches. Each of the drive systems except the gate drive (M-109C) and slip sheet extend (M-110) is provided with either proximity switches or limit switches at each end of travel (Ref. TPCN #4). The purpose of these switches is to deactivate the drive motors under a fault (motor run away) condition or in the event of over travel when operated in the JOG mode. This test sequence consisted of placing each drive system (one at a time) in JOG mode and operating them in each direction of travel until the motor was deactivated. Once the motor stopped, it was verified that the switches deactivated the motors prior to engaging a hardstop and that the proper signal and error message were received at the Control System. In each case the end-of-travel limit switches performed as designed for all of the drive systems of the Side Transfer, Rod Compaction, and Rod Loading Systems. Therefore, each was judged acceptable for continuing on to the next series of tests.

The next set of sensors to be tested were the rod counters (ZE109E and ZE109F). The purpose of these sensors is to count the rods which enter and exit the Rod Compaction System for fuel accountability. This test sequence consisted of placing the Side Transfer System in the JOG mode of operation and pushing three rods across the first counter (ZE109F). Once this was completed, it was verified that the system registered the correct number of rods. The second sensor (ZE109E) was tested in the same manner using the rake carriage drive system. In each instance the sensors functioned as designed to meet the acceptance criteria. Therefore, both were judged acceptable for continuing on to the next series of tests.

The last sensor to be tested was the over height alarm sensor. The purpose of this sensor is to stop fuel canister loading operations if the reconfigured rod bundle is too high to fit into the canister. This test sequence consisted of placing the Rod Loading System elevation drive into its full down position and the rod pusher drive into its full west position. Once in position, a wedge was placed under the sensor to register a height greater than the canister opening and the pusher drive operated to load fuel rods

into the fuel canister. It was then verified that the pusher drive motor was deactivated and an alarm message registered at the control console. The system functioned as designed to stop the pusher drive but did not register the fault condition at the control console (Ref. ERL #4). The problem was evaluated and the sensor set point was reset. The sensor was then retested in both the JOG and HAND modes of operations and found acceptable.

4.3 INTERLOCK VERIFICATION

This test sequence consisted of setting up various interface conditions for the different drive systems of the Side Transfer System, Rod Compaction System, and Rod Loading System. Once these conditions were set up, an attempt was made to operate the affected drive system through its range of motion. The purpose of this test was to verify that the drive systems would operate only when a predefined set of conditions was satisfied. This test consisted of either applying or not applying various interface conditions through temporary changes in the Control System data registers. Once these interface conditions were set up, an attempt was made to operate the appropriate drive system in the HAND mode. This test series continued until every practical combination of these interfaces was tested to verify that each drive system would operate only under the proper conditions.

During this test, 10 different drive system operations were tested as follows:

- Side transfer "OPEN" was successfully tested for two interface conditions dealing with the position of the pull heads.
- Side transfer "CLOSE" was successfully tested for 16 interface conditions dealing with the position of the pull heads, rake, rake carriage, and fuel. ERL #5 and TPCN #25 were issued to update the system and test procedure due to a change in the software.
- Rake carriage drive "OPEN" was successfully tested for 16 interface conditions dealing with the position of the side transfer, fuel, rake, and gate. ERL #6 and TPCN #16 were issued to correct an error in the test procedure.
- Rake carriage drive "CLOSE" was successfully tested for 16 interface conditions (Ref. ERL #7 and TPCN #9) dealing with the position of the rake, rake carriage, gate, and slip sheets.

- Gate drive "OPEN" was successfully tested for four interface conditions dealing with the presence of fuel and the position of the slip sheets. TPCN #8 was issued to update the test procedure to test a more realistic set of conditions for this drive.
- Slip sheets "OPEN" were successfully tested for four interface conditions dealing with the presence of fuel and position of the gate.
- Slip sheet "CLOSE" was successfully tested for four interface conditions dealing with the presence of fuel and the position of the gate. During the course of this test sequence, several problems were observed. Even though they had no bearing on the results of this test, they were recorded to ensure proper closure (Ref. ERL #8).
- Hopper elevation "OPEN" was successfully tested for four interface conditions dealing with the presence of fuel and the position of the gate.
- Hopper elevation "CLOSE" was successfully tested for nine interface conditions dealing with the position of fuel, slip sheets, and rod pusher. TPCN #9 was issued to add an interlock to this test sequence judged necessary to ensure the safe operation of this drive.
- Rod pusher "CLOSE" was tested for four interface conditions dealing with the position of the slip sheets and the hopper bottom support. TPCN #17 was issued to correct an error in the test procedure.

Based on the results of the testing performed on the software interlocks, the Side Transfer System, Rod Compaction System, and Rod Loading System were judged acceptable for continuing on to the next test series.

4.4 SINGLE AND AUTO MODE VERIFICATION

This test sequence consisted of operating the Side Transfer System, Rod Compaction System, and Rod Loading System in both the SINGLE mode and AUTO mode of operations. The purpose of these tests was to verify that the operating sequence for each system was correct and that the proper hold points were implemented. Each test executed all process steps from side transfer of the fuel rods from the Extraction System to loading the reconfigured rod bundle into a

fuel canister. In each test the rod consolidation equipment operated as designed with only minor problems. TPCN #11 had to be issued to clarify the test procedure. In addition, TPCNs #12, 13, and 20 had to be issued to implement minor corrections to the test acceptance criteria. Based on the results of these tests, the Rod Consolidation System was judged acceptable for the normal IST.

4.5 SYSTEM FAULT TEST

This test sequence consisted of implementing a servo-drive fault during the operation of one of the drive systems. The purpose of this test was to verify that the equipment properly responded to the fault condition and that the proper signals and error messages were displayed at the Control System. The test was executed by operating the Rod Consolidation System in the SINGLE mode and simulating a torque fault condition in the slip sheet servo-drive motor by temporarily changing the Control System data register. In addition, the system was tested for an end-of-travel fault by activating the end-of-travel limit switch for the rake carriage drive. During the initial testing, all acceptance criteria but one were met. The proper cameras were called up but could not be displayed. The switcher was not functioning (Ref. ERL #16). Once the switcher was repaired, the system performed as designed, meeting all acceptance criteria as follows:

- Power to the motor was deactivated.
- Alarm was sounded.
- Error message was displayed and printed.
- The proper cameras were called up and displayed.
- The system was recovered from the fault condition.

Therefore, the Rod Consolidation System was judged to be acceptable for continuing on to the next series of tests.

4.6 ROD LOADING SYSTEM LOAD TEST

This test sequence consisted of operating both the hopper elevation drive system and rod pusher drive system under their design loads. The purpose of these tests was to verify that each drive system was capable of producing the force required to meet its respective design function. The first load test performed was on the rod pusher. This test consisted of driving the rod pusher against the compression force gauge until a force of between 2900 to 3100 lbs.

was reached. Once this force was achieved, it was held for a minimum of 2 minutes and released. The second load test was performed on the hopper elevation system. This test consisted of loading a 3000 lb. test weight into the hopper and raising the bottom support approximately 4.0 inches. Once in position, the bottom support was lowered approximately 2.0 inches and held there for a minimum of 2 minutes. After each test sequence the systems were visually inspected for deformation and/or damage.

The rod pusher system performed as designed, meeting all test criteria. However, the hopper elevation system was not capable of raising the test load. It was not a test or design requirement that the elevation system have the capability to lift this load. The only requirement for the elevation system was to hold the load in position during hopper loading operations and lower the load to the full down position for canister loading operations. However, in order to provide greater flexibility in the design to recover from off-normal conditions, it was decided that the system should have the capability of lifting the reconfigured rod bundle. Therefore, the drive motor was replaced with a larger motor (model 2106) and retested. With the new motor, the elevation drive system met or exceeded all requirements. A visual inspection after each load test revealed no damage to either of the systems.

4.7 FUEL ROD PROCESS OPERATIONAL TEST

This test consisted of operating the Side Transfer, Rod Compaction, and Rod Loading Systems in both the SINGLE and AUTO modes of operation to process simulated fuel rods. Three individual test sequences were performed using 0.375 inch diameter solid carbon steel rods to simulate W 17x17 fuel rods. Each of these tests was successfully completed, meeting or exceeding all requirements.

The first test sequence consisted of processing 34 simulated fuel rods from side transfer operations to loading the fuel rods into the loading system hopper. The purpose of this test was to operate these systems under design conditions to determine the effect that the fuel rods would have on the operation of the systems. Each system was placed in the SINGLE mode of operation, and 34 straight rods were positioned on the Extraction System. The condition of each rod was recorded prior to initiating the test. Once the rods were in position, the system process was initiated, stepping the equipment through the process operation until one row of rods was loaded into the hopper. During this test, several problems were encountered. The rod counters (ZE-109E and ZE-109F) would not consistently provide an accurate count of the number of rods transferred to the Compaction System or the Loading System.

Numerous runs (approximately eight) were made to determine the problem. After many observations, a minor adjustment was made to the position of counter ZE-109E, and the speed at which the rods were passed over the counters was decreased by 75% for ZE-109E and 50% for ZE-109F (Ref. ERLs #9 and 11). In addition, several small problems were noted during the compaction of the rods. The first of these problems affected the loading of the hopper. The rods were not being tightly compacted against the gate and the rods were being loaded into the hopper at a sufficient angle (east/west) so that the gate would straddle the last rod when it was lowered. Two fixes were implemented to correct these problems. The first fix was to add shims to the rake (Ref. ERL #10). This kept the rods straight during transfer operations to the slip sheets. The second fix was to increase the "HOME" off-set (Ref. ERL #12) which adjusted all of the set point positions an equal amount, enabling the rake to compact the rod against the gate. The system was retested once all of the fixes were implemented and functioned as designed.

The second test sequence was identical to the first except five of the straight rods were replaced with bowed rods. These rods were bowed between 0.75 and 1.626 inches over the length of the rods. Again, 34 rods (29 straight and 5 bowed) were placed on the Extraction System (Ref. TPCN #19). Each system was then placed into the SINGLE mode of operation and the systems stepped through the auto sequence to load one row of rods into the hopper. This time the system operated as designed, meeting all requirements.

The last test sequence was an expansion of the first two defined above. This test consisted of randomly placing 68 rods (63 straight and 5 bowed) so that 34 rods were on the Extraction System and 34 rods were on the Clamping Table (Ref. TPCN #23). The purpose of this test was to operate the Rod Consolidation System under design conditions, to test all process operations and Consolidation Table interface operations. Each of the systems (Side Transfer, Rod Compaction, and Rod Loading) and interfacing systems (Clamping Table, Extraction System, and Fuel Canister Upender) were placed in the AUTO mode of operation. Once all systems were ready, the test was initiated to first side transfer the 34 rods placed on the Extraction System to the Compaction System. When this operation was completed, the 34 rods were extracted from the Clamping Table in parallel with the compaction/hopper loading process operation on the first set of 34 rods. The second set of 34 rods was then side transferred to the Compaction System and loaded into the hopper. The process continued through three complete hopper loading sequences (three rows of reconfigured rods). At this point the system was made to believe that a full complement of rods had been

loaded into the hopper and canister process operations were initiated. The test was concluded with the loading of the three rows of rods from the hopper into the fuel canister and upending the canister approximately 20 degrees. During this test sequence, several problems were observed as follows:

- The fuel rods tended to bunch up at the midpoint along their length during compaction and hopper loading operations. This only occurred when more than 34 rods were loaded in the Compaction System.
- An interference existed between the rake frame and gate when the gate was in the open position and rake was in the full south position.
- The fuel rods were pushed too far into the pull head grippers when the recovery routine was executed to attempt to regrip rods missed during the initial extraction operations.
- A bowed rod sprung over the tops of the other rods during hopper loading operation. The rod which caused the problem during this test sequence was bowed > 5.0, inches which is well beyond the design criterion of less than or equal to 2.0 inches.
- If the last rod in the array of rods transferred to the Compaction System was bowed, it had a tendency to drop below the rake on the ends. This could cause damage to that rod or cause the system to fault.
- The pull head grippers consistently failed on "OVER TIME" faults when they were being closed and opened.

None of these problems affected the test and all acceptance criteria were met. However, it was decided that even though these problems appeared to have no affect on the consolidation process, fixes would be implemented and both the second test sequence above and this test sequence would be rerun (Ref. ERL #20).

Several modifications were made to the existing design, and new design features were added to implement all fixes for the problems defined above. The fixes made to the Rod Compaction System are as follows:

- A hold down was installed on the rake carriage to prevent the rods from bunching up at the center during compaction

and hopper loading operations (Ref. ERL #13). This hold down was fabricated and installed per Design Change Notice 9315-DCN-1194. It was designed to restrict vertical movement of the last 18 rods loaded into the Compaction System.

- The set point for the up position of the gate was reduced by eight counts (Ref. ERL #18). This change eliminated the interference without affecting the gate position and travel length criteria.
- Wooden dowels were inserted into each of the grippers to restrict the depth of insertion of the fuel rods (Ref. ERL #19). This temporary fix is fine for the cold check-out testing. However, the pull heads should be redesigned to eliminate this problem for a second generation system design.
- Both slip sheets were disassembled, and the thickness of the bottom plate was reduced by 0.13 to 0.25 inch. In addition, the leading edge was tapered on the bottom side of the plate (Ref. ERL #20). This fix reduced the thickness of the slip sheet bottom plate to less than the diameter of the fuel rod, reducing the chance of the rods springing over the rod previously dropped into the hopper.
- A 2.0" x 2.0" x .25" angle was bolted onto the table rail which supports the end of the fuel rods once it is dropped from the grippers. This angle spans the length of the rail across the extraction area to the hopper wall (Ref. ERL #20). This fix would prevent the end of the fuel rods from dropping below the rake.
- A temporary fix was implemented to increase the "TIME-OUT" for the grippers. This fix provided a larger time band which permitted the grippers to operate to complete their function before a fault condition was flagged. Since this problem is associated with the Extraction System, which was not being tested as part of this test sequence, the problem was transferred to the Extraction System test (SOT NO. 9315-TP-201)(Ref. ERL #21 in Attachment 1 of this appendix).

After all of these fixes were implemented, the system was retested per ERL #20. This retest consisted of repeating the second and third test sequences as defined above in this section. As a result

of this retest, all problems noted during the original test run had been resolved. The Side Transfer System, Rod Compaction System, and Rod Loading Systems met all requirements and were released for the normal IST.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

In general, the Side Transfer System, Fuel Rod Compaction System, and Fuel Rod Loading System performed as designed with minor modifications. Each of these systems performed its respective function to transfer the rods from the Extraction System, compact the fuel rods into a tight array, reconfigure the fuel rods into a predefined geometry, and load the reconfigured rod bundle into a fuel canister of like geometry. The following summarizes the conclusions drawn from this SOT.

- All drives operated as designed under both loaded and unloaded conditions.
- All systems operated as designed for all modes (JOG, HAND, SINGLE, and AUTO) of operations.
- All interface requirements were met or exceeded.
- All systems operated as designed under fault conditions.
- The proper interfaces with the clamping table and fuel canister were achieved.

Based on these conclusions, the Side Transfer, Rod Compaction, and Rod Loading Systems have been judged acceptable for the normal IST.

5.2 RECOMMENDATIONS

As a result of the SOT performed, several recommendations have been identified. These recommendations, along with those identified in Section 7.0 of the main body of this report, should be implemented for the next generation system. These recommendations are as follows:

- Provide each drive system with an absolute resolver for position control. This will eliminate the need to "HOME" the system periodically and thus eliminate the error introduced by the homing process.

- Reevaluate the use of proximity switches for end-of-travel limit switches. These switches require extensive setup time, making them impractical for remote applications.
- Redesign the rod counters using a different approach. The size of the rods make the setup of the counters very difficult. In addition they are very sensitive to the speed and position of the rods as they are pushed across the counter.
- Replace the hopper bottom support with a roller assembly. This will significantly reduce the force required to push the rods into the fuel canister.
- Redesign the rake/consolidation table interface so that the rake extends below the table rails or the bottom end of the rake is spring loaded in the vertical (down) direction. This will eliminate the chance of the rods slipping under the rake.
- Redesign the pusher drive systems providing the drive screw with a carrier to eliminate oscillation at high speeds.

ATTACHMENT 1
SYSTEM OPERATIONAL TEST PROCEDURE
FOR THE
ROD SIDE TRANSFER, ROD COMPACTION SYSTEM,
AND ROD LOADING SYSTEM
(WBS 1.3.2.3, 1.3.2.4)
DOCUMENT NO..9315-TP-207

HALLIBURTON NUS
Environmental Corporation

Record Copy

Signature

Peter V. Gidd Date 4/23/92

TEST PROCEDURE

CLIENT: DOE-IDAHO

SPECIFICATION NO.: 9315-TP-207

LOCATION: COLD TEST FACILITY

REVISION NO.: 1

TITLE: SYSTEM OPERATIONAL TEST PROCEDURE FOR THE ROD SIDE TRANSFER, COMPACTION, LOADING AND CONSOLIDATION TABLE (WBS 1.3.2.3/1.3.2.4)

RELEASED FOR:

☐

REVIEW

☒

TEST

SYSTEM OPERATIONAL TEST PROCEDURE
FOR THE
ROD SIDE TRANSFER,
COMPACTION, LOADING AND
CONSOLIDATION TABLE
(WBS 1.3.2.3/1.3.2.4)

APPROVED L.H. for F. Gallo
PROJECT MANAGER

DATE 11-25-91

APPROVED [Signature]
QUALITY ASSURANCE

DATE 11-25-91

APPROVED R. Michalski
DISCIPLINE MANAGER

DATE 11-25-91

APPROVED [Signature]
AUTHOR

DATE 11-22-91

1	<u>L.P. Plow</u>	<u>1/29/92</u>	<u>[Signature]</u>	<u>1/31/92</u>	<u>[Signature]</u>	<u>3/20</u>		
REV	PREPARED	DATE		DATE		DATE	APPROVED	DATE

NUS CORPORATION

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE i of ii

REVISION CONTROL SHEET

Revised Page No.

Latest Revision

Date

Original

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11-22-91

All Pages As Marked

1

01-03-92

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1.0 OBJECTIVE OF TEST

The objective of this Test Procedure is to demonstrate the performance of the Rod Side Transfer, Compaction, Loading and Consolidation Table. These detailed test steps will demonstrate the acceptability of the equipment to satisfy design requirements.

2.0 PREREQUISITES

2.1 System set-up has been performed per the instruction of Appendix A.

Test Conductor Frank M. Mallo Date 6/18/92

QA Clinton K. Claggett Date 6/18/92

2.2 Camera, film, lighting and personnel are available to take photographs per the instruction of Appendix C and the detailed procedure steps (Section 8.0).

Test Conductor Frank M. Mallo Date 6/18/92

QA Clinton K. Claggett Date 6/18/92

2.3 The QA/QC Data Package has been prepared in accordance with Specification 9315-M-200, and the applicable Bill of Material, and is acceptable.

Test Conductor Frank M. Mallo Date 7/23/92

QA Clinton K. Claggett Date 7/23/92

2.4 The system has been assembled in accordance with all applicable Drawings, DCNs and FCRs of the QA/QC Data Package.

Test Conductor Frank M. Mallo Date 6/18/92

QA Clinton K. Claggett Date 6/18/92

2.5 The Test Conductor has been qualified and certified in accordance with QAP 2.0.

Test Conductor Frank M. Mallo Date 6/18/92

QA Clinton K. Claggett Date 6/18/92

ERL #15
VRC 7/20/92
TPCN #6
888 6/18/92

- 2.6 All test personnel participating in this test have been trained per the instruction of Section 6.4 of Reference 11.1.

Test Conductor Frank M. Gallo Date 6/18/92
QA Clinton R. Claggett Date 6/18/92

- 2.7 The checklist contained in the Control System SOT (9315-TP-601) applicable to this system must be completed and the results accepted prior to the initiation of testing under this procedure.

Test Conductor Frank M. Gallo Date 6/18/92
QA Clinton R. Claggett Date 6/18/92

- 2.8 A limited access area with warning signs has been established around the equipment being tested.

Test Conductor Frank M. Gallo Date 6/18/92
QA Clinton R. Claggett Date 6/18/92

- 2.9 The system FAT has been completed and accepted by NUS.

Test Conductor Frank M. Gallo Date 6/18/92
QA Clinton R. Claggett Date 6/18/92

- 2.10 All equipment required to support this test as defined in Section 6.0 of this procedure is operational and calibrated as required.

Test Conductor Frank M. Gallo Date 6/18/92
QA Clinton R. Claggett Date 6/18/92

- 2.11 A visual inspection of the system being tested has been performed to verify there are no obstructions and/or damage to the equipment that may impact testing.

Test Conductor Frank M. Gallo Date 6/18/92
QA Clinton R. Claggett Date 6/18/92

- 2.12 The environmental conditions as defined in Section 4.0 are met.

Test Conductor Frank M. Gallo Date 6/18/92
QA Clinton R. Claggett Date 6/18/92

- 2.13 Procedures for changeover of fuel types for the Control System are in place in the Control Room.

Test Conductor Frank M. Mallo Date 6/18/92
QA Clinton R. Claggett Date 6/18/92

- 2.14 The Clamping Table is operational.

Test Conductor Frank M. Mallo Date 6/18/92
QA Clinton R. Claggett Date 6/18/92

- 2.15 The Fuel Canister Upender is operational.

Test Conductor Frank M. Mallo Date 6/18/92
QA Clinton R. Claggett Date 6/18/92

- 2.16 The Extraction System is operational.

Test Conductor Frank M. Mallo Date 6/18/92
QA Clinton R. Claggett Date 6/18/92

3.0 INITIAL TEST CONDITIONS

- 3.1 *TPCW 6 VNC 7/20/92* The Fuel Canister Upender has been loaded with an empty square fuel canister ~~and is in the down (horizontal) position.~~

Test Conductor Daniel M. Chapman Date 7/20/92 *reference TPCW 6.*

- 3.2 The PWR clamps have been installed on the Clamping Table.

Test Conductor Frank M. Mallo Date 6/18/92

- 3.3 *TPCW 6 VNC 7/20/92* The ~~B&W 15 x 15~~ ^{12 x 17} pull heads have been installed on the Extraction System.

Test Conductor Frank M. Mallo Date 6/18/92

4.0 ENVIRONMENTAL CONDITIONS

At least one HVAC unit for the control room and the air circulation system for the Test Cell should be operating and maintaining the test cell and control room temperatures in the ranges 60° to 90°F and 65° to 85°F.

Test Conductor

Frank Russo

Date

6/18/92

5.0 SPECIAL PRECAUTIONS

All precautions, warnings and notes are addressed in the Detail Test Steps (Section 8.0), prior to the step to which they apply.

6.0 SPECIAL EQUIPMENT REQUIRED

6.1 20 ft. tape measure with a minimum of 1/16 inch increments. ✓
(calibration not required)

6.2 Dial caliper with a 0-12 in. range (calibration required) ✓

6.3 Stopwatch (calibration not required) ✓

~~6.4 Ampmeter with a 0-5 amp range. (calibration required)~~

~~6.5 Torque measuring device with a 0-15 ft-lb range. (calibration required)~~

6.6 Rod pusher compression load test fixture, Dwg. 9315-M-0012 Gr. 4
(calibration required)

6.7 Square fuel canister, EG&G Dwg. B5R-M00100

~~6.8 Round fuel canister, EG&G Dwg. 425671~~

~~6.9 B&W 15x15 Type 1 Class 1 mock-up fuel assembly~~

~~6.10 B&W 15x15 Type 1 Class 2 mock-up fuel assembly~~

~~6.11 B&W Type 1 Class 2 special rods~~

6.12 Wooden blocks and shims equal to 8.5 inches

6.13 Fuel canister test load, Dwg. 9315-M-0010, Gr. 3 (calibration not required)

6.14 The following 10 ft. sections of carbon steel tubing:

Quantity	Size
60	3/8 inch
10	7/16 inch
10	1/2 inch
10	9/16 inch

TPCN #1
EMF
6/15/92

TPCN #1
EMF
6/15/92

TPCN #1
EMF
6/15/92

7.0 TEST DATA RECORDING

7.1 Test Data Records

The test conductor shall designate one copy of the test procedure and its attachments as the "Record Copy" and shall ensure that this copy is maintained current. All test data, significant events, and observations must be recorded in this document. Additional sheets may be used as necessary, but must be permanently affixed to this report by staples and/or tape.

7.2 Test Procedure Modification

This section addresses the process for making modifications to the approved Test Procedure. These modifications will fall into one of three categories, as follows:

- Corrections are modifications to the procedure due to typos or incorrect information.
- Minor Changes are modifications which do not affect functional intent or acceptance criteria of the test.
- Major Changes are changes that affect functional intent or acceptance criteria.

Each of these modifications will be handled differently. If a correction is required to the procedure, it will be made with pen and ink in the "Record Copy", as they are found. The test conductor will make the appropriate change. Once the change is made, he will initial and date the change for future reference. All modifications which are considered minor changes must be documented on "Temporary Procedure Change Notice" (TPCN) forms (refer to Appendix D). This change shall be approved by the test conductor by annotating that the test procedures are using the TPCN form. All modifications which are considered a major change must also be documented on the TPCN form. However, when a major change is required, testing shall be halted until the TPCN is approved by the responsible Test Engineer, Test Conductor, Quality Assurance and Project Engineer.

7.3 Repairs/Retesting

This section addresses the process for making necessary repairs to the equipment and retesting of the system. If during testing a problem is observed which requires repair or rework of the equipment, testing shall be halted. If the repair/rework is minor, the Test Conductor will document the problem, cause, and corrective action implemented, the faulty system will be retested. All remaining tests will continue on until conclusion. If the problem requires redesign of the faulty system, all testing of this equipment will be halted. The problem and recommended solution will be documented and submitted to the Test Review Group (TRG) for approval. Once approval and the repair is complete, testing of the equipment will be accomplished in accordance with this procedure.

8.0 DETAILED TEST STEPS

The following sequences of tests are arranged per fuel type. All tests pertaining to a certain fuel are performed, then repeated for the next consecutive fuel type. The order in which these tests are performed will not have an impact on the results and can therefore be performed in any order as deemed appropriate by the test conductor.

~~8.1 System Verification for the GE 8x8 BWR Fuel Type~~

~~The following series of tests is performed to verify the operability of the Rod Side Transfer, Compaction, Loading and Consolidation Table specific to the GE 8 x 8 BWR fuel type. Prior to initiating testing, verify the control system is programmed for the GE 8 x 8 BWR fuel type.~~

~~Test Conductor _____ Date _____~~

~~8.1.1 Sensor Operation Verification Test~~

WARNING

Stay clear of all moving equipment while in operation.

~~8.1.1.1 Verify the operation of the Side Transfer (M-108A) travel sensors as follows:~~

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

TPCN # 1
Delete this section
through page 136
JAF
4/15/12

8.4 System Verification for the W 17 X 17 PWR Fuel Type

The following series of tests is performed to verify the operability of the Rod Side Transfer, Compaction, Loading and Consolidation Table specific to the W 17 X 17 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the W 17 X 17 PWR fuel type.

Test Conductor Frank Wells Date 6/18/92

8.4.1 Sensor Operation Verification Test

WARNING

Stay clear of all moving equipment while in operation.

8.4.1.1 Verify the operation of the Side Transfer (M-108A) travel sensors as follows:

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1

1. Switch the control system to the JOG mode at full speed and drive the Side Transfer Assembly to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.
3. Drive the Side Transfer Assembly north until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel. ✓
- Hard stops were not engaged. ✓

Test Conductor Frank D. Mallo Date 6/18/92
QA Clinton K. Claggett Date 6/18/92

4. Drive the Side Transfer Assembly south until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.
- Hard stops were not engaged.

Test Conductor Frank D. Mallo Date 6/18/92
QA Clinton K. Claggett Date 6/18/92

5. Repeat steps 3. and 4. two additional times.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated in each direction.
- Hard stops were not engaged.

Test Conductor Frank D. Mallo Date 6/18/92 ✓
QA Clinton K. Claggett Date 6/18/92

6. The above steps have been completed.

Test Conductor Frank D. Mallo Date 6/18/92

- 8.4.1.2 Verify the operation of the Rake Carriage (M-109A) travel sensors as follows:

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Switch the control system to the JOG mode at full speed and drive the Rake Carriage to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.
3. Drive the Rake Carriage south until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel. ✓
- Hard stops were not engaged. ✓

Test Conductor

Date

QA

Date

4. Drive the Rake Carriage north until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.
- Hard stops were not engaged.

Test Conductor

Date

QA

Date

5. Repeat steps 3. and 4. two additional times.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated in each direction.
- Hard stops were not engaged.

Test Conductor J. M. Galle Date 6/18/92
QA Clinton K. Claggett Date 6/18/92

6. The above steps have been completed.

Test Conductor J. M. Galle Date 6/18/92

8.4.1.3 Verify the operation of the Rake (M-109B) travel sensors as follows:

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

TAKE PHOTOGRAPH AND RECORD INFORMATION IN LOG

1. Switch the control system to the JOG mode at full speed and drive the Rake to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.
3. Drive the Rake up until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.
- Hard stops were not engaged.

Test Conductor J. M. Galle Date 6/18/92
QA Clinton K. Claggett Date 6/18/92

4. Drive the Rake down until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.
- Hard stops were not engaged.

Test Conductor

F. M. Ballo

Date

6/18/92

QA

Clinton R. Leggett

Date

6/18/92

5. Repeat steps 3. and 4. two additional times.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated in each direction.
- Hard stops were not engaged.

Test Conductor

F. M. Ballo

Date

6/18/92

QA

Clinton R. Leggett

Date

6/18/92

6. The above steps have been completed.

Test Conductor

F. M. Ballo

Date

6/18/92

8.4.1.4 Verify the operation of the Gate (M-109C) travel sensors as follows:

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

*****TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG*****

1. Switch the control system to the JOG mode at full speed and drive the Gate to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.
3. Drive the Gate up until it automatically shuts off.

acceptance
criteria
may be
revised
for the
position
See acceptance
criteria
log 6/18/92

TPCN
524
SMF
6/17/92

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.
- Hard stops were not engaged.

Test Conductor _____ Date _____

QA _____ Date _____

4. Drive the Gate down until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.
- Hard stops were not engaged.

Test Conductor _____ Date _____

QA _____ Date _____

5. Repeat steps 3. and 4. two additional times.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated in each direction.
- Hard stops were not engaged.

Test Conductor _____ Date _____

QA _____ Date _____

6. The above steps have been completed.

Test Conductor _____ Date _____

7/26/97
TREN
6/17/97

8.4.1.5 Verify the operation of the Slip Sheet (M-110) travel sensors as follows:

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Switch the control system to the JOG mode at full speed and drive the Slip Sheet to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.

~~3. Drive the Slip Sheet north until it automatically shuts off.~~

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.
- Hard stops were not engaged.

Test Conductor _____ Date _____
QA _____ Date _____

4. Drive the Slip Sheet south until it automatically shuts off.

~~5. Repeat steps 1 and 4 two additional times.~~ 6/12/92

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.
- Hard stops were not engaged.

Test Conductor Frank M. Ball Date 6/18/92
QA Antonia R. Laggett Date 6/18/92

5. Repeat steps 1 and 4 two additional times.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated in each direction.

South

TRW
out
2/17/92

TRW
out
6/12/92

TRW
out
6/12/92

TRW
out
6/12/92

- Hard stops were not engaged.

Test Conductor F. M. Mallo Date 6/18/92
QA Clinton K. Clegett Date 6/18/92

6. The above steps have been completed.

Test Conductor F. M. Mallo Date 6/18/92

8.4.1.6 Verify the operation of the Hopper (M-111) travel sensors as follows:

WARNING

Stay clear of all moving equipment while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Switch the control system to the JOG mode at full speed and drive the Hopper to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.
3. Drive the Hopper up until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.
- Hard stops were not engaged. *all TAC met*

Test Conductor F. M. Mallo Date 6/18/92
QA Clinton K. Clegett Date 6/18/92

4. Drive the Hopper down until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.
- Hard stops were not engaged. *all TAC met*

Test Conductor F. M. Mallo Date 6/18/92
QA Clinton K. Clegett Date 6/18/92

5. Repeat steps 3. and 4. two additional times.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated in each direction.

- Hard stops were not engaged.

all TAC met

Test Conductor P. B. Gallo

Date 6/18/92

QA

Clinton R. Clegg

Date 6/18/92

6. The above steps have been completed.

Test Conductor P. B. Gallo

Date 6/18/92

8.4.1.7 Verify the operation of the Rod Loader (M-112) travel sensors as follows:

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

TAKE PHOTOGRAPH AND RECORD INFORMATION IN LOG

1. Switch the control system to the JOG mode at full speed and drive the Rod Loader to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.
3. Drive the Rod Loader east until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.

- Hard stops were not engaged.

all TAC met

Test Conductor P. B. Gallo

Date 6/18/92

QA

Clinton R. Clegg

Date 6/18/92

4. Drive the Rod Loader west until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated at the end of travel.

- Hard stops were not engaged.

all TAC met

Test Conductor

Date

QA

Date

5. Repeat steps 3. and 4. two additional times.

Acceptance Criteria:

- The control system indicates that the limit switch (proximity sensor) was activated in each direction.

- Hard stops were not engaged.

all TAC met

Test Conductor

Date

QA

Date

6. The above steps have been completed.

Test Conductor

Date

8.4.2 Drive System Operation Verification Test

WARNING

Stay clear of all moving equipment while in operation

8.4.2.1 Verify the Side Transfer (M-108A) drive system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Switch the control system to the HAND mode and drive the Side Transfer north until it automatically shuts off.

- TACH #2
JUN 7/10/92
2. Connect instrument leads to the Side Transfer drive motor (M-108A) for measuring torque.

3. Make a temporary mark as a reference point to measure travel from.

- TACH #2
JUN 7/10/92
4. Drive the Side Transfer south and measure motor operating torque, total travel time and distance.

Type of Measuring Device	Range
Identification No.	Calibration Due Date

1 Torque _____
Travel Time 57.9 sec
→ Travel Distance 65.5 in.

Acceptance Criteria

- Motor torque is ~~≤ 1.83 ft-lbs.~~
- Elapsed time to extend or retract Side Transfer mechanism is < 60 seconds.
- The distance traveled when extended is ~~68.00~~ 65 1/2 ± 1/8 inches.

← Measurement taken from Home position, not north resolver position. All other measurements taken from north resolver position.

Test Conductor W.D. [Signature]

Date 6-19-92

QA

Clinton K. [Signature]

Date 6/19/92

TACH 14
JUN 7/10/92

TAC
CN 001

RL #2
KBH
6-19-92

5. Drive the Side Transfer north and measure ~~motor operating torque~~, total travel time and distance.

Type of Measuring Device	Range
Identification No.	Calibration Due Date

Torque —
Travel Time 57.4 sec
Travel Distance 65.25 in

Acceptance Criteria

- ~~Motor torque is ≤ 1.83 ft-lbs.~~
- Elapsed time to extend or retract Side Transfer mechanism is < 60 seconds.
- The distance traveled when retracted is 68.00 - 0.00 inches.

Test Conductor RB Hayes Date 6-19-92

QA Clinton R. Cleary Date 6/19/92

6. Repeat steps 4 and 5 two additional times.

Type of Measuring Device	Range
Identification No.	Calibration Due Date

South

North

Torque	<u>—</u>	<u>—</u>
Travel Time	<u>57.4 sec</u>	<u>57.0 sec</u>
Travel Distance	<u>65.19 in.</u>	<u>65.13 in.</u>
Torque	<u>—</u>	<u>—</u>
Travel Time	<u>57.4 sec</u>	<u>57.1 sec</u>
Travel Distance	<u>65.13 in.</u>	<u>65.13 in.</u>

Acceptance Criteria

- ~~Motor torque is ≤ 1.83 ft-lbs.~~
- Elapsed time to extend or retract Side Transfer mechanism is < 60 seconds.
- The distance traveled when retracted is 68.00 - 0.00 inches.

Test Conductor RB Hayes Date 6-19-92

QA Clinton R. Cleary Date 6/19/92

7. The above steps have been completed.

Test Conductor RB Hayes Date 6-19-92

TPEN #2
KBH
6-19-92

RL #1

KBH
6-19-92

TAC CN #1
SOP 6/16/92

TPEN #2
KBH
6-19-92

RL #2

KBH
6-19-92

TAC CN #1
SOP 6/16/92

8.4.2.2 Verify the Rake Carriage (M-109A) drive system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Switch the control system to the HAND mode and drive the Rake Carriage south until it automatically shuts off.

- TPCN 2
VVC
7/10/92
2. ~~Connect instrument leads to the Rake Carriage drive motor (M-109A) for measuring torque.~~

3. Make a temporary mark as a reference point to measure travel from.

- TPCN
VVC
7/10/92
4. Drive the Rake Carriage north and measure ~~motor operating torque~~, and total travel distance.

Type of Measuring Device	Range
Identification No.	Calibration Due Date

TPCN #2
VVC
7/10/92

RL #2 → Torque
Travel Distance 33.13 in.

KDH
6-19-92

Acceptance Criteria

- ~~Rake carriage motor torque is < 4.25 lb ft.~~
- Rake travel distance when extended is 35.00 ~~± 0.06~~ 34 1/4 ± 1/8 inches.

Test Conductor JB Stanger Date 6-19-92

QA Clinton R. Claggett Date 6/19/92

- TPCN 2
VVC
7/10/92
5. Drive the Rake Carriage south and measure ~~motor operating torque~~ and total travel distance.

Type of Measuring Device	Range
Identification No.	Calibration Due Date

RL #2 → Torque
Travel Distance 33.13 in

KDH
6-19-92

Acceptance Criteria

- TPCN 2
VVC
7/10/92
- ~~Rake carriage motor torque is < 4.25 lb ft.~~
 - Rake travel distance when retracted is 35.00 ~~± 0.06~~ 34 1/4 ± 1/8 inches.

Test Conductor JB Stanger Date 6-19-92

QA Clinton R. Claggett Date 6/19/92

6. Repeat steps 4 and 5 two additional times.

Type of Measuring Device	Range
Identification No.	Calibration Due Date

	North	South
Torque	33.13 in. KBH	
Travel Distance	33.13 in.	33.13 in.
Torque		
Travel Distance	33.13 in.	33.13 in.

Acceptance Criteria

- Rake carriage motor torque is $< 4.25 \text{ lb-ft}$
 - Rake travel distance traveled is $35.00 - 0.00$ inches.
- Test Conductor JB Hayes Date 6-19-92
- QA Clinton R. Claggett Date 6/19/92

7. The above steps have been completed.

Test Conductor JB Hayes Date 6-19-92

8.4.2.3 Verify the Rake (M-1098) drive system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

- Switch the control system to the HAND mode and drive the Rake up until it automatically shuts off.
- Connect instrument leads to the Rake drive motor (M-1098) for measuring current.
- Make a temporary mark as a reference point to measure travel from.

4. Drive the Rake down and measure motor operating current, total travel time and distance. From the mark.

Type of Measuring Device	Range
Identification No.	Calibration Due Date

Current _____

Travel Time 2.2 sec.

Travel Distance _____

Distance from rail 0.51 in.

Acceptance Criteria

- TPCN 002
VFC 7/20/92
- ~~Rake motor current~~ ≤ 0.72 amps.
 - Rake ~~opens~~ or closes in ≤ 3 seconds.

- TPCN 003
VFC 7/20/92
- ~~Rake moves~~ $0.625 \pm .06$ inch.
 - Rake ~~distance~~ $0.625 \pm .06$ inch. ≤ 0.125 inch. ≤ 12

QA

Clinton B. Claggett

Date 6-19-92

Date 6/19/92

5. Drive the Rake up and measure ~~motor operating current~~, total travel time and distance.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Current _____

Travel Time 2.7 sec.

Travel Distance .69

(measured at east end)

Acceptance Criteria

- TPCN 002
VFC 7/20/92
- ~~Rake motor current~~ ≤ 0.72 amps.
 - Rake ~~opens or closes~~ in ≤ 3 seconds.

- TPCN 003
VFC 7/20/92
- ~~Rake moves~~ $0.625 \pm .06$ inch.

Test Conductor JB James

Date 6-19-92

QA

Clinton B. Claggett

Date 6/19/92

TPCN #2
VFC 7/20/92

TPCN 003
VFC 7/20/92

RAKE ~~distance~~

~~TPCN 003~~
~~VFC 7/20/92~~

TPCN # ⁰⁰⁷ ~~005~~ 6. Repeat steps 4 and 5 two additional times.

KJH
6-19-92

TPCN 2
VME
7/12/92

Type of Measuring Device	Range
Identification No.	Calibration Due Date

Down

Up

Current

Travel Time

Travel Distance

RAKE DISTANCE FROM RAIL

Current

Travel Time

Travel Distance

RAKE DISTANCE FROM RAIL

Acceptance Criteria

2.1 SEC

2.14 .051 in.

2.3 SEC

2.14 .051 in.

2.6 SEC

.69 in.

2.7 SEC

.69 in.

← measured at east end

← measured at east end

• Rake motor current ≤ 0.72 amps.

• Rake opens or closes in ≤ 3 seconds.

• Rake moves $0.625 \pm .06$ inch.

• Rake distance from rail in the

Test Conductor

Date

QA

Date

7. The above steps have been completed.

Test Conductor

Date

TPCN 2
VME
7/12/92

TPCN 3
VME
7/12/92

TPCN 7
VME
7/12/92

JB Hayes

closed position > 0.0 in and ≤ 0.125 in.

6-19-92

6/19/92

6-19-92

8.4.2.4 Verify the Gate (M-109C) drive system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Switch the control system to the HAND mode and drive the Gate up until it automatically shuts off.

- TPCN 2
V-1
7/12/92
2. ~~Connect instrument leads to the Gate drive motor (M-109C) for measuring current.~~

3. Make a temporary mark as a reference point to measure travel from.

- TPCN 005
KBH
6-19-92
4. Drive the Gate down and measure ~~motor operating current~~, total travel time and distance, ~~from the rail.~~

Type of Measuring Device	Range
Identification No.	Calibration Due Date

Current _____
Travel Time 3.1 sec.
Travel Distance .113
from rail

Acceptance Criteria

- ~~Rake motor current~~ ≤ 0.74 amps.
- Gate time to open or close is ≤ 4.0 seconds.

- Gate moves $0.625 \pm .06$ inch.
distance from rail is > 0.0 in. and ≤ 0.125 in. in the closed position

Test Conductor RP [Signature] Date 6-19-92

QA

Date 6/19/92

- TPCN 7
V-1
7/12/92
5. Drive the Gate up and measure ~~motor operating current~~, total travel time and distance, ~~from the rail.~~

Type of Measuring Device	Range
Identification No.	Calibration Due Date

Current _____
Travel Time 3.8 sec.
Travel Distance .69 in.
from rail

Acceptance Criteria

- ~~Rake motor current~~ ≤ 0.74 amps.
- Gate time to open or close is ≤ 4.0 seconds.

- Gate moves $0.625 \pm .06$ inch, from rail

Test Conductor RP [Signature] Date 6-19-92

QA

Date 6/19/92

TPCN 005 6. Repeat steps 4 and 5 two additional times.

KBH
6-19-92

Type of Measuring Device	Range
Identification No.	Calibration Due Date

TPCN 2
7/20/92
TPCN 7
7/21/92
TPCN 2
7/21/92
TPCN 7
7/21/92

	Down	Up
Current	—	—
Travel Time	3.0 sec.	3.2 sec.
Travel Distance	0.69 in.	0.69 in.
from rail		
Current	—	—
Travel Time	3.0 sec.	3.6 sec.
Travel Distance	1.00 in.	0.69 in.
from rail		

Acceptance Criteria

- TPCN 2
7/20/92 | Rake motor current ≤ 0.74 amps.
- Gate time to open or close is ≤ 4.0 seconds.
- TPCN 7
7/21/92 | Gate moves $0.625 \pm .06$ inch, from rail.
- Gate distance from rail is > 0.0 in. and ≤ 0.125 in. in the closed position.
- Test Conductor BB Zanger Date 6-19-92
- QA Clinton C. Clegg Date 6/19/92

7. The above steps have been completed.

Test Conductor BB Zanger Date 6-19-92

8.4.2.5 Verify the Slip Sheet (M-110) drive system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

- Switch the control system to the HAND mode and drive the Slip Sheet south until it automatically shuts off.
- TPCN 2
7/20/92 | ~~Connect instrument leads to the Slip Sheet drive motor (M-110) for measuring torque.~~
- Make a temporary mark as a reference point to measure travel from.
- TPCN 7
7/21/92 | Drive the Slip Sheet north and measure ~~motor operating torque and total travel distance.~~ Also measure the clearance between the slip sheets and hopper wall.

TPCN 2
7/20/92
TPCN 7
7/21/92

Type of Measuring Device	Range
Identification No.	Calibration Due Date

Torque
Slip Sheet Clearance 0.45 / 0.60
Travel Distance 8.43 / 8.468
E / W

Acceptance Criteria

- TPCN 2 7/10/92
- 8.45 $\pm$.06
+ .06
- TPCN 14 7/11/92
SAY 1 06 20
1. Both slip sheets move 8.5 $\pm$.00 inch.
2. ~~Motor torque is less than 3.98 ft.-lbs.~~
3. Both slip sheets are within 1/16 inch but not in contact with hopper wall (Dwg. 9315-M-2504, Item 4) when fully extended.

Test Conductor Eric Funt

Date 6/22/92

QA [Signature]

Date 6/22/92

5. Drive the Slip Sheet south and measure ~~motor operating torque~~ and total travel distance.

Type of Measuring Device	Range
Identification No.	Calibration Due Date

~~Torque~~
Travel Distance 8.45 $\pm$.06

Acceptance Criteria

- TPCN 14 7/11/92
SAY 1 06 20
- 8.45 $\pm$.06
+ .06
1. Both slip sheets move 8.5 $\pm$.00 inch.
2. ~~Motor torque is less than 3.98 ft.-lbs.~~

Test Conductor Eric Funt

Date 6/22/92

QA [Signature]

Date 6/22/92

6. Repeat steps 4 and 5 two additional times.

Type of Measuring Device	Range
Identification No.	Calibration Due Date

	North	South
Torque	8.45	8.45
Slip Sheet Clearance	8.467 / 8.463	8.467 / 8.463
Travel Distance	8.467 / 8.463	8.467 / 8.463
Torque	8.45	8.45
Slip Sheet Clearance	8.467 / 8.463	8.467 / 8.463
Travel Distance	8.467 / 8.463	8.467 / 8.463

Acceptance Criteria

- Both slip sheets move $8.5 \pm .06$ inch.
- ~~Motor torque is less than 3.98 ft.-lbs.~~
- Both slip sheets are within 1/16 inch but not in contact with hopper wall (Dwg. 9315-M-2504, Item 4) when fully extended.

Test Conductor Sam Farnett Date 6/22/92
QA Mike Date 6/22/92

7. The above steps have been completed.

Test Conductor Sam Farnett Date 6/22/92

8.4.2.6 Verify the Hopper Elevation (M-111) drive system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

- Switch the control system to the HAND mode and drive the Hopper elevation up.
- ~~Connect instrument leads to the Hopper elevation drive motor (M-111) for measuring torque.~~
- Establish a reference mark to locate the full up position of the hopper.

4. Drive the Hopper elevation motor (M-111) down one (1) row. Measure and record ~~motor operating torque and~~ travel distance. Move the Hopper down 25 more successive positions measuring torque and travel distance each time.

Type of Measuring Device _____ Range _____
 Identification No. _____ Calibration Due Date _____

Row (i)	Torque (ft.-lbs.)	Distance to full up position (m_i)	Successive Travel Distance ($m_i - m_{i-1}$)
1		.390	
2		.720	.330
3		1.050	.330
4		1.379	.329
5		1.715	.336
6		2.040	.325
7		2.365	.325
8		2.705	.340
9		3.030	.325
10		3.300	.330
11		3.700	.340
12		4.025	.325
13		4.350	.325
14		4.675	.325
15		5.000	.325
16		5.325	.325
17		5.655	.330
18		5.980	.325
19		6.310	.330
20		6.640	.330
21		6.973	.333
22		7.300	.329
23		7.635	.335
24		7.965	.330
25		8.295	.330
26		8.620	.325

1/2 12/24/20
 4/24/20

Acceptance Criteria

- ~~Hopper elevation drive motor torque is ≤ 3.88 ft.-lbs.~~
- Travel distance for 1st row is $0.374^{+.02}_{-.00}$ inch.
- Travel distance for 2nd - 26th row is $0.324^{+.02}_{-.00}$

 Test Conductor Ernst

 Date 6/22/92

 QA H. B. [unclear]

 Date 6/22/92

- Raise Hopper elevation to the full up position and repeat Step 4.

Type of Measuring Device	Range
Identification No.	Calibration Due Date

Row (i)	Torque (ft.-lbs.)	Distance to full up position (mi)	Successive Travel Distance (mi-mi ₋₁)
1		.390	
2		.120	.330
3		1.050	.330
4		1.379	.329
5		1.715	.336
6		2.040	.325
7		2.365	.325
8		2.705	.340
9		3.030	.325
10		3.360	.330
11		3.700	.340
12		4.025	.325
13		4.350	.325
14		4.675	.325
15		5.000	.325
16		5.325	.325
17		5.655	.330
18		5.980	.325
19		6.310	.330
20		6.640	.330
21		6.973	.333
22		7.300	.327
23		7.635	.335
24		7.965	.330
25		8.295	.330
26		8.620	.325

11/21/92
 2014 5/15/92

Acceptance Criteria

~~Hopper elevation drive motor torque is ≤ 3.88 ft.-lbs.~~

- Travel distance for 1st row is $0.374 \pm .02$ inch.
- Travel distance for 2nd - 26th row is $0.324 \pm .02$

Test Conductor 2nd Fanst Date 6/22/92

QA 1/1/1992 Date 6/22/92

6. The above steps have been completed.

Test Conductor 2nd Fanst Date 6/22/92

8.4.2.7 Verify the Rod Loader (M-112) drive system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Switch the control system to the HAND mode and drive the Rod Loader west until it automatically shuts off.
2. ~~Connect instrument leads to the Rod Loader drive motor (M-112) for measuring torque.~~
3. Make a temporary mark as a reference point to measure travel from.
4. Drive the Rod Loader east and measure ~~motor operating torque,~~ total travel time and distance.

Type of Measuring Device	Range
Identification No.	Calibration Due Date

~~Torque~~
Travel Time 322 sec.
Travel Distance 196.625

RL #3
2nd
6/22/92

Acceptance Criteria

- ~~Rod loader drive motor torque is ≤ 12.34 ft.-lbs.~~
- Rod loader drive travel distance is 196.00 ± 0.25 inches.
- Time to fully move loader drive is < 100 sec.

Test Conductor 2nd Fanst Date 6/22/92

QA 1/1/1992 Date 6/22/92

TPCN 14
VNC
7/21/92

TPCN 002
vnc
7/10/92

5. Drive the Rod Loader west and measure ~~motor operating torque,~~
total travel time and distance.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Torque _____
Travel Time 322
Travel Distance 196.625

RL # 3
2015 6/22/92

Acceptance Criteria

TPCN 002
vnc
7/10/92

- Rod loader drive motor torque is ≤ 12.34 ft. lbs. 196.5 ± 0.25
- Rod loader drive travel distance is 196.00 ± 0.00 inches.
- Time to fully move loader drive is < 100 sec. 325

TPCN 14
vnc
7/11/92

TPCN
001
2015 6/1/92

Test Conductor E. Forrest Date 6/22/92
QA W. H. H. H. Date 6/22/92

6. Repeat steps 4 and 5 two additional times.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

West

East

Torque _____
Travel Time 322
Travel Distance 196.625

Torque _____
Travel Time 322
Travel Distance 196.625

RL # 3
6/22/92

TPCN 002
vnc
7/10/92

Torque _____
Travel Time 322
Travel Distance 196.625

Torque _____
Travel Time 322
Travel Distance 196.625

Acceptance Criteria

TPCN 002
vnc
7/10/92

- Rod loader drive motor torque is ≤ 12.34 ft. lbs. 196.5 ± 0.25
- Rod loader drive travel distance is 196.00 ± 0.00 inches.
- Time to fully move loader drive is < 100 sec. 325

TPCN 14
vnc
7/11/92

TPCN
001
2015 6/1/92

Test Conductor E. Forrest Date 6/22/92
QA W. H. H. H. Date 6/22/92

7. The above steps have been completed.

Test Conductor E. Forrest Date 6/22/92

8.4.3 Rod Counter Verification Test

WARNING

Stay clear of all moving equipment while in operation.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Place the control system in the JOG mode and move the side transfer system (M-108A) north to the full retracted position.
2. Open the rake (M-109B) and move the rake carriage (M-109A) fully south.
3. Close gate (M-109C).
4. Place three (3)^{unc}_{or more 7/16/92} of the 3/8 inch rods on the fuel support rails against the side transfer fingers.
5. JOG the side transfer (M-108A) fingers south to the fully extended position. Verify the rods passed over the fuel rod counting sensor (ZE109F) and that the registers in the control system PLC acknowledge three rods.

Acceptance Criteria

- Control system indicates that each rod was passed over the counter.

Test Conductor L. M. Dello Date 7/16/92
QA A. R. Culpeper Date 7/16/92

6. Move the side transfer (M-108A) fingers north to the full retracted position.
7. Move the rake carriage (M-109A) fully north and close the rake (M-109B).
8. JOG the rake carriage (M-109A) south. Verify the rods passed over the fuel rod counting sensor (ZE 109E) and that the registers in the control system PLC acknowledge three rods.

Acceptance Criteria

- Control system indicates that each rod was passed over the counter.

Test Conductor L. M. Dello Date 7/16/92
QA A. R. Culpeper Date 7/16/92

9. Retrieve rods from the compaction system and open the rake (M-1098).
10. Repeat Steps 4 through 9 two (2) additional times.

Acceptance Criteria

- Control system indicates that each rod was passed over both counters.

Test Conductor F. M. Mallo Date 7/16/92

QA R. Mulgrew Date 7/16/92

11. The above steps have been completed.

Test Conductor F. M. Mallo Date 7/16/92

8.4.4 Hopper Over Height Alarm Verification Test

WARNING

Stay clear of all moving equipment while in operation.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Place control system in the JOG mode and lower the hopper (M-111) to the full down position.
2. Move the rod loader (M-112) to the full west position.
3. Manually raise the funnel assembly top plate and weight bars (Dwg. 9315-M-2431, Items 10 and 11) to an inside opening of approximately 8.50 inches. Place wood blocks and shims inside opening to maintain this distance.
4. Measure and record the opening then attempt to drive the rod loader (M-112) east. Verify the rod loader does not move and the control system acknowledges a fault.

Type of Measuring Device Caliper Range 0 - 12"
Identification No. 175 Calibration Due Date 8/26/92

Distance 8.55" inch

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the side transfer can be moved north. Mark the appropriate column per the test result.

Condition

A. Pull heads back (east).

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

<u>Test</u>	<u>A</u>	<u>System Operates</u>		<u>Expected Result</u>
i	0	☐ yes	☒ no	no
ii	1	☒ yes	☐ no	yes

Acceptance Criteria

- Drive system does not operate unless the following conditions are satisfied: A.

Test Conductor Erin Furest

Date 6/22/12

QA G. P. [Signature]

Date 6/22/12

3. The above steps have been completed.

Test Conductor Erin Furest

Date 6/22/12

8.4.5.2 Verify the Side Transfer (M-108A) closed (south) interlocks as follows:

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the side transfer can be moved south. Mark the appropriate column per the test result.

Condition

- A. Pull heads back (east).
- B. Carriage closed (south).
- C. No fuel.
- D. Rake open.

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

Test	A	B	C	D	System Operates		Expected Result
i	0	0	0	0	yes	no	no
ii	1	0	0	0	yes	no	no
iii	0	1	0	0	yes	no	no
iv	0	0	1	0	yes	no	no
v	0	0	0	1	yes	no	no
vi	1	1	0	0	yes	no	no
vii	1	0	1	0	yes	no	no
viii	1	0	0	1	yes	no	no
ix	0	1	1	0	yes	no	no
x	0	1	0	1	yes	no	no
xi	0	0	1	1	yes	no	no
xii	1	1	1	0	yes	no	yes
xiii	1	1	0	1	yes	no	yes
xiv	1	0	1	1	yes	no	no
xv	0	1	1	1	yes	no	no
xvi	1	1	1	1	yes	no	yes

Acceptance Criteria

- Drive system does not operate unless the following conditions are satisfied: A + B + (C or D).

Test Conductor ER Farnest

Date 6/22/92

QA SPF

Date 6/22/92

3. The above steps have been completed.

Test Conductor ER Farnest

Date 6/22/92

RL
5
WIP GLS
No

yes
yes

yes

8.4.5.3 Verify the Carriage Drive (M-109A) open (north) interlocks as follows:

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the carriage can be moved north. Mark the appropriate column per the test result.

Condition

- A. Side transfer open (north).
- B. No fuel present.
- C. Rake up.
- D. Gate closed.

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

Test	A	B	C	D	System Operates			Expected Result
i	0	0	0	0	—	yes	no	no
ii	1	0	0	0	—	yes	no	no
iii	0	1	0	0	—	yes	no	no
iv	0	0	1	0	—	yes	no	no
v	0	0	0	1	—	yes	no	no
vi	1	1	0	0	—	yes	no	yes
vii	1	0	1	0	—	yes	no	no
viii	1	0	0	1	—	yes	no	yes
ix	0	1	1	0	—	yes	no	no
x	0	1	0	1	—	yes	no	no
xi	0	0	1	1	—	yes	no	no
xii	1	1	1	0	—	yes	no	yes
xiii	1	1	0	1	—	yes	no	yes
xiv	1	0	1	1	—	yes	no	yes
xv	0	1	1	1	—	yes	no	no
xvi	1	1	1	1	—	yes	no	yes

TPCN 16
VAC
7/21/92

yes no RLA# 6
SAP 6/23/92

Acceptance Criteria

- Drive system does not operate unless the following conditions are satisfied: A + ~~B or (C + D)~~. (B or D).

Test Conductor Ed Forest Date 6/23/92

QA W. J. [Signature] Date 6/23/92

3. The above steps have been completed.

Test Conductor Ed Forest Date 6/23/92

8.4.5.4 Verify the Carriage Drive (M-109A) closed (south) interlocks as follows:

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the carriage drive can be moved south. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Rake closed

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

see
TACN 9 and
refer to
Page 167A
vnt
7/10/92

Test	A	B	System Operates		Expected Result	
i	0	0	☒	yes	☐	no
ii	1	0	☒	yes	☐	no
iii	0	1	☒	yes	☒	yes
iv	1	1	☒	yes	☒	yes

RL #7
UP
4/23/92

Acceptance Criteria

- Drive system does not operate unless the following conditions are satisfied: A or B.

Test Conductor 213 Forest Date 6/23/92
QA 12 J. L. Spence Date 6/23/92

3. The above steps have been completed.

Test Conductor 213 Forest Date 6/23/92

* yes when rake carriage is fully open.
Other wise result is no
208 6/23/92

(see pg 167A)

Revised Interlocks

Page 168A

TPCN 9
Page 2 of 2
7/15/92

Section 8.4.5.4 - Interlock verification Carriage Drive (M109A) closed (south)

Condition

- A. Rake is Open; 1
- B. Carriage is presently fully Open (north); 1
- C. Gate is Open; 1
- D. Slip Sheet is Closed (north); 1

Test	A	B	C	D	System Operates	Expected Result
1	1	0	0	0	✓ yes no	yes
2	1	0	0	1	✓ yes no	yes
3	1	0	1	0	✓ yes no	yes
4	1	0	1	1	✓ yes no	yes
5	1	1	0	0	✓ yes no	yes
6	1	1	0	1	✓ yes no	yes
7	1	1	1	0	✓ yes no	yes
8	1	1	1	1	✓ yes no	yes
9	0	0	0	0	yes ✓ no	no
10	0	0	0	1	yes ✓ no	no
11	0	0	1	0	yes ✓ no	no
12	0	0	1	1	✓ yes no	yes
13	0	1	0	0	✓ yes no	yes
14	0	1	0	1	✓ yes no	yes
15	0	1	1	0	yes ✓ no	yes NO KBH
16	0	1	1	1	yes ✓ no	yes NO 7-15-92

TPCN
#79710192
SAP
7/15/92

Revised acceptance criteria Formula is "A or (not B + C + D) or (B + not C)" 7/15/92

Test Conductor
C.A.

BB Hayes
PV Judd

Date 7-15-92

Date 7-15-92

8.4.5.5 Verify the Gate Drive (M-109C) open interlocks as follows:

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the gate can be opened. Mark the appropriate column per the test result.

Condition

A. No fuel present

TPCN 8
VPC
7/20/92

B. ~~Side transfer open (north)~~ SLIP SHEET OPEN (south)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

Test	A	B	System Operates		Expected Result	
i	0	0	☒ yes	☐ no	☐ yes	☒ no
ii	1	0	☒ yes	☐ no	☐ yes	☒ no
iii	0	1	☐ yes	☒ no	☒ yes	☐ no
iv	1	1	☒ yes	☐ no	☐ yes	☒ no

TPCN 8
VPC
7/20/92
#68
EMP
6/23/92

Acceptance Criteria

- Drive system does not operate unless the following conditions are satisfied: ~~A or B~~. A or (not A + not B)

Test Conductor EMP Date 6/23/92

QA W. G. [Signature] Date 6/23/92

3. The above steps have been completed.

Test Conductor EMP Date 6/23/92

8.4.5.6 Verify the Slip Sheet (M-110) open (south) interlocks as follows:

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the slip sheet can be moved south. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Gate closed.

NOTE

Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

<u>Test</u>	<u>A</u>	<u>B</u>	<u>System Operates</u>	<u>Expected Result</u>
i	0	0	☐ yes ☒ no	no
ii	1	0	☒ yes ☐ no	yes
iii	0	1	☒ yes ☐ no	yes
iv	1	1	☒ yes ☐ no	yes

Acceptance Criteria

- Drive system does not operate unless the following conditions are satisfied: A or B.

Test Conductor SPB Furest Date 6/23/92
 QA A. M. Kope Date 6/23/92

3. The above steps have been completed.

Test Conductor SPB Furest Date 6/23/92

8.4.5.7 Verify the Slip Sheet (M-110) close (north) interlocks as follows:

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the slip sheet can be moved north. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Gate closed

NOTE

Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

RL #8
 KSG 7/14/92

Test	A	B	<u>System Operates</u>		<u>Expected Result</u>
i	0	0	☒ yes	☒ no	no
ii	1	0	☒ yes	☐ no	yes
iii	0	1	☒ yes	☐ no	yes
iv	1	1	☒ yes	☐ no	yes

Acceptance Criteria

- Drive system does not operate unless the following conditions are satisfied: A or B.

Test Conductor R. Gummam

Date 7/14/92

QA A. M. Jones

Date 7/14/92

3. The above steps have been completed.

Test Conductor R. Gummam

Date 7/14/92

8.4.5.8 Verify the Hopper Elevation (M-111) open (down) interlocks as follows:

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the hopper elevation can be moved down. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Gate closed

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

PL#8
K9 7/14/92

Test	A	B	System Operates		Expected Result
i	0	0	☒ yes	☒ no	no
ii	1	0	☒ yes	☒ no	yes
iii	0	1	☒ yes	☐ no	yes
iv	1	1	☒ yes	☐ no	yes

Acceptance Criteria

- Drive system does not operate unless the following conditions are satisfied: A or B.

Test Conductor R. Summerville Date 7/14/92

QA L. Mulgrew Date 7/14/92

3. The above steps have been completed.

Test Conductor R. Summerville Date 7/14/92

8.4.5.9 Verify the Hopper Elevation (M-111) close (up) interlocks as follows:

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the hopper elevation can be moved up. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Slip sheet open (south)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

R.L. #8
KJ 7/14/92
10 min
TDCN #8
KJ 7/14/92
Page 172A

Test	A	B	<u>System Operates</u>		<u>Expected Result</u>
i	0	0	☒	yes	no
ii	-1	0	☒	yes	yes
iii	-0	1	☒	yes	yes
iv	+1	1	☒	yes	yes

Acceptance Criteria

- Drive system does not operate unless the following conditions are satisfied: A or B.

Test Conductor R. Gummam Date 7/14/92
QA _____ Date _____

3. The above steps have been completed.

Test Conductor Frank M. Gills Date 7/14/92

8.4.5.9

Add condition,

C. Rod Loader is open (back)

Test	A	B	C	System Operates		Expected Results
1	0	0	1	yes	no	no
2	1	0	1	yes	no	yes
3	0	1	1	yes	no	yes
4	1	1	1	yes	no	yes
5	0	0	0	yes	no	no
6	1	0	0	yes	no	no
7	0	1	0	yes	no	no
8	1	1	0	yes	no	no

Acceptance Criteria

C and (A or B)

TEST CONDUCTOR

QA

DATE

DATE

7/14/92

7/14/92

8.4.5.10 Verify the Rod Loading Drive (M-112) ^{close} ~~open~~ (east) interlocks as follows: TPCN 17
VPC
7/21/92

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the rod loader can be moved east. Mark the appropriate column per the test result.

Condition

- A. Slip sheet open (south)
- B. Hopper open (down)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

<u>Test</u>	<u>A</u>	<u>B</u>	<u>System Operates</u>	<u>Expected Result</u>
i	0	0	— yes ☒ no	no
ii	1	0	— yes ☒ no	no
iii	0	1	— yes ☒ no	no
iv	1	1	☒ yes — no	yes

Acceptance Criteria

- Drive system does not operate unless the following conditions are satisfied: A and B.

Test Conductor R. Gunnarsson Date 7/14/92

QA H. T. [Signature] Date 7/14/92

3. The above steps have been completed.

Test Conductor Frank B. Mallo Date 7/21/92

8.4.6 Single Mode Verification Test

TPCN #10
VAC
7/17/92

Place the Rod Side Transfer, Compaction, Loading and Consolidation Table in SINGLE mode and verify system automatic sequence. ~~This test verifies operation of machine motions and does not include actual consolidation operations of mock-up fuel rods.~~ Add and remove mock-up fuel rods as required to facilitate system operations.

WARNING

Stay clear of all moving equipment while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Initiate the side transfer and compaction process in the SINGLE mode and verify the following machine movements.

Acceptance Criteria

- ~~Rake (M-104B) raised~~ Carriage (M-109A) extended north.
- ~~Carriage (M-109A) extended north~~ Rake (M-104B) raised
- Side transfer (M-108A) retracted south
- Rake (M-109B) lowered
- Side transfer (M-108A) extended north
- Carriage (M-109A) retracted south
- Gate (M-109C) raised
- Carriage (M-109A) retracted south a maximum of 8.51 inches.
- Gate (M-109C) lowered
- Slip sheets (M-110) retracted south
- Hopper elevation (M-111) lowered
- Slip sheets (M-110) extended north

Test Conductor Wesley M. Chapman

Date 7/17/92

QA Peter V. Jurek

Date 7/17/92

See RL # 10, 11, 12, 13 & 14 ^{VAC} 7/17/92

TPCN #12
VAC 7/17/92

TPCN 13
VNC
7/21/92

~~2. Repeat step 1 an additional 18 times and verify the following machine movements.~~

Acceptance Criteria

- ~~• Rake (M-104B) raised~~
- ~~• Carriage (M-109A) extended north~~
- ~~• Side transfer (M-108A) retracted south~~
- ~~• Rake (M-109B) lowered~~
- ~~• Side transfer (M-108A) extended north~~
- ~~• Carriage (M-109A) retracted south~~
- ~~• Gate (M-109C) raised~~
- ~~• Carriage (M-109A) retracted south a maximum of 8.51 inches.~~
- ~~• Gate (M-109C) lowered~~
- ~~• Slip sheets (M-110) retracted south~~
- ~~• Hopper elevation (M-111) lowered~~
- ~~• Slip sheets (M-110) extended north~~

~~Test Conductor _____~~

~~Date _____~~

~~QA _____~~

~~Date _____~~

3. After completion of the above steps, initiate and verify the following machine movements in the loading process.

Acceptance Criteria

- Hopper elevation (M-111) lowered to the full down position. ✓
- Rod loader (M-112) retracted east. ✓
- Rod loader (M-112) extended west. ✓
- Hopper elevation (M-111) raised to start position.

Test Conductor F. M. Dello

Date 7/21/92

QA D. J. [Signature]

Date 7/21/92

4. The above steps have been completed.

Test Conductor F. M. Dello

Date 7/21/92

8.4.7 Auto mode Verification Test

TPCN 12
7/21/92
WLC
7/20/92

Place the Rod Side Transfer, Compaction, Loading and Consolidation Table in the AUTO mode and verify system automatic sequence. ~~This test verifies operation of machine motions and does not include actual consolidation operations of mockup fuel rods.~~ Add and remove mock-up fuel rods as required to facilitate system operation.

WARNING

Stay clear of all moving equipment while in operation.

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

TPCN 12
7/21/92

1. Press GO to initiate automatic processing and verify the following machine movements were automatically completed ~~19 times~~ without operator intervention. 7/21/92

Acceptance Criteria

- ~~Rake (M-1098) raised~~ Carriage (M-1098) extended north Amc 7/20/92
- ~~Carriage (M-1098) extended north~~ Rake (M-10913) raised TPCN 12
WLC
7/21/92
- Side transfer (M-108A) retracted south
- Rake (M-1098) lowered
- Side transfer (M-108A) extended north
- Carriage (M-109A) retracted south
- Gate (M-109C) raised
- Carriage (M-109A) retracted south a maximum of 8.51 inches.
- Gate (M-109C) lowered
- Slip sheets (M-110) retracted south
- Hopper elevation (M-111) lowered
- Slip sheets (M-110) extended north

Test Conductor F. M. Dello

Date 7/21/92

QA 11/21/92

Date 7/21/92

2. Verify the following machine movements were automatically completed without operator intervention.

Acceptance Criteria

- TPU #20
7/21/92
JH
- Hopper elevation (M-111) lowered to the full down position.
 - Rod loader (M-112) retracted east.
 - Rod loader (M-112) extended west.
 - Hopper elevation (M-111) raised to start position.

Test Conductor J H Dello

Date 7/21/92

QA

L K [signature]

Date 7/21/92

3. The above steps have been completed.

Test Conductor J H Dello

Date 7/21/92

8.4.8 Servo Drive Fault Test

WARNING

Stay clear of all moving equipment while in operation

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Place the control system in the "SINGLE" mode and initiate normal processing operations.
2. Temporarily force the data register to implement a fault with the compaction carriage drive motor (M-109A).
3. Press "CONTINUE" to drive the compaction carriage and verify the drive motor stops and registers a fault in the control room.

Acceptance Criteria:

- The faulted motor stops when fault condition is implemented.
- Alarm system is activated.
- Alarm system is silenced when acknowledged by operator.
- Control system displays fault condition on screen.

TPCN 18
NAC
7/21/92

- A report is printed defining the fault condition ~~when commanded by the operator.~~

Test Conductor Frank D. Mello ⁴⁹⁸ Date 8/10/92

QA W. M. G. S. ⁴⁹⁸ Date 7/16/92

4. Verify cameras No. 4 and No. 9 are activated and view the faulted drive system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- Video images from cameras No. 4 and NO. 9 are displayed on monitors when "CAMERA CALL" is touched on control screen.
- Camera No. 4 and No. 9 can be positioned to provide an unobstructed view of the faulted drive system and a close up view of faulted drive system.

Test Conductor F. D. Mello Date 8/10/92

QA W. M. G. S. Date 8/10/92

*all criteria met
498 7/16/92*

RL #16

5. Correct fault condition and verify the compaction carriage (M-109A) can be moved in the "SINGLE" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

Test Conductor J. P. Nullo

Date 8/10/92

QA [Signature]

Date 8/10/92

6. Temporarily force the data register to implement a fault with the rod loader drive motor (M-112).

7. Press "CONTINUE" to drive the rod loader and verify the drive motor stops and registers a fault in the control room.

Acceptance Criteria:

- The faulted motor stops when fault condition is implemented.
- Alarm system is activated.
- Alarm system is silenced when acknowledged by operator.
- Control system displays fault condition on screen.
- A report is printed defining the fault condition ~~when commanded by the operator.~~

Test Conductor J. P. Nullo

Date 8/10/92

QA [Signature]

Date 8/10/92

8. Verify cameras No. 4 and No. 9 are activated and view the faulted drive system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- Video images from cameras No. 4 and NO. 9 are displayed on monitors when "CAMERA CALL" is touched on control screen.
- Camera No. 4 and No. 9 can be positioned to provide an unobstructed view of the faulted drive system and a close up view of faulted drive system.

Test Conductor J. P. Nullo

Date 8/10/92

QA [Signature]

Date 8/10/92

TPC-002
8/9 7/22/92

9. Correct fault condition and verify the rod loader (M-112) can be moved in the "SINGLE" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

Test Conductor P. M. Ballo Date 8/10/92

QA A. M. Ballo Date 8/10/92

10. The above steps have been completed.

Test Conductor P. M. Ballo Date 8/10/92

8.5.9 Rod Pusher Load Test

| 1

WARNING

Stay clear of all moving equipment while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

Verify the push force of the rod loader (M-112) as follows:

1. Place the control system in the JOG mode and drive the rod loader (M-112) west.
2. Drive the hopper elevation (M-111) to the full down position.
3. Install the rod pusher compression load test fixture (Dwg. 9315-M-0012, Gr. 4) in the hopper.
- ~~4. Connect instrument leads to rod loader motor (M-112) to measure torque.~~
5. Drive the rod loader to within 6 inches of the test fixture at full speed then stop. Reset JOG speed to 10% full speed and continue driving rod loader until contact is made with the test fixture.
6. Drive rod loader into test fixture at 10% full JOG speed until a compressive load of 3000 ± 100 lbs. is applied. Cut off motor at this load and wait 2 minutes before releasing load. ~~Prior to reaching the 3000 ± 100 lb. limit, measure and record the max motor torque.~~ Record observations below.

Type of Measuring Device _____

Range _____

Identification No. _____

Calibration Due Date _____

Torque _____ ft.-lbs.

Observations:

TPEN #2
5/14/52

TPCN #2
SOF 5/16/92

Acceptance Criteria

- ~~Rod pusher motor torque is less than 12.34 ft.-lb.~~
- Test load does not decrease more than 5% at end of 2 minute waiting period.

Test Conductor EB Forest Date 6/29/92

QA W. J. Mulgrew Date 6/29/92

7. Drive the rod loader (M-112) west until the load is relieved, remove test fixture and shut system off.

8. Inspect the rod loader system for any damage and record observations below.

Observations:

No evidence of abnormal wear or deformation noted

Acceptance Criteria

- Visual inspection of the rod pusher has been performed and there is no damage which will impact pusher operations.

Test Conductor EB Forest Date 6/29/92

QA W. J. Mulgrew Date 6/29/92

9. The above steps have been completed.

Test Conductor EB Forest Date 6/29/92

8.5.10 Hopper Drive Load Test

WARNING

Stay clear of all moving equipment while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

Load test the hopper elevation drive (M-111) as follows:

1. Place the control system in the JOG mode and drive the rod loader (M-112) full west, the hopper elevation (M-111) full down and the slip sheets (M-110) full south.
2. Set the fuel canister test load (9315-M-0010, Gr. 3) to 3000 lbs. by removing plates as required.
3. Lift the test load using the overhead crane and deposit the load slowly onto the rod hopper bottom support.

- TPCN #2 5/6/92*
- ~~4. Connect instrument leads to the hopper elevation motor (M-111) to measure torque.~~
 5. Reset JOG speed to 50% full speed and raise the test load approximately 4.0 inches and stop. ~~Measure and record the max motor torque prior to stopping motor (M-111).~~

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

~~Torque _____ ft. lbs.~~

Acceptance Criteria

- ~~• Hopper rod support drive motor (M-111) is < 3.88 ft. lbs.~~

~~Test Conductor _____ Date _____~~

~~QA _____ Date _____~~

6. Lower hopper elevation to approximately 2.0 inches from bottom support rails and stop. Measure and record the hopper elevation initially and after a 2 minute holding period.

Type of Measuring Device	<u>TAPE MEASURE</u>	Range	<u>N/A</u>
Identification No.	<u>N/A</u>	Calibration Due Date	<u>N/A</u>

Initial height 5 $\frac{7}{8}$ " inch *from reference mark*
Final height 5 $\frac{7}{8}$ " inch
Difference 0 inch

Acceptance Criteria

- Rod support elevation should not drift downwards more than 0.05 inch while motor power is cut off under load.

Test Conductor E. J. Forrest Date 6/21/92
QA J. M. Maly Date 6/29/92

7. Lower hopper elevation to the full down position and remove test load.
8. Inspect the hopper elevation drive system for any damage and record observations below.

Observations:

*no evidence of abnormal condition
ntal.*

Acceptance Criteria

- Visual inspection of the hopper elevation drive system has been performed and there is no damage which will impact operations.

Test Conductor E. J. Forrest Date 6/25/92
QA J. M. Maly Date 6/29/92

9. The above steps have been completed.

Test Conductor EM Forest Date 6/29/92

8.5.11 Side Transfer, Compaction and Loading Operational Tests (Small Rods)

TPCN 1
7/20/92

SMF
5/6/92

This test is to be performed in the SINGLE mode using the 3/8 inch tubes to simulate small fuel rods. (3/8" RODS MAY BE USED IN LIEU OF TUBES)

WARNING

Stay clear of all moving equipment while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

TAKE PHOTOGRAPH AND RECORD INFORMATION IN LOG

TPCN 19
7/11/92

1. Select ³⁴50-3/8 inch test rods and visually inspect for straightness and damage. Record condition of tubes below.

Observations:

Rod conditions as follows

- 1) numerous nick and marks along the lengths
- 2) Rod randomly bowed. (NONE appear > 1.5")
- 3) numerous rods discolored at opoth along the lengths
- 4) No major marks or nicks
- 5) None seem to be twisted

Test Conductor Frank M. Bello Date 7/22/92

TPCN 19
7/11/92

2. Place control system in SINGLE mode and the side transfer, compaction and loading systems in the HOME positions.
3. Place ³⁴30 rods in the side transfer mechanism and ~~20 rods in the compaction system,~~
4. Press "GO" to initiate processing in the SINGLE mode.
5. Verify the rods placed on the side transfer system can be observed from underneath by CCTV. Fill out CCTV Assessment form in Appendix E.

Acceptance Criteria

- Rods can be viewed via CCTV underneath rod extraction system to verify no rods are being gripped by pull head.

Test Conductor J. M. Bullo

Date 7/22/92

QA A. M. G. [signature]

Date 7/22/92

6. Continue processing until ²² rods have been deposited in the hopper. Verify the side transfer, compaction and loading process was performed in sequence.

Acceptance Criteria

- Side transfer, compaction and loading operations are performed in their proper sequence as defined in Section 8.5.6.
- Rods are positioned in hopper in a triangular pattern array.

Test Conductor J. M. Bullo

Date 7/22/92

QA A. M. G. [signature]

Date 7/22/92

7. Verify the registers in the control system PLC accounted for all rods passed over counters.

Acceptance Criteria

- Rod counter accounted for all rods transferred into compaction and loading systems.
- Rods are positioned in hopper in a triangular pattern array.

Test Conductor J. M. Bullo

Date 7/22/92

QA A. M. G. [signature]

Date 7/22/92

8. Turn system "OFF" if not done so already and remove all rods from hopper.

9. Inspect condition of rods after processing and compare to initial condition as recorded in Step 1. Record observations below.

Observations

No change from initial condition observed

Test Conductor J. M. Bullo

Date 7/22/92

TPCW #21
8/8 7/22/92

TPCW 19
8/8 7/22/92

10. The above steps have been completed.

Test Conductor J H Bulb

Date 7/22/92

8.5.12 Side Transfer, Compaction and Loading Operational Tests (Modified Small Rods)

This test is to be performed in the SINGLE mode using the 3/8 inch tubes used in the previous section. Two of the 50 tubes are to be locally increased in diameter to simulate a bulge or defect which could be encountered with actual fuel rods.

WARNING

Stay clear of all moving equipment while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

TAKE PHOTOGRAPH AND RECORD INFORMATION IN LOG

1. Select two of the 50 rods used in the previous section and locally increase the diameter of each rod by wrapping tape (electrical, duct or masking) around the circumference. Make a band of tape approximately 2 inches wide located approximately 1 ft. from one end. Increase the diameter by 0.020-0.030 inch. Measure and record the average diameter on the taped section and the untaped section.

Taped diameter _____ inch

Untaped diameter _____ inch

Test Conductor _____ Date _____

2. Repeat step 9 of Section 8.5.11 and record below the initial test condition of the rods.

TPEN #1
Step 9/6/92

8.5.13

Side Transfer, Compaction and Loading Operational Tests (~~B&W 15 x 15 bowed rods~~) (*Reference RL #20*)

This test is to be performed in the SINGLE mode using the ~~B&W 15 x 15 mockup bowed rods~~. *3/8 inch rods*

WARNING

Stay clear of all moving equipment while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

TAKE PHOTOGRAPH AND RECORD INFORMATION IN LOG

1. Inspect and record the condition of the ~~30 B&W 15 x 15 mockup~~ bowed rods below. Also record the maximum bow found. *TPCN 19 5/7/92*

Max bow 1 5/16 inches

Observations

- 1) Numerous nicks and marks along the length
- 2) numerous discolor marks.
- 3) No major damage, nick or marks
- 4) No twisted rods.

Test Conductor J. M.ullo Date 7/22/92

2. Drive the side transfer, compaction and loading systems to the HOME position.
3. Set the control system to the SINGLE mode if not already performed.
4. Place ^{29 straight and 5} ~~all 30~~ bowed rods on the side transfer mechanism, randomly changing the bow direction. *TPCN 19 5/7/92*
5. Press "GO" to initiate processing in the SINGLE Mode.

6. Verify the rods placed on the side transfer system can be observed from underneath by CCTV. Fill out CCTV Assessment Form in Appendix E.

Acceptance Criteria

- Rods can be viewed via CCTV underneath rod extraction system to verify no rods are being gripped by pull heads.

Test Conductor F. M. Balle Date 7/22/92

QA A. S. Marquez Date 7/22/92

7. Continue processing until ²²all rods have been deposited in the hopper. Verify the side transfer, compaction and loading process was performed in sequence.

Acceptance Criteria

- Side transfer, compaction and loading operations are performed in their proper sequence as defined in Section 8.5.6.
- Rods are positioned in hopper in a triangular pattern arrangement.

Test Conductor F. M. Balle Date 7/22/92

QA A. S. Marquez Date 7/22/92

8. Verify the registers in the control system PLC accounted for all rods passed over counters.

Acceptance Criteria

- Rod counter accounted for all rods transferred into compaction and loading systems.

Test Conductor F. M. Balle Date 7/22/92

QA A. S. Marquez Date 7/22/92

TPW #21
8/8 7/22/92

9. Turn system "OFF" if not done so already and remove all rods from hopper.
10. Inspect condition of rods after processing and compare to initial condition as recorded in Step 1. Record observations below.

Observations

Same as defined in step 1 above

Test Conductor *F. J. Nello* Date *2/22/92*

11. The above steps have been completed.

Test Conductor *F. J. Nello* Date *2/22/92*

8.5.14 Off-Normal Extraction System Verification Test

This test is to be performed with 2 B&W 15x15 Type 1 mock-up fuel assemblies after the upper end fitting has been removed. If the mock-up fuels are not available, a suitable fixture to hold 30 fuel rods will have to be utilized.

WARNING

Stay clear of all moving equipment while in operation.

NOTE

The operator must press "CONTINUE" to perform the next consecutive operation.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Set up the clamping table and extraction system for processing B&W 15x15 fuel.
2. Place 2 B&W 15x15 Type 1 (1 Type 1 Class 1, 1 Type 1 Class 2) mockup fuels on the clamping table using the FAHF or B&W horizontal lift fixture.

*TPC #1
5/6/92*

8.5.15 Process Operational Verification Test (*Reference RL #20*)

TPCN #1
5/6/92

~~This test is to be performed with the 2 B&W Type 1 mock-up fuels set up in steps 12-14 of the previous section (8.5.14). If the 2 mock-up fuels can not be utilized, a suitable test fixture will have to be used which will simulate the B&W 15x15 array.~~

w/ 17x17

This test will demonstrate the consolidation process from the extraction through the fuel canister loading steps in the SINGLE mode.

WARNING

Stay clear of all moving equipment while in operation.

NOTE

The operator must press "CONTINUE" to perform the next consecutive operation.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

SSR TPCN #23 1/22/92

~~1. Place the 2 B&W 15x15 Type 1 mock-up fuel assemblies on the clamping table using the B&W horizontal lift fixture.~~

34 TEST RODS 83 straight and 5 bowed test rods in a test fixture
2. Place the control system in the ~~SINGLE~~ *Atto* mode and initiate processing by pressing "GO".

side transfer/compaction

2A initiate extraction operations when side transfer is safe.
3. Verify by CCTV both rows of rods extracted were released by the grippers prior to side transfer. Fill out a CCTV Assessment form in Appendix E.

TPCN #23 1/22/92

Acceptance Criteria

- Rods can be viewed via CCTV underneath rod extraction system to verify all rods released from grippers.

Test Conductor *F. D. Ballo*

Date *1/22/92*

QA

D. M. Algren

Date *1/22/92*

4. Continue processing and verify the side transfer, compaction and hopper loading operations were performed in sequence.

Acceptance Criteria

- Side transfer, compaction and hopper loading operations are performed in their proper sequence as defined in Section 8.5.6.

Test Conductor Frank M. Bullo Date 7/22/92

QA A. J. Mulgrew Date 7/22/92

5. ~~Repeat steps 3 and 4 an additional 14 times for the remaining rows of rods.~~ ^{no additional runs}

Acceptance Criteria

- Rods can be viewed via CCTV underneath rod extraction system to verify all rods released from grippers.
- Side transfer, compaction and hopper loading operations are performed in their proper sequence as defined in Section 8.5.6.

Test Conductor Frank M. Bullo Date 7/22/92

QA A. J. Mulgrew Date 7/22/92

6. Verify all rods were positioned correctly in the hopper and that the registers in the control system PLC acknowledged all rods loaded in hopper.

Acceptance Criteria

- Rods counter accounted for all rods into compaction and loading systems.
- Rods are positioned into hopper in a triangular pattern array.

Test Conductor Frank M. Bullo Date 7/22/92

QA A. J. Mulgrew Date 7/22/92

IN #23
ISS 7/22/92
REV #22
ISS 7/22/92
ISS 7/22/92

7. Complete process by loading rods into square fuel canister.

Acceptance Criteria

- Rod pusher pushes rods into fuel canister to a depth of $4.0 \pm .125$ inches and returns to full extend position.

Test Conductor Frank M. Mallo

Date 7/22/92

QA

Atchafalaya

Date 2/22/92

TPCN 24
S48
7/23/92

8. Remove rods from fuel canister and record the general condition after processing. ~~Separate the rods into Type 1 Class 1, Type 1 Class 2 and Type 1 Class 2 bowed rods.~~

Observations

The rods were nicked and scratched and bowed which were presents when the rods were loaded onto the system for testing. No damage or noticeable marking of the rods occurred due to the process equipment.

Test Conductor S. M. Mallo

Date 7/22/92

TRAN #1
S48F 5/6/92

9. ~~Remove the mock-up skeletons from the clamping table and place on the reassembly table using the B&W horizontal lift fixture. Rebuild both mock-up assemblies per the procedure in the Mock-up Reassembly Procedures Manual. Do not use the bowed rods when rebuilding the Type 1 Class 2 mock-up.~~

10. The above steps have been completed.

Test Conductor Frank M. Mallo

Date 7/23/92

2 of 7

9.0 POST PERFORMANCE REVIEW AND APPROVAL

The following signatures certify that the completed test, with all data collected, has been reviewed, and that the system has passed the requirements for system operational test.

Test Engineer

9/18/92
Date

Quality Assurance

9/21/92
Date

Project Engineer

9/21/92
Date

Test Director

9/21/92
Date

10.0 RETENTION OF TEST RECORDS

The original working copy, including test exceptions and resolution and acceptance signatures, are to be maintained by the Test Director and stored at the NUS Gaithersburg building, Document Control Center. One copy of the original working document shall be sent to the DOE representative for their use and retention.

11.0 REFERENCES

- 11.1 Document 9315-P-120, Test Administration Manual for System Operational Test and Integrated Systems Tests, latest revision.
- 11.2 Specification 9315-TAC-207, System Operational Test Acceptance Criteria for the Rod Side Transfer, Compaction, Loading and Consolidation Table, latest revision.
- 11.3 Fuel Rod Consolidation Project, Phase II Final Report, Volume 1.
- 11.4 Specification 9315-E-601, "Software Functional Specification for the Prototypical Rod Consolidation Demonstration Project."
- 11.5 Design calculations, File No. 1096-M-16 Rod Compaction System.
- 11.6 Design calculations, File No. 1096-M-19 Rod Loading System.
- 11.7 Time Study, NUS Letter to DOE, 9316-88-46 dated March 13, 1988.
- 11.8 Globe Motor Catalog D-500.
- 11.9 Industrial drive catalog motor performance catalog.

1.0 Equipment Set-Up

Prepare the Axes (Drive Servo Controls) for Operation

Note: Each of the drive motors and its controls are required to be adjusted and tuned/calibrated, one-by-one as detailed below, prior to all other system testing. In the following steps, ensure that only the axis under consideration in that step is being driven.

1.1 Side Transfer

Ensure that the carriage is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

- 1 Verify that the Side Transfer Drive Motor (M-108A) is mechanically and electrically coupled after completion of the Control System SOT.
- 2 Adjust the motor control parameters for (M-108A) per instructions from Modicon, and as recorded in the following Side Transfer Drive (M-108A) personality record form.

Axis personality record form

 Machine Name/Number: Side Transfer

 Axis Number: M-108A

Personality Variable	Projected Value	Final Value
Number of Motor Poles (NPOLES)	6	
Resolution (RES)	1000	
Rate Loop Proportional Gain (RPG)	20	
Rate Loop Integral Gain (RIG)	250	
Acceleration Time Constant (ATC)	98	
Following Error Limit (FE_LIM)	100000	
Peak Current Limit (IMAX)	100	
Average Current Trip Level (IAVG_LIM)	30	
CW End-of-Travel Limit (+EOT)	0	
CCW End-of-Travel Limit (-EOT)	0	
In-Position Tolerance Band (POS_TOL)	20	
In-Sync Tolerance Band (SYNC_TOL)	500	
Linear Acceleration (ACCEL)	10611	
Linear Deceleration (DECEL)	10611	
Position Cmd Time Constant (PCTC)	N/A	
Velocity Feed Forward (VFF) on/off	N/A	
Motor Base Speed (BASE_SPD)	3600	

- 3 Record resolver counts/turn for the resolver GE-108A and enter into the Control System the maximum speed for JOG mode in Resolver Counts/Sec. as noted below:

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-108A		1000	2400

- 4 Select Side Transfer (M-108A) at the Control Console and set JOG speed at approximately 10% of maximum JOG Speed. JOG the Side Transfer to a position $0.55 \pm .05$ inch from the north mechanical stop (HOME). Adjust the sensor (ZE-108A) by physically moving the sensor so that it "trips on" with the carriage in that position. JOG toward and away from the sensor and verify sensor position.

CAUTION: Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

- 5 Repeat Step 4 at the south mechanical stop by adjusting sensor ZE-108B at $0.55 \pm .05$ inch.
- 6 Create and verify an Axis Homing Sequence (AHS) for the Side Transfer Drive Motor (M-108A) and resolver (GE-108A). (See "Start Program" in the Software Detail Design Document by Modicon.) AHS parameters to be as given below. At completion of AHS, record "Home Offset" and "Final Home Position" in the chart below.

Motor Tag No: M-108A Home Direction: ~~CCW~~ CW

Resolver Tag No.: GE-108A Resolver Counts/Turn: 1000

Home Speed: 1000 RPM 2400 counts/sec.

Home Offset: -1000 Resolver Counts

Final Home Position: 0

7 Return the AHS for the Side Transfer Drive Motor, M-108A, to "Home-As-Is".

1.2 Rake Carriage

Ensure that the carriage is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

- 1 Verify that the Rake Carriage Drive Motor (M-109A) is mechanically and electrically coupled after completion of the Control System SOT.
- 2 Adjust the motor control parameters for (M-109A) per instructions from Modicon, and as recorded in the following Rake Carriage Drive (M-109A) personality record form.

Axis personality record form

 Machine Name/Number: Rake Carriage

 Axis Number: M-109A

Personality Variable	Projected Value	Final Value
Number of Motor Poles (NPOLES)	6	
Resolution (RES)	1000	
Rate Loop Proportional Gain (RPG)	20	
Rate Loop Integral Gain (RIG)	250	
Acceleration Time Constant (ATC)	98	
Following Error Limit (FE_LIM)	100000	
Peak Current Limit (IMAX)	100	
Average Current Trip Level (IAVG_LIM)	40	
CW End-of-Travel Limit (+EOT)	0	
CCW End-of-Travel Limit (-EOT)	0	
In-Position Tolerance Band (POS_TOL)	20	
In-Sync Tolerance Band (SYNC_TOL)	500	
Linear Acceleration (ACCEL)	8000	
Linear Deceleration (DECEL)	8000	
Position Cmd Time Constant (PCTC)	N/A	
Velocity Feed Forward (VFF) on/off	N/A	
Motor Base Speed (BASE_SPD)	3600	

- 3 Record resolver counts/turn for the resolver GE-109A and enter into the Control System the maximum speed for JOG mode in Resolver Counts/Sec. as noted below:

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-109A		1000	2467

- 4 Select Rake Carriage (M-109A) at the Control Console and set JOG speed at approximately 10% of maximum JOG Speed. JOG the Rake Carriage to a position ~~0.55 ± .05~~ inch from the north mechanical stop (HOME). Adjust the sensor (ZE-109A) by physically moving the sensor so that it "trips on" with the carriage in that position. JOG toward and away from the sensor and verify sensor position.

CAUTION: Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

- 5 Repeat Step 4 at the south mechanical stop by adjusting sensor ZE-109B ~~to 0.55 ± .05 inch~~ *to 2" ± .06 inch when measured between the rake and the gate at WEST end of the gate.*
- 6 Create and verify an Axis Homing Sequence (AHS) for the Y-Turret Axis Drive Motor (M-109A) and resolver (GE-109A). (See "Start Program" in the Software Detail Design Document by Modicon.) AHS parameters to be as given below. At completion of AHS, record "Home Offset" and "Final Home Position" in the chart below.

Motor Tag No: M-109A Home Direction: CW

Resolver Tag No.: GE-109A Resolver Counts/Turn: 1000

Home Speed: 1000 RPM 2467 counts/sec.

Home Offset: -100 Resolver Counts

Final Home Position: 0

- 7 Return the AHS for the Rake Carriage Drive Motor, M-109A, to "Home-As-Is".

1.3 Slip Sheet

Ensure that the Slip Sheet is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

- 1 Verify that the Slip Sheet (M-110) is mechanically and electrically coupled after completion of the Control System SOT.
- 2 Adjust the motor control parameters for (M-110) per instructions from Modicon, and as recorded in the following Slip Sheet (M-110) personality record form.

Axis personality record form:

 Machine Name/Number: Slip Sheet

 Axis Number: M-110

Personality Variable	Projected Value	Final Value
Number of Motor Poles (NPOLES)	6	
Resolution (RES)	1000	
Rate Loop Proportional Gain (RPG)	6	
Rate Loop Integral Gain (RIG)	180	
Acceleration Time Constant (ATC)	40	
Following Error Limit (FE_LIM)	100000	
Peak Current Limit (IMAX)	60	
Average Current Trip Level (IAVG_LIM)	40	
CW End-of-Travel Limit (+EOT)	0	
CCW End-of-Travel Limit (-EOT)	0	
In-Position Tolerance Band (POS_TOL)	20	
In-Sync Tolerance Band (SYNC_TOL)	50	
Linear Acceleration (ACCEL)	3500	
Linear Deceleration (DECEL)	3500	
Position Cmd Time Constant (PCTC)	N/A	
Velocity Feed Forward (VFF) on/off	N/A	
Motor Base Speed (BASE_SPD)	3600

- 3 Record resolver counts/turn for the resolver GE-110A and enter into the Control System the maximum speed for JOG mode in Resolver Counts/Sec. as noted below:

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-110A		1000	520

- Each edge of slip sheet aligns with southern outside edge of hopper, ± 0.06 inch (Home).*
- 4 Select Slip Sheet (M-110) at the Control Console and set JOG speed at approximately 10% of maximum JOG Speed. JOG the Slide to a position ~~0.85~~ *0.95* inch from the South mechanical stop (HOME). Adjust the sensor (ZE-110B) by physically moving the sensor so that it "trips on" with the saddle in that position. JOG toward and away from the sensor and verify sensor position.

CAUTION: Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

- Note: There is no north sensor.*
- 5 Repeat Step 4 at the North mechanical stop by adjusting sensor ZE-110A at $0.95 \pm .05$ inch.
- 6 Create and verify an Axis Homing Sequence (AHS) for the Slip Sheet Motor (M-110) and resolver (GE-110A). (See "Start Program" in the Software Detail Design Document by Modicon.) AHS parameters to be as given below. At completion of AHS, record "Home Offset" and "Final Home Position" in the chart below.

Motor Tag No: M-110 Home Direction: CCW

Resolver Tag No.: GE-110A Resolver Counts/Turn: 1000

Home Speed: 100 RPM 520 counts/sec.

Home Offset: 0 Resolver Counts

Final Home Position: 0

7 Return the AHS for the Slip Sheet Drive Motor, M-110, to "Home-As-Is".

1.4 Hopper Elevation

Ensure that the hopper is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

- 1 Verify that the Hopper Elevation Drive Motor (M-111) is mechanically and electrically coupled after completion of the Control System SOT.
- 2 Adjust the motor control parameters for (M-111) per instructions from Modicon, and as recorded in the following Hopper Elevation Drive Axis (M-111) personality record form.

Axis personality record form:

 Machine Name/Number: Hopper Elevation

 Axis Number: M-111

Personality Variable	Projected Value	Final Value
Number of Motor Poles (NPOLES)	6	
Resolution (RES)	1000	
Rate Loop Proportional Gain (RPG)	20	
Rate Loop Integral Gain (RIG)	150	
Acceleration Time Constant (ATC)	30	
Following Error Limit (FE_LIM)	100000	
Peak Current Limit (IMAX)	100	
Average Current Trip Level (IAVG_LIM)	40	
CW End-of-Travel Limit (+EOT)	0	
CCW End-of-Travel Limit (-EOT)	0	
In-Position Tolerance Band (POS_TOL)	20	
In-Sync Tolerance Band (SYNC_TOL)	500	
Linear Acceleration (ACCEL)	10000	
Linear Deceleration (DECEL)	10000	
Position Cmd Time Constant (PCTC)	N/A	
Velocity Feed Forward (VFF) on/off	N/A	
Motor Base Speed (BASE_SPD)	3600	

- 3 Record resolver counts/turn for the resolver GE-111 and enter into the Control System the maximum speed for JOG mode in Resolver Counts/Sec. as noted below:

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-111		1000	5750

- 4 Select Hopper Elevation (M-111) at the Control Console and set JOG speed at approximately 10% of maximum JOG Speed. JOG the Hopper Elevation to a position $0.55 \pm .05$ inch ~~from the lower mechanical stop (HOME)~~. Adjust the sensor (ZE-111A) by physically moving the sensor so that it "trips on" with the saddle in that position. JOG toward and away from the sensor and verify sensor position.

CAUTION: Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

- 5 Repeat Step 4 at the upper ~~mechanical stop~~ ^{end} by adjusting sensor ZE-111B ~~to~~ ^{to} ~~0.55 ± .05 inch~~ ^{stop the hopper elevator flush ± .06 inches} with top of the hopper on the North Side measured at the East end.
- 6 Create and verify an Axis Homing Sequence (AHS) for the Hopper Elevation Drive Motor (M-111) and resolver (GE-111). (See "Start Program" in the Software Detail Design Document by Modicon.) AHS parameters to be as given below. At completion of AHS, record "Home Offset" and "Final Home Position" in the chart below.

Motor Tag No: M-111 Home Direction: CW

Resolver Tag No.: GE-111 Resolver Counts/Turn: 1000

Home Speed: 1000 RPM 5750 counts/sec.

Home Offset: -8000 Resolver Counts

Final Home Position: 0

- 7 Return the AHS for the Hopper Elevation Drive Motor, M-111, to "Home-As-Is".

1.5 Rod Loader

Ensure that the carriage is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

- 1 Verify that the Rod Loader Drive Motor (M-112) is mechanically and electrically coupled after completion of the Control System SOT.
- 2 Adjust the motor control parameters for (M-112) per instructions from Modicon, and as recorded in the following Rod Loader (M-112) personality record form.

Axis personality record form:

Machine Name/Number: Rod Loader

Axis Number: M-112

Personality Variable	Projected Value	Final Value
Number of Motor Poles (NPOLES)	6	
Resolution (RES)	1000	
Rate Loop Proportional Gain (RPG)	18	
Rate Loop Integral Gain (RIG)	150	
Acceleration Time Constant (ATC)	236	
Following Error Limit (FE_LIM)	100000	
Peak Current Limit (IMAX)	100	
Average Current Trip Level (IAVG_LIM)	60	
CW End-of-Travel Limit (+EOT)	0	
CCW End-of-Travel Limit (-EOT)	0	
In-Position Tolerance Band (POS_TOL)	40	
In-Sync Tolerance Band (SYNC_TOL)	500	
Linear Acceleration (ACCEL)	10000	
Linear Deceleration (DECEL)	10000	
Position Cmd Time Constant (PCTC)	N/A	
Velocity Feed Forward (VFF) on/off	N/A	
Motor Base Speed (BASE_SPD)	3600	

- 3 Record resolver counts/turn for the resolver GE-112 and enter into the Control System the maximum speed for JOG mode in Resolver Counts/Sec. as noted below:

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-112	6	1000	6450

- 4 Select Rod Loader (M-112) at the Control Console and set JOG speed at approximately 10% of maximum JOG Speed. JOG the Rod Loader to a position where ~~0.55 ± .05 inch from the retracted mechanical stop (HOME)~~ *WEST* Adjust the sensor (ZE-112A) by physically moving the sensor so that it "trips on" with the saddle in that position. JOG toward and away from the sensor and verify sensor position.

CAUTION: Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

- 5 Repeat Step 4 at the ~~extended mechanical stop~~ *EAST end* by adjusting sensor ZE-112B to ~~at 0.55 ± .05 inch.~~ *stop the loader at .9 ± .06 inches between the loader ram and the funnel frame at point of interference.*
- 6 Create and verify an Axis Homing Sequence (AHS) for the Rod Loader Drive Motor (M-112) and resolver (GE-112). (See "Start Program" in the Software Detail Design Document by Modicon.) AHS parameters to be as given below. At completion of AHS, record "Home Offset" and "Final Home Position" in the chart below.

Motor Tag No: M-112 Home Direction: CCW

Resolver Tag No.: GE-112 Resolver Counts/Turn: 1000

Home Speed: 1000 RPM 6450 counts/sec.

Home Offset: 1000 Resolver Counts

Final Home Position: 0

~~7. Return the AHS for the ^{Rod Loader} ~~Bucket~~ Drive Motor, ^{M-112} ~~M-109B~~, to "Home-As-Is".out~~

1.6 Rake Drive

Ensure that the rake is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

1. Verify that the Rake Drive Motor (M-104B) ⁹ is mechanically and electrically coupled after completion of the Control System SOT.
2. Select Rake Drive (M-104B) ⁹ at the Control Console and set the control system to the JOG mode. Jog the Rake to the full up position and cause control system to shut motor (M-104B) ⁹ off prior to hard stop engagement.
3. Drive Rake to the full down position and cause control system to shut motor (M-104B) ⁹ off prior to hard stop engagement.
4. Create and verify an Axis Homing Sequence (AHS) for the Rake Drive Motor (M-109B) and resolver (GE-109B). (See "Start Program in the Software Detail Design Document by Modicon.) AHS parameters to be as given below. At completion of AHS, record "Home Offset" and "Final Home Position" in the chart below.

Motor Tag No.: M-109B

Home Direction: N/A

Resolver Tag No.: GE-109B

Resolver Counts/Turn: N/A

Home Speed: N/A RPM N/A counts/sec.

Home Offset: N/A Resolver Counts

Final Home Position: N/A

1.7 Gate Drive

Rewrite to not use prev. sensor which are removed
Ensure that the Gate is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

1. Verify that the Gate Drive Motor (M-109C) is mechanically and electrically coupled after completion of the Control system SOT.
2. Select Gate (M-109C) at the Control Console. ~~JOG the Gate to a position 0.55 + .05 inch from the upper mechanical stop. Adjust the sensor (GE-109C) by physically moving the sensor so that it "trips on" with the gate in that position. JOG toward and away from the sensor and verify sensor position.~~

CAUTION: Observe carefully as the machine moves
and be prepared to activate emergency
stop if necessary.

3. Repeat Step 4 at the lower mechanical stop by adjusting sensor ZE-1090 at
~~0.55 ± .05 inch.~~

Create and verify an Axis Homing Sequence (AHS) for the Gate Drive Motor
(M-109C) and resolver (GE-109C). (See "Start Program" in the Software
Detail Design Document by Modicon.) AHS parameters to be as given below.
At completion of AHS, record "Home Offset" and "Final Home Position" in
the chart below.

N/A Motor Tag No.: M-109b Home Direction: N/A
Resolver Tag No.: GE-109b Resolver Counts/Turn: N/A
Home Speed: N/A RPM N/A counts/sec.
Home Offset: N/A Resolver Counts
Final Home Position: N/A

The following signature certifies that the equipment set-up performed in
Appendix A has successfully been completed.

Signature [Signature] Date 6-16-92

APPENDIX B
SAFETY PROCEDURES

SYSTEMS OPERATIONS TEST SAFETY CONSIDERATIONS

Performance of the SOTs in a manner which precludes the injury of personnel involved in the test performance or working in the Test Facility is of paramount importance. The following steps shall be taken to minimize the possibility of personnel being injured during the performance of SOTs:

1. Contraves and NUS will advise their employees and any subcontractors to stay clear of the Test Facility when tests are being conducted unless they are involved in the test performance or have another work assignment in the Test Facility.
2. Contraves will post a warning sign at the entrance to the Test Facility when testing is in progress advising personnel of the need to stay away unless involved in the testing or have some authorized work assignment in the area.
3. When feasible and deemed advisable by the Test Conductor the machine being tested will be surrounded by a portable barrier (ropes and posts) with a Caution Sign warning individuals to stay clear of the area unless authorized to enter by the Test Conductor.
4. When machines are being moved by installed motors the NUS electrical engineer operating the motor or the Test Conductor will be located in a position which permits him/her to observe the machine operation so that the equipment can be stopped if a dangerous situation appears to be developing. Such situations could involve unanticipated machine performance or personnel entering the test area and placing themselves in jeopardy.
5. When an SOT is in progress the Test Conductor will remain in the vicinity of the test so the all personnel involved in the test are under his observation and will perform any required test support activities directly under his supervision.
6. Only Contraves personnel who have been qualified to the DOE Hoisting and Rigging Manual Rev. 10-88 will operate the Test Facility overhead crane.
7. Only NUS test engineers will operate the Robotic Bridge Transporter (RBT), the Manipulator Transporter (MT), and the RM-10A Robot Arms.
8. Slings, hooks, and chains utilized with the Test Facility overhead crane or with the RBT will be those purchased specifically for use on the DOE project and have been certified to meet the requirements of ANSI 330.9.
9. The making of all electrical connections to the various equipment will be supervised by an NUS electrical engineer.

10. Protective headgear will be worn in the Test Facility when ever the Robotic Bridge Transporter (RBT) the Manipulator Transporter (MT) are being utilized or at any time the Test Conductor deems the use of protective head gear is appropriate.
11. The NUS Test Conductor is responsible to see that all the above safety requirements are implemented during the performance of the test for which he has responsibility.
12. The Test Conductor will verify that all test specific safety prerequisites identified in test procedures are satisfied and that any precautions identified in specific procedure steps as followed.
13. The NUS Test Director will perform frequent informal surveillance of the testing operations to verify the safety requirements are being adhered to by the personnel performing the test or other work in the test area.

APPENDIX C

PHOTO DOCUMENTATION REQUIREMENTS

Photo Documentation Requirements

Photographs are required to be taken of all System Operational Tests (SOTs). The following is a bulletized list which identifies when these photographs must be taken, as a minimum. Additional photographs may be taken at any other time during the test, as specified by the Test Conductor.

- Photographs must be taken of the initial setup for each test sequence.
- Photographs must be taken of the following critical interfaces between system, as a minimum,
 - Excell Crane/Downender (Loading of Fuel)
 - RBT/Fuel Assembly Storage Rack
 - RBT/Downender
 - RBT/Staging and Cutting Station
 - RBT/Clamping Table
 - FAHF/Mockup Fuel Assembly
 - Pull-Head Gripper/Fuel Rods
 - Rod Loader/Canister
 - NFBC Loader/Canister
 - RBT/Off-Normal Table
 - MT/Off-Normal Table
 - Fuel Canister/Storage Rack
 - NFBC Canister/Storage Rack
 - RBT/FAHF and RM-10A
 - Excell Crane/Fuel Canister Upender (Loading and Unloading)
 - Excell Crane/NFBC Canister Upender (Loading and Unloading)
 - MT/RM-10A
- Photographs must be taken of any equipment damaged during testing.
- Photographs must be taken of any damage to mockup fuel rods and/or mockup fuel assemblies.
- Photographs must be taken of the cutter to fuel assembly interfaces as follows:
 - In position prior to cut
 - During cutting operation
 - Cut area of end fitting after cut operation
 - Cut area of fuel assembly after cut operation
- Photographs must be taken of each "Hold Point".
- Photographs must be taken of the problem areas of any subsystem which does not perform its expected function.
- Photographs must be taken of any component, subsystem, or system, determined by the test conductor to be operating out of the normal/expected condition (i.e., excessive deflection, vibration, etc.).

FUEL ROD CONSOLIDATION PROJECT
PHOTOGRAPHIC LOG

TEST PROCEDURE No. 207

ENTRY NO.	FILM ROLL #	FRAME NO.	DATE/TIME	STEP NUMBER	EQUIPMENT/PURPOSE
26	14	10	7-15-92	8.4.5.6	Slip sheet interlock test
27	14	9	7-15-92	8.4.5.7	" " " "
28	14	8	7-15-92	8.4.5.8	Hopper Elevation " "
29	14	7	7-15-92	8.4.5.9	" " " "
30	14	6	7-15-92	8.4.5.10	Rod Loader " "
31	14	5	7/21/92	8.4.6.7	^{auto} Single Mode setup 7/21/92
32	14	4	7/21/92	8.4.6.7	Rod compaction
33	14	3	7/21/92	8.4.6.7	Rod loading System
34	14	2	7/21/92	8.4.6.7	Rod extends through tunnel
35	14	1	7/22/92	8.4.6	Single mode Setup
36	15	25	7/22/92	8.5.11	Granular compaction test Setup
37	15	24	7/22/92	8.5.11 ^{step} 6	rod behind rake out of position
38	15	23	7/22/92	8.5.11 ^{step} 6	rod held in and half out of hopper
39	15	22	7/22/92	8.5.13	Setup
40	15	21	7/22/92	8.5.13	Optional test to see if we can load last few remaining rods out of and off the day
41	15	20	7/22/92	8.5.13	View of last 12 rods loading ^{being} loaded into hopper from optional test (item 40 done)
42	15	19	7/22/92	8.5.15	FCU/Hopper interface setup
43	15	18	7/22/92	8.5.15	Comp. tube/extract system interface Setup
44	15	17	7/22/92	8.5.15	Compaction System Setup
45	15	16	7/22/92	8.5.15	Extraction System/Undermining System Setup

FUEL ROD CONSOLIDATION PROJECT
PHOTOGRAPHIC LOG

TEST PROCEDURE No. 207

ENTRY NO.	FILM ROLL #	FRAME NO.	DATE/TIME	STEP NUMBER	EQUIPMENT/PURPOSE
1	12	17	6/18/92 10:18	8.4.1	Side Transfer in retract position
2	12	16	6/18/92 10:26	8.4.4	Side transfer extended
3	12	15	6/18/92 10:26	8.4.1	" "
4	12	14	6/18/92 10:26	8.4.1	Side transfer extended from the top
5	12	13	6/18/92 10:47	8.4.1.2	Rake drive extend full south
6	12	12	6/18/92 10:59	8.4.1.3	Rake
7	12	11	6/18/92 11:00	8.4.1.3	Rake up hand stop
8	12	10	6/18/92	8.4.1.5	Slip sheet open position
9	12	9	6/18/92 1:10	8.4.1.6	Hopper drive start point
10	12	8	6/18/92 1:57	8.4.1.7	Pusher drive at initial point of travel
11	12	7	6/18/92 2:03	8.4.1.7	Pusher full extend on limit switch
12	12	6	6/19/92 0900	8.4.2.1	Side Transfer home position
13	12	5	6/19/92 1010	8.4.2.2	Rake carriage south
14	12	4	6/19/92 1100	8.4.2.3	Rake
15	12	3	6/19/92 1120	8.4.2.4	Gate
16	12	2	6/22/92	8.4.2.5	Slip sheet
17	12	1	6/22/92	8.4.2.6	HOPPER DRIVE ELEVATION
18	13	24	6/22/92	8.4.2.7	ROD LATCHER
19	13	23	6/22/92	8.4.4	HOPPER CONVEYOR LIGHT ALARM
20	13	22	6/22/92		HOPPER LOAD TEST
21	14	15	7-15-92	8.4.5.1	Side Transfer interlock test
22	14	14	7-15-92	8.4.5.2	" " " "
23	14	13	7-15-92	8.4.5.3	Rake Carriage " "
24	14	12	7-15-92	8.4.5.4	" " " "
25	14	11	7-15-92	8.4.5.5	Gate Drive " "

APPENDIX D

TEMPORARY PROCEDURE CHANGE NOTICE AND REPAIR LOG

Rev A 2/14/92

TEST PROCEDURE 9315-TP-212-207 REVISION ~~2~~ 1 PAGE 02

TEMPORARY PROCEDURE CHANGE NOTICE #1 Not Used / M8 8/14/92

DATE Feb 14 1992

PROCEDURE NO. 9315-TP-207 REV 1

ROP SIDE TRAP
COMPACTION &
TITLE LOADING
CONSOLIDATION

PROCEDURE SECTION(S) 8.0.1, 8.0.2 AND 8.0.3 ADDED TEST SECTION

PROCEDURE CHANGE: (Use reverse side if necessary.)

ADD TEST STEPS TO VERIFY HOPPER DISCHARGE FUNNEL
ALIGNS WITH FUEL CANISTER AND PROJECTION OF
FUNNEL DISCHARGE PERIMETER IS INSIDE CANISTER
OPENING

REASON FOR CHANGE: TRAPPER OF UNCOMPLETED TEST
STEPS FROM FUEL CANISTER UPENDER SOT, 9315-TP-206
REV 1.

REASON FOR CHANGE:

Classification
MINOR ☐ YES ☒ NO
MAJOR ☒ YES ☐ NO

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES ☐ NO.

See added section 8.0.1, 8.0.2 AND 8.0.3

APPROVALS

Robert Zell 2/14/92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)
W. Zell - NOT USED 8/14/92
TEST DIRECTOR DATE

NOTES: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-207 REVISION 1 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE TPCN # 1

DATE 5/21/92

PROCEDURE NO. 9315-TP-207 ^{7/21/92} REV. 1 ^{7/20/92} TITLE

PROCEDURE SECTION(S) See below ^{7/21/92}

PROCEDURE CHANGE: (Use reverse side if necessary.)

Delete the attached pages and other pages as marked in Text
3-3 (Page 3), Page 4, Page 6, Page 229, Page 231, Page 234, Page 23C, Page 239, Page 241
7-45, 55-136, 181-224, 232-233, 237-238, and 242-268. ^{7/21/92}
MARK UP TO USE 3/8" RODS WHERE REQUIRED. ^{7/21/92}

REASON FOR CHANGE:

Program changes reduced the scope of testing as shown on attached list

CLASSIFICATION OF CHANGE

MINOR YES NO

MAJOR YES ☒ NO ^{7/21/92}

REVISION TO ORIGINAL PROCEDURE REQUIRED YES NO

APPROVALS

Ed Fancst 5/21/92 (1)(2)
TEST ENGINEER DATE
1/1/1992 7/21/92 (2)
QUALITY ASSURANCE DATE
Frank D. Mallo 7/21/92 (2)
PROJECT ENGINEER DATE
TEST DIRECTOR 7/21/92 (2)
DATE

- Notes: (1) Required for minor changes
(2) Required for major changes

TABLE II

SYSTEMS OPERATION TESTING FOR MODIFIED PHASE III TEST PROGRAM

FUEL ROD EXTRACTION SYSTEM--9315-TP-201

1. Perform Section 8.1

CLAMPING TABLE--9315-TP-202

1. Perform Section 8.1 steps 8.1.3, 8.1.4, and 8.1.6.
2. Perform Section 8.3

FUEL ASSEMBLY HANDLING FIXTURE--9315-TP-205

1. Perform Section 8.5 except step 8.5.1.

ROD COMPACTION/LOADING--9315-TP-207

1. Perform Section 8.4
2. Perform Section 8.5, steps 8.5.9, 8.5.10, 8.5.11, 8.5.13 (Use 3/8" OD rods), and 8.5.15 (Use 3/8" OD rods).

UPPER CUTTING SYSTEM--9315-TP-209B

1. Perform Section 8.3
2. Perform Section 8.4

ROBOTIC BRIDGE TRANSPORTER--9315-TP-212

1. Perform Section 8.1 steps 8.1.1.3, 8.1.2.3, 8.1.3.2, and 8.1.4.2.
2. Perform Section 8.2.
3. Perform Section 8.3 except steps 8.3.1, 8.3.2, and 8.3.3.
Note: In equipment I&C set-up, program in pick up and set down of fuel in positions 2-3 and 7-1 in the Fuel Assembly Storage Rack.

CONTROL SYSTEMS--9315-TP-601

Perform Control System Check Lists necessary to support the following SOTs:

201	207
202	209B
205	212

TEST PROCEDURE 9315-TP-207 REVISION 1 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE #2

DATE 5/5/92

PROCEDURE NO. TP 207

REV. 1

TITLE

PROCEDURE SECTION(S) MULTIPLE

8.4.2.1, Page 147-148
8.4.2.2, Page 149-150
8.4.2.3, Page 150-152
8.4.2.4, Page 153-154

8.4.2.5, Page 154-156 8.5.10, Page 227
8.4.2.6, Page 156-159
8.4.2.7, Page 159-160
8.5.9, Page 225-226

PROCEDURE CHANGE: (Use reverse side if necessary.)

TORQUE AND CURRENT MEASUREMENTS HAVE BEEN DELETED FROM PROGRAM REQUIREMENTS

Delete actions related to obtaining torque and current measurements. ^{unc} 7/20/92

REASON FOR CHANGE:

Torque and current measurements have been deleted from ~~program~~ program requirements ^{unc} 7/20/92
Reference TAC Change Notice 002, Item 6.

CLASSIFICATION OF CHANGE

MINOR ☒ YES ☐ NO

MAJOR ☐ YES ☒ NO ^{unc} 7/20/92

REVISION TO ORIGINAL PROCEDURE REQUIRED ☐ YES ☐ NO

APPROVALS

E. B. Farrest 5/5/92 (1)(2)
TEST ENGINEER DATE
A. S. [unclear] 7/21/92 (2)
QUALITY ASSURANCE DATE
F. M. [unclear] 7/21/92 (2)
PROJECT ENGINEER DATE
[Signature] 7/21/92 (2)
TEST DIRECTOR DATE

- Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE

9315-TP-207

REVISION

1

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

TPCN # 3

DATE 6/16/92

PROCEDURE NO. 9315 TP 207

REV.

1

TITLE

Rod Computation (etc)

PROCEDURE SECTION(S) 8.4.2.3

p 150, 151

PROCEDURE CHANGE: (Use reverse side if necessary.)

eliminate rake travel measurement when going to closed position and change rake travel measurement to a rake opening measurement when traveling to the open position.

REASON FOR CHANGE:

YAE 1.1.2 specifies a rake opening criteria. Rake opening and repeatability of the opening is the parameter of concern.

CLASSIFICATION OF CHANGE

MINOR ☐ YES ☒ NO ☐

MAJOR ☐ YES ☐ NO ☒

REVISION TO ORIGINAL PROCEDURE REQUIRED ☐ YES ☒ NO

APPROVALS

This TPCN revises test procedure acceptance criteria to be consistent with the TPC. Therefore, it is a minor TPCN. 6/16/92

CB Jones 6/15/92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-207 REVISION 1 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

TPCN 004

DATE _____

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE _____

PROCEDURE SECTION(S) 8.4.1.4 p.141 ^{unc} 8.4.1.5 p.143
Ann 142 7/12/92

PROCEDURE CHANGE: (Use reverse side if necessary.)

Delete 8.4.1.4 (No proximity sensors on Gate)

Modify 8.4.1.5 as shown in text to test south end proximity sensor.

Delete 8.4.1.5.3 and subsequent acceptance criteria. Correct steps to repeat steps 1, 2 & 4. Revise acceptance criteria for south direction only. me 7/12/92

REASON FOR CHANGE: Proximity sensors are not installed on Gate. Thus can not be tested. Only the south end travel proximity sensor is installed on the slip sheet.

CLASSIFICATION OF CHANGE

MINOR ☐ YES ☐ NO ☐

MAJOR ☐ YES ☒ NO ^{7/12/92}

REVISION TO ORIGINAL PROCEDURE REQUIRED ☐ YES ☐ NO

Reference TAC CN 002 items 4 & 5 ^{unc} 7/20/92

APPROVALS

EO Fanest 6/17/92 (1)(2)
TEST ENGINEER DATE

[Signature] 7/21/92 (2)
QUALITY ASSURANCE DATE

[Signature] 7/21/92 (2)
PROJECT ENGINEER DATE

[Signature] 7/21/92 (2)
TEST DIRECTOR DATE

Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-207 REVISION 1 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

TPCN 005

DATE 6/18/92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE _____

PROCEDURE SECTION(S) 2.3

PROCEDURE CHANGE: (Use reverse side if necessary.)

QA/QC Data package review has not been completed. This does not affect testing. Therefore testing will proceed.

No procedure change required. Package review will be completed later.
See ERL #15 ^{UNC} 7/12/92

REASON FOR CHANGE: Does not affect testing or test results.

CLASSIFICATION OF CHANGE

MINOR YES ☒ NO ☐

MAJOR YES ☐ NO ☐

REVISION TO ORIGINAL PROCEDURE REQUIRED YES ☐ NO ☐

APPROVALS

Frank J. Sallo (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-207 REVISION 1 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

TPCN 006 Jgg 7/20/92

DATE 6/18/92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE

PROCEDURE SECTION(S) 3.1, Pg 3

PROCEDURE CHANGE: (Use reverse side if necessary.) Jgg 6/18/92

Fuel canister is loaded into the ^{up}downender but will not be placed into the horizontal position until required by the specific test steps

Delete ... and is in the down (horizontal) position. VAC 7/20/92

REASON FOR CHANGE: provides clear access to the table to perform test sections 8.4.1, 8.4.2 & 8.4.4 and avoids possible damage to the canister

CLASSIFICATION OF CHANGE

MINOR ☒ YES ☒ NO

MAJOR ☐ YES ☐ NO

REVISION TO ORIGINAL PROCEDURE REQUIRED ☐ YES ☐ NO

APPROVALS

Frank Rosallo 6/18/92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-207

REVISION 1

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

TPCN # 007

7/20/92

DATE 6-19-92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE Compaction Systems SOT

PROCEDURE SECTION(S) B.4.2.3 B.4.2.4

Page 151 MC 7/20/92 Page 152 7/20/92
Page 150

PROCEDURE CHANGE: (Use reverse side if necessary.)

Add closed or down distance criteria for the rake and gate. Both systems should have a clearance above the rails of $> 0.0 \text{ inch and } \leq .125 \text{ inch}$.

- Rake distance from rail is between 0.0 and 0.125 inches (or equivalent) 7/20/92

REASON FOR CHANGE:

To clarify procedure and add acceptance criteria.

CLASSIFICATION OF CHANGE

MINOR YES NO ☒

MAJOR ☒ YES ☒ NO

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES NO

This TPCN does not impact the TAC 7/20/92
This is an added acceptance criteria for the test procedure.

APPROVALS

JB Hayes 6-19-92 (1)(2)
TEST ENGINEER DATE

A Mulgrew 7/21/92 (2)
QUALITY ASSURANCE DATE

J Mello 7/21/92 (2)
PROJECT ENGINEER DATE

[Signature] 7/21/92 (2)
TEST DIRECTOR DATE

- Notes:
- (1) Required for minor changes
 - (2) Required for major changes

TEST PROCEDURE

9315-TP-205 207

REVISION

2

PAGE 02

TEMPORARY PROCEDURE CHANGE NOTICE

TPCN # 8

8/1/92

DATE 6/33/92

PROCEDURE NO. 9315 TP 207

REV. 2

TITLE LED Compaction

PROCEDURE SECTION(S) 8.4.5.5

Page 168 of 172

PROCEDURE CHANGE: (Use reverse side if necessary.)

Condition B changed to slip sheet with open
Expected results change change as shown

i to go
iii to no

Revise acceptance criteria formula from $A + B$ to A or $(not A + not B)$

REASON FOR CHANGE: Gate operation should be interlocked with
slip sheet so that it can not be open with fuel present
and the slip sheet open. Gate not interlocked with side transfer.

CLASSIFICATION OF CHANGE

See TAC CN 002 7/20/92

MINOR ☐ YES ☐ NO

MAJOR ☐ YES ☒ NO

REVISION TO ORIGINAL PROCEDURE REQUIRED ☐ YES ☐ NO

APPROVALS

E. S. Forrest 6/23/92 (1)(2)
TEST ENGINEER DATE

A. M. Wilson 7/21/92 (2)
QUALITY ASSURANCE DATE

F. J. Mallo 7/21/92 (2)
PROJECT ENGINEER DATE

[Signature] 7/21/92 (2)
TEST DIRECTOR DATE

- tes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-205 207

REVISION 1

PAGE 02

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 6/25/92

#9 7/20/92
Page 1 of 2 7/20/92

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE Red Compression

PROCEDURE SECTION(S) 8.4.5.4
Page 167 7/21/92

PROCEDURE CHANGE: (Use reverse side if necessary.)

Reference RL #7/20/92

Add the following interlock tests to
Section 8.4.5.4 Camcign open interlocks

see attached sheet
Place sheet in Record copy as page ~~167A~~ 167A

REASON FOR CHANGE:

New Tests more clearly reflect the
existing interlock logic

CLASSIFICATION OF CHANGE

This TCN affects TAC 154. See TNC CN 002.
Date 7/10/92

MINOR YES NO

MAJOR YES NO 7/20/92

REVISION TO ORIGINAL PROCEDURE REQUIRED YES NO

APPROVALS

EB Forest 6/25/92 (1)(2)
TEST ENGINEER DATE
A. Mulgrew 7/21/92 (2)
QUALITY ASSURANCE DATE
F. H. Malle 7/21/92 (2)
PROJECT ENGINEER DATE
[Signature] 7/21/92 (2)
TEST DIRECTOR DATE

- tes: (1) Required for minor changes
(2) Required for major changes

Section 8.4.5.4 - Interlock verification Carriage Drive (M109A) closed (south)

Condition

- A. Rake is Open; 1
- B. Carriage is presently fully Open (north); 1
- C. Gate is Open; 1
- D. Slip Sheet is Closed (north); 1

<u>Test</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>System Operates</u>	<u>Expected Result</u>
1	1	0	0	0	___yes___no	yes
2	1	0	0	1	___yes___no	yes
3	1	0	1	0	___yes___no	yes
4	1	0	1	1	___yes___no	yes
5	1	1	0	0	___yes___no	yes
6	1	1	0	1	___yes___no	yes
7	1	1	1	0	___yes___no	yes
8	1	1	1	1	___yes___no	yes
9	0	0	0	0	___yes___no	no
10	0	0	0	1	___yes___no	no
11	0	0	1	0	___yes___no	no
12	0	0	1	1	___yes___no	yes
13	0	1	0	0	___yes___no	yes
14	0	1	0	1	___yes___no	yes
15	0	1	1	0	___yes___no	yes no KBH
16	0	1	1	1	___yes___no	yes no 7-15-12

Revised acceptance criteria formula is "A or (not B + C + D) or (B + not C)" vms 7/16/12

TEST PROCEDURE 9315-TP-205 207 REVISION 2 PAGE D2

TEMPORARY PROCEDURE CHANGE NOTICE # 810 Lrs 7/20/92

DATE 7/14/92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE

PROCEDURE SECTION(S) 8.4.5.9
Page 172 TIL/92

Reference RL# 8 TIL/92

PROCEDURE CHANGE: (Use reverse side if necessary.)

See reverse side page 2 rev 7/21/92
Add page 172 A TIL/92

REASON FOR CHANGE:

This interlock test involves an additional condition, i.e. Rod Loader, M112, must be open (back).

CLASSIFICATION OF CHANGE

This test procedure change notice impacts the TAC, See TAC CN002. 7/21/92 Item 9.

MINOR ☒ YES ☐ NO

MAJOR ☐ YES ☒ NO

REVISION TO ORIGINAL PROCEDURE REQUIRED ☐ YES ☒ NO

APPROVALS

Kristic T. Gunnarsson 7/14/92
TEST ENGINEER DATE (1)(2)

A. M. M. 7/14/92 (2)
QUALITY ASSURANCE DATE

Frank M. Mallo 7/21/92 (2)
PROJECT ENGINEER DATE

[Signature] 7/21/92 (2)
TEST DIRECTOR DATE

- Notes:
- (1) Required for minor changes
 - (2) Required for major changes

8.4.5.9

Add condition,

C. Rod Loader is open (back)

Test	A	B	C	System Operates		Expected Results
1	0	0	1	yes	no	no
2	1	0	1	yes	no	yes
3	0	1	1	yes	no	yes
4	1	1	1	yes	no	yes
5	0	0	0	yes	no	no
6	1	0	0	yes	no	no
7	0	1	0	yes	no	no
8	1	1	0	yes	no	no

Acceptance Criteria

C and (A or B)

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 02

TEMPORARY PROCEDURE CHANGE NOTICE # ¹¹~~60~~ 388 7/20/92

DATE 7/17/92

SYSTEM OPERATIONAL TEST
PROCEDURE FOR THE ROD SIDE
TRANSFER, COMPACTION, LANDING
AND CONSOLIDATION TABLE.

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE

PROCEDURE SECTION(S) 8.6^w 8.4.6^c 8.4.7^w
_{Page 174 Page 176}

PROCEDURE CHANGE: (Use reverse side if necessary.)

Delete: This test verifies operation of machine motions and does not include actual consolidation operations of mock-up fuel rods.

Replace with: Add and remove mock-up fuel rods as required to facilitate system operations.

REASON FOR CHANGE:

The process control system will not operate unless rods are indicated. Rod manipulations enable sequence progression and do not impact acceptance criteria.

CLASSIFICATION OF CHANGE

MINOR YES ☒ NO ☐

MAJOR YES ☐ NO ☐

REVISION TO ORIGINAL PROCEDURE REQUIRED YES ☒ NO ☐

APPROVALS

Luciel M. Chapman 7/17/92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- Notes:
- (1) Required for minor changes
 - (2) Required for major changes

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 02

Page 12-1 of 5

TEMPORARY PROCEDURE CHANGE NOTICE H 12 Egg 7/20/92

DATE 7/17/92

PROCEDURE NO. 9315-TP-207 REV. 1

TITLE SYSTEM OPERATIONAL TEST
PROCEDURE FOR THE ROD SIDE
TRANSFER, COMPACTION, LOADING
AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.4.6 & 8.4.7

PROCEDURE CHANGE: (Use reverse side if necessary.)

Revise Acceptance Criteria Sequence on Pages 174 & 175

From: Rake (M-1048) raised

Carriage (M-109A) extended north

To: Carriage (M-109A) extended north

Rake (M-1048) raised

Similar for 8.4.7 on Page 176

REASON FOR CHANGE:

Control logic sequence is revised to move the carriage north before raising the rake in order to avoid contact interference with the gale if the carriage is south. This changes the sequence specified in the Acceptance Criteria but does not change system function.

CLASSIFICATION OF CHANGE

MINOR YES NO

MAJOR YES ☒ NO

REVISION TO ORIGINAL PROCEDURE REQUIRED YES ☒ NO

See the CN 001 for revision to the title which is attached as pages #12-2-5/12/92

APPROVALS

David McChapman 7/17/92 (1)(2)
TEST ENGINEER DATE

Robert V. Dill 7/17/92 (2)
QUALITY ASSURANCE DATE

Frank M. Mello 7/20/92 (2)
PROJECT ENGINEER DATE

[Signature] 7/20/92 (2)
TEST DIRECTOR DATE

Notes: (1) Required for minor changes
(2) Required for major changes

TAC CHANGE NOTICE

DATE: 6-17-92

CHANGE NOTICE NO. 001

TAC NO: 9315-TAC-207

TITLE: Rod Extraction, compaction, and Loading

=====

TAC CHANGE AND REASON FOR CHANGE

1. Change section 1.1.1 Side Transfer travel distance when
extended from 68.00 ± 0.00 to $65 \frac{1}{2} \pm \frac{1}{8}$ ".

Reason for Change

Side transfer functions to move rods beneath the open rake so that rake can collect them and move the rods to the gate and the hopper. A travel distance of $65 \frac{1}{2}$ " is sufficient for the side transfer to move the last rod under the rake and is achievable with the current equipment design.

2. Change section 1.1.2 Rake travel distance when extended from
 $35.00 \pm .00$ inches to $34 \frac{1}{4} \pm \frac{1}{8}$ inches.

Reason for Change

Rake travel functions to move rods from side transfer mechanism under the gate into the slip sheet. Travel distance to achieve this as determined during equipment set up is $34 \frac{1}{4}$ inches.

(If more space is needed, use additional sheets)

=====

ENGINEER

*E.B. Forest**6/17/92*

Date

QUALITY ASSURANCE

*Clinton R. Clay**6/17/92*

Date

PROJECT MANAGER

*F. H. Ballo**7/21/92*

Date

Page 2 of 2

TAC NO: 207

CHANGE NOTICE NO: 001

TAC CHANGE NOTICE (cont'd)

3. Change section 1.1.3 Slip Sheet Travel distance from $8.5 \pm .06$
to $8.45 \pm .00$

Reason for Change

Slip sheet position is controlled by resolver counts. This change allows the slip sheet to approach within 1/16" of the north hopper Wall. Rods can be loaded into the slip sheet from this position without dropping and can be laid evenly in the hopper as the slip sheet retracts. Additional extension of the slip sheet would cause contact with gate assembly.

4. Change section 1.1.5 Rod pusher travel distance from
 $196.00 \pm .25$ to $196.5 \pm .00$

Reason for Change

During set ups it was determined that increasing the travel distance from 196 to 196.5 inches would provide additional insertion of the rods into the canister and permit the canister lid to be installed without further movement of the rods as the canister is upended.

Department of Energy

Idaho Field Office
785 DOE Place
Idaho Falls, Idaho 83401-1562

August 4, 1992

61 Bure
Sub 4.1 - Original
Chm
DIC
Pyh *DoE* *IA*
SOT-503 No Gt he
Tracking Log
F.6 Gt he - Gp
Record cor
SOT.

Mr. Peter V. Judd
NUS Project
c/o Contraves-USA
620 Epsilon Drive
Pittsburgh, PA 15238

SUBJECT: Review of Halliburton NUS (HNUS) System Operational Test (SOT)
Test Acceptance Criteria (TAC) Change Notice for the Rod Side
Transfer, Compaction, Loading, and Consolidation Table System

REFERENCE: Halliburton NUS transmittal to DOE-ID, ED-DOE-PVJ-92-2408, TAC
Change Notice 001 and 002, 9315-TAC-207, Rev.2, July 22, 1992

Dear Mr. Judd:

DOE-ID has reviewed the TAC Change Notices (TCNs) under the REVIEW/APPROVAL provision for the contract and finds them acceptable. The TCNs are approved for implementation.

If you have any questions, please contact me on (208) 526-6668 or
D. C. Koelsch, of my staff, on (208) 526-5930.

Sincerely,

Walter J. Mings, Acting Chief
Civilian Rad-Waste Branch

cc: J. H. Clark, EG&G

910 CLOPPER ROAD • P.O. BOX 6032 • GAITHERSBURG, MARYLAND 20877-0962 • (301) 258-6000

ED-DOE-PVJ-92-2408
July 22, 1992

Mr. W.J. Mings, Chief
Civilian Rad-Waste Branch
U. S. Department of Energy
Idaho Field Office - MS 1136
785 DOE Place
Idaho Falls, ID 83401-1562

Subject: Contract DE-AC07-86ID12651 - Rod Consolidation Project
Systems Operational Test--Rod Side Transfer,
Compaction, Loading, and Consolidation Table Test
Acceptance Criteria Change Notice (TCN) - Approval

Reference: 1. 9315-TAC-207 Rev 2, - Rod Side Transfer, Compaction,
Loading, and Consolidation Table

Dear Mr. Mings:

Attached are TCNs 002 and 003 to reference 1 for your approval.

If you have any questions, please call the undersigned on
(412) 967-7304.

Very truly yours,

Peter V. Judd
Project Manager

ht

Attachments:

TCN 002
TCN 003

cc: D.C. Koelsch - DOE-ID
J.H. Clark - EG&G

cc: DOE - WASH
Subj 4.1 - WASH
CHRON. WASH

cc: Judd Chron. WASH
DOE Chron. WASH
SOFT BOOK - WASH
TCN TRACKING LOG - WASH

TEST PROCEDURE 9315-TP-207 REVISION 1 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 7/21/92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE

PROCEDURE SECTION(S) 8.4.6 (Page 175) and 8.4.7 (Page 176)

PROCEDURE CHANGE: (Use reverse side if necessary.)

- ① Delete Step 8.4.6.2 on page 175. This step repeats Step 8.4.6.1 an additional 18 times
- ② on Page 176, delete "19 times" from Step 8.4.7.1

REASON FOR CHANGE:

19 repetitions of the same operation is deemed excessive.

CLASSIFICATION OF CHANGE

MINOR YES ☒ NO

MAJOR YES NO

REVISION TO ORIGINAL PROCEDURE REQUIRED YES NO

This is a minor TPCN because the repetitions are not required by the TAC. Change ① only deletes repetitions of the acceptance criteria.

APPROVALS

David M. Chap 7/21/92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- Notes:
- (1) Required for minor changes
 - (2) Required for major changes

TEST PROCEDURE 9315-TP-207 REVISION 1 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 7/2/92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE

PROCEDURE SECTION(S) 8.4.2.1 (Page 147 & 148), 8.4.2.2 (Page 149 & 150)
8.4.2.5 (Page 155 & 156) & 8.4.2.7 (Page 159 & 160)

PROCEDURE CHANGE: (Use reverse side if necessary.)

Revise Section 8.4.2.1 acceptance criteria to $65\frac{1}{2} \pm 1\frac{1}{8}$ as per TAC CN 001 at 3 places.
Revise Section 8.4.2.2 acceptance criteria to $34\frac{1}{4} \pm \frac{1}{8}$ as per TAC CN 001 at 3 places.
Revise Section 8.4.2.5 acceptance criteria to $8.45 \pm .05$ as per TAC CN 001 at 3 places.
Revise Section 8.4.2.7 acceptance criteria to 196.5 ± 0.25 as per TAC CN 001 at 3 places.

REASON FOR CHANGE:

Distance criteria were not met in initial testing. TAC Change Notice 001 revises acceptance criteria.

CLASSIFICATION OF CHANGE

MINOR YES NO

MAJOR YES ☒ NO

REVISION TO ORIGINAL PROCEDURE REQUIRED YES NO

APPROVALS

David M. Chapman 7/2/92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-207 REVISION 1 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 7/21/92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE

PROCEDURE SECTION(S) 8.4.2.7

Ref RL #3

PROCEDURE CHANGE: (Use reverse side if necessary.)

Revise Section 8.4.2.7 rod loading time acceptance criteria to <325 seconds on pages 159 and 160 (3 places).

REASON FOR CHANGE:

Observed loading time did not meet the existing "<100 sec" criteria. TAC CN 002 revised the time to "<325 sec".

CLASSIFICATION OF CHANGE

MINOR YES NO

MAJOR YES ☒ NO

REVISION TO ORIGINAL PROCEDURE REQUIRED YES NO

APPROVALS

David M. Chapman 7/21/92 (1)(2)
TEST ENGINEER DATE
W. J. [Signature] 7/21/92 (2)
QUALITY ASSURANCE DATE
Frank D. Bello 7/21/92 (2)
PROJECT ENGINEER DATE
[Signature] 7/21/92 (2)
TEST DIRECTOR DATE

- Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-207 REVISION 1 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 7/21/92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE _____

PROCEDURE SECTION(S) 8.4.5.3, Page 166

Reference RL #6

PROCEDURE CHANGE: (Use reverse side if necessary.)

Revise Section 8.4.5.3, Page 166 to correct test VIII to a "yes" expected result. Also, revise acceptance criteria formula to read "A + (B or D)".

REASON FOR CHANGE:

Phase III design development revised carriage drive interlock logic to enable carriage motion north with the rakedown. See TAC Change Notice 002, Item 11.

CLASSIFICATION OF CHANGE

MINOR ☐ YES ☐ NO ☐

MAJOR ☐ YES ☒ NO ☐

REVISION TO ORIGINAL PROCEDURE REQUIRED ☐ YES ☒ NO

APPROVALS

<u>Daniel M. Chapman</u>	<u>7/21/92</u>	(1)(2)
TEST ENGINEER	DATE	
<u>A. M. Muelken</u>	<u>7/21/92</u>	(2)
QUALITY ASSURANCE	DATE	
<u>F. B. Mello</u>	<u>7/21/92</u>	(2)
PROJECT ENGINEER	DATE	
<u>[Signature]</u>	<u>7/21/92</u>	(2)
TEST DIRECTOR	DATE	

Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-207

REVISION 1

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 7/21/92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE _____

PROCEDURE SECTION(S) B.4.5.10, Page 173

PROCEDURE CHANGE: (Use reverse side if necessary.)

Revise B.4.5.10 to verify rod loading interlocks in the "close" (east) direction.

REASON FOR CHANGE:

Correct typographical error. See also TAC CN 002, Item 12 which corrects the same error in the TAC.

CLASSIFICATION OF CHANGE

MINOR ☒ YES ☐ NO ☐

MAJOR ☐ YES ☐ NO ☐

REVISION TO ORIGINAL PROCEDURE REQUIRED ☐ YES ☐ NO

APPROVALS

Daniel M. Chapman 7/21/92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-207 REVISION 1 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 7/21/92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE _____

PROCEDURE SECTION(S) 8.4.8, Page 178

PROCEDURE CHANGE: (Use reverse side if necessary.)

Revise the acceptance criteria for the alarm printout to delete
"when commanded by the operator".

REASON FOR CHANGE:

Alarm report printout is automatic. TAC Change Notice 002, Item 13
revises the TAC.

CLASSIFICATION OF CHANGE

MINOR ☐ YES ☐ NO ☐

MAJOR ☐ YES ☒ NO ☐

REVISION TO ORIGINAL PROCEDURE REQUIRED ☐ YES ☐ NO

APPROVALS

W. M. Chapman 7/21/92 (1) (2)
TEST ENGINEER DATE

M. J. Bullock 7/21/92 (2)
QUALITY ASSURANCE DATE

F. J. Bullock 7/21/92 (2)
PROJECT ENGINEER DATE

[Signature] 7/21/92 (2)
TEST DIRECTOR DATE

- Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-207 REVISION 1 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 7/21/92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE _____

PROCEDURE SECTION(S) 8.5.11 (Page 229), 8.5.13, 8.5.15

PROCEDURE CHANGE: (Use reverse side if necessary.)

- Revise section 8.5.11, Page 229, item 1 to 34 rods
- Revise section 8.5.11, Page 229, item 3 to 34 rods in side transfer and no rods in compaction
- Revise section 8.5.13, Page 234, item 1 to 5 bowed rods
- Revise section 8.5.13, Page 234, item 4 to 29 straight and 5 bowed rods
- ~~Revise section 8.5.15, Page 239, item 1 to 61 straight rods and 5 bowed rods in alert failure~~
- Revise 8.5.11, Page 229, second set of acceptance criteria, to add a criteria from the TAC related to triangular packing.

*Voided
See
TPCN #23*

REASON FOR CHANGE:

Revised for re-focused Phase III test program as per TAC Change Notice 002 and existing TAC.

CLASSIFICATION OF CHANGE

MINOR ☐ YES ☐ NO ☐

MAJOR ☐ YES ☒ NO ☐

REVISION TO ORIGINAL PROCEDURE REQUIRED ☐ YES ☐ NO

APPROVALS

<u><i>William Phlips</i></u>	<u>7/21/92</u>	(1)(2)
TEST ENGINEER	DATE	
<u><i>W. J. Mulvaney</i></u>	<u>7/21/92</u>	(2)
QUALITY ASSURANCE	DATE	
<u><i>F. M. Mallo</i></u>	<u>7/21/92</u>	(2)
PROJECT ENGINEER	DATE	
<u><i>[Signature]</i></u>	<u>7/21/92</u>	(2)
TEST DIRECTOR	DATE	

- Notes: (1) Required for minor changes
(2) Required for major changes

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 7/22/92

PROCEDURE NO. 9315-TP-207 REV. 2 TITLE _____

PROCEDURE SECTION(S) 8.4.6 & 8.4.7

PROCEDURE CHANGE: (Use reverse side if necessary.)

^{order of}
Reverse first two bullets under test acceptance criteria
in Step 3 of Section 8.4.6 and Step 2 of Section 8.4.7

REASON FOR CHANGE: Sequence out of order

NOTE TCN not required. TAC not part of 9315-TAC-207

CLASSIFICATION OF CHANGE

MINOR ☒ YES _____ NO _____

MAJOR _____ YES _____ NO _____

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES _____ NO _____

APPROVALS

Frank J. Mello 7/22/92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- 13: (1) Required for minor changes
(2) Required for major changes

TEMPORARY PROCEDURE CHANGE NOTICE TPCN #21

DATE 7/22/92

PROCEDURE NO. 9315-TP-207 REV. 2 TITLE

PROCEDURE SECTION(S) 8.5.11 & 8.5.13

PROCEDURE CHANGE: (Use reverse side if necessary.)

In section 8.5.11 step 6 and 8.5.13 step 7 remove the word ALL and replace with 22.

REASON FOR CHANGE: The system works with multiples of 22 & 21 since 34 rods are being used the 12 rods cannot be loaded during this cycle.

CLASSIFICATION OF CHANGE

MINOR YES ☒ NO

MAJOR YES NO

REVISION TO ORIGINAL PROCEDURE REQUIRED YES ☒ NO only required for re-focused test program

APPROVALS

Frank M. Wells 7/22/92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE (2)
DATE

PROJECT ENGINEER (2)
DATE

TEST DIRECTOR (2)
DATE

- (1) Required for minor changes
- (2) Required for major changes

TEMPORARY PROCEDURE CHANGE NOTICE TPCN #22

DATE 7/22/92

PROCEDURE NO. 9315-TP-207 REV. 2 TITLE

PROCEDURE SECTION(S) 8.5.15

PROCEDURE CHANGE: (Use reverse side if necessary.)
Section 8.5.15 step 5 change 14 turns to one additional turn
and eliminate the remainder of this step
Section 8.5.15 step

REASON FOR CHANGE: Eliminated use of 15x15 assemblies for reforecast test program

CLASSIFICATION OF CHANGE
MINOR YES ☒ NO ☐
MAJOR YES ☐ NO ☐

See

REVISION TO ORIGINAL PROCEDURE REQUIRED YES ☒ NO ☐ only required for reforecast test program.

APPROVALS

P. B. Galle
TEST ENGINEER 7/22/92 (1)(2)
DATE

QUALITY ASSURANCE (2)
DATE

PROJECT ENGINEER (2)
DATE

TEST DIRECTOR (2)
DATE

- (1) Required for minor changes
- (2) Required for major changes

TEMPORARY PROCEDURE CHANGE NOTICE TPCN #23

IE 7/22/92
PROCEDURE NO. 9315-TP-207 REV. 2 TITLE
PROCEDURE SECTION(S) 8.5.15

PROCEDURE CHANGE: (Use reverse side if necessary.)

Reverse Step 1 : manually place 6.3 straight and 5 bowed rods (randomly mixed) so that 34 rods are on the extraction/side transfer table and 34 in the test fixture on the clamping table
1) Change Step 2 from single to auto mode and add after initiate 'side transfer/compact' add step between 2 and 3 : 'initiate extraction operations when side transfer is safe'
2) eliminate step 5
Use TPCN #19 Fifth Bullet and TPCN #22
REASON FOR CHANGE: Provide a more in depth test sequence while eliminating unnecessary steps

CLASSIFICATION OF CHANGE

MINOR YES ☒ NO
MAJOR YES NO

REVISION TO ORIGINAL PROCEDURE REQUIRED YES ☒ NO Required for modified test program only.

APPROVALS

P. M. Dally 7/23/92 (1)(2)
TEST ENGINEER DATE
QUALITY ASSURANCE (2)
PROJECT ENGINEER (2)
TEST DIRECTOR (2)

NOTES: (1) Required for minor changes
(2) Required for major changes

TEMPORARY PROCEDURE CHANGE NOTICE

24

E 7/23/92

PROCEDURE NO. 9315-TP-207 REV. 2 TITLE

PROCEDURE SECTION(S) 8.5.15

PROCEDURE CHANGE: (Use reverse side if necessary.)

Remove last sentence in Step 8

REASON FOR CHANGE: GFE rods not used in refocused test plan program

CLASSIFICATION OF CHANGE

MINOR YES ☒ NO

MAJOR YES NO

REVISION TO ORIGINAL PROCEDURE REQUIRED YES ☒ NO required only for refocused test + program

APPROVALS

Frank Walls 7/23/92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- (1) Required for minor changes
- (2) Required for major changes

TEST PROCEDURE 9315-TP-207 REVISION PAGE 02 1 of 2

TEMPORARY PROCEDURE CHANGE NOTICE

#25

DATE 10/8/92

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE SOT Procedures for Side Transfer, Rod Compaction and Rod Loading Sys.
PROCEDURE SECTION(S) 8.4.5.2

PROCEDURE CHANGE: (Use reverse side if necessary.)

Update Section 8.4.5.2 per the attached sheet (page 2 of 2)

REASON FOR CHANGE: The condition of 'Carriage closed (South)' has no effect on the operation of the side transfer. In addition ~~the~~ ^{the} limitation for the system the carriage is south when the side transfer is operated.

CLASSIFICATION OF CHANGE

MINOR ☐ YES ☐ NO ☐

MAJOR ☐ YES ☒ NO ☐

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES ☐ NO

APPROVALS

Frank Mello 10/8/92 (1)(2)
TEST ENGINEER DATE
D. J. Mello 10/8/92 (2)
QUALITY ASSURANCE DATE
Frank Mello 10/8/92 (2)
PROJECT ENGINEER DATE
[Signature] 10/8/92 (2)
TEST DIRECTOR DATE

- NOTES: (1) Required for minor changes
(2) Required for major changes

8.4.5.2 Verify the Side Transfer (M-108A) closed (south) interlocks as follows:

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the side transfer can be moved south. Mark the appropriate column per the test result.

Condition

- A. Pull heads back (east).
- ~~B. Carriage closed (south).~~
- ~~B. No fuel.~~
- C. Rake open.

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

Test	A	B	C	SYSTEM	Operates	Expected Results
I	0	0	0	—	Yes	No
II	1	0	0	—	Yes	No
III	0	1	0	—	Yes	No
IV	0	0	1	—	Yes	No
V	1	1	0	—	Yes	No
VI	1	0	1	—	Yes	No
VII	0	1	1	—	Yes	No
VIII	1	1	1	—	Yes	No

Acceptance Criteria

- Drive system does not operate unless the following conditions are satisfied: A + (B OR C)

Test Conductor _____ Date _____

QA _____ Date _____

3. The above steps have been completed.

Test Conductor _____ Date _____

Department of Energy

Idaho Field Office
785 DOE Place
Idaho Falls, Idaho 83401-1562

October 21, 1992

Peter V. Judd
HNUS Project
c/o Contraves-USA
620 Epsilon Drive
Pittsburgh, PA 15238

SUBJECT: Review of Halliburton NUS System Operation Test (SOT) Test
Acceptance Criteria (TAC) Change Notice (TCN) Number 003 for the Rod
Side Transfer, Compaction, Loading, and Consolidation Table,
9315-TAC-207, Revision 2 (NP WJM 92-137)

REFERENCE: Halliburton NUS Corporation letter to DOE-ID, ED-DOE-PVJ-92-2472,
dated October 8, 1992

Dear Mr. Judd:

DOE-ID has reviewed the subject TCN under the REVIEW/APPROVAL provision of the
contract and finds it acceptable. The TCN is approved for implementation.

If you have further questions, please contact me at (208) 526-6668 or
D. C. Koelsch (208) 526-5930.

Sincerely,

A handwritten signature in dark ink, appearing to read "W. J. Mings", is written over the typed name.

Walter J. Mings, Acting Chief
Civilian Rad-Waste Branch

cc: F. G. Gallo, NUS
J. H. C1 ~~EG&G~~

Post-It™ brand fax transmittal memo 7671		# of pages > 2
To	Peter Judd	
Co.	From Dave Koelsch	
Dept.	Co.	
Fax #	Phone #	
	Fax #	

TAC CHANGE NOTICE

DATE: 10/8/92

CHANGE NOTICE NO. 003

TAC NO: 9315-TAC-207 REV 2

TITLE: System Operational Test Acceptance Criteria for Red Side Transfer, Composition, Loading and Consolidation Table (WBS 1.3.2.3/1.3.2.4)

TAC CHANGES AND REASON FOR CHANGE

1. CHANGE: On page 4, section 1.5.2 delete item B 'Carriage (lose AND' . also change (C) and (D) to (B) and (C) and ~~let~~ change A+B+(C OR D) to A+(B OR C)

Reason: The condition of 'Carriage closed (saith)' has no affect on the operation of the side Transfer

(If more space is needed, use additional sheets)

ENGINEER

Frank S. Sallo

10/8/92

Date

QUALITY ASSURANCE

A. Mulyrew

10/8/92

Date

PROJECT MANAGER

J. J. J. J. J.

10/8/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

ERL #1

DATE 6/18/92

LOG # 1

PROCEDURE NO. 9315-TP-207 REV. 1 TITLE _____

PROCEDURE SECTION(S) 8.4.1.3, Page 14 ^{Ver} 7/20/92

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE:

checked gap under rake lever arms a .0015 " thick shim could not be passed under the arm between the frame. The motor did not torque out. Can not verify that the hand ~~stop~~ stop was not engaged.

TEST CONDUCTOR

F. M. Gallo

SOLUTION/CORRECTIVE ACTION:

in jog mode the rake travel limits are identical to those established for the auto/hand mode. Will check gap when performing section 8.4.2.3 if the same condition exists then the test results will be accepted

TEST CONDUCTOR F. M. Gallo

DATE 6/18/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE See above. Gap checked when performing Section 8.4. to verifying proper operation of rake

TEST CONDUCTOR Frank M. Gallo

DATE 7/22/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 6-19-92

LOG # 2

Page 1 of 11

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE Consolidation System TP

PROCEDURE SECTION(S) B.4.2.1

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE:

- ① Travel distance of side transfer was not within tolerance of acceptance criteria.
- ② Travel distance of rake carriage was not within tolerance of acceptance criteria.

TEST CONDUCTOR

W.B. Haynes

SOLUTION/CORRECTIVE ACTION:

- ① Will require dispositioning; however, side transfer travel is sufficient to transfer rods to rake.
- ② Will require dispositioning; however, rake carriage travel is sufficient to accept rods from side transfer.

TEST CONDUCTOR W.B. Haynes

DATE 6-19-92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE SEE TPCN #14 and TACCN 002

TPCN 002
attached | 12/9/92

TEST CONDUCTOR Unish M Chapman

DATE 7/21/92

CK - 27

TAC CHANGE NOTICE

DATE: 7/20/92 CHANGE NOTICE NO. 002
TAC NO: 9315-TAC-207, REV.2
TITLE: System Operational Test Acceptance Criteria for Rod
Side Transfer, Compaction, Loading and Consolidation
Table (WBS 1.3.2.3/1.3.2.4)

=====

TAC CHANGES AND REASON FOR CHANGE

1. On Page 6, acceptance criteria, revise the sequence

From: . Rake (M-109B) raised.
. Carriage (M-109A) extended.

To: . Carriage (M-109A) extended.
. Rake (M-109B) raised.

Reason: Sequence logic is revised to move the carriage
north prior to raising the rake in order to
avoid contact interference with the gate if
the carriage is fully south. This has no impact
on processing operations.
2. On Page 6, acceptance criteria, add

". Lower Hopper Elevation (M-111) to bottom."

above

". Retract Rod Loader (M-112)."

Reason: The hopper must be at the bottom position prior to
initiating canister loading operations. This is
already addressed in the test procedure. It is added
to the TAC to reflect correct sequencing.

(If more space is needed, use additional sheets)

=====

ENGINEER

David M. Chap 7/21/92
Date

QUALITY ASSURANCE

[Signature] 7/21/92
Date

PROJECT MANAGER

P. D. Mello for PVS 7/21/92

TAC CHANGE NOTICE (Cont'd)

3. On Page 6, Test entry, delete the note:

"Note: These tests are performed
with no fuel rods."

Reason: The process control system must believe that fuel is present before it will operate in the auto (or single) mode. Fuel rods are added as per a Test Procedure TPCN to enable operations. The presence of these rods is transparent to the acceptance criteria at this point.

4. On Page 3, Step 1.2.4, delete the test entry

"Repeat 1.2.1 above for motor M-109C"

and the acceptance criteria

". Same as for 1.2.1".

Reason: The Gate motor M-109C is not provided with end-of-travel limit switches (proximity sensors). This is an erroneous TAC entry. TAC item 1.1.2 already demonstrates gate travel.

5. On Page 3, Step 1.2.5, revise the slip sheet motor M-110 acceptance criteria to read:

". Same as for 1.2.1, South end of travel only"

Reason: The Slip Sheet motor M-110 is not provided with a south end-of-travel limit switch (proximity sensor). This is an erroneous TAC entry. TAC item 1.1.3 already demonstrates slip sheet travel.

6. Delete acceptance criteria and basis entries related to measurement of torque or current values.

- . On Page 1, 1.1.1, delete "Motor torque is $\leq$ 1.83 ft-lbs" and basis.
- . On Page 1, 1.1.2, delete "Rake motor current is $\leq$ 0.72 amps" and basis.
- . On Page 1, 1.1.2, delete "Rake carriage motor torque is $\leq$ 4.25 lb-ft" and basis.

E/R 2 4 of 11

CHANGE NOTICE NO: 002

TAC CHANGE NOTICE (Cont'd)

- . On Page 2, 1.1.2, delete "Gate motor current is $\leq$ 0.74 amps" and basis.
- . On Page 2, 1.1.3, delete "Motor torque is less than 3.98 ft-lbs" and basis.
- . On Page 2, 1.1.4, delete " Hopper elevation drive motor torques is $\leq$ 3.88 ft-lbs" and basis.
- . On Page 3, 1.1.5, delete " Rod pusher drive motor torque is $\leq$ 12.34 ft-lb" and basis.
- . On Page 7, 1.8, delete " Rod pusher motor torque is less than 12.34 lb-ft" and basis.
- . On Page 7, 1.9, delete " hopper rod support drive motor torque is less than 3.88 lb-ft" and basis.

Reason: Torque and current measurements have been deleted from program requirements.

7. On page 5, acceptance criteria 1.5.5, revise

FROM: (A) No fuel
OR
(B) Side Transfer OPEN
A or B

TO: (A) No fuel
OR
(B) Slip Sheet OPEN
A or (not A + not B)

Reason: The Gate is not interlocked with the side transfer but is interlocked with the Slip Sheet position. If there is fuel, the gate can only open with the slip sheet extended CLOSE. This is consistent with the TAC basis reference which indicates "slip sheet not extended".

8. On page 4, acceptance criteria 1.5.4, revise

FROM: (A) No fuel
OR
(B) Rak: CLOSE
A or B

CHANGE NOTICE NO: 002

TAC CHANGE NOTICE (Cont'd)

TO: (A) Rake is OPEN
(B) Carriage is presently fully OPEN
(C) Gate is OPEN
(D) Slip Sheet is CLOSE

A or (not B + C + D) or (B + not C)

REASON: Interlock logic is revised in Phase III design development to be as follows:

The carriage can be closed at any time

. The rake is up OPEN (and we can't move any rods present)

OR

. If the rake is down CLOSE (and we can move any present rods), then

. If the carriage is not fully open (that is, it is already compacted or loaded rods), then

. The Gate must be open.

AND

. The Slip Sheet must be extended.

OR

. If the carriage is fully open (that is, we have not yet compacted rods), then

. the Gate must be closed.

9. On page 5, acceptance criteria 1.5.9, revise

FROM: (A) No fuel
OR
(B) Slip Sheet OPEN
A or B

TO: (A) No fuel
(B) Slip Sheet OPEN
(C) Rod Loader is OPEN (back)
C and (A or B)

REASON: An interlock is added in Phase III design development to ensure that the rod loader is retracted before raising the hopper elevation. This is to avoid interference with an extended rod loader over the hopper.

ERK = 60711

TAC CHANGE NOTICE (Cont'd)

10. On Page 3, acceptance criteria 1.1.5, revise

FROM: . Time to fully extend pusher drive is < 100 sec.

TO: . Time to fully extend pusher drive is < 325 sec.

REASON: Rod loader speed is mechanically limited. The rod loading time does not impact the throughput rate which is limited by the fuel assembly preparation rate.

11. On Page 4, acceptance criteria 1.5.3,, simplify the existing logic

FROM: (A) Side transfer OPEN
(B) No Fuel
OR
(C) Side Transfer OPEN
(D) Rake UP
AND
(E) Gate CLOSE
A + (B or (C + D = E))

TO: (A) Side Transfer OPEN
(B) No Fuel
(C) Rake UP
(D) Gate CLOSE
A + [B or (C + D)]

REASON: This simplified logic reflects the logic as used in the preparation of the test procedure.

Revise further,

TO: (A) Side Transfer OPEN
(B) No Fuel
(C) Rake UP
(D) Gate CLOSE
A + [B or D]

TAC CHANGE NOTICE (Cont'd)

REASON: Phase III design development requires that the carriage be allowed to move north with the rake down even if fuel is present. This avoids a contact interference problem between the gate and the rake if the rake is opened with the carriage fully south. Moving the carriage north with the rake down does not interfere with side transfer and compaction operations with fuel present.

This revised formula reflects the formula revision used in the test procedure.

12. On page 5, revise test entry 1.5.10
FROM: Operate Rod Loading System Drive (M-112) in 'open' direction

TO: Operate Rod Loading System Drive (M-112) in 'close' direction

REASON: The interlocks are applicable for rod loading operations. Operating the rod loader to load rods is to operate in the CLOSE direction. Correct the minor error.

13. On Page 7, revise acceptance criteria 1.7 (seventh dot)

FROM: . A report is printed defining the fault condition when commanded by the operator

TO: . A report is printed defining the fault condition

REASON: Alarm report printout is automatic.

14. On Page 2, acceptance criteria 1.1.4, delete the following from the second criteria:

- W 15 X 15, 1st row 0.422, 2nd row 0.365
- B&W 15 X 15, 1st row 0.430, 2nd row 0.373
- GE 8 X 8, 1st row 0.493, 2nd row 0.429

REASON: This testing is deleted from the refocused Phase III test program.

15. On Page 8, revise test entry 1.10, first sentence

FROM: Place 34 rods in Side Transfer mechanism and 20 in compaction system.

TAC CHANGE NOTICE (Cont'd)

- TO: Place 34 3/8" rods in Side Transfer mechanism.
- REASON: 34 rods are adequate to demonstrate the acceptance criteria.
16. On page 8, delete test entry and acceptance criteria 1.11.
- REASON: This testing is deleted in the refocused Phase III test program.
17. On Page 8, test entry 1.12, revise the first sentence
- FROM: Place the 30 B&W 15 X 15 bowed rods into the side transfer system.
- TO: Place five 3/8" bowed rods into the side transfer system with 29 straight rods.
- REASON: B&W 15 X 15 testing is deleted in the refocused Phase III test program. Five bowed rods is adequate to demonstrate the acceptance criteria.
18. On page 8, delete test entry and acceptance criteria 1.13.
- REASON: This testing is deleted in the refocused Phase III test program.
19. On page 9, revise test entry to delete the note related to B&W 15 X 15 fuel assemblies.

Also, revise the test entries first sentence

- FROM: Process, using single mode, two B&W 15 X 15 fuel assemblies from Rod extraction thru canister loading.
- TO: Process, using single mode, 63 straight and 5 bowed 3/8" rods from Rod extraction thru canister loading.
- REASON: B&W 15 X 15 testing is deleted in the refocused Phase III test program. The 63 straight and 5 bowed rods are adequate to demonstrate the acceptance criteria.

ER#2 9711

TAC NO: 9315-TAC-207, REV.2

Page 8 of 8

CHANGE NOTICE NO: 002

TAC CHANGE NOTICE (Cont'd)

20. On page 9, delete test entry, acceptance criteria, and basis (as applicable) for items 1.15, 1.15.1., 1.15.2, 1.15.3, and 1.16.

REASON: This testing is deleted in the refocused Phase III test program.

Department of Energy

Idaho Field Office
785 DOE Place
Idaho Falls, Idaho 83401-1562

August 4, 1992

Gibson
Sub 4.1 - Original
Chm
D/C
Pgh DOE ID
SOT-503 N&G h

Tracking Log
F.6.6.6.6.6
Record for
SOT.

Mr. Peter V. Judd
NUS Project
c/o Contraves-USA
620 Epsilon Drive
Pittsburgh, PA 15238

SUBJECT: Review of Halliburton NUS (HNUS) System Operational Test (SOT)
Test Acceptance Criteria (TAC) Change Notice for the Rod Side
Transfer, Compaction, Loading, and Consolidation Table System

REFERENCE: Halliburton NUS transmittal to DOE-ID, ED-DOE-PVJ-92-2408, TAC
Change Notice 001 and 002, 9315-TAC-207, Rev.2, July 22, 1992

Dear Mr. Judd:

DOE-ID has reviewed the TAC Change Notices (TCNs) under the REVIEW/APPROVAL provision for the contract and finds them acceptable. The TCNs are approved for implementation.

If you have any questions, please contact me on (208) 526-6668 or
D. C. Koelsch, of my staff, on (208) 526-5930.

Sincerely,

Walter J. Mings, Acting Chief
Civilian Rad-Waste Branch

cc: J. H. Clark, EG&G

910 CLOPPER ROAD • P.O. BOX 6032 • GAITHERSBURG, MARYLAND 20877-0962 • (301) 258-6000

ED-DOE-PVJ-92-2408
July 22, 1992

Mr. W.J. Mings, Chief
Civilian Rad-Waste Branch
U. S. Department of Energy
Idaho Field Office - MS 1136
785 DOE Place
Idaho Falls, ID 83401-1562

Subject: Contract DE-AC07-86ID12651 - Rod Consolidation Project
Systems Operational Test--Rod Side Transfer,
Compaction, Loading, and Consolidation Table Test
Acceptance Criteria Change Notice (TCN) - Approval

Reference: 1. 9315-TAC-207 Rev 2, - Rod Side Transfer, Compaction,
Loading, and Consolidation Table

Dear Mr. Mings:

Attached are TCNs 002 and 003 to reference 1 for your approval.

If you have any questions, please call the undersigned on
(412) 967-7304.

Very truly yours,

Peter V. Judd
Project Manager

ht

Attachments:

TCN 002

TCN 003

cc: D.C. Koelsch - DOE-ID
J.H. Clark - EG&G

ccc OCE - walt

Subj 4.1 - walt

Chron. walt

For Judd Chron. walt

DOE Chron. walt

SO7 Book - walt

TCN Tracking Log - walt

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 6/22/92

LOG RL # 3

PROCEDURE NO. 9315 TP 207

REV. 1

TITLE Red Compensation

PROCEDURE SECTION(S) 8.4.2.7 pages 159 & 160 ^{7/21/92}

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# 15 ^{7/21/92}

PROBLEM AND CAUSE: Red Pusher Travel Time exceeded acceptance criteria (322 seconds as opposed to 100 second criteria)

TEST CONDUCTOR 213 Forest

SOLUTION/CORRECTIVE ACTION:

TPCN# 15 is issued, based upon TAC Change Notice 002, to revise the acceptance criteria to 325 seconds.

TEST CONDUCTOR Virgil M. Chapman

DATE 7/21/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

TEST CONDUCTOR Virgil M. Chapman

DATE 7/21/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 6/22/92

LOG RL #4

PROCEDURE NO. 9315 TP-207

REV. 1

TITLE Red Compensation

PROCEDURE SECTION(S) 5.4.4

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE: Over height fault occurred but not indicated in Control Room.

TEST CONDUCTOR

SAFARI

SOLUTION/CORRECTIVE ACTION:

None required. Reverify operation in "HAND" Mode that control system indicated overheight fault.

TEST CONDUCTOR

[Signature]

DATE 09-21-92

QUALITY ASSURANCE

DATE _____ (1)

PROJECT ENGINEER

DATE _____ (1)

TEST DIRECTOR

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE Reverify operation in "HAND" Mode that Control System properly indicate overheight fault.

TEST CONDUCTOR

[Signature]

DATE 09-21-92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 6/23/92

LOG RL # 5

PROCEDURE NO. 9315-TP-207 REV. 1

TITLE Rod Compaction

PROCEDURE SECTION(S) 8.4.5.2 p. 165

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE: Expected results for 8.4.5.2 interlock test were different due to a software change which allows the crane carriage to travel north while the scale transfer is in the south extended position

TEST CONDUCTOR EB Forest

SOLUTION/CORRECTIVE ACTION: accept as is. Proper interlock results have been marked in record copy and verified.

TEST CONDUCTOR EB Forest

DATE 6/23/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

TEST CONDUCTOR EB Forest

DATE 6/23/92

REFERENCE TPCN # 25 17m
10/25/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 6/23/92

LOG RL #6

PROCEDURE NO. 9315-TP-207 REV. 1

TITLE Red Compaction

PROCEDURE SECTION(S) 8.4.5.3

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# 16^{unc} 7/11/92

PROBLEM AND CAUSE:

*Expected result for interlock test VIII
was not achieved*

TEST CONDUCTOR

EB Forest

SOLUTION/CORRECTIVE ACTION:

*Expected result should be yes (carriage moves north)
(Side Transfer North, fuel present, valve closed, gate closed)*

TEST CONDUCTOR EB Forest

DATE 6/23/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

TPCN 16 and TACCN 002 correct documentation.

TEST CONDUCTOR Wingfield Chap

DATE 7/12/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 6/25/92

LOG RL # 7

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE _____

PROCEDURE SECTION(S) 8.4.5.4

CLASSIFICATION OF CHANGE: REPAIR _____

REDESIGN _____

TPCN#

79 ^{me 7/20/92}

PROBLEM AND CAUSE:

Interlock table need to be revised to consider additional conditions and tests. Expected result for test "i" was not achieved

TEST CONDUCTOR

EB Forest

SOLUTION/CORRECTIVE ACTION:

Page 16 ~~7~~ A added to list new conditions and tests

TEST CONDUCTOR

EB Forest

DATE

6/25/92

QUALITY ASSURANCE

DATE

(1)

PROJECT ENGINEER

DATE

(1)

TEST DIRECTOR

DATE

(1)

Notes: (1) Required for redesign

CORRECTIVE ACTION:

COMPLETE

Page Added (167 A) with revised Software DCN #083

TEST CONDUCTOR

EB Forest

DATE

6/25/92

implemented

SEE TPCN #9

ggg
10/21/92

ggg
7/14/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 7-14-92

LOG # 8

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE

PROCEDURE SECTION(S) 8.4.5.7, 8.4.5.8, 8.4.5.9

CLASSIFICATION OF CHANGE: REPAIR ☒

REDESIGN ☐

TPCN# 107121^{UAC}kr

PROBLEM AND CAUSE:

- * Setpoints for OPEN and CLOSE on drive M109C, gate, must be programmed.
- * Lower and Raise indicators on Rod Loading screen need adjustment; both come on at the same time.
- * OPEN and CLOSE setpoints on drive M110 must be programmed. This only refers to screen indicators; actual position setpoints are O.K.

TEST CONDUCTOR

K. GUNNARSON

SOLUTION/CORRECTIVE ACTION:

make necessary fixes as defined above

TEST CONDUCTOR

Frank M. Mally

DATE

7/14/92

QUALITY ASSURANCE

DATE

(1)

PROJECT ENGINEER

DATE

(1)

TEST DIRECTOR

DATE

(1)

Notes: (1) Required for redesign

CORRECTIVE ACTION:

COMPLETE

DCN-38 issued and fixes made

TEST CONDUCTOR

Frank M. Mally

DATE

9/17/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 7/17/92 LOG #9

PROCEDURE NO. 207 REV. 1 TITLE _____

PROCEDURE SECTION(S) 8.4.3 steps 1 thru 5

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE:

Rod counter was not consistent in counting the number of rods transferred during compaction system. Problem was being caused by the speed at which the rods were passed over the counter.

TEST CONDUCTOR Frank M Mallo

SOLUTION/CORRECTIVE ACTION:

Slow the speed of the side transfer to 25% of full speed over its last 1/3 of travel.

TEST CONDUCTOR	<u>Frank M Mallo</u>	DATE	<u>7/17/92</u>
QUALITY ASSURANCE	<u>D. Williams</u>	DATE	<u>7/17/92</u> (1)
PROJECT ENGINEER	<u>Frank M Mallo</u>	DATE	<u>7/17/92</u> (1)
TEST DIRECTOR	<u>Peter J. Jell</u>	DATE	<u>7/17/92</u> (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE section 8.4.3 has been completed.

TEST CONDUCTOR David M. Chap DATE 7/21/92

DCN #033
implemented
permanently
8/4/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 7/20/92

LOG # 10

PROCEDURE NO. 9315-TP-207 REV. 1

TITLE SYSTEM OPERATIONAL TEST PROCEDURE FOR THE SIDE TRANSFER, COMPACTION, LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.4.6 and TPCN 9's 10

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN ☐ TPCN#

PROBLEM AND CAUSE:

During revised testing of Section 8.4.6 as per TPCN ¹⁰⁻¹¹⁻⁹² ~~9's 10~~ ^{7/21/92}, observed that 21 rods, not 22 were loaded to the slip sheet. The gate is not correctly positioned, or the carriage is not correctly positioned to load the setpoint number of rods. Visually, the gate is centered over the 22nd rod. Shimming the gate North could resolve this problem.

TEST CONDUCTOR

David M. Chapman 7/20/92

SOLUTION/CORRECTIVE ACTION:

Shims added to gate

TEST CONDUCTOR Frank M. Bello

DATE 7/22/92

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR

DATE (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE testing of sections 8.4.6 & 8.4.7 verify proper

TEST CONDUCTOR Frank M. Bello

DATE 7/22/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 7/20/92

LOG # 11

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE

SYSTEM OPERATIONAL TEST PROCEDURE
FOR THE SIDE TRANSFER, COMPACTION,
LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.4.6 and TPCN 9310

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE:

During revised testing of Section 8.4.6 as per TPCN 9310^{11/12, 11/14/92}, observed that rod count was lost. 20 rods were counted when 22 should have been counted. See also RL #10 which observed 21, not 22 rods loaded. Lowering carriage speed may resolve this problem.

TEST CONDUCTOR

W. M. Chapin 7/20/92

SOLUTION/CORRECTIVE ACTION:

Reduce rate speed by 50%/make adjustments to counter

TEST CONDUCTOR

J. M. Hall

DATE

7/22/92

QUALITY ASSURANCE

DATE

(1)

PROJECT ENGINEER

DATE

(1)

TEST DIRECTOR

DATE

(1)

Notes: (1) Required for redesign

CORRECTIVE ACTION:

COMPLETE

Speed reduced and counter adjusted
Testing per 8.4.6 & 8.4.7 verify proper fix

TEST CONDUCTOR

J. M. Hall

DATE

7/22/92

DCU-033
implemented
permanently
8/5/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 7/20/92

LOG # 12

PROCEDURE NO. 9315-TP-207 REV. 1

TITLE SYSTEM OPERATIONAL TEST PROCEDURE FOR THE SIDE TRANSFER, COMPACTION, LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.4.6 and TPCN #10

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE:

During revised testing as per Section 8.4.6 and TPCN #10, ^{11.52-7/11/92} observed that, after compaction, rods were not fully compacted. An estimated 1/4" of free space was observed between the "compacted" rods and the gate. However, during rod loading to slipsheet, some of this gap was apparently taken up. See also RL #10.

TEST CONDUCTOR

David McChap 7/20/92

SOLUTION/CORRECTIVE ACTION:

No action taken. Shimming of Make reduced gap and performance of test section 8.4.6 & 8.4.7 verify proper and repeatable operations.

TEST CONDUCTOR Frank M. Bullo

DATE 7/22/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE Home offset was change to compact Rod

TEST CONDUCTOR Frank M. Bullo

DATE 7/22/92

DCN-033
implemented
fix
Lys
8/14/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 7/20/92

LOG # 13

PROCEDURE NO. 9315-TP-207 REV. 1

TITLE SYSTEM OPERATIONAL TEST PROCEDURE FOR DIE SIDE TRANSFER, COMPACTING, LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.4.6 and TPCW 9.10

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE:

During revised testing of Section 8.4.6 as per TPCW ^{11.12, rev 7/21/92} 9.10, observed that, when the gate closed after loading rods, the remaining compacted rods were bunched up. The rods remained in sequence using 3/8" rods. This may be resolvable by limiting gate closure to the value required to restrain rods.

TEST CONDUCTOR

Wingfield, 7/20/92

SOLUTION/CORRECTIVE ACTION:

an additional hold down was added to rake assembly
DCN is in process. Testing of section 8.4.6 & 8.4.7 verify proper function of system

TEST CONDUCTOR Frank M. Bullo

DATE 7/22/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE 9315-DCN-1194 issued and work completed. Final
retest per EKL #20 789 10/21/92

TEST CONDUCTOR Frank M. Bullo

DATE 7/22/92

(1) FIELD CHANGE REQUEST NO. _____

DESIGN CHANGE NOTICE NO. 9315-DCN-1194(2) PROJECT DOE Rod Consolidation Project(3) DOCUMENT 9315-M-2312 Rev 0 Sht. 1

Drawing	Rev.	Sheet	Specification	Rev.	Other	Rev.
---------	------	-------	---------------	------	-------	------

(4) CHANGE DESCRIPTION

Fabricate and install rod hold-down to rake per this DCN.
^{plate}

MATERIAL LIST

Item	Description	Req'd	Mat'l
1	Angle, 4.00 x 4.00 x .38 THK x 2.88 W	1	AL
2	Angle, 4.00 x 4.00 x .38 THK x 2.88 W	1	AL
3	Flatbar, 2.50 W x .25 THK x 6.88 LG	1	SST 304
4	Soc. Hd Cap Screw, 3/8-16 UNC 2A x 1.38 LG	4	SST Comm. 1B-B
5	Flat washers 3/8 Ø	8	SST Comm. 1B-B
6	Lock washers 3/8 Ø	4	SST Comm. 1B-B
7	Slotted Flat Countersunk Machine screws 1/4-20 UNC 2A x 1.00 LG	2	SST Comm. 1B-B
8	Flat washers 1/4 Ø	2	SST Comm. 1B-B
9	Lock washers 1/4 Ø	2	SST Comm. 1B-B
10	Hex nuts 1/4-20 UNC 2B	2	SST Comm. 1B-B
11	Hex nuts 3/8-16 UNC 2B	4	SST Comm. 1B-B

(5) JUSTIFICATION

Rod hold-down plate is required to keep rods from climbing up on top of one another (Does not affect design function).

(6) SUBMITTED: _____

(7) APPROVALS:

MD. J. Hayes 7-24-92
 Originator
Frank M. Mulla 7/27/92
 Discipline Manager
Robert J. Juel 7/27/92
 Quality Assurance
 Prof. Eng. Reg. No. Date

Frank M. Mulla 7/27/92
 Project
 Client
 Other
 Other

CLIENT:	FILE NO.: DCN - 1194	BY:	PAGE 2 OF 3
SUBJECT:		CHECKED BY:	DATE: 7-24-92

TEST PROCEDURE 9315-TP-207

REVISION 1

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EXCEPTION/REPAIR LOG

DATE 7/20/92

LOG # 141

PROCEDURE NO. 9315-TP-207 REV. 1

TITLE SYSTEM OPERATIONAL TEST PROCEDURE FOR THESIDE TRANSFER, COMPACTION, LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.4.6 and TPCN 9.1.10

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE:

During revised testing of Section 8.4.6 as per TPCN 9.1.10, it was observed that the rake and the hopper were not fully parallel. There is approximately 1/16" difference between the W/S distances at the East & West ends. However, this had no observed impact on processing operations. This may be acceptable as is.

TEST CONDUCTOR

David M. Chapman 7/10/92

SOLUTION/CORRECTIVE ACTION:

None. Resending of section 8.4.6 & 8.4.7
verify no impact effects

TEST CONDUCTOR Frank M. Bello

DATE 7/22/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

TEST CONDUCTOR Frank M. Bello

DATE 7/22/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 7/20/92

LOG 15

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE SYSTEM OPERATIONAL TEST PROCEDURE FOR THE SIDE TRANSFER, COMPACTION, LOADING AND CONSOLIDATION TEST

PROCEDURE SECTION(S) 2.3

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN ☐ TPCN#

PROBLEM AND CAUSE:

Reference TPCN 5

QA/QC Data Package Review has not been completed. This does not affect testing. Therefore testing will proceed.

TEST CONDUCTOR

Virgil M. Chapman 7/20/92

SOLUTION/CORRECTIVE ACTION:

Verify completion of DATA pack IST

TEST CONDUCTOR Frank M. Gallo

DATE 7/20/92

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR

DATE (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE Data package review was completed and all open items closed. CTRL # 223 closed 8/12/92

TEST CONDUCTOR Frank M. Gallo

DATE 10/21/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 7/21/92

LOG 16

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE SYSTEM OPERATIONAL TEST PROCEDURE FOR THIS SIDE TRANSFER, COMPACTOR, LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.4.8

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN ☐ TPCN#

PROBLEM AND CAUSE:

proper cameras were called up but were not displayed on monitors, Switcher is not functioning

TEST CONDUCTOR

Frank M. Sallo

SOLUTION/CORRECTIVE ACTION:

Consult with Diamond Electronics and have representative come in to implement fix

TEST CONDUCTOR

Frank M. Sallo

DATE

7/21/92

QUALITY ASSURANCE

DATE

(1)

PROJECT ENGINEER

DATE

(1)

TEST DIRECTOR

DATE

(1)

Notes: (1) Required for redesign

CORRECTIVE ACTION:

COMPLETE

Switches repaired and functioning. Test Section 8.4.8 to be completed 7/23/92

TEST CONDUCTOR

F. M. Sallo

DATE

7/23/92

TEST PROCEDURE 9315-TP-207

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EXCEPTION/REPAIR LOG

DATE 7/21/92

LOG 17

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE SYSTEM OPERATIONAL TEST PROCEDURE FOR THE SIDE TRANSFER, COMPACTING, LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.4.6

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN ☐ TPCN#

PROBLEM AND CAUSE:

Rod count was inconsistent not counting proper number of rods.

TEST CONDUCTOR

F. M. Gallo

SOLUTION/CORRECTIVE ACTION:

Slow down speed of rake carriage drive. Will not affect throughput since fuel assembly preparation system controls the process time.

TEST CONDUCTOR F. M. Gallo

DATE 7/21/92

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR

DATE (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

*speed reduced 50%
position and minor adjustments made
to position of counter. Retest of section 8.4.6 and
8.4.7. verify proper operation*

TEST CONDUCTOR F. M. Gallo

DATE 7/22/92

*TCN-033
implemented
fix
8/8/92
9/4/92*

TEST PROCEDURE 9315-TP-207

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EXCEPTION/REPAIR LOG

#18

DATE 7/23/92

LOG

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE

SYSTEM OPERATIONAL TEST PROCEDURE
FOR THE SIDE TRANSFER, COMPACTION,
LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.5.11

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN ☐ TPCN#

PROBLEM AND CAUSE: RAKE frame interfered with gate knife when
gate was in open position.

TEST CONDUCTOR

F. B. Mallo

SOLUTION/CORRECTIVE ACTION: Change the up position on the gate from
196 counts to 188 counts in register 47113

NOTE: Temporary fix implemented for testing sections 8.5.11, 8.5.13 & 8.5.15. eliminating
the problem

TEST CONDUCTOR F. B. Mallo

DATE 7/23/92

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR

DATE (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

DCN #38 issued and fix retested
per ERL #20

TEST CONDUCTOR Frank B. Mallo

DATE 9/17/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG
OBSERVATION

DATE 7/23/92

LOG # 19

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE

SYSTEM OPERATIONAL TEST PROCEDURE
FOR THE SIDE TRANSFER, COMPACTION
LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.5.15

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE: Rods were pushed in the gripper too far to be released when executing the regrip function. This is caused by the design of the fingers

TEST CONDUCTOR

F. B. Mallo

SOLUTION/CORRECTIVE ACTION: For 2ND generation design, redesign the fingers to eliminate this problem. For the cold test facility temporarily place ~ 3/8" dia rods in fingers to restrict the depth of insertion of the rods

TEST CONDUCTOR F. B. Mallo

DATE 7/23/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE None Required

TEST CONDUCTOR F. B. Mallo

DATE 7/23/92

3 of 7

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

**EXCEPTION/REPAIR LOG
OBSERVATION**

DATE 7/23/92

LOG 20

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE SYSTEM OPERATIONAL TEST PROCEDURE FOR THE SIDE TRANSFER, COMPACTION, LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.5.13 & 8.5.15

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE: During two of the ~~8~~ ~ 8 test sequence performed during 7/20/92 to 7/22/92 a broiled rod was placed out of position during hopper loading sequence. This caused interference with the slip sheet return move causing a fault. It is to be noted that this problem was random and occurred much less frequent than it occurred. the number of times.

TEST CONDUCTOR F. J. Hall

SOLUTION/CORRECTIVE ACTION: a possible solution would be to Reduce the thickness of the bottom plate of the slip sheet by ~~1/8 to 3/16~~ 1/8 to 1/4 inches and ~~bevel~~ the leading edge on the bottom surface of the bottom slip sheet plate. In addition weld the table rail in the area where the rods are deposited into the table.

TEST CONDUCTOR Frank J. Hall

DATE 7/23/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE Time Required but fix made (Reference PL 22)
Repeat test sections 8.5.13 and 8.5.15

TEST CONDUCTOR F. J. Hall

DATE 7/23/92

Retesting per attached sheets completed. Problem encountered with rod counter and rods riding under the rake. The rod counter will need to be evaluated to determine problem. The problem with the rods riding under the rake can be fixed by adding an extension on the table rail. Both problems added to punch list. No additional testing needed.
F. J. Hall 9/18/92

(2) PROJECT DOE FUEL ROD CONSOLIDATION PROJECT

(3) DOCUMENT 9315-M-2410 REV. 0 SHT. 1

(4) CHANGE DESCRIPTION

- 1) Reduce thickness of Slip Sheet from .375 to .200 ^{+ .010} _{-.025} as shown on attached Sheet
- 2) Change lead edge of slip sheet as shown on attached sheet.

(5) JUSTIFICATION *Reduction in thickness is required to improve handling of bowed rods during hopper loading operations based on SOT TEST results*

(6) SUBMITTED: _____

(7) APPROVALS:

<u>P. H. Bullo</u>	<u>7/27/92</u>
<u>P. H. Bullo</u>	<u>7/27/92</u>
<u>P. V. Juhl</u>	<u>7/27/92</u>

<u>P. V. Juhl</u>	<u>7/27/92</u>
Project	_____
Client	_____
Other	_____
Other	_____

Prof. Eng. _____ Reg. No. _____ Date _____

NEW

DETAIL A

$.200 \pm .010$
 $.200 \pm .025$

EE DETAIL A

$8.87 \pm .03$

8-32 UNC-2B x .50 DEEP
16 PLACES
(MARKED 'B')

3/8-16 UNC-2B THRU
3 PLACES
(MARKED 'A')

1/2-13 UNC-2B THRU
2 PLACES (MARKED 'C')

TOLERANCES-UNLESS OTHERWISE SPECIFIED

	UNDER 6"	6" TO 18"	OVER 18"
.X	±.1	±.2	±.3
.XX	±.03	±.05	±.07

8.5.13 Side Transfer, Compaction and Loading Operational Tests (~~B&W 15 x 15~~ bowed rods)

TRCN #1
\$98
8/6/92

This test is to be performed in the SINGLE mode using the ~~B&W 15 x 15~~ mockup bowed rods. 3/8 INCH RODS.

WARNING

Stay clear of all moving equipment while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

TAKE PHOTOGRAPH AND RECORD INFORMATION IN LOG

1. Inspect and record the condition of the ⁵~~30~~ B&W 15 x 15 mockup, bowed rods below. Also record the maximum bow found.

Max bow 1.5" inches

TRCN #19
TRCN #1
\$98
8/6/92

Observations

Rods are scratched and marked. Rust ~~scale~~ scale was on all rods. Scratches and marks were not very deep ~ .001 - .005" at most

Test Conductor Frank M. Galt Date 9/17/92

2. Drive the side transfer, compaction and loading systems to the HOME position.
3. Set the control system to the SINGLE mode if not already performed.
4. Place ^{29 STRAIGHT AND 5}~~30~~ bowed rods on the side transfer mechanism, randomly changing the bow direction.
5. Press "GO" to initiate processing in the SINGLE Mode.

TRCN #19
\$98
8/6/92

6. Verify the rods placed on the side transfer system can be observed from underneath by CCTV. Fill out CCTV Assessment Form in Appendix E.

Acceptance Criteria

- Rods can be viewed via CCTV underneath rod extraction system to verify no rods are being gripped by pull heads.

Test Conductor N/A Date _____

QA _____ Date _____

7. Continue processing until ²² rods have been deposited in the hopper. Verify the side transfer, compaction and loading process was performed in sequence.

Acceptance Criteria

- Side transfer, compaction and loading operations are performed in their proper sequence as defined in Section 8.5.6.
- Rods are positioned in hopper in a triangular pattern arrangement.

Test Conductor Frank M. Mallo Date 9/17/92

QA Peter V. Juhl Date 9/17/92

8. Verify the registers in the control system PLC accounted for all rods passed over counters.

Acceptance Criteria

- Rod counter accounted for all rods transferred into compaction and loading systems.

Test Conductor Frank M. Mallo Date 9/17/92

QA Peter V. Juhl Date 9/17/92

Completed in
previous test
not performed
in this test
J. H. Mallo
9/17/92

Test # 21
199
8/16/92

9. Turn system "OFF" if not done so already and remove all rods from hopper.
10. Inspect condition of rods after processing and compare to initial condition as recorded in Step 1. Record observations below.

Observations

No change observed

Test Conductor Frank M. Hall Date 9/17/92

11. The above steps have been completed.

Test Conductor Frank M. Hall Date 9/17/92

8.5.14 Off-Normal Extraction System Verification Test

This test is to be performed with 2 B&W 15x15 Type 1 mock-up fuel assemblies after the upper end fitting has been removed. If the mock-up fuels are not available, a suitable fixture to hold 30 fuel rods will have to be utilized.

WARNING

Stay clear of all moving equipment while in operation.

NOTE

The operator must press "CONTINUE" to perform the next consecutive operation.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Set up the clamping table and extraction system for processing B&W 15x15 fuel.
2. Place 2 B&W 15x15 Type 1 (1 Type 1 Class 1, 1 Type 1 Class 2) mockup fuels on the clamping table using the FAHF or B&W horizontal lift fixture.

*TPW #1
8/29
8/16/92*

3. Remove one fuel rod from any position in the top row of the Type 1 Class 2 mock-up and replace with one Type 1 Class 2 broken rod.
4. Visually inspect the condition of the fuel rods in the top rows of both assemblies without removing them. Record observations below.

Observations

Test Conductor _____ Date _____

5. Place the clamping table and extraction system in the SINGLE mode and initiate processing by pressing "GO".
6. Verify the broken rod was visually detected at the "HOLD POINT" during the first 6 inches of the extraction process.

Acceptance Criteria

- Broken rod was detected at "HOLD POINT".

Test Conductor _____ Date _____

QA _____ Date _____

7. Open pull head grippers up to release rods, then temporarily shut system down.
8. Manually slide the broken rod out of the pull head gripper then slide the rod back into the fuel assembly.

Acceptance Criteria

- Broken rod could be manually slide back into the assembly.

Test Conductor _____ Date _____

QA _____ Date _____

TPEN 11
878 8/10/92

9. Continue the extraction process by pulling the remaining rods completely out of the assembly and onto the side transfer system. Stop extraction process after the first row has been pulled.
10. Shut system down and remove the rods. Inspect the rods for damage and record observations below.

Observations

Test Conductor _____ Date _____

11. Remove both mock-up fuel assemblies from the clamping table and place on the reassembly tables using the B&W horizontal lift fixture.
12. Replace the Type 1 Class 1 rods extracted back into the Type 1 Class 1 mock-up assembly.
13. The Type 1 Class 2 mock-up assembly will require 15 bowed rods to be installed in a random pattern for the next test. Remove the broken rod and 10 rods from the other two outer rows that are accessible (5 rods per side).
14. Place 10 bowed rods in each empty space on the 2 vertical rows and 5 bowed rods in the top row. Fill the remaining empty spaces on the top row with Type 1 Class 2 rods pulled in step 9.
15. The above steps have been completed.

Test Conductor _____ Date _____

TPCW #1
F99 8/16/92

8.5.15 Process Operational Verification Test

TPCN #1
fig 4
3/6/92

This test is to be performed with the 2 B&W Type 1 mock-up fuels set up in steps 12-14 of the previous section (8.5.14). If the 2 mock-up fuels can not be utilized, a suitable test fixture will have to be used which will simulate the B&W 15x15 array.

This test will demonstrate the consolidation process from the extraction through the fuel canister loading steps in the SINGLE mode.

WARNING

Stay clear of all moving equipment while in operation.

NOTE

The operator must press "CONTINUE" to perform the next consecutive operation.

TPCN #1
and
TPCN #23
fig 8
3/6/92

*****TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG*****

1. Place the 2 B&W 15x15 Type 1 mock-up fuel assemblies on the clamping table using the B&W horizontal lift fixture. *Manually place 33 Straight and 5 bowed rods (randomly mixed) so that 34 rods are on extraction system and 34 rods on the test fixture on the clamping table*
2. Place the control system in the SINGLE mode and initiate side transfer processing by pressing "GO". *Auto*
- 2A. *INITIATE ROD Extraction operations when side transfer system is safe*
3. Verify by CCTV both rows of rods extracted were released by the grippers prior to side transfer. Fill out a CCTV Assessment form in Appendix E.

TPCN #23
fig 9
3/6/92

Acceptance Criteria

- Rods can be viewed via CCTV underneath rod extraction system to verify all rods released from grippers.

Test Conductor N/A Date _____
QA _____ Date _____

Done in previous test
Not to be
redone here
F. H. Hall

4. Continue processing and verify the side transfer, compaction and hopper loading operations were performed in sequence.

Acceptance Criteria

- Side transfer, compaction and hopper loading operations are performed in their proper sequence as defined in Section 8.5.6.

Test Conductor J. H. Mello Date 9/17/92

QA Peter J. Juhl Date 9/17/92

TRCN #23
Fig 8/6/92
JG

5. ~~Repeat steps 3 and 4 an additional 14 times for the remaining rows of rods.~~

Acceptance Criteria

- Rods can be viewed via CCTV underneath rod extraction system to verify all rods released from grippers.
- Side transfer, compaction and hopper loading operations are performed in their proper sequence as defined in Section 8.5.6.

Test Conductor J. H. Mello Date 9/17/92

QA Peter J. Juhl Date 9/17/92

6. Verify all rods were positioned correctly in the hopper and that the registers in the control system PLC acknowledged all rods loaded in hopper.

Acceptance Criteria

problem with rod
meter. Would not
write proper count
J. H. Mello
9/17/92

- Rods counter accounted for all rods into compaction and loading systems.
- Rods are positioned into hopper in a triangular pattern array.

Test Conductor Frank Mello Date 9/17/92

QA Peter J. Juhl Date 9/17/92

Problem with positioning rods in
hopper. Rods were not supported
on table rails and could bunch
up on east end. This caused
the rod counter to be off and
the rods to be loaded into the
hopper improperly.
J. H. Mello
9/17/92

7. Complete process by loading rods into square fuel canister.

Acceptance Criteria

- Rod pusher pushes rods into fuel canister to a depth of $4.0 \pm .125$ inches and returns to full extend position.

Test Conductor N/A Date _____

QA _____ Date _____

8. Remove rods from fuel canister and record the general condition after processing. ~~Separate the rods into Type 1 Class 1, Type 1 Class 2 and Type 1 Class 2 bowed rods.~~

Observations

Rods were marked & scratch log. There was no noticeable change in the rods from their condition when test was initiated.

Test Conductor F. M. Galle Date 9/17/92

- ~~9. Remove the mock-up skeletons from the clamping table and place on the reassembly table using the B&W horizontal lift fixture. Rebuild both mock up assemblies per the procedure in the Mock-up Reassembly Procedures Manual. Do not use the bowed rods when rebuilding the Type 1 Class 2 mock-up.~~

10. The above steps have been completed.

Test Conductor F. M. Galle Date 9/17/92

Was performed
using original
testing not performed
as part of this
retest
J. G. Galle
9/17/92

TPCN #24
J. G.
8/6/92

TPCN #1
J. G.
8/6/92

ADDITIONS TO PUNCH LIST

ITEM NO. _____ WBS NO. 1323 DATE 9/18/92 SOURCE 9315-TP-207

SYSTEM Rod Compaction RESPONSIBLE ENGINEER F. GALLO

CATEGORY I-P I-S (I-M) I-O I-M II

DESCRIPTION

Rods will ride under table ^{on east end of table} causing the compaction of the rods to be off. This in turn cause the rod counter to miss count and the loading sequence to be off by one rod on the east end. Add an extension to table top rail.

STATUS

ADDITIONS TO PUNCH LIST

ITEM NO. _____ WBS NO. 1323 DATE 9/18/92 SOURCE 9315-TP-207

SYSTEM Rod Compaction RESPONSIBLE ENGINEER G Cole

CATEGORY I-P I-S (I-M) I-O I-M II

DESCRIPTION

Rod counter not counting the proper number of rods. could be caused by problem identified above. This needs to be checked out.

STATUS

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 7/23/92

LOG 21

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE SYSTEM OPERATIONAL TEST PROCEDURE FOR THE SLOPE TRANSFER, COMPACTION, LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) 8.5.15

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN ☐ TPCN#

PROBLEM AND CAUSE:

grippers were faulting due to 'over time' in travel.

TEST CONDUCTOR

F. H. Hall

SOLUTION/CORRECTIVE ACTION:

Increase the 'TIME out' of the grippers. This was temporarily done for this test and the problem was eliminated

NOTE This ERL is against the extraction system tested under 9315-TP-201

TEST CONDUCTOR Frank M. Hall

DATE 7/23/92

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR

DATE (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE *A copy of this ERL has been incorporated (revised) into 9315-TP-201*

TEST CONDUCTOR Frank M. Hall

DATE 7/23/92

Refer to ERL 9315-TP-201 (see attached Appendix 1) Two test problems encountered on 7/23/92. Both occurred on 7/23/92. Both were corrected by increasing the time out of the grippers. The problem was eliminated.

*F. H. Hall
9/18/92*

*DCU-038
implements fix
increase time out
to 60 sec
8/14/92*

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE 03

EXCEPTION/REPAIR LOG

DATE 8/4/92

LOG

22 8/4/92

PROCEDURE NO. 9315-TP-207

REV. 1

TITLE

SYSTEM OPERATIONAL TEST PROCEDURE
FOR THE SIDE TRANSFER, COMPACTION,
LOADING AND CONSOLIDATION TABLE

PROCEDURE SECTION(S) _____

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN _____ TPC# _____

PROBLEM AND CAUSE: The up position of hopper needs to be modified to coincide with the first made to the slip sheet

TEST CONDUCTOR

Frank M. Gales

SOLUTION/CORRECTIVE ACTION: Program in new set point and issue DCN.

TEST CONDUCTOR Frank M. Gales

DATE 8/4/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE DCN-46 implemented and retested per ERL #20

TEST CONDUCTOR Frank M. Gales

DATE 9/17/92

APPENDIX E
CCTV ASSESSMENT FORM

CCTV Assessment

1. Operation: (describe type of operation here)

Test Section 8 4.6 ~~evaluated~~ cameras are positioned to view down the length of the hopper from both the east and west direction. The purpose of this view is to provide the operator with a view to determine the number of rocks loaded into the slip sheet if the ^{last} count does not match the expected value.

2. Camera Assessment

Camera No.

Evaluation

(describe the view that the camera is capable of providing)

Both cameras provided extremely clear views of the rocks in the slip sheets. Both overviews and close ups can be obtained. As a result is very simple to count the number of $\frac{3}{8}$ " dia rocks loaded into the slip sheet. In addition the top surface of the hopper wall was blackened to greatly accentuate the view.

3. Recommendations: (Recommend cameras that provide the best view of the system)

Both cameras 3 and 4 provided excellent views. preference of which camera to use was dependent on the operator making the observation. The top rail of the hopper should be /left blackened and should be incorporated into the design. This significantly improved the view ~~which was~~

Test Conductor

Frank M. Bulles

Date

7/22/92

QA

A. MacLagan

Date

7/22/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE E-2

CCTV Assessment

1. Operation: (describe type of operation here)

Viewing rods after extraction operations with camera #8

2. Camera Assessment

Camera No.

Evaluation

(describe the view that the camera is capable of providing)

Viewing rods on the extraction system after dropped from the pull heads is impossible. The view is in approximately the same plane and hard/impossible to distinguish rods individual rods. However can verify no rods are being gripped by the pull heads

3. Recommendations: (Recommend cameras that provide the best view of the system)

view rod to verify number pulled prior to chopping from gripper. NOTE the system is setup this way.

Test Conductor

Frank Stachels

Date

7/22/92

QA

A. M. Kelly

Date

7/22/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE E-2

CCTV Assessment

1. Operation: (describe type of operation here)

Viewing rods after extraction operations to determine if rods remain in the grippers and how many rods completely extracted. The condition when viewed was all rods were on the table and the pull head extracted to their full retracted position.

2. Camera Assessment

Camera No. 8

Evaluation

(describe the view that the camera is capable of providing)

View is good for determining if any rods remained stuck in the grippers. However once the rods are dropped onto the table it is impossible to obtain a clear picture. Therefore determining if all rods were pulled is impossible once dropped.

3. Recommendations: (Recommend cameras that provide the best view of the system)

~~E~~ NONE

Test Conductor

Frank M. Gallo

Date

7/22/92

QA

R. Pulgarin

Date

2/22/92

TEST PROCEDURE 9315-TP-207

REVISION 1

PAGE E-2

CCTV Assessment

1. Operation: (describe type of operation here)

- 1) Verify Number of rods pulled 1 inch at the clamping table
- 2) Verify Number of rods extracted into the ^(consolidation) table top.
- 3) Verify Number of rods released from the grippers.

2. Camera Assessment

Camera No. 4, 7 & 8

Evaluation

(describe the view that the camera is capable of providing)

At the "Verify Pulling Operation" Cameras 4 & 7 are called up. Only #7 is useful - view was crisp and clear. I could easily see that the rods were gripped or not gripped.

At "Enter # rods remains" Cameras 4 & 7 are called, 4 is not useful neither is #7. I called Cam #8 - limit sw. is in the way of the north Pull head - glare and bad angle make it impossible to verify the south Pull head.

At "Verify Pulling Clear" cam's #4 & 7 are called - neither is useful. I switched to #8 but its view won't allow me to count the remaining rods especially on the south pull head.

3. Recommendations: (Recommend cameras that provide the best view of the system)

- 1) Cameras 4 and 7 are called up at each of the operator hold points for verifying No. of rods pulled and pull head cleared neither are useful. Camera #8 is marginal at best but provides the best chance of viewing. The camera call for these hold pts should be programmed to bring up Camera #8.
- 2) Relocate Camera #8 ~~and~~ ^{add} to the pull head frame either north or south and add an additional camera to the system which will be positioned in the other pull head frame.

Test Conductor Frank B. Gable

Date 2/22/92

QA

J. Mulgrew

Date 2/22/92

CCTV Assessment

1. Operation: (describe type of operation here)

Drive fault test using cameras 8449 to observe problem when control system detects fault

2. Camera Assessment

Camera No. 449

Evaluation
(describe the view that the camera is capable of providing)

Both camera's provide an excellent view of the complete compaction, extraction and loading systems. Both overviews and closeups can be obtained for all drives, sensors, and drive screws.

3. Recommendations: (Recommend cameras that provide the best view of the system)

None

Test Conductor

S. J. Bullock

Date

8/10/92

QA

H. M. M. M. M.

Date

8/10/92

APPENDIX F
TRAINING SIGN-OFF SHEET

NAME (Print)

Clinton R. Clagett
G. JEAN-PHILIPPE
T. MCGREW
E. FORREST
V. W. Chapman
K. Gunnarsson

SIGNATURE

Clinton R. Clagett
~~G. Jean-Philippe~~
T. McGrew
E. B. Forrest
Vigil M. Chapman
Kris Gunnarsson

APPENDIX I-4.8
WASTE COLLECTION SYSTEM
(WBS 1.3.1.6, 1.3.1.7)
TEST RESULTS AND ANALYSIS REPORT

1.0 INTRODUCTION

This appendix addresses the System Operational Testing (SOT) for the Waste Collection Systems (Ref. SOT Test Procedure 9315-TP-208 A and B). It provides a brief discussion of the original purpose of this test sequence and the status of the system. A record copy of the test procedure for this system is provided as Attachment 1 to this appendix for future reference.

2.0 TEST OBJECTIVES

The purpose of this SOT was to verify that the as-built condition of the Waste Collection Systems met or exceeded their associated performance requirements. The primary objectives of this testing were as follows:

- Verification of system part-program under operational conditions.
- Verification of system interfaces.
- Verification of system operations.

This test procedure provides for the qualification of the Waste Collection Systems for Integrated System Testing (IST).

3.0 TEST RESULTS

The test program for the Rod Consolidation System was refocused due to a lack of funding to complete all of the tests identified for the program. This refocusing of the test program eliminated all SOTs and ISTs not required to demonstrate the consolidation of the government-furnished W 17x17 mock-up fuel assemblies. Since the Waste Collection Systems are required to clean the process cell, and does not impact fuel processing, its SOT was eliminated from the restructured program. As a result, none of the Control System set points were established, and no operational verification tests were performed beyond those completed as part of the Factory Acceptance Test for the equipment.

ATTACHMENT 1
SYSTEM OPERATIONAL TEST PROCEDURE
FOR THE
WASTE COLLECTION SYSTEMS
(WBS 1.3.1.6 & WBS 1.3.1.7)
DOCUMENT NO. 9315-TP-208 A&B

HALLIBURTON NUS
Environmental Corporation

Y. Kent

TEST PROCEDURE

CLIENT: DOE-IDAHO SPECIFICATION NO: 9315-TP-208 A & B
LOCATION: COLD TEST FACILITY REVISION: 0

TITLE: SYSTEM OPERATIONAL TEST PROCEDURE FOR THE WASTE COLLECTION SYSTEMS

RELEASED FOR:

☐

REVIEW

☒

TEST

SYSTEM OPERATIONAL TEST PROCEDURE
FOR
THE WASTE COLLECTION SYSTEMS
(Fines, Crud and Portable Vacuum Systems)

WBS 1.3.1.6
WBS 1.3.1.7

APPROVED

Frank J. Miller
PROJECT MANAGER

DATE 11/15/91

APPROVED

W. J. Miller
QUALITY ASSURANCE

DATE 11/15/91

APPROVED

R. W. Miller
DISCIPLINE MANAGER

DATE 11/18/91

APPROVED

W. J. Miller
AUTHOR

DATE 11/18/91

REV	PREPARED	DATE	APPROVED	DATE	APPROVED	DATE	APPROVED	DATE	APPROVED	DATE

NUS CORPORATION

TEST PROCEDURE 9315-TP-208 A & B

REVISION 0

PAGE 1 of 11

REVISION CONTROL SHEET

Revised Page No.

Latest Revision

Date

Original

0

11/18/91

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1.0 OBJECTIVE OF TEST

The objective of this Test Procedure is to ensure that the Waste Collection System meets or exceeds the functional and performance requirements. Included in the test are the Fines Collection, Crud Collection and Portable Vacuum Systems.

2.0 PREREQUISITES

2.1 Camera, film, lighting and personnel are available to take photographs and or videos per the instruction of Appendix B and the detailed procedure steps (Section 8).

Test Conductor _____ Date _____

QA _____ Date _____

2.2 The QA/QC Data Package has been prepared in accordance with Specification 9315-M-200, and the applicable Bill of Material, and is acceptable.

Test Conductor _____ Date _____

QA _____ Date _____

2.3 The system has been assembled in accordance with all applicable Drawings, DCNs and FCRs, of the QA/QC Data package.

Test Conductor _____ Date _____

QA _____ Date _____

2.4 The Test Conductor has been qualified and certified in accordance with QAP 2.0.

Test Conductor _____ Date _____

QA _____ Date _____

- 2.5 All test personnel participating in this test have been trained per the instructions of Section 6.4 of Reference 11.8.

Test Conductor _____ Date _____

QA _____ Date _____

- 2.6 The checklist contained in the Control System SOT (9315-TP-601) applicable to this system must be completed and the results accepted prior to the initiation of testing under this procedure.

Test Conductor _____ Date _____

QA _____ Date _____

- 2.7 A limited access area with warning signs has been established around the equipment being tested.

Test Conductor _____ Date _____

QA _____ Date _____

- 2.8 The system FAT has been completed and accepted by HALLIBURTON NUS.

Test Conductor _____ Date _____

QA _____ Date _____

- 2.9 All equipment required to support this test as defined in Section 6.0 of this procedure is operational and calibrated as required.

Test Conductor _____ Date _____

QA _____ Date _____

- 2.10 A visual inspection of the system being tested has been performed to verify there are no obstructions and/or damage to the equipment that may impact testing.

Test Conductor _____ Date _____

QA _____ Date _____

- 2.11 The environmental conditions as defined in Section 4.0 are met.

Test Conductor _____ Date _____

QA _____ Date _____

3.0 INITIAL TEST CONDITIONS

- 3.1 The supply reservoir (Dwg. 9315-M-1607, Item 6) shall be filled approximately 3/4 up the sight glass with fresh water conforming to ANSI N45.2.1 para. 3.4 requirements.

Test Conductor _____ Date _____

- 3.2 The RM 10-A has been attached to the RBT and is fully operational.

Test Conductor _____ Date _____

4.0 ENVIRONMENTAL CONDITIONS

- 4.1 At least one HVAC unit for the control room and the air circulation system for the Test Cell should be operating and maintaining the test cell and control room temperatures in the ranges 60° to 90°F and 65° to 85°F respectively. The relative humidity in the control room shall be in the range of 45% to 85%.

5.0 SPECIAL PRECAUTIONS

- 5.1 All precautions, warnings and notes are addressed in the Detail Test Steps (Section 8.0), prior to the step to which they apply.

Test Conductor _____ Date _____

6.0 SPECIAL EQUIPMENT REQUIRED

- 6.1 5 gallon buckets, 3 required
- 6.2 Flowmeter, range 0-10 gpm
- 6.3 Measuring weigh scale, range 0-10 lbs.
- 6.4 100 Simulated fuel pellets
- 6.5 8 lbs. AC Fine Test Dust (ACFTD) available from AC Spark Plug Division of General Motors.
- 6.6 15 lbs. S.S. cutting chips
- 6.7 20 lbs. S.S. cutting fines
- 6.8 15 lbs. miscellaneous small bolts, nuts, tubing pieces and springs
- 6.9 Hopper basket transfer container (Dwg. 9315-M-9202) or equivalent container.
- 6.10 Bag filter transfer container (Dwg. 9315-M-9203) or equivalent container.

7.0 TEST DATA RECORDING

7.1 Test Data Records

The test conductor shall designate one copy of the test procedure and its attachments as the "Record Copy" and shall ensure that this copy is maintained current. All test data, significant events, and observations must be recorded in this document. Additional sheets may be used as necessary, but must be permanently affixed to this report by staples and/or tape.

7.2 Test Procedure Modification

This section addresses the process for making modifications to the approved Test Procedure. These modifications will fall into one of three categories, as follows:

- Corrections are modifications to the procedure due to typos or incorrect information.
- Minor Changes are modifications which do not affect functional intent or acceptance criteria of the test.
- Major Changes are changes that affect functional intent or acceptance criteria.

Each of these modifications will be handled differently. If a correction is required to the procedure, it will be made with pen and ink in the "Record Copy", as they are found. The test conductor will make the appropriate change. Once the change is made, he will initial and date the change for future reference. All modifications which are considered minor changes must be documented on "Temporary Procedure Change Notice" (TPCN) forms (refer to Appendix C). This change shall be approved by the test conductor by annotating that the test procedures are using the TPCN form. All modifications which are considered a major change must also be documented on the TPCN form. However, when a major change is required, testing shall be halted until the TPCN is approved by the responsible Test Engineer, Test Conductor, Quality Assurance and Project Engineer.

7.3 Repairs/Retesting

This section addresses the process for making necessary repairs to the equipment and retesting of the system. If during testing a problem is observed which requires repair or rework of the equipment, testing shall be halted. If the repair/rework is minor, the Test Conductor will document the problem, cause, and corrective action implemented, the faulty system will be retested. All remaining tests will continue on until conclusion. If the problem requires redesign of the faulty system, all testing of this equipment will be halted. The problem and recommended solution will be documented and submitted to the Test Review Group (TRG) for approval. Once approval and the repair is complete, testing of the equipment will be accomplished in accordance with this procedure.

8.0 DETAILED TEST STEPS

The Crud and Fines Collection Systems are designed for continuous duty during fuel consolidation operations. Both systems are an integral part of one another and are therefore designed to operate simultaneously. The systems are both activated and deactivated from the operators control panel by the M124A and M124B pump motors and the M124C Rotocloner motor.

8.1 Control/Mechanical Interface Verification Tests**8.1.1 Verify the pump flow sensor setpoints as follows:**

1. Install a test flowmeter downstream of the flow sensor (Dwg. 9315-M-9103, Item 11) and upstream from the branch connection.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

2. Activate motors M124A, B and C from the control panel.
3. Reduce flowrate by throttling ball valve (Dwg. 9315-M-9103, Item 5) located between pumps and reservoir until the low setpoint alarm in the control room has been activated. Record the flow rate at which the alarm was activated.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Flowrate _____ gpm

Acceptance Criteria

- The low setpoint alarm shall be activated at a flowrate of 8.5 gpm, +0.0, -0.5 gpm. (Low setpoint alarm notifies operator that one pump has failed.)

Test Conductor _____ Date _____

QA _____ Date _____

4. Repeat step 3 two additional times.

5. Reduce flowrate further by throttling ball valve until motors M124A, B and C automatically shutdown. Record the final flowrate before the motors were deactivated.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Flowrate _____ gpm

Acceptance Criteria

- The low-low setpoint shall deactivate motors M124A, B and C at a flowrate of 3.5 gpm, +0.0, -0.5 gpm. (Low-low setpoint deactivates motors to prevent pump damage at low fluid levels).

Test Conductor _____ Date _____

QA _____ Date _____

6. Repeat step 5 two additional times.

7. Open ball valve up completely to restore flow to system and reactivate motors M124A, B and C. Verify water flow to both upper and lower chip collection hoppers (Dwg 9315-M-1659) and air discharge from Rotoclone.

Test Conductor _____ Date _____

QA _____ Date _____

8.1.2 Verify overflow level switch is operational as follows:

1. Close the overflow level switch drain valve (Dwg. 9315-M-9103, Item 47) if not already in the closed position.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

2. With motors M124A, B and C activated, fill hopper overflow tube (Dwg. 9315-M-9103, Item 32) from the Lower Chip Collection hopper with approximately 1.0 gallon of water by using a garden hose or funnel and bucket.
3. Verify the overflow alarm is activated in the control room and that the majority of the water emptied in the overflow tube flows out into the opposite hopper.
4. Repeat steps 2 and 3 filling from the Upper Chip Collection hopper.

Acceptance Criteria

- The overflow alarm is activated upon water flow through the overflow tube from either hopper. (Overflow alarm alerts operator of a clogged hopper or filter.)

Test Conductor _____ Date _____

QA _____ Date _____

5. Place a bucket under the drain valve of Step 1 and open the valve. Once all water has drained and the alarm shuts off, close the valve.

Test Conductor _____ Date _____

QA _____ Date _____

8.2 Operational Tests

8.2.1 Verify the suction ability of the portable vacuum as follows:

1. In a dry bucket, mix approximately 0.5 lbs. of S.S. chips, 0.5 lbs. of S.S. fines, 20 simulated fuel pellets and 0.5 lbs. of miscellaneous bolts, tubing and springs.
2. Deactivate motors M124A, B and C and remove hopper baskets (Dwg. 9315-M-1659, Item 2 and 8).
3. Randomly deposit small amounts of the mixture described in Step 1 in both hoppers, on the cutting table and around the floor area where debris could accumulate during the cutting process.
4. Weigh and record portable vacuum canister.

Vacuum canister empty weight _____ lbs.

Test Conductor _____ Date _____

QA _____ Date _____

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

5. With the portable vacuum plugged into an electrical outlet, switch the unit on and vacuum up the debris deposited in Step 3.
6. Weigh and record the portable vacuum canister along with vacuumed deposits, and compare to the empty canister weight.

Used vacuum canister weight _____ lbs
Empty vacuum canister weight _____ lbs
Difference _____ lbs

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Test Conductor _____ Date _____

QA _____ Date _____

Acceptance Criteria

- All simulated fuel pellets, springs and rods were lifted by the vacuum and contained within its canister and 99% by weight of all chips and fines vacuumed were contained within the canister. (Static lift requirements per calculation 1096-M-18.)
- The vacuum was able to be positioned to reach areas to be tested.

Test Conductor _____ Date _____

QA _____ Date _____

7. Replace the hopper baskets removed in Step 2 and place the portable vacuum off to the side for further testing.

Test Conductor _____ Date _____

QA _____ Date _____

8.2.2 Test the Crud Collection System as follows:

1. Assemble the extra crud collection filter bag and basket together (Dwg. 9315-M-9103, Item 37 and inner basket of Item 36) and deposit 0.2 lbs. of test dust and 1.3 lbs. of S.S. fines into the filter bag.
2. Immerse the filter partially in water so that the filter bag and contents become completely saturated. Remove the filter and allow to stand for approximately 5 minutes to release any excess water. Weigh the moist filter and contents and record this weight as the crud test standard filter weight.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Type of Measuring Device _____ Range _____

Identification No. _____ Calibration Due Date _____

Crud test standard filter weight _____ lbs.

Test Conductor _____ Date _____

QA _____ Date _____

3. Mix 0.2 lbs. of test dust and 1.3 lbs. of S.S. fines in a small dry container.
4. Activate the M124A, B and C motors.
5. Deposit approximately 0.25 lbs. of the mixture in Step 3 and ten (10) simulated fuel pellets into each of the six (6) crud collection hoppers.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

6. Five (5) minutes after performing Step 4.
7. Assemble a new filter bag into the filter basket used as the test standard, discard old bag and place basket/bag assembly by the crud collection filter (Dwg. 9315-M-9103, Item 36).

WARNING

In the following tests involving the RBT and RM-10A, extreme caution shall be taken when positioning the RBT and RM-10A in the jog mode to ensure that no contact is made with adjacent equipment. Additionally, all personnel shall stay clear of the moving equipment to prevent injury.

8. With the RM-10A attached to the RBT, jog the RBT to a location above the crud collection filter.
9. Position the RM-10A over the filter, remotely loosen the three (3) top cover eyenuts, swing the three (3) eyenut assemblies clear of the top cover and remove the top cover exposing the filter basket/bag.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to remove the eyenut assemblies were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

10. Grapple the filter lifting bail with the RM-10A and raise out of the filter housing, stopping above the housing to allow excessive fluid to drip out.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to raise the test filter, were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

11. Remove the test filter basket/bag from the RM-10A manipulator and exchange with the clean filter basket/bag assembly.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Test Conductor _____ Date _____

QA _____ Date _____

12. Weigh and record the test filter basket/bag assembly, along with any deposits in the filter housing or top, and compare to the test standard filter.

Type of Measuring Device _____ Range _____

Identification No. _____ Calibration Due Date _____

test standard filter _____ lbs.

test filter _____ lbs.

difference _____ lbs.

Acceptance Criteria

- The difference in weight between the test standard filter and the test filter shall be no greater than 0.75 lbs.
(Based on a 50% system efficiency which would only have a 10% reduction in system volume after 3 years of operation.)

Test Conductor _____ Date _____

QA _____ Date _____

13. Using the RM-10A, remotely insert the clean filter basket/bag assembly in the filter housing, replace the filter top, reposition the eyenut assemblies in the top cover slots and tighten the eyenuts.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to insert the filter basket/bag assembly, and reposition and tighten the eyenuts were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

14. Move the RM-10A clear of the filter and jog the RBT out of the way until further required.

Test Conductor _____ Date _____

QA _____ Date _____

15. With the portable vacuum plugged into an electrical outlet, switch the unit on and vacuum up the 60 fuel pellets and remaining crud/fines mixture from the six (6) crud collection hoppers.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- A total of 60 simulated fuel pellets and 95% of the remaining crud and fines were lifted by the vacuum and contained within its canister. (Static lift requirements per calculation 1096-M-18.)

Test Conductor _____ Date _____

QA _____ Date _____

16. Activate motors M124A, B and C and verify no leakage from the crud collection filter (Dwg. 9315-M-9103, Item 36). Once verified, deactivate motors M124A, B and C.

Test Conductor _____ Date _____

QA _____ Date _____

8.2.3 Fines Collection Tests

8.2.3.1 Fines Collection Flow Tests

1. Attach the temporary flowmeter to upper hopper coolant line and activate motors M124A, B and C.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

2. Measure and record the flowrate.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Flowrate _____ gpm

Acceptance Criteria

- The coolant line shall have a discharge flow of 1.0 ± 0.5 gpm. (Flow requirement per calculation 1096-M-15.)

Signature _____

Date _____

3. Repeat step 2 two additional times.
4. Remove the flowmeter from the upper hopper coolant line and attach it to the upper hopper wash line.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

5. Measure and record the flowrate.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Flowrate _____ gpm

Acceptance Criteria

- The hopper wash line shall have a discharge flow of 4.0 ± 1.0 gpm. (Flow requirement per calculation 1096-M-15.)

Test Conductor _____

Date _____

QA _____

Date _____

6. Repeat step 5 two additional times.

7. Remove the flowmeter from the upper hopper wash line and attach it to the lower hopper coolant line.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

8. Measure and record the flowrate.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Flowrate _____ gpm

Acceptance Criteria

- The coolant line shall have a discharge flow of 1.0 ± 0.5 gpm. (Flow requirement per calculation 1096-M-15.)

Test Conductor _____ Date _____

QA _____ Date _____

9. Repeat step 8 two additional times.

10. Remove the flowmeter from the lower hopper coolant line and attach it to the lower hopper wash line.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

11. Measure and record the flowrate.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Flowrate _____ gpm

Acceptance Criteria

- The hopper wash line shall have a discharge flow of 4.0 ± 1.0 gpm. (Flow requirement per calculation 1096-M-15.)

Test Conductor _____ Date _____

12. Repeat step 11 two additional times.

13. Remove the flowmeter from the lower hopper wash line.

Test Conductor _____ Date _____

8.2.3.2 Hopper Fluid Level Test (unloaded)

1. With motors M124A, B and C activated, measure and record the fluid levels in both the upper and lower hoppers, measured from the screen surface to the water level. (Add 3 inches to this measurement to include below screen surface.)

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Upper hopper level _____

Lower hopper level _____

Acceptance Criteria

- The hopper fluid levels shall be between 1/4 to 3/4 full (3.5 - 11.0 inches). (Hopper static head resulting from filter pressure drop per vendor catalog, see calculation 1096-M-15.)

Test Conductor _____ Date _____

QA _____ Date _____

8.2.3.3 Hopper Fluid Level Test (loaded)

1. Assemble the extra fines collection filter bag and basket together (Dwg. 9315-M-9103, Item 42 and inner basket of Item 41) and deposit 4.0 lbs. of S.S. fines into the filter bag. Immerse the filter partially in water so that the filter bag and contents become completely saturated.
2. Remove the filter and allow to stand for approximately 5 minutes to release any excess water. Weigh the moist filter and contents and record this weight as the fines test standard filter weight.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Type of Measuring Device _____ Range _____

Identification No. _____ Calibration Due Date _____

Fines test standard filter weight _____ lbs.

Test Conductor _____ Date _____

QA _____ Date _____

3. Assemble a new filter bag into the filter basket of Step 1, discard the old bag. Assemble a new filter bag into the other extra filter basket so that two (2) extra filter bag/basket assemblies are on hand.

Test Conductor _____ Date _____

4. In a dry container mix 2 lbs. of S.S. chips and 6 lbs. of miscellaneous bolts, tubing and springs.
5. Deposit 4 lbs. of S.S. fines into the upper hopper and 4 lbs. of S.S. fines into the lower hopper (8 lbs total.)

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

6. Wait five (5) minutes after performing Step 4, then add 4 lbs. of the mixture in Step 3 into both the upper and lower hoppers (8 lbs. total).

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

7. Measure and record the fluid levels in both the upper and lower hoppers, measured from the screen surface to the water level. (Add 3 inches to this measurement to include below screen surface.)

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Upper hopper level _____
Lower hopper level _____

Acceptance Criteria

- The hopper fluid levels shall be no greater than 3/4 full (11.0 inches). (Hopper static head resulting from a loaded filter.)

Test Conductor _____ Date _____
QA _____ Date _____

8.2.3.4 Fines Collection Efficiency Test

1. Deenergize motors M124A, B and C then allow the system to drain down.

Test Conductor _____ Date _____

WARNING

In the following tests involving the RBT and RM-10A, extreme caution shall be taken when positioning the RBT and RM-10A in the jog mode to ensure that no contact is made with adjacent equipment. Additionally, all personnel shall stay clear of the moving equipment to prevent injury.

2. Move the RM-10A to the upper hopper by jogging the RBT into position above the hopper.
3. Lower either the M121E1 or M121E2 auxiliary hoist hook and center over the upper hopper by jogging the RBT.

4. Using the RM-10A, remotely connect the auxiliary hoist hook to the upper hopper lifting bail, then raise the hopper basket straight up and clear of the hopper.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to raise hopper basket, were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

5. Manually remove the loaded hopper basket from the hoist hook and empty all contents of the basket into a container for weighing.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

6. Weigh and record the contents of the upper hopper basket.

Type of Measuring Device _____ Range _____
Identification No. _____ Calibration Due Date _____

Captured weight _____ lbs.

Acceptance Criteria

- The debris collected on each hoppers screen shall not weigh less than 4.0 lbs. (Based on a 80% collection efficiency. The remaining 20% or less will be vacuumed up out of the hopper.)

Test Conductor _____ Date _____

QA _____ Date _____

7. Manually connect the hopper basket to the auxiliary hoist hook, then lower the basket back into the upper hopper until seated. Using the RM-10A remove the auxiliary hoist hook from the lifting bail and raise the hoist hook up completely.

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to replace basket, were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

8. Move the RM-10A over the upper hopper final filter (Dwg. 9315-M-9103, Item 41) by jogging the RBT into position. Remotely loosen the three (3) top cover eye nuts, swing the three (3) eyenut assemblies clear of the top cover and remove the top cover exposing the filter basket/bag.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to loosen and clear the eyenut assemblies, were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

9. Grapple the filter lifting bail with the RM-10A and raise out of the filter housing, stopping above the housing to allow excessive fluid to drip out.

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to raise filter, were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

10. Remove the test filter basket/bag from the RM-10A manipulator and exchange with the clean filter basket/bag assembly.

Test Conductor _____ Date _____

11. Weigh and record the test filter basket/bag assembly, along with any deposits in the filter housing or top, and compare to the test standard filter.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Type of Measuring Device _____ Range _____

Identification No. _____ Calibration Due Date _____

test standard filter _____ lbs.

test filter _____ lbs.

difference _____ lbs.

Acceptance Criteria

- The difference in weight between the test standard filter and the test filter shall be no greater than 0.8 lbs.
(Based on a 80% system efficiency.)

Test Conductor _____ Date _____

QA _____ Date _____

12. Using the RM-10A, remotely insert the clean filter basket/bag assembly in the filter housing, replace the filter top, reposition the eyenut assemblies in the top cover slots and tighten the eyenuts.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to replace the filter and reposition the eyenut assemblies were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

13. Move the RM-10A to the lower hopper by jogging the RBT into position above the hopper.
14. Lower either the M121E1 or M121E2 auxiliary hoist hook and center over the lower hopper by jogging the RBT.
15. Using the RM-10A, remotely connect the auxiliary hoist hook to the lower hopper lifting bail, then raise the hopper basket straight up and clear of the hopper.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to raise the lower hopper basket, were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

16. Manually remove the loaded hopper basket from the hoist hook and empty all contents of the basket into a container for weighing.

17. Weigh and record the contents of the lower hopper basket.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Captured weight _____ lbs.

Acceptance Criteria

- The debris collected on each hopper's screen shall not weigh less than 4.0 lbs. (Based on a 80% collection efficiency. The remaining 20% or less will be vacuumed up out of the hopper.)

Test Conductor _____ Date _____

QA _____ Date _____

18. Manually connect the hopper basket to the auxiliary hoist hook, then lower the basket back into the lower hopper until seated. Using the RM-10A remove the auxiliary hoist hook from the lifting bail and raise the hoist hook up completely.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to replace the hopper basket, were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

19. Move the RM-10A over the lower hopper final filter (Dwg. 9315-M-9103, Item 41) by jogging the RBT into position. Remotely loosen the three (3) top cover eye-nuts, swing the three (3) eye-nut assemblies clear of the top cover and remove the top cover exposing the filter basket/bag.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to loosen and clear eye nut assemblies, were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

20. Grapple the filter lifting bail with the RM-10A and raise out of the filter housing, stopping above the housing to allow excessive fluid to drip out.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to raise filter, were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

21. Remove the test filter basket/bag from the RM-10A manipulator and exchange with the clean filter basket/bag assembly.

Test Conductor _____ Date _____

QA _____ Date _____

22. Weigh and record the test filter basket/bag assembly, along with any deposits in the filter housing or top, and compare to the test standard filter.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

test standard filter _____ lbs.

test filter _____ lbs.

difference _____ lbs.

Acceptance Criteria

- The difference in weight between the test standard filter and the test filter shall be no greater than 0.4 lbs. (Based on a 90% system efficiency.)

Test Conductor _____ Date _____

QA _____ Date _____

23. Using the RM-10A, remotely insert the clean filter basket/bag assembly in the filter housing, replace the filter top, reposition the eyenut assemblies in the top cover slots and tighten the eyenuts.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical access and remote manipulations using the RM-10A, to insert the filter, reposition and tighten the eyenut assemblies, were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

24. Activate motors M124A, B and C and verify no leakage from both fines collection filters (Dwg. 9315-M-9103, Item 41). Upon verification deactivate motors M124A, B and C.

Test Conductor _____ Date _____

8.2.3.5 Remote Waste Transfer

1. Verify that the hopper basket transfer container (Dwg. 9315-M-9202) is located by the waste transfer arm, and the bag filter transfer container (Dwg. 9315-M-9203) is filled with water to the filter support plate, and is also located by the waste transfer arm.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Test Conductor _____ Date _____

WARNING

In the following tests involving the RBT and RM-10A, extreme caution shall be taken when positioning the RBT and RM-10A in the jog mode to ensure that no contact is made with adjacent equipment. Additionally, all personnel shall stay clear of the moving equipment to prevent injury.

2. Position the RM-10A over the waste transfer arm by jogging the RBT into position. Lower either the M121E1 or M121E2 auxiliary hoist hook over the bag filter transfer container and using the RM-10A connect the hoist hook to the transfer container lifting bail.
3. Lift the bag filter transfer container and move it to a flat surface as close as possible to the crud collection filter (Dwg. 9315-M-9103, Item 36) using the RBT in the jog mode.
4. Lower the transfer container onto the surface until slack in the cable is present. Using the RM-10A, unlatch the transfer container top, remove, and place off to the side.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical and horizontal access and all remote manipulations, to remove the transfer container top, were possible without interferences.

Test Conductor _____ Date _____

QA _____ Date _____

5. With the RBT stationary, manipulate the RM-10A so the filter is within reach. Manually place the filter basket used in Step 8.2.2.12 in the manipulators of the RM-10A and remotely insert the filter basket into one of the small filter support holes in the transfer container. Remotely replace the transfer container lid and relatch to seal.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical and horizontal access and all remote manipulations, to insert filter basket and relatch seal, were possible without interferences.

Test Conductor _____ Date _____

QA _____ Date _____

6. Raise the transfer container and move to a flat surface close to the lower hopper final filter (Dwg. 9315-M-9103, Item 41) using the RBT in the jog mode.

7. Repeat Steps 4 and 5 using the filter basket of Step 8.2.3.4.12, and inserting it into the larger holes of the transfer container.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical and horizontal access and all remote manipulations, to insert filter basket, were possible without interferences.

Test Conductor _____ Date _____

QA _____ Date _____

8. Raise the transfer container and move to a flat surface close to the upper hopper final filter (Dwg. 9315-M-9103, Item 41) using the RBT in the jog mode.

9. Repeat Steps 4 and 5 using the filter basket of Step 8.2.3.4.22, and inserting it into the larger holes of the transfer container.

Acceptance Criteria

- Vertical and horizontal access and all remote manipulations, to insert filter basket, were possible without interferences.

Test Conductor _____ Date _____

QA _____ Date _____

10. Raise the transfer container and move the RBT to the waste transfer arm in the jog mode. Lower the transfer container and position the lifting bail on the waste transfer arm with the aid of the RM-10A if required. Disconnect the auxiliary hoist hook from the lifting bail and push the transfer arm and container through to the clean side.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical and horizontal access and all remote manipulations were possible without interferences.
- All remote steps were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

12. Lower the transfer container onto the surface until slack in the cable is present. Using the RM-10A, unlatch the transfer container top, remove, and place off to the side. Disconnect the auxiliary hoist hook from the lifting bail.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical and horizontal access and all remote manipulations were possible without interferences.

Test Conductor _____ Date _____

QA _____ Date _____

13. Position the auxiliary hoist hook over the upper hopper basket and remotely connect it to the hopper basket lifting bail using the RM-10A. Lift the hopper basket out of the hopper and move it to the transfer container.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical and horizontal access and all remote manipulations, to move hopper basket to transfer container, were possible without interferences.

Test Conductor _____ Date _____

QA _____ Date _____

14. Lower the hopper basket into the transfer container. Remotely disconnect the auxiliary hoist hook from the basket, connect the auxiliary hoist hook to the transfer container top then reposition onto the transfer container and latch.

Acceptance Criteria

- Vertical and horizontal access and all remote manipulations were possible without interferences.

Test Conductor _____ Date _____

QA _____ Date _____

15. Lift the transfer container and move it to the waste transfer arm using the RBT in the jog mode.

16. Lower the transfer container and position the lifting bail on the waste transfer arm with the aid of the RM-10A if required. Disconnect the auxiliary hoist hook from the lifting bail and push the transfer arm and container through to the clean side.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical and horizontal access and all remote manipulations were possible without interferences.
- All remote steps were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

17. Manually remove the hopper basket transfer container from the waste transfer arm, unlatch top and withdraw the upper hopper basket. Replace and latch top, then place on the waste transfer arm and swing over to the contaminated side. Repeat Steps 11 through 16, moving to and removing the lower hopper basket.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN PHOTOGRAPHIC LOG

Acceptance Criteria

- Vertical and horizontal access and all remote manipulations were possible without interferences.
- All remote steps were successfully accomplished.

Test Conductor _____ Date _____

QA _____ Date _____

9.0 POST PERFORMANCE REVIEW AND APPROVAL

The following signatures certify to the completion of this test, that the test exceptions and resolution are acceptable, and the system has passed the requirements for the system operation test.

Test Engineer

Date

Quality Assurance

Date

Project Engineer

Date

Test Director

Date

10.0 RETENTION OF TEST RECORDS

The original working copy, including test exceptions and resolution and acceptance signatures, are to be maintained by the Test Director and stored at the NUS Gaithersburg building, Document Control Center. One copy of the original working document shall be sent to the DOE representative for their use and retention.

11.0 REFERENCES

- 11.1 NUS Drawings: 9315-M-0063
9315-M-9103
9315-M-9104
9315-M-1659
- 11.2 Fuel Rod Consolidation Project Phase II Final Report, 9315-P-101, NUS Corporation, latest revision.
- 11.3 Calculation 1096-M-15, Fines Collection System Design.
- 11.4 Calculation 1096-M-21, FRCP Crud Collection Systems.
- 11.5 Calculation 1096-M-18, Portable Vacuums.
- 11.6 Prototypical Spent Fuel Rod Consolidation System Test Plan, 9315-P-109 NUS Corporation, latest revision.
- 11.7 Specification 9315-TAC-208, A&B, System Operational Test Acceptance Criteria for the Waste Collection System, latest revision.
- 11.8 Administrative Procedure 9315-P-120, Test Administration Manual for Systems Operational Test and Integrated Systems Tests.

APPENDIX A
SAFETY PROCEDURES

SYSTEMS OPERATIONS TEST SAFETY CONSIDERATIONS

Performance of the SOTs in a manner which precludes the injury of personnel involved in the test performance or working in the Test Facility is of paramount importance. The following steps shall be taken to minimize the possibility of personnel being injured during the performance of SOTs:

1. Contraves and NUS will advise their employees and any subcontractors to stay clear of the Test Facility when tests are being conducted unless they are involved in the test performance or have another work assignment in the Test Facility.
2. Contraves will post a warning sign at the entrance to the Test Facility when testing is in progress advising personnel of the need to stay away unless involved in the testing or have some authorized work assignment in the area.
3. When feasible and deemed advisable by the Test Conductor, the machine being tested will be surrounded by a portable barrier (ropes and posts) with a Caution Sign warning individuals to stay clear of the area unless authorized to enter by the Test Conductor.
4. When machines are being moved by installed motors, the NUS electrical engineer operating the motor or the Test Conductor will be located in a position which permits him/her to observe the machine operation so that the equipment can be stopped if a dangerous situation appears to be developing. Such situations could involve unanticipated machine performance or personnel entering the test area and placing themselves in jeopardy.
5. When a SOT is in progress the Test Conductor will remain in the vicinity of the test so that all personnel involved in the test are under his observation and will perform any required test support activities directly under his supervision.
6. Only Contraves personnel who have been qualified to the DOE Hoisting and Rigging Manual Rev. 10-88 will operate the Test Facility overhead crane.
7. Only NUS test engineers will operate the Robotic Bridge Transporter (RBT), the Manipulator Transporter (MT), and the RM-10A Robot Arms.
8. Slings, hooks, and chains utilized with the Test Facility overhead crane or with the RBT will be those purchased specifically for use on the DOE project and have been certified to meet the requirements of ANSI B30.9.
9. The making of all electrical connections to the various equipment will be supervised by an NUS electrical engineer.

10. Protective headgear will be worn in the Test Facility whenever the Robotic Bridge Transporter (RBT), the Manipulator Transporter (MT) are being utilized or at any time the Test Conductor deems the use of protective head gear is appropriate.
11. The NUS Test Conductor is responsible to see that all the above safety requirements are implemented during the performance of the test for which he has responsibility.
12. The Test Conductor will verify that all test specific safety prerequisites identified in test procedures are satisfied and that any precautions identified in specific procedure steps are followed.
13. The NUS Test Director will perform frequent informal surveillance of the testing operations to verify the safety requirements are being adhered to by the personnel performing the test or other work in the test area.

APPENDIX B

PHOTO DOCUMENTATION REQUIREMENTS

Photo Documentation Requirements

Photographs are required to be taken of all System Operational Tests (SOTs). The following is a bulletized list which identifies when these photographs must be taken, as a minimum. Additional photographs may be taken at any other time during the test, as specified by the Test Conductor.

- Photographs must be taken of the initial setup for each test sequence.
- Photographs must be taken of the following critical interfaces between system, as a minimum,
 - Excell Crane/Downender (Loading of Fuel)
 - RBT/Fuel Assembly Storage Rack
 - RBT/Downender
 - RBT/Staging and Cutting Station
 - RBT/Clamping Table
 - FAHF/Mockup Fuel Assembly
 - Pull-Head Gripper/Fuel Rods
 - Rod Loader/Canister
 - NFBC Loader/Canister
 - RBT/Off-Normal Table
 - MT/Off-Normal Table
 - Fuel Canister/Storage Rack
 - NFBC Canister/Storage Rack
 - RBT/FAHF and RM-10A
 - Excell Crane/Fuel Canister Upender (Loading and Unloading)
 - Excell Crane/NFBC Canister Upender (Loading and Unloading)
 - MT/RM-10A
- Photographs must be taken of any equipment damaged during testing.
- Photographs must be taken of any damage to mockup fuel rods and/or mockup fuel assemblies.
- Photographs must be taken of the cutter to fuel assembly interfaces as follows:
 - In position prior to cut
 - During cutting operation
 - Cut area of end fitting after cut operation
 - Cut area of fuel assembly after cut operation
- Photographs must be taken of each "Hold Point".
- Photographs must be taken of the problem areas of any subsystem which does not perform its expected function.
- Photographs must be taken of any component, subsystem, or system, determined by the test conductor to be operating out of the normal/expected condition (i.e., excessive deflection, vibration, etc.).

APPENDIX C**TEMPORARY PROCEDURE CHANGE NOTICE AND REPAIR LOG**

TEST PROCEDURE 9315-TP-208 A & B REVISION 0 PAGE C-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE _____

PROCEDURE NO. _____ REV. _____ TITLE _____

PROCEDURE SECTION(S) _____

PROCEDURE CHANGE: (Use reverse side if necessary.)

REASON FOR CHANGE: _____

CLASSIFICATION OF CHANGE

MINOR _____ YES _____ NO _____

MAJOR _____ YES _____ NO _____

REVISION TO ORIGINAL PROCEDURE REQUIRED _____ YES _____ NO

APPROVALS

TEST ENGINEER DATE (1)(2)

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

NOTES: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE

9315-TP-208 A & B

REVISION

0

PAGE C-3

EXCEPTION/REPAIR LOG

DATE _____

LOG _____

PROCEDURE NO. _____

REV. _____ TITLE _____

PROCEDURE SECTION(S) _____

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN # _____

PROBLEM AND CAUSE: _____

TEST CONDUCTOR _____

SOLUTION/CORRECTIVE ACTION: _____

TEST CONDUCTOR _____

DATE _____

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

NOTES: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

TEST CONDUCTOR _____

DATE _____

APPENDIX D

TRAINING SIGN-OFF SHEET

NAME (Print)

SIGNATURE

APPENDIX I-4.9
WASTE CONTAINER TRANSFER FIXTURE
(WBS 1.3.5.3)
TEST RESULTS AND ANALYSIS REPORT

1.0 INTRODUCTION

This appendix addresses the System Operational Testing (SOT) for the Waste Container Transfer Fixture (Ref. SOT Test Procedure 9315-TP-208C). It provides a brief discussion of the original purpose of this test procedure and the status of the system. A record copy of the test procedure for this system is provided as Attachment 1 to this appendix for future reference.

2.0 TEST OBJECTIVES

The purpose of this SOT was to verify that the as-built condition of the Waste Container Transfer Fixture met or exceeded its associated performance requirements. The primary objectives of this testing were as follows:

- Verification of system interfaces
- Verification of system operations

This test procedure provides for the qualification of the Waste Container Transfer Fixture for Integrated System Testing (IST).

3.0 TEST RESULTS

The test program for the Rod Consolidation System was refocused due to a lack of funding to complete all of the tests identified for the program. This refocusing of the test program eliminated all SOTs and ISTs not required to demonstrate the consolidation of the government-furnished W 17x17 mock-up fuel assemblies. Since the Waste Container Transfer Fixture is required to handle the positioning of the waste container between the contaminated and clean side of the process cell, and does not impact fuel processing, its SOT was eliminated from the restructured test program. As a result, no operational verification tests have been performed beyond those completed as part of the Factory Acceptance Test for the equipment.

ATTACHMENT 1
SYSTEM OPERATIONAL TEST PROCEDURE
FOR THE
WASTE CONTAINER TRANSFER FIXTURE
(WBS 1.3.5.3)
DOCUMENT NO. 9315-TP-208C

NUS
CORPORATION
ENGINEERING DIVISION

TEST PROCEDURE

CLIENT: DOE/Rod Consolidation PROCEDURE NO.: 9315-TP-208C
LOCATION: Cold Test Facility REVISION NO.: 1

TITLE:

RELEASED FOR: ☐ REVIEW ☒ TEST

SYSTEM OPERATIONAL TEST PROCEDURE
FOR
WASTE CONTAINER TRANSFER FIXTURE
(WBS 1.3.5.3)

APPROVED Frank M. Dello DATE 5/17/91
PROJECT MANAGER
APPROVED [Signature] DATE 5-17-91
QUALITY ASSURANCE
APPROVED R. Michajliew DATE MAY 17, '91
DISCIPLINE MANAGER
APPROVED J. W. [Signature] DATE 5/13/91
AUTHOR

1	<u>Min [Signature]</u>	<u>4/30/92</u>	<u>R. Michajliew</u>	<u>4/30/92</u>	<u>[Signature]</u>	<u>4/30/92</u>	<u>[Signature]</u>	<u>4/30/92</u>		
REV	PREPARED	DATE	APPROVED	DATE	APPROVED	DATE	APPROVED	DATE	APPROVED	DATE

NUS CORPORATION

REVISION CONTROL SHEETRevised Page No.Latest RevisionDate

Original

0

May 13, 1991

All

1

April 22, 1992

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1.0 Objective of Test

The objective of this test of the Waste Container Transfer Fixture is:

1. To verify and demonstrate its structural integrity.
2. To demonstrate that, while under load, the fixture arm can be rotated over its full range of travel by the RM-10A.

2.0 Prerequisites

2.1 The equipment data package is complete.

Signature _____ Date _____

Quality Assurance _____ Date _____

2.2 The Waste Transfer Fixture must be installed and have completed FATs successfully.

Signature _____ Date _____

Quality Assurance _____ Date _____

2.3 A test weight of 1,260 lbs. which can be suspended from the fixture hook must be available.

Signature _____ Date _____

Quality Assurance _____ Date _____

2.4 The RM-10A and RBT must have completed FATs successfully.

Signature _____ Date _____

Quality Assurance _____ Date _____

2.5 The RM-10A and RBT must be installed and operational.

Signature _____ Date _____

Quality Assurance _____ Date _____

3.0 Initial Test Conditions

3.1 Not Applicable.

4.0 Environmental Conditions

4.1 The building heating, cooling and ventilating systems are maintaining the cell temperature between 60°F and 95°F.

5.0 Special Precautions

5.1 None

6.0 Special Equipment Required

6.1 None.

7.0 TEST DATA RECORDING

7.1 Test Data Records

The test conductor shall designate one copy of the test procedure and its attachments as the "Record Copy" and shall ensure that this copy is maintained current. All test data, significant events, and observations must be recorded in this document. Additional sheets may be used as necessary, but must be permanently affixed to this report by staples and/or tape.

7.2 Test Procedure Modification

This section addresses the process for making modifications to the approved Test Procedure. These modifications will fall into one of three categories, as follows:

- Corrections are modifications to the procedure due to typos or incorrect information.
- Minor Changes are modifications which do not affect functional intent or acceptance criteria of the test.
- Major Changes are changes that affect functional intent or acceptance criteria.

Each of these modifications will be handled differently. If a correction is required to the procedure, it will be made with pen and ink in the "Record Copy", as they are found. The test conductor will make the appropriate change. Once the change is made, he will initial and date the change for future reference. All modifications which are considered minor changes must be documented on "Temporary Procedure Change Notice" (TPCN) forms (refer to Appendix D). This change shall be approved by the test conductor by annotating that the test procedures are using the TPCN form. All modifications which are considered a major change must also be documented on the TPCN form. However, when a major change is required, testing shall be halted until the TPCN is approved by the responsible Test Engineer, Test Conductor, Quality Assurance and Project Engineer.

7.3 Repairs/Retesting

This section addresses the process for making necessary repairs to the equipment and retesting of the system. If during testing a problem is observed which requires repair or rework of the equipment, testing shall be halted. If the repair/rework is minor, the Test Conductor will document the problem, cause, and corrective action implemented, the faulty system will be retested. All remaining tests will continue on until conclusion. If the problem requires redesign of the faulty system, all testing of this equipment will be halted. The problem and recommended solution will be documented and submitted to the Test Review Group (TRG) for approval. Once approval and the repair is complete, testing of the equipment will be accomplished in accordance with this procedure.

8.0 Detailed Procedures

- 8.1 Select easily identified points near the upper bearing and on the hook of the movable arm and measure and record the distance between them. Measure and record in Table 8.9 the perpendicular distance from the south wall to a point near the upper bearing support on the fixed part of the assembly.

Signature _____ Date _____

CAUTION

In the following loaded tests, ensure that no personnel are in a position to be injured in the event of a failure of the transfer arm.

- 8.2 Using the RM-10A, swing the transfer arm to a position approximately 60° away from the perpendicular to the south wall and toward the "hot" side of the cell.

- RM-10A is able to move the transfer arm to the desired position $\pm 5^\circ$.

Signature _____ Date _____

- 8.3 Drive the RBT and RM-10A to the test load storage position and lower the auxiliary hook to place it near the test load lifting bale. Use the RM-10A to position the hook on the 1265 lb. test load and lift the load.

- Test load is successfully lifted by auxiliary crane.

Signature _____ Date _____

- 8.4 Transfer the test load to the location of the transfer arm and lower it to place the lifting bale on the transfer arm hook. Use the RM-10A to assist in this operation, if necessary. When the operation is completed, raise the auxiliary hook clear of the transfer fixture.

- Test load is successfully transferred to waste transfer arm.

Signature _____ Date _____

- 8.5 Using the RM-10A, rotate the transfer arm and load clockwise approximately 120° to move the test load into the "cold" side of the cell.
- RM-10A is able to swing the loaded transfer arm through required rotation.

Signature _____ Date _____

- 8.6 Using the RM-10A, rotate the transfer arm and load back to the original position in the "hot" side and then return to the "cold" side position. If size of test load and wall clearances permit, swing arm in each direction an additional distance, however, do not swing beyond 90° away from the "hot-cold" wall.

- RM-10A can move loaded transfer arm in either direction.

Signature _____ Date _____

- 8.7 Return the transfer arm and load to the position obtained in step 8.5.

Signature _____ Date _____

- 8.8 Lower auxiliary hook and with the help of the RM-10A, attach the hook and lift the test load clear of the transfer arm. Deposit test load in designated storage area.

- Test load successfully transferred to auxiliary crane hook.

Signature _____ Date _____

- 8.9 Repeat the measurements taken in step 8.1 and record in Table 8.9 below. Determine if permanent deformation exists.

Description of Measurement	Values Measured		Perm. Def.
	Step 8.1	Step 8.9	

Table 8.9

- No permanent deformation detected within limits of accuracy of measurements.

Signature _____ Date _____

9.0 Post Performance Review and Approval

9.1 Test exceptions and resolution

9.2 Test Data Records

The test conductor shall designate one copy of the test procedure and its attachments as the "Record Copy" and shall ensure that this copy is maintained current. All test data, significant events, and observations must be recorded in this document. Additional sheets may be used as necessary, but must be permanently affixed to this report by staples and/or tape.

9.3 Test Procedure Modification

This section addresses the process for making modifications to the approved Test Procedure. These modifications will fall into one of three categories, as follows:

- Corrections are modifications to the procedure due to typos or incorrect information.
- Minor Changes are modifications which do not affect functional intent or acceptance criteria of the test.
- Major Changes are changes that affect functional intent or acceptance criteria.

Each of these modifications will be handled differently. If a correction is required to the procedure, it will be made with pen and ink in the "Record Copy", as they are found. The test conductor will make the appropriate change. Once the change is made, he will initial and date the change for future reference. All modifications which are considered minor changes must be documented on "Temporary Procedure Change Notice" (TPCN) forms (refer to Appendix A). This change shall be approved by the test conductor by annotating that the test procedures are using the TPCN form. All modifications which are considered a major change must also be documented on the TPCN form. However, when a major change is required, testing shall be halted until the TPCN is approved by the responsible Test Engineer, Test Conductor, Quality Assurance and Project Engineer.

9.4 Repairs/Re-Testing

This section addresses the process for making necessary repairs to the equipment and re-testing of the system. If during testing a problem is observed which requires repair or rework of the equipment, testing shall be halted. If the repair/rework is minor, the Test Conductor will document the problem, cause, and corrective action (refer to Appendix A). Once documented, and the corrective action implemented, the faulty system will be re-tested. All remaining tests will continue on until conclusion. If the problem requires redesign of the faulty system, all testing of this equipment will be halted. The problem, potential solutions, and recommended solution will be documented and submitted to the Test Review Group (TRG) for approval. Once approval and the system completed, testing will be rerun, using a copy of the original approved test procedure.

9.5 Test Acceptance

The following signatures certify to the completion of this test, that the test exceptions and resolution are acceptable, and the system has passed the requirements for the system operational test.

Test Engineer Date

Quality Assurance Date

Project Engineer Date

Test Director Date

10.0 Retention of Test Records

The original working copy, including test exceptions and resolution and acceptance signatures, are to be maintained by the Test Director and stored at the NUS Gaithersburg building, Document Control Center. One copy of the original working document shall be sent to the DOE representative for DOE use and retention.

11.0 References

- 11.1 Test Plan, Specification No. 9315-T-109 Latest Revision, "Prototypical Spent Fuel Rod Consolidation System Test Plan."
- 11.2 Fuel Rod Consolidation Project, Phase II Final Report, Volume 1.
- 11.3 MUS Calculation Document. File No. 1096-M-25.

APPENDIX A
EQUIPMENT SETUP

APPENDIX B
SAFETY PROCEDURES

SYSTEMS OPERATIONS TEST SAFETY CONSIDERATIONS

Performance of the SOTs in a manner which precludes the injury of personnel involved in the test performance or working in the Test Facility is of paramount importance. The following steps shall be taken to minimize the possibility of personnel being injured during the performance of SOTs:

1. Contraves and NUS will advise their employees and any subcontractors to stay clear of the Test Facility when tests are being conducted unless they are involved in the test performance or have another work assignment in the Test Facility.
2. Contraves and/or NUS personnel will post a warning sign at the entrance to the Test Facility when testing is in progress advising personnel of the need to stay away unless involved in the testing or have some authorized work assignment in the area.
3. When feasible and deemed advisable by the Test Conductor the machine being tested will be surrounded by a portable barrier (ropes and posts) with a Caution Sign warning individuals to stay clear of the area unless authorized to enter by the Test Conductor.
4. When machines are being moved by installed motors the NUS electrical engineer operating the motor or the Test Conductor will be located in a position which permits him/her to observe the machine operation so that the equipment can be stopped if a dangerous situation appears to be developing. Such situations could involve unanticipated machine performance or personnel entering the test area and placing themselves in jeopardy.
5. When an SOT is in progress the Test Conductor will remain in the vicinity of the test so the all personnel involved in the test are under his observation and will perform any required test support activities directly under his supervision.
6. Only Contraves and/or NUS personnel who have been qualified to the JOE Hoisting and Rigging Manual Rev. 10-88 will operate the Test Facility overhead crane.
7. Only NUS test engineers will operate the Robotic Bridge Transporter (RBT), the Manipulator Transporter (MT), and the RM-10A Robot Arms.
8. Slings, hooks, and chains utilized with the Test Facility overhead crane or with the RBT will be those purchased specifically for use on the JOE project and have been certified to meet the requirements of ANSI B30.9.
9. The making of all electrical connections to the various equipment will be supervised by an NUS electrical engineer.

10. Protective headgear will be worn in the Test Facility when ever the Robotic Bridge Transporter (RBT) the Manipulator Transporter (MT) are being utilized or at any time the Test Conductor deems the use of protective head gear is appropriate.
11. The NUS Test Conductor is responsible to see that all the above safety requirements are implemented during the performance of the test for which he has responsibility.
12. The Test Conductor will verify that all test specific safety prerequisites identified in test procedures are satisfied and that any precautions identified in specific procedure steps as followed.
13. The NUS Test Director will perform frequent informal surveillance of the testing operations to verify the safety requirements are being adhered to by the personnel performing the test or other work in the test area.

APPENDIX C
PHOTO DOCUMENTATION REQUIREMENTS

Photo Documentation Requirements

Photographs are required to be taken of all System Operational Tests (SOTs). The following is a bulletized list which identifies when these photographs must be taken, as a minimum. Additional photographs may be taken at any other time during the test, as specified by the Test Conductor.

- Photographs must be taken of the initial setup for each test sequence.
- Photographs must be taken of the following critical interfaces between system, as a minimum,
 - Excell Crane/Downender (Loading of Fuel)
 - RBT/Fuel Assembly Storage Rack
 - RBT/Downender
 - RBT/Staging and Cutting Station
 - RBT/Clamping Table
 - FAHF/Mockup Fuel Assembly
 - Pull-Head Gripper/Fuel Rods
 - Rod Loader/Canister
 - NFBC Loader/Canister
 - RBT/Off-Normal Table
 - MT/Off-Normal Table
 - Fuel Canister/Storage Rack
 - NFBC Canister/Storage Rack
 - RBT/FAHF and RM-10A
 - Excell Crane/Fuel Canister Upender (Loading and Unloading)
 - Excell Crane/NFBC Canister Upender (Loading and Unloading)
 - MT/RM-10A
- Photographs must be taken of any equipment damaged during testing.
- Photographs must be taken of any damage to mockup fuel rods and/or mockup fuel assemblies.
- Photographs must be taken of the cutter to fuel assembly interfaces as follows:
 - In position prior to cut
 - During cutting operation
 - Cut area of end fitting after cut operation
 - Cut area of fuel assembly after cut operation
- Photographs must be taken of each "Hold Point".
- Photographs must be taken of the problem areas of any subsystem which does not perform its expected function.
- Photographs must be taken of any component, subsystem, or system, determined by the test conductor to be operating out of the normal/expected condition (i.e., excessive deflection, vibration, etc.).

TEST PROCEDURE **9315-TP-208C**

REVISION 1

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APPENDIX D

TEMPORARY PROCEDURE CHANGE NOTICE AND REPAIR LOG

TEST PROCEDURE **9315-TP-208C**

REVISION **1**

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE _____

PROCEDURE NO. _____ REV. _____ TITLE _____

PROCEDURE SECTION(S) _____

PROCEDURE CHANGE: (Use reverse side if necessary.)

REASON FOR CHANGE: _____

CLASSIFICATION OF CHANGE

MINOR ____ YES ____ NO ____

MAJOR ____ YES ____ NO ____

REVISION TO ORIGINAL PROCEDURE REQUIRED ____ YES ____ NO

APPROVALS

TEST ENGINEER DATE (1)(2)

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-208C

REVISION 1

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EXCEPTION/REPAIR LOG

DATE _____ LOG _____

PROCEDURE NO. _____ REV. _____ TITLE _____

PROCEDURE SECTION(S) _____

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN # _____

PROBLEM AND CAUSE: _____

TEST CONDUCTOR _____

SOLUTION/CORRECTIVE ACTION: _____

TEST CONDUCTOR _____

DATE _____

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

NOTES: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

TEST CONDUCTOR _____

DATE _____

APPENDIX E
CCTV ASSESSMENT FORM

CCTV Assessment

1. Operation: (describe type of operation here)

2. Camera Assessment

Camera No.

Evaluation

(describe the view that the camera is capable of providing)

3. Recommendations: (Recommend cameras that provide the best view of the system)

Test Conductor _____ Date _____

QA _____ Date _____

TEST PROCEDURE 9315-TP-200C

REVISION 1

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APPENDIX F
TRAINING SIGN-OFF SHEET

TEST PROCEDURE 9315-TP-200C

REVISION 1

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NAME (Print)

Signature

APPENDIX I-4.10
CUTTING AND STAGING SYSTEM
(WBS 1.3.1.3)
TEST RESULTS AND ANALYSIS REPORT

1.0 INTRODUCTION

This appendix addresses the System Operational Testing (SOT) for the Cutting and Staging System (Ref. the record copy of 9315-TP-209A, Attachment 1 to this appendix). It provides an overview of the function of the equipment, procedures used during testing, results obtained, and conclusions and recommendations. The purpose of the SOT was to verify that the as-built condition of the system met or exceeded the associated performance requirements. The primary objectives of this testing were as follows:

- Verification of system mechanical operation under loaded and unloaded conditions.
- Verification of system part-program operations with the equipment under loaded and unloaded conditions.
- Verification of software interlocks.
- Verification of motor fault response.
- Verification of system interfaces.

Upon completion of the SOT, the Cutting and Staging System was judged acceptable and released for normal Integrated System Testing (IST).

2.0 EQUIPMENT FUNCTION

The Cutting and Staging System has two functions. The first function is to provide a support surface and clamp system which centers and restrains the fuel assemblies while the cutting systems remove the end fittings. The second function is to provide a staging area for fuel placement when the Clamping Table is full and the cutting process is complete. The Cutting Station is designed to support and restrain one PWR or BWR fuel assembly. The Staging Station is designed to support either two PWR or three BWR fuel assemblies.

The Cutting and Staging System consists of a six-leg structural steel frame measuring 40.50" wide x 127.00" long (Ref. Dwg. 9315-S-1501). Mounted to the frame is a stainless steel table top measuring 46.00" wide x 14' 00" long x 0.25" thick. Mounted to the table top are three sets of support cradles consisting of three cradles per set. The six outer cradles measure 11.50" wide x 23.75" long and are sized for either BWR or PWR fuels. The three inner cradles measure 8.75" wide x 23.75" long and are sized for BWR fuel only. Housed under the three lower (west) cradles are load cells which signal the Control System when a load is present.

Mounted to the south side of the table frame are three platforms which support the fuel while the cutting process is performed. Housed under the middle platform is a load cell to signal the Control System when a load is present. Attached to the two outer platforms are self centering clamps which center and restrain the fuel. The clamps consist of two clamp arms and pads which drive inward or outward simultaneously. The clamp arms are driven by a single lead screw which has right and left hand threads at opposite ends of the screw to permit motion in different directions. The lead screw is mounted in bearings at the center and both ends. A DC motor is mounted to one end of the screw as the drive unit. The other end of the screw is coupled to an absolute resolver to permit automatic positioning.

The clamp drives are designed to stop on position or force. As previously mentioned, an absolute resolver is coupled to the lead screw to position the clamps. The resolver signals the Control System to shut the drive off and apply the brakes when a predefined set point has been reached. To stop on force, the clamps must contact a solid object which has a larger envelope than the position set point of the clamps. As the clamps contact an object or fuel assembly, the motor keeps driving the clamps until a resisting force is generated. The maximum force that the clamps reach is defined by the maximum overcurrent value that is established for the DC drive motor. By changing the overcurrent value, the force value is changed. Once the maximum force is reached, the drive is shut off and the brakes are applied to prevent backdriving of the lead screw.

3.0 TEST PROCEDURE

The test procedure (Ref. Attachment I to this appendix) organized testing into the following sections below. These sections were repeated for each of the five fuel types utilizing fuel specific software.

- Drive System Verification - This section tested the clamp positioning and travel time to the open and closed positions utilizing the HAND mode of operation.
- Interlock Verification - Control System interlocks were tested to verify that specific drive motors could not be energized if interfacing drive systems or machines were positioned to undesired locations in the HAND mode.
- SINGLE Mode Verification - The process sequence of the Cutting Station clamps was tested in this section to verify that the single step control function performed as desired and in the correct sequence.

- AUTO Mode Verification - This section, much like the SINGLE mode test, verified the automatic process sequence operated in the correct and uninterrupted order.
- Clamp Drive Fault Test - This section tested the drive motor to verify that if a fault was implemented, the alarm system would deactivate the motor, notify the operator which motor was affected and the cause of the fault, print out a report of the condition, signal an audio alarm, and activate specific cameras to be called up on the control console. Additionally, this test verified that the system could be recovered from the fault condition.
- Clamp Force Test - This section tested the force generated by the clamps utilizing the HAND mode of operation.

In addition to these test sections, two other tests were performed which were not common to all fuel types. The tests and fuel types they were tested for are as follows.

- Sensor Operation Verification Test - This test section verified the operation of the four load cells on the Cutting and Staging Tables utilizing a GE 8x8 and B&W 15x15 mock-up fuel.
- Fuel Centering Test - This test section verified that the clamps could reposition and center an offset B&W 15x15 mock-up fuel. The B&W 15x15 mock-up fuel was selected because it was the heaviest fuel used in this test program.

The test results and data for each of these test sections are contained within the record copy (Ref. Attachment 1) of the test procedure. Each test step has been signed by appropriate personnel as required for final disposition of this SOT. Section 4.0 of this volume provides a typical format for the test procedure and includes an explanation and reference as to the location of the test data included in the various sections of the test procedure.

Two processes were implemented for making all necessary changes to the official test procedure and/or equipment. The first process is a Temporary Procedure Change Notice (TPCN). The TPCNs were used to make changes to the test procedure. For this test sequence eight TPCNs were issued as follows:

- TPCNs #1, 4, and 7 were issued to delete or revise prerequisites, test steps, and acceptance criteria that

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could not be performed as written.

- TPCNs #2, 5, and 6 were issued to correct errors in the test procedure.
- TPCNs # 3 and 8 were issued to add or clarify test procedure steps.

Each TPCN identified the change, reason for change, and final disposition for approval of the test results. A copy of each TPCN is included in Attachment 1.

The second process is an Exception/Repair Log (ERL). The ERLs were used to document either fixes to the equipment to meet acceptance criteria or to justify acceptance of the test results that did not meet the test criteria. For this test, 27 ERLs were issued as follows:

- ERLs #1, 2, 4, 5 and 6 were issued to take exception to prerequisites not completed prior to testing.
- ERLs #3, 11, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 26 and 27 were issued to accept results that did not meet either the requirements or acceptance criteria of the test.
- ERLs #7, 8, 9, 10, 12, 13, 17 and 25 were issued to implement fixes to the equipment or software in order to meet the acceptance criteria.

Each of these ERLs identified a problem encountered during testing, the proposed solution to the problem, and the final disposition (accept as is or fix) to close out the ERL. A copy of each ERL is included in Attachment 1.

If a change to the acceptance criteria was required, a Test Acceptance Criteria (TAC) Change Notice (TCN) was issued against the TAC document. A TPCN would then be issued to reflect changes to the procedure. For this procedure, five TCNs were issued against the TAC. The TCNs issued against the TAC documents can be found in the Test Section of the QA Records Package, which is a Phase III deliverable.

4.0 TEST RESULTS

The Cutting and Staging System SOT was performed prior to restructuring of the test program which tested equipment and software associated with processing only the Westinghouse (W) 17x17

fuel. Therefore, all five fuel types were tested during this SOT. However, retests were performed at a later date to verify that the clamp positioning and forces were acceptable for the W 17X17 fuel type only. These retests were necessary because of changes performed to the equipment and acceptance criteria. The results presented below will not be broken up by fuel types unless a specific problem was encountered that was fuel specific. This is due to the repetitive nature of the testing performed.

Prior to initiating this test, a list of prerequisites had to be satisfied (Ref. Section 2.0 of Attachment 1). These prerequisites identified all of the requirements for initiating this test sequence and served as an informal Operational Readiness Review (ORR). As a result of this informal ORR, it was determined that five prerequisites could not be satisfied. Two prerequisites (Ref. ERLs #1 and 4) could not be satisfied due to the existence of open items on the QA/QC data package. Two other prerequisites (Ref. ERLs #2 & 5) could not be satisfied due to the existence of incomplete testing and calibration of equipment required to support certain sections of the SOT. The remaining prerequisite (Ref. ERL #6) could not be completed due to an open item on the Control System checklist. Based on an evaluation of these outstanding items by the review committee, it was determined that only ERL #6 could affect the operation of the equipment or the validity of the test results. ERL #6 was written because brakes were not included on the original clamp drives. Testing of the Cutting and Staging System was initiated, however, to verify if brakes were actually required for the clamps to function as intended.

4.1 SENSOR OPERATION VERIFICATION TEST

The purpose of this test was to verify that the Control System acknowledged the presence of a weight when the four load cells located on the Cutting and Staging Stations were activated. This test was performed in the GE 8x8 and B&W 15x15 test sections only, utilizing the JOG mode of operation.

This test was performed using a GE 8x8 and B&W 15x15 mock-up fuel as the test weight. The mock-up fuels were placed on the Cutting Station and Staging Stations using the Fuel Assembly Handling Fixture. The fuel was lowered to each station and the Control System PLC registers checked to verify that a load was present. All loads were acknowledged by the Control System; therefore, the test was judged acceptable for continuing on to the the next series of tests.

4.2 DRIVE SYSTEM VERIFICATION

The purpose of this test was to verify that clamp openings in the

open and closed positions met design requirements for the five fuel types. Additionally, the operational time was verified against the acceptance criteria. The HAND mode of operation was utilized for this test to verify that the set points were correct for automatic positioning.

Multiple problems were encountered during this test sequence which resulted in equipment modifications and changes to the acceptance criteria. The first of these problems was that the clamps would not close down enough to restrain the GE 8x8 fuel (Ref. ERL #7). The problem was complicated further when hardstops were added to prevent driving the clamp arms into the outer bearing blocks. As a result, 0.125 inch spacer plates were added to the inside of the clamp pads to decrease the opening by 0.250 inch total. This corrected the problem, and the desired opening of 5.19 ± 0.03 was obtained.

The second problem encountered was that the clamps would not open to 11.00 ± 0.03 inch as required by the acceptance criteria (Ref. ERLs #7 and 12). A further reduction in the opening was created when the spacer plates were added to the clamp pads as defined above. Since the clamps could not be modified to open further, the acceptance criteria were reevaluated and changed to agree with other clamp openings used in the cell (Ref. TPCN #7 and TCN 003). This value was changed to > 10.30 inches to allow for positioning of the widest fuel (8.54 inches) with a 1.50 inch bow and an RBT positioning accuracy of ± 0.13 inch. This opening was achieved and found acceptable.

The clamp operating time was also changed as a result of slowing down the drive speed (Ref. TPCN #7 and TCN 002). The operating time was changed from 11 - 27 seconds to 5 - 40 seconds. This range was achieved and found acceptable. The drive speed was slowed down because different drive motors were added which utilized a different power voltage and gear ratio. The motors were changed to add brakes.

An informal review of the SOT by the ORR group concluded that a retest of this test section and the clamp force tests was required to reverify that previous tests had been performed correctly (Ref. ERL #26). The W 17x17 part-program was the only test section retested due to the restructured test program. All the above changes were incorporated into this test procedure and verified to be correct. Based on these test results, this test sequence was judged acceptable for continuing on to the next series of tests.

4.3 INTERLOCK VERIFICATION

The purpose of this test was to verify that the clamp drives (M-

104P and Q) could not be energized if interfacing drives or equipment were positioned to undesired locations. This test was performed using the HAND mode of operation. In most cases, the interfacing equipment was positioned through temporary changes to the Control System data registers rather than physically moving the equipment. This was not always a straightforward task and on numerous occasions caused problems.

Once initial setup of the Control System was performed, only one problem was encountered with the interlocks (Ref. ERL #3). The software was corrected and the interlock retested. Based on these test results, this test section was judged acceptable for continuing on to the next series of tests.

4.4 SINGLE MODE VERIFICATION

The purpose of the SINGLE mode test was to verify that the Cutting Station auto process sequence was correct and that the single step function operated as desired. Setup of the SINGLE mode test was similar to that of the interlock tests. Multiple Control System data registers were temporarily modified to "fake out" the drives into thinking that all interlocks were satisfied and that interfacing machines were either safe or in the proper position. As with the interlock tests, this was not always a straightforward task and on various occasions created problems.

Once the interlocks were satisfied and initial setup was complete, the single step test sequence was operated to verify proper sequential order. With the exception of a minor procedural change (Ref. TPCN #6) that involved deleting a step for operator intervention, all steps performed as designed. Based on these results, this test section was judged acceptable for continuing on to the next series of tests.

4.5 AUTO MODE VERIFICATION

Similar to the SINGLE mode test, the purpose of the AUTO mode test was to verify that the Cutting Station process sequence was correct and that the automatic function operated as desired. Since the SINGLE mode test had been operated prior to this test, temporary changes to the Control System data registers remained the same, requiring minimal setup of the Control System.

The same procedural change made during the SINGLE mode test (Ref. TPCN #6) was also required for this test section. After the change was made, no problems were encountered with the process sequence. Based on these test results, this test section was judged acceptable for continuing on to the next series of tests.

4.6 CLAMP DRIVE FAULT TEST

The purpose of this test was to verify that if a fault was implemented to the system in one of the automatic modes, the alarm system would function as follows:

- Motors are automatically deactivated if a fault condition is applied.
- Audio alarm is automatically activated and can be deactivated by the operator.
- Fault condition is displayed on the control console.
- Fault condition is printed out on the printer.
- Cameras 3 and 10 are activated when called up by the operator.
- System can be recovered and processing continued.

An overcurrent fault was selected for this test sequence and was simulated to one of the clamp drive motors by temporarily changing the Control System data registers. An attempt was made to close the clamps in the HAND mode. Almost immediately, the system was deactivated and the alarm system activated. The alarm system functioned as designed with the exception of the audio alarm (Ref. ERL #10). The audio alarm was simply not turned on at the time of the test. The alarm was activated and the test sequence was rerun to verify that it was functioning.

In addition to this, it was questionable as to whether cameras 3 and 10, 4 and 10, or all three were supposed to be assigned to the clamps (Ref. ERLs 11 and 27). As tested, cameras 4 and 10 were activated when called up by the operator. It was recommended that cameras 3 and 10 be assigned to the upper clamp (M-104Q) and cameras 4 and 10 be assigned to the lower clamp (M-104P) to provide unobstructed views. This could not be performed since only the same two cameras could be assigned to both clamps due to the way the Control System was designed. Therefore, cameras 4 and 10 were accepted on the basis that other cameras could be called up manually if desired by the operator.

Based on the above results and exceptions taken, this test sequence was judged acceptable for continuing on to the next series of tests.

4.7 CLAMP FORCE TEST

The purpose of this test was to verify that the forces generated by the clamps in the HAND mode of operation met the acceptance criteria. This test sequence was performed a number of times because of changes to the equipment and acceptance criteria.

The clamp force test was initially performed without brakes on the clamp drive motors (M-104P and Q). Clamp forces were measured by closing the clamps on a test fixture set at the width of the various fuel assemblies. The test fixture contained a load cell which produced an output reading in millivolts, which was proportional to pounds force. Clamp forces were to be greater than 450 lbs. but less than 500 lbs. to meet the acceptance criteria. However, the acceptance criteria could not be met for several reasons (Ref. ERL #9). Maximum clamp forces between 450 and 500 lbs. were obtained only several times out of multiple attempts. This was due to the fast buildup of forces and the slow sampling time of the Control System. Even when correct values were reached, the motors would be backdriven once deenergized. This was due to the inability of the drive motors to resist rotating from the clamp reaction forces. Therefore, further evaluation of the drive motors and acceptance criteria was required before testing was resumed.

As a result of the above problems, new clamp drive motors were installed with brakes. In addition to this, the load cell test gauge was replaced with a mechanical type force gauge so that clamp forces could be read directly off the gauge. Retests were performed which proved successful at maintaining clamp forces once the motors were deenergized. However, obtaining consistent forces between 450 and 500 lbs. could not be done. Therefore, the clamp force acceptance criteria range was increased to 300 - 500 lbs. (Ref. TPCN #7 and TCN 002).

Retests were performed only for the W 17x17 part-program because of the restructured test program. Testing was initiated using the new acceptance criteria. However, consistent force readings in the 300 to 500 lb. range could not be obtained because of the fast buildup of forces and the slow sample time of the Control System. In addition to this, it was found from preliminary testing that peak current value settings that produced clamp forces in excess of 500 lbs. were required for the clamps to center offset fuel without producing torque faults. Clamp forces produced using this peak current setting ranged from 490 - 730 lbs. Even though the 500 lb. limit was exceeded, no damage to fuel assembly grid spacers had occurred during multiple operations of these clamps during testing or in support of other tests and equipment setup. Because it is required that the clamps center an offset fuel assembly, this peak current set point had to be used to avoid torque faults.

Therefore, it was recommended that the clamps be accepted as is. This recommendation was based on the constant use of the clamps without causing damage to the mock-up fuels.

4.8 FUEL CENTERING TEST

The purpose of this test was to verify that the clamps were capable of centering an offset B&W 15x15 mock-up fuel assembly within ± 0.03 inch of its true centerline position. This test sequence was performed a minimum of three times to verify the repeatability of the system.

This was by far the most important design feature of the clamps and produced the best test results. The fuel was offset approximately 0.75 inch and the clamps closed to center the fuel three separate times. Each time, the clamps centered the fuel within 0.005 inch of the centerline position. Based on these test results, this test sequence was judged acceptable.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

In general, the Cutting and Staging System performed as designed. The clamps generated sufficient force to center and restrain the fuel without damaging it. This would apply to fuels ranging in widths from 5.20 inches (GE 8x8) to 8.54 inches (B&W 15x15). The following conclusions are drawn from the Cutting and Staging System SOT.

- All drives operated as designed under loaded and unloaded conditions.
- All control modes of operation (JOG, HAND, SINGLE, and AUTO) performed as designed.
- The interlocks performed as designed.
- The clamp drive fault alarm system performed as designed.

Based on these conclusions, the Cutting and Staging System was judged acceptable for the normal IST.

5.2 RECOMMENDATIONS

As a result of the SOT performed, several recommendations have been made. These recommendations, along with those identified in Section 7.0 of the main body of this report, should be implemented for the next generation system. These recommendations are as

follows.

- Increase clamp lead screw length and modify clamp arms to enable a wider range of clamp travel and to prevent using the bearing blocks as hardstops.
- Increase clamp lead screw diameter to strengthen motor and resolver coupling points.
- Increase Control System sample time or reduce motor speed to enable more consistent clamp forces.
- Change clamp pad supports from a flat plate surface to a roller surface to reduce clamp force necessary to center clamps.
- Spring load clamps to restrict clamp force to desired levels.

ATTACHMENT 1

SYSTEM OPERATIONAL TEST PROCEDURE

FOR THE

CUTTING AND STAGING SYSTEM

(WBS 1.3.1.3)

DOCUMENT NO. 9315-TP-209A

NUS
CORPORATION
ENGINEERING DIVISION

Signature

Record Copy
Peter V. Jull

Date

12/1/91

TEST PROCEDURE

CLIENT: DOE/Rod Consolidation

PROCEDURE NO.: 9315-TP-209A

LOCATION: Cold Test Facility

REVISION NO.: 2

TITLE:

RELEASED FOR:

☐

REVIEW

☒

TEST

SYSTEM OPERATIONAL TEST PROCEDURE
FOR
STAGING/CUTTING SYSTEM

(WBS 1.3.1.3)

APPROVED

P. M. Mello

PROJECT MANAGER

DATE

6/3/91

APPROVED

[Signature]

QUALITY ASSURANCE

DATE

5/29/91

APPROVED

R. Nichols

DISCIPLINE MANAGER

DATE

5/29/91

APPROVED

J. Vaughan

AUTHOR

DATE

14 May '91

2	<i>Ken Hargrave</i>	11/2/90	<i>R. Nichols</i>	11/2/90	<i>[Signature]</i>	11/2/90	<i>R. Nichols</i>	11/2/90		
1	<i>[Signature]</i>	10/3/90	<i>[Signature]</i>	10/3/90	<i>[Signature]</i>	10/3/90	<i>[Signature]</i>	10/3/90		
REV	PREPARED	DATE	APPROVED	DATE	APPROVED	DATE	APPROVED	DATE	APPROVED	DATE

NUS CORPORATION

TEST PROCEDURE 9315-TP-209A

REVISION 2

PAGE i of ii

REVISION CONTROL SHEET

Revised Page No.

Latest Revision

Date

Original

0

May 7, 1991

All

1

October 30, 1991

All as marked

2

November 20, 1991

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1.0 OBJECTIVE OF TEST

The objective of this Test Procedure is to demonstrate the acceptability of the Staging/Cutting System. These detailed test steps will demonstrate the acceptability of the equipment to satisfy design requirements.

2.0 PREREQUISITES

- 2.1 System set-up has been performed per the instruction of Appendix A. RL# 3

Test Conductor Chenette P. Hanger Date 12-4-91

QA Joseph D. Gant Date 12/09/91

- 2.2 Camera, film, lighting and personnel are available to take photographs per the instruction of Appendix C and the detailed procedure steps (Section 8.0).

Test Conductor Chenette P. Hanger Date 12-4-91

QA Joseph D. Gant Date 12/09/91

- 2.3 The QA/QC Data Package has been prepared in accordance with Specification 9315-M-200, and the applicable Bill of Material, and is acceptable. RL# 4

Test Conductor Eric Forrest Date 3/23/92

QA W. M. Lyndell Date 3/23/92

- 2.4 The system has been assembled in accordance with all applicable Drawings, DCNs and FCRs of the QA/QC Data Package. RL# 4

Test Conductor Eric Forrest Date 3/23/92

QA W. M. Lyndell Date 3/23/92

- 2.5 The Test Engineer/Conductor has been qualified and certified in accordance with QAP 2.0.

Test Conductor Chenette P. Hanger Date 12-4-91

QA Joseph D. Gant Date 12/09/91

TPC 931
KSH
8-11-91

- 2.6 All test personnel participating in this test have been trained per the instruction of Section 6.4 of Reference 11.X. ⁶ KH 12-4-91

Test Conductor Kenneth B. Hayes Date 12-10-91

QA Joseph A. Gant Date 12-10-91

- 2.7 The checklist contained in the Control System SOT (9315-TP-601) ^{RL} applicable to this system must be completed and the results ^{#6} accepted prior to the initiation of testing under this procedure.

Test Conductor Kenneth B. Hayes Date 12-9-91

QA Joseph A. Gant Date 12/09/91

- 2.8 A limited access area with warning signs has been established around the equipment being tested.

Test Conductor Kenneth B. Hayes Date 12-10-91

QA Joseph A. Gant Date 12-10-91

- 2.9 The system FAT has been completed and accepted by NUS. ^{RL #1}

Test Conductor Ernst Forest Date 31-3-92

QA Joseph A. Gant Date 3/23/92

- 2.10 All equipment required to support this test as defined in Section 6.0 of this procedure is operational and calibrated as required. ^{RL #5}

Test Conductor Kenneth B. Hayes Date 12-11-91

QA Joseph A. Gant Date 12-11-91

- 2.11 A visual inspection of the system being tested has been performed to verify there are no obstructions and/or damage to the equipment that may impact testing.

Test Conductor Kenneth B. Hayes Date 12-9-91

QA Joseph A. Gant Date 12/9/91

- 2.12 The environmental conditions as defined in Section 4.0 are met.

Test Conductor Kenneth B. Hayes Date 12-9-91

QA Joseph A. Gant Date 12/09/91

- 2.13 ~~Procedures for changeover of fuel types for the Control System are in place in the Control Room.~~ TPCN # 1

Test Conductor Kenneth B. Haynes Date 12-9-91

QA Joseph A. Gant Date 12-10-91

- 2.14 The RBT has been accepted by its FAT and is operational.

Test Conductor Kenneth B. Haynes Date 12-4-91

QA Joseph A. Gant Date 12/09/91

- 2.15 The Fuel Assembly Handling Fixture (FAHF) has been accepted by its FAT and is operational. RL # 2

Test Conductor Erin Farrell Date 3/20/92

QA William J. Jones Date 3/23/92

- 2.16 As a minimum, cameras 3 and 10 are installed and operational.

Test Conductor Kenneth B. Haynes Date 12-9-91

QA Joseph A. Gant Date 12/09/91

3.0 INITIAL TEST CONDITIONS

- 3.1 The RBT is coupled both electrically and mechanically to the BWR FAHF and is operational.

Test Conductor Kenneth B. Haynes Date 12-10-91

- 3.2 The following fuel assembly mockups must be available and loaded in the storage rack, or test cell accessible to the FAHF.

- General Electric 8 x 8 Type 1, P2.
- Babcock & Wilcox 15 x 15 Type 1, Class 1.

Test Conductor Kenneth B. Haynes Date 12-10-91

- 3.3 TV monitors are "ON" with crosshair alignment verified. KH 12-9-91

Test Conductor Kenneth B. Haynes Date 12-10-91

- 3.4 All slides of the upper cutting system in the "HOME" position. The upper cutting system has not been completed, therefore will not impact testing. KH 12-9-91

Test Conductor Kenneth B. Haynes Date 12-9-91

PCN # 7
KH
12-9-91

- 3.5 Band saw of the lower cutting system in the fully raised position* and
driven to the fully retracted position. FH 12-9-91
Test Conductor Kenneth B. Wagoner Date 12-10-91

4.0 ENVIRONMENTAL CONDITIONS

At least One HVAC unit for the control room and the air circulation system for the Test Cell should be operating and maintaining the test cell and control room temperatures in the ranges 60° to 90°F and 65° to 85°F respectively.

Test Conductor Kenneth B. Wagoner Date 12-9-91

5.0 SPECIAL PRECAUTIONS

All precautions, warnings and notes are addressed in the Detail Test Steps (Section 8.0), prior to the step to which they apply.

6.0 SPECIAL EQUIPMENT REQUIRED

- 6.1 Compression Load Test Fixture - Dwg. 9315-M-0012 (calibration required) | 2
- 6.2 Inside micrometer or measuring device with a range of 5-12 inches (calibration required). | 2
- 6.3 Stopwatch (calibration not required)

7.0 TEST DATA RECORDING

7.1 Test Data Records

The test conductor shall designate one copy of the test procedure and its attachments as the "Record Copy" and shall ensure that this copy is maintained current. All test data, significant events, and observations must be recorded in this document. Additional sheets may be used as necessary, but must be permanently affixed to this report by staples and/or tape.

7.2 Test Procedure Modification

This section addresses the process for making modifications to the approved Test Procedure. These modifications will fall into one of three categories, as follows:

- Corrections are modifications to the procedure due to typos or incorrect information.
- Minor Changes are modifications which do not affect functional intent or acceptance criteria of the test.

- Major Changes are changes that affect functional intent or acceptance criteria.

Each of these modifications will be handled differently. If a correction is required to the procedure, it will be made with pen and ink in the "Record Copy", as they are found. The test conductor will make the appropriate change. Once the change is made, he will initial and date the change for future reference. All modifications which are considered minor changes must be documented on "Temporary Procedure Change Notice" (TPCN) forms (refer to Appendix D). This change shall be approved by the test conductor by annotating that the test procedures are using the TPCN form. All modifications which are considered a major change must also be documented on the TPCN form. However, when a major change is required, testing shall be halted until the TPCN is approved by the responsible Test Engineer, Test Conductor, Quality Assurance and Project Engineer.

7.3 Repairs/Retesting

This section addresses the process for making necessary repairs to the equipment and retesting of the system. If during testing a problem is observed which requires repair or rework of the equipment, testing shall be halted. If the repair/rework is minor, the Test Conductor will document the problem, cause, and corrective action implemented, the faulty system will be retested. All remaining tests will continue on until conclusion. If the problem requires redesign of the faulty system, all testing of this equipment will be halted. The problem and recommended solution will be documented and submitted to the Test Review Group (TRG) for approval. Once approval and the repair is complete, testing of the equipment will be accomplished in accordance with this procedure.

8.0 DETAILED TEST STEPS

The following sequences of tests are arranged per fuel type. All tests pertaining to a certain fuel are performed, then repeated for the next consecutive fuel type. The order in which these tests are performed will not have an impact on the results and can therefore be performed in any order as deemed appropriate by the test conductor.

8.1 System Verification for the GE 8 x 8 BWR Fuel Type

The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the GE 8 x 8 BWR fuel type. Prior to initiating testing, verify the control system is programmed for the GE 8 x 8 BWR fuel type.

Test Conductor JB Stagers

Date 12-10-91

8.1.1 Sensor Operation Verification Test

WARNING

Stay clear of the test load during overhead movement.

Verify the operation of the staging/cutting table load cells as follows:

1. Open upper (M-104Q) and lower (M-104P) clamps.
2. Set control system to "JOG" mode.
3. Using the RBT and FAHF, pickup the GE 8 x 8 mockup fuel from the storage rack and move over the No. 1 staging station.
4. Lower the mockup fuel at 30% full speed until fully seated. Verify control system acknowledges receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Acceptance Criteria:

- Fuel assembly mockup was positioned via the RBT and FAHF.
(PLC) KH 12-10-91
- Control system indicates fuel at station No. 1 and no fuel at all other stations.

Test Conductor J. D. Hays

Date 12-10-91

QA J. D. Hays

Date 12-10-91

5. Raise mockup fuel at 30% full speed from staging station No. 1 and lower on staging station No. 2. Verify control system acknowledges receipt of fuel.

(PLC) KH 12-11-91

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Acceptance Criteria:

- Fuel assembly mockup was positioned via the RBT and FAHF.
(PLC) KH 12-11-91
- Control system indicates fuel at station No. 2 and no fuel at all other stations.

Test Conductor J. D. Hays

Date 12-11-91

QA J. D. Hays

Date 12-11-91

6. Raise mockup fuel at 30% full speed from staging station No. 2 and lower on staging station No. 3. Verify control system acknowledges receipt of fuel.

(PLC) KH 12-10-91 2

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

Acceptance Criteria:

- Fuel assembly mockup was positioned via the RBT and FAHF.
- Control system indicates fuel at station No. 3 and no fuel at all other stations.

Test Conductor MB Hayes Date 12-10-91

QA J. Ayers Date 12-10-91

7. Raise mockup fuel at 30% full speed from staging station No. 3 and lower on cutting station. Verify control system acknowledges receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

Acceptance Criteria:

- Fuel assembly mockup was positioned via the RBT and FAHF.
- Control system indicates fuel at cutting station and no fuel at all other stations.

Test Conductor MB Hayes Date 12-10-91

QA J. Ayers Date 12-10-91

8. Raise mockup fuel at full speed from cutting station and move to storage racks.

9. Position mockup fuel at 30% full speed in storage rack and release once seated.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

10. Switch control system to the "HAND" mode and send the FAHF back to the "HOME" position or laydown area (whichever is more convenient).

11. The above steps have been completed.

Test Conductor MB Hayes Date 12-11-91

8.1.2 Drive System Operation Verification Test

WARNING

Stay clear of clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

 Type of Measuring Device Dial Caliper Range 0-12 in
 Identification No. NUS-001 Calibration Due Date 4-29-92

 Upper clamp opening (open position) 10.870 inch 10.870
 Lower clamp opening (open position) 10.730 inch 10.730

RETEST RL #7

Acceptance Criteria:

RL #7

- Clamp jaws separated by 11.00 ± .03 inches.

 Test Conductor J.B. Hays Date 12-10-91

 QA J. V. Hays Date 12-10-91

3. Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

 Type of Measuring Device Dial Caliper Range 0-12 in
 Identification No. NUS-001 Calibration Due Date 4-29-92

 Upper clamp opening (closed position) 5.302 inch 5.16
 Lower clamp opening (closed position) 5.280 inch 5.20
 Closing time 24 seconds

 RETEST RL #7
 3/4/92 3/15/92

Acceptance Criteria:

- Clamp jaws separated by 5.19 ± .03 inches.

 T.H.C.
 K.S.H.
 8-4-92

TICK #7
KPH
8-4-92

- Time to close is between ⁵11 sec. and ⁴⁰27 sec.

Test Conductor KB Haynes Date 12-10-91

QA J. Alfaro Date 12-10-91

- Repeat Steps 2 and 3 two additional times.

Type of Measuring Device Dial Caliper Range 0-12 in.
Identification No. NUS-001 Calibration Due Date 4-29-92

Upper clamp opening (open position)	<u>10.815</u>	inch	RETEST R47 10.45
Lower clamp opening (open position)	<u>10.730</u>	inch	10.53
Upper clamp opening (closed position)	<u>5.305</u>	inch	5.16
Lower clamp opening (closed position)	<u>5.240</u>	inch	5.16
Closing time	<u>24</u>	seconds	

Upper clamp opening (open position)	<u>10.855</u>	inch	10.45
Lower clamp opening (open position)	<u>10.582</u>	inch	10.50
Upper clamp opening (closed position)	<u>5.282</u>	inch	5.17
Lower clamp opening (closed position)	<u>5.260</u>	inch	5.17
Closing time	<u>25</u>	seconds	

3.49/40 100

Acceptance Criteria:

- Clamp jaws separated by ^{>10.30}11.00 ± .03 inches.
- Clamp jaws separated by 5.19 ± .03 inches.
- Time to close is between ⁵11 sec. and ⁴⁰27 sec.

2-7

Test Conductor KB Haynes Date 12-10-91

QA J. Alfaro Date 12-10-91

- The above steps have been completed.

Test Conductor KB Haynes Date 12-10-91

TICK #7
KPH
8-4-92

8.1.3 Interlock Verification Test

WARNING

Stay clear of clamps while in operation

8.1.3.1 Verify the lower clamp (M-104P) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the lower clamp can be opened. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

Test	A	B	C	D	System Operates			Expected Result
i	0	0	0	0	☐	yes	☒ no	no
ii	1	0	0	0	☒	yes	☐ no	yes
iii	0	1	0	0	☐	yes	☒ no	no
iv	0	0	1	0	☐	yes	☒ no	no
v	0	0	0	1	☐	yes	☒ no	no
vi	1	1	0	0	☒	yes	☐ no	yes
vii	1	0	1	0	☒	yes	☐ no	yes
viii	1	0	0	1	☒	yes	☐ no	yes
ix	0	1	1	0	☐	yes	☒ no	no
x	0	1	0	1	☐	yes	☒ no	no
xi	0	0	1	1	☐	yes	☒ no	no
xii	1	1	1	0	☒	yes	☐ no	yes
xiii	1	1	0	1	☒	yes	☐ no	yes
xiv	1	0	1	1	☒	yes	☐ no	yes
xv	0	1	1	1	☒	yes	☒ no	yes
xvi	1	1	1	1	☒	yes	☐ no	yes

KH RL #8
12-16-91

Acceptance Criteria:

- System does not operate unless the following conditions are satisfied: A or (B + C + D).

Test Conductor MB Stanger Date 12-16-91

QA Jill Hester Date 12-16-91

3. The above steps have been completed.

Test Conductor MB Stanger Date 12-10-91

- 8.1.3.2 Verify the upper clamp (M-104Q) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the upper clamp can be opened. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

Test	A	B	C	D	System Operates			Expected Result
i	0	0	0	0	—	yes	✓	no
ii	1	0	0	0	✓	yes	—	yes
iii	0	1	0	0	—	yes	✓	no
iv	0	0	1	0	—	yes	✓	no
v	0	0	0	1	—	yes	✓	no
vi	1	1	0	0	✓	yes	—	yes
vii	1	0	1	0	✓	yes	—	yes
viii	1	0	0	1	✓	yes	—	yes
ix	0	1	1	0	—	yes	✓	no
x	0	1	0	1	—	yes	✓	no
xi	0	0	1	1	—	yes	✓	no
xii	1	1	1	0	✓	yes	—	yes
xiii	1	1	0	1	✓	yes	—	yes
xiv	1	0	1	1	✓	yes	—	yes
xv	0	1	1	1	✓	yes	✓	yes
xvi	1	1	1	1	✓	yes	—	yes

KH
12-10-91

RL #8

Acceptance Criteria:

- System does not operate unless the following conditions are satisfied: A or (B + C + D).

Test Conductor MB Haynes

Date 12-16-91

QA G. A. G. S.

Date 12-16-91

3. The above steps have been completed.

Test Conductor MB Haynes

Date 12-16-91

8.1.4 Single Mode Verification Test

Place the Cutting/Staging System in SINGLE mode and verify system automatic sequence.

WARNING

Stay clear of the cutting table clamps system while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

8.1.4.1 Verify receipt of fuel at the cutting/staging system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

1. Simulate fuel placement on the cutting table by temporarily forcing the data register and verify receipt of fuel.

2

Acceptance Criteria:

- Request made for fuel assembly transfer.
- Transfer verified.

Test Conductor MB Haynes

Date 12-16-91

QA G. A. G. S.

Date 12-16-91

2. The above step has been completed.

Test Conductor MB Haynes

Date 12-16-91

8.1.4.2 Verify clamping operations ~~as follows~~ receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

~~1. Press "Continue" to position and close clamps.~~

Acceptance Criteria:

- ~~Both upper and lower~~
• ~~When "Continue" is touched on the screen, clamps close.~~ automatically

Test Conductor MB Hayes

Date 12-16-91

QA

Jim Goff

Date 12-16-91

Step not
required.
KH 12-16-91

~~2. The above step has been completed.~~

~~Test Conductor~~ _____

~~Date~~ _____

8.1.5 Auto Mode Verification Test

Place the Cutting/Staging System in AUTO mode and verify system automatic sequence.

WARNING

Stay clear of the cutting table clamps while in operation.

NOTE

Operator must press "CONTINUE" after each "HOLD POINT" to complete automatic operation.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

1. Simulate fuel placement on the cutting table as performed in Section 8.1.4.1 and press GO to initiate the automatic fuel clamping process. Verify the process was automatically completed.

Acceptance Criteria:

- Request made for fuel assembly transfer.
- Transfer verified.

- ~~Both upper and lower~~
• ~~When "Continue" is touched on the screen, clamps close.~~ automatically

Test Conductor MB Hayes

Date 12-16-91

QA

Jim Goff

Date 12-16-91

2. The above step has been completed.

Test Conductor MB Hayes

Date 12-16-91

KH
12-16-91
TPCN #6

8.1.6 Clamp Drive Fault Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG TPCN 4

1. Place the cutting/staging system in the ~~"SINGLE"~~ ^{HAND} mode and initiate operations to close the cutting table clamps (M-104P, M-104 Q).

2. Temporarily alter the control system software to implement an overcurrent fault with either clamp drive motor.

TPCN 5 ← 3. Press ~~"CONTINUE"~~ ^{GC} to drive the clamps close and verify the drive motor stops and registers a fault in the control room.

Acceptance Criteria:

- ✓ • Motor stops when fault condition is implemented.
- RL# 10 { • Alarm system is activated.
- Alarm is silenced when acknowledged by operator.
- ✓ • Control system displays fault condition on control screen.
- ✓ • A report is printed defining the fault condition when commanded by the operator.

Test Conductor MB Hayes Date 12-16-91

QA JA Date 12-16-91

4. Verify cameras No. 3 and No. 10 are activated and view the cutting/staging system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- Video images from cameras No. 3 and NO. 10 are displayed on monitors when "CAMERA CALL" is touched on control screen.
- Camera No. 3 and No. 10 can be positioned to provide an unobstructed view of the cutting table clamps.

Test Conductor MB Hayes Date 12-13-91

QA JA Date 12-13-91

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode. TPCN #4
KH 12-13-91 HAND

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued. TPCN #4
KH 12-13-91 HAND

Test Conductor Ken Hayes

Date 12-13-91

QA

JD Fort

Date 12-13-91

6. The above steps have been completed.

Test Conductor JB Hayes

Date 12-13-91

8.1.7 Clamp Force Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the force exerted by both cutting table clamps as follows:

1. Place cutting/staging system in "JOG" mode. HAND KH 12-12-91 TPCN #2

2. Open both upper (M-104Q) and lower (M-104P) clamps.

3. Set up load cell fixture (9315-M-0012) to a width of 5.52 KH 12-12-91 5.25 ± .03 TPCN #3 inches and place between the upper clamps.

4. Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

Type of Measuring Device Multimeter Range Various

Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force _____ lbs. RL #9

RETEST RL #7
483 LBS

Acceptance Criteria:

- Clamping force greater than 450 lbs. but less than 500 lbs.

Test Conductor JB Hayes

Date 12-13-91

QA

JD Fort

Date 3/23/92

TPC #7
KBH
8-4-92

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device Multimeter Range Various
Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force _____ lbs.

Clamp force _____ lbs.

RETEST RL#9
500 LBS.

RL#9

450 LBS

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor WB Hayes Date 12-13-91

QA J. B. Hayes Date 3/23/92

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device Multimeter Range Various
Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force _____ lbs.

Clamp force _____ lbs.

Clamp force _____ lbs.

RETEST RL#9
450 LBS

RL#9

450 LBS

150 LBS

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor WB Hayes Date 12-13-91

QA J. B. Hayes Date 3/23/92

7. The above steps have been completed.

Test Conductor WB Hayes Date 12-13-91

TICN#7
KBH
B-4-92

TICN#7
KBH
B-4-92

SPECIFICATION 9315-TP-209A

REVISION 2

PAGE 1

	Mode of Operation	Load Cell Fixture Width	Voltage at Max Force	Max Force	Voltage After Backdriven	Force After Backdriven	Comments
1	JOG	5.28 in	2.7 mV	450 lbs	0	0	Clamp barely contacted fixture, driven to h.s.
2	"	5.66 in	12.6 mV	2066 lbs	not recorded	not recorded	Shims added to fixture width
3	"	5.66 in	15.3 mV	2550 lbs	"	"	"
4	HAND	5.50 in	3.1 mV	516 lbs	1.2 mV	200 lbs	Backdriven force remained constant
5	"	"	3.6 mV	600 lbs	1.0 mV	167 lbs	"
6	"	"	2.7 mV	450 lbs	1.2 mV	200 lbs	overcurrent setting was changed
7	"	"	2.7 mV	450 lbs	1.3 mV	216 lbs	Backdriven force remained constant
8	"	"	2.6 mV	433 lbs	1.3 mV	217 lbs	"
9	"	"	2.6 mV	433 lbs	1.2 mV	200 lbs	"
10	"	"	3.4 mV	566 lbs	1.0 mV	167 lbs	overcurrent setting was changed
11	"	"	2.9 mV	483 lbs	1.1 mV	183 lbs	Backdriven force remained constant
12	"	"	3.1 mV	517 lbs	1.0 mV	167 lbs	"
13	"	"	2.8 mV	467 lbs	1.0 mV	167 lbs	overcurrent setting was changed
14	"	"	2.8 mV	467 lbs	1.2 mV	200 lbs	Backdriven force remained constant
15	"	"	3.0 mV	600 lbs	1.1 mV	183 lbs	overcurrent setting was changed
16	"	"	3.2 mV	533 lbs	1.2 mV	200 lbs	"
17	"	"	3.6 mV	600 lbs	1.0 mV	167 lbs	"
18	"	"	4.0 mV	667 lbs	0.9 mV	150 lbs	"
19	"	"	3.6 mV	600 lbs	1.0 mV	167 lbs	"
20	"	"	4.8 mV	800 lbs	0.7 mV	117 lbs	"
21	"	"	3.6 mV	600 lbs	1.0 mV	167 lbs	"
							ff

- Notes
1. Max. voltage was read visually on multimeter. for tests 1 → 14. Due to max clamp force lasting only 1-2 seconds, the true maximum force could not be accurately read. A min-max record function was used for tests 15-21, these values are accurate.
 2. Backdrive time was approximately 1-2 seconds after motor shut off.

	Mode of Operation	Load Cell Fixture width	Voltage at max Force	Max Force	Voltage After Backdriven	Force After Backdriven	Comments
1.	HAND	5.50 in.	2.5 mV	417 lbs.	1.4 mV	316 lbs.	Backdriven force remained constant
2.	"	"	2.5 mV	417 lbs.	1.8 mV	300 lbs.	"
3.	"	"	2.0 mV	333 lbs.	1.4 mV	317 lbs.	overcurrent setting was changed
4.	"	"	2.3 mV	383 lbs.	1.4 mV	317 lbs.	n/c
5.	"	"	2.1 mV	350 lbs.	2.0 mV	333 lbs.	n/c
6.	"	"	3.2 mV	533 lbs.	1.7 mV	283 lbs.	overcurrent setting was changed
7.	"	"	2.5 mV	417 lbs.	1.4 mV	317 lbs.	n/c
8.	"	"	4.4 mV	733 lbs.	1.3 mV	217 lbs.	n/c
9.	"	"	6.6 mV	1000 lbs.	0.8 mV	133 lbs.	overcurrent setting was changed
10.	"	"	2.8 mV	467 lbs.	2.0 mV	333 lbs.	Clamps stopped at max value due to a fault
11.	"	"	2.8 mV	467 lbs.	1.9 mV	317 lbs.	when continue was pressed, max.
12.	"	"	2.8 mV	467 lbs.	1.9 mV	317 lbs.	voltage output jumped to over 10 mV on load cell.

Notes: 1. Max voltage was read visually for tests 1-9. Min-max record function was used for tests 10-12.

8.2 System Verification for the CE 14 x 14 PWR Fuel Type

The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the CE 14 x 14 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the CE 14 x 14 PWR fuel type.

Test Conductor MB Hayes Date 12-13-91

8.2.1 Drive System Operation Verification Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

Type of Measuring Device Dial Caliper Range 0-12 in
Identification No. NUS-001 Calibration Due Date 4-29-91

Upper clamp opening (open position) 10.824 inch
Lower clamp opening (open position) 10.816 inch

TEST 14.10
10.46
10.45
RL #12

Acceptance Criteria:

- Clamp jaws separated by > 10.30 inches.

Test Conductor MB Hayes Date 12-16-91

QA J. Alfaro Date 12-16-91

7/10/91
KPH
8-4-92

3. Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device	<u>Dial Caliper</u>	Range	<u>0-12 in</u>
Identification No.	<u>NUS-001</u>	Calibration Due Date	<u>4-29-92</u>

Upper clamp opening (closed position) 8.215 inch
 Lower clamp opening (closed position) 8.190 inch
 Closing time 11 seconds

Acceptance Criteria:

- Clamp jaws separated by $8.21 \pm .03$ inches.
- Time to close is between ⁵11 sec. and ⁴⁰27 sec.

Test Conductor MB Hayes Date 12-17-91

QA S. Alfaro Date 12-17-91

4. Repeat Steps 2 and 3 two additional times.

Type of Measuring Device	<u>Dial Caliper</u>	Range	<u>0-12 in.</u>
Identification No.	<u>NUS-001</u>	Calibration Due Date	<u>4-29-92</u>

Upper clamp opening (open position) 10.820 inch
 Lower clamp opening (open position) 10.807 inch
 Upper clamp opening (closed position) 8.250 inch RL#12
 Lower clamp opening (closed position) 8.200 inch
 Closing time 11 seconds

Upper clamp opening (open position) 10.825 inch
 Lower clamp opening (open position) 10.800 inch
 Upper clamp opening (closed position) 8.246 inch
 Lower clamp opening (closed position) 8.190 inch
 Closing time 12 seconds

TIC 2-1
 RPT
 6-4-92

ITEM #7
KPH
B.U. 02

Acceptance Criteria:

- Clamp jaws separated by ^{710.50}~~11.00~~ ± .03 inches.
- Clamp jaws separated by 8.21 ± .03 inches.
- Time to close is between ⁵~~11~~ sec. and ⁴⁰~~27~~ sec.

Test Conductor HD Hayes Date 12-16-91

QA [Signature] Date 12-16-91

5. The above steps have been completed.

Test Conductor HD Hayes Date 12-16-91

8.2.2 Interlock Verification Test

WARNING

Stay clear of clamps while in operation

8.2.2.1 Verify the lower clamp (M-104P) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the lower clamp can be opened. Mark the appropriate column per the test result.

2

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

Test	A	B	C	D	System Operates			Expected Result
i	0	0	0	0	—	yes	✓	no
ii	1	0	0	0	✓	yes	—	no
iii	0	1	0	0	—	yes	✓	no
iv	0	0	1	0	—	yes	✓	no
v	0	0	0	1	—	yes	✓	no
vi	1	1	0	0	✓	yes	—	no
vii	1	0	1	0	✓	yes	—	no
viii	1	0	0	1	✓	yes	—	no
ix	0	1	1	0	—	yes	✓	no
x	0	1	0	1	—	yes	✓	no
xi	0	0	1	1	—	yes	✓	no
xii	1	1	1	0	✓	yes	—	no
xiii	1	1	0	1	✓	yes	—	no
xiv	1	0	1	1	✓	yes	—	no
xv	0	1	1	1	✓	yes	✓	no
xvi	1	1	1	1	✓	yes	—	no

Acceptance Criteria:

 KH
 12-16-91

- System does not operate unless the following conditions are satisfied: A or (B + C + D).

 Test Conductor HB Hargreaves

 Date 12-16-91

QA

Calvin

 Date 12-16-91

3. The above steps have been completed.

 Test Conductor HB Hargreaves

 Date 12-16-91

8.2.2.2 Verify the upper clamp (M-104Q) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

1. Place the control system in the HAND mode.

2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the upper clamp can be opened. Mark the appropriate column per the test result.

2

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

NOTE

 Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

Test	A	B	C	D	System Operates			Expected Result
i	0	0	0	0	☐	yes	☒ no	no
ii	1	0	0	0	☒	yes	☐ no	yes
iii	0	1	0	0	☐	yes	☒ no	no
iv	0	0	1	0	☐	yes	☒ no	no
v	0	0	0	1	☐	yes	☒ no	no
vi	1	1	0	0	☒	yes	☐ no	yes
vii	1	0	1	0	☒	yes	☐ no	yes
viii	1	0	0	1	☒	yes	☐ no	yes
ix	0	1	1	0	☐	yes	☒ no	no
x	0	1	0	1	☐	yes	☒ no	no
xi	0	0	1	1	☐	yes	☒ no	no
xii	1	1	1	0	☒	yes	☐ no	yes
xiii	1	1	0	1	☒	yes	☐ no	yes
xiv	1	0	1	1	☒	yes	☐ no	yes
xv	0	1	1	1	☒	yes	☒ no RL#8	yes
xvi	1	1	1	1	☒	yes	☐ no	yes

Acceptance Criteria:

 K14
 12-16-91

- System does not operate unless the following conditions are satisfied: A or (B + C + D).

 Test Conductor BD Hayes

 Date 12-16-91

 QA J. Clifton

 Date 12-16-91

- The above steps have been completed.

 Test Conductor BD Hayes

 Date 12-16-91

8.2.3 Single Mode Verification Test

Place the Cutting/Staging System in SINGLE mode and verify system automatic sequence.

WARNING

Stay clear of the cutting table clamps system while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

8.2.3.1 Verify receipt of fuel at the cutting/staging system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Simulate fuel placement on the cutting table by temporarily forcing the data register and verify receipt of fuel.

Acceptance Criteria:

- Request made for fuel assembly transfer.
- Transfer verified.

Test Conductor MB Hayes Date 12-16-91
QA JL Yates Date 12-16-91

2. The above step has been completed.

Test Conductor MB Hayes Date 12-16-91

8.2.3.2 Verify clamping operations as follows: receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Press "Continue" to position and close clamps.

Acceptance Criteria:

- ~~When "Continue" is touched on the screen, clamps close automatically.~~
Both upper and lower

Test Conductor MB Hayes Date 12-16-91
QA JL Yates Date 12-16-91

2. The above step has been completed.

Test Conductor _____ Date _____

Step not
required

KH 12-16-91

8.2.4 Auto Mode Verification Test

Place the Cutting/Staging System in AUTO mode and verify system automatic sequence.

WARNING

Stay clear of the cutting table clamps while in operation.

NOTE

Operator must press "CONTINUE" after each "HOLD POINT" to complete automatic operation.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Simulate fuel placement on the cutting table as performed in Section 8.2.3.1 and press GO to initiate the automatic fuel clamping process. Verify the process was automatically completed.

Acceptance Criteria:

- Request made for fuel assembly transfer.
- Transfer verified.
- ~~Both upper and lower~~ ^{RH 12-16-91}
~~When "Continued" is touched on the screen, clamps close automatically.~~ ^{TPCN # 6}

Test Conductor MB Hayes Date 12-16-91

QA Jay Date 12-16-91

2. The above step has been completed.

Test Conductor MB Hayes Date 12-16-91

8.2.5 Clamp Drive Fault Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Place the cutting/staging system in the "SINGLE" mode and initiate operations to close the cutting table clamps (M-104P, M-104 Q).
2. Temporarily alter the control system software to implement an overcurrent fault with either clamp drive motor.
3. Press "CONTINUE" to drive the clamps close and verify the drive motor stops and registers a fault in the control room.

Acceptance Criteria:

- RL #10 {
- Motor stops when fault condition is implemented.
 - Alarm system is activated.
 - Alarm is silenced when acknowledged by operator.
 - Control system displays fault condition on control screen.
 - A report is printed defining the fault condition when commanded by the operator.

Test Conductor MB Hayes Date 12-16-91

QA Jay Date 12-16-91

4. Verify cameras No. ^{4 KH 12-13-91 RL #11} 3 and No. 10 are activated and view the cutting/staging system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- Video images from cameras No. ^{4 KH 12-13-91 RL #11} 3 and NO. 10 are displayed on monitors when "CAMERA CALL" is touched on control screen.
- Camera No. ^{4 KH 12-13-91 RL #11} 3 and No. 10 can be positioned to provide an unobstructed view of the cutting table clamps.

Test Conductor W.D. Haynes Date 12-14-91

QA J. Alfano Date 12-14-91

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

HAND KH 12-13-91 TPCN # 4

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued. ^{HAND TPCN #4 KH 12-13-91}

Test Conductor W.D. Haynes Date 12-14-91

QA J. Alfano Date 12-14-91

6. The above steps have been completed.

8.2. ^{6 KH 12-14-91} Test Conductor W.D. Haynes Date 12-14-91
Clamp Force Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the force exerted by both cutting table clamps as follows:

- Place cutting/staging system in ^{HAND KH 12-17-91} "JOG" mode. TPCN #2
- Open both upper (M-104Q) and lower (M-104P) clamps.
- Set up load cell fixture (9315-M-0012) to a width of 8.27 ±.03 inches and place between the upper clamps.

4. Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

Type of Measuring Device Multimeter Range Various
Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force 200 lbs. RL #13

RETEST RL17
450 LBS

Acceptance Criteria:

- Clamping force greater than ³⁰⁰450 lbs. but less than 500 lbs.

Test Conductor JB Hays Date 12-17-91

QA [Signature] Date 3/23/92

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device Multimeter Range Various
Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force 267 lbs.

RL #13

RETEST RL17
440 LBS
440 LBS

Clamp force 267 lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰450 lbs. but less than 500 lbs.

Test Conductor JB Hays Date 12-17-91

QA [Signature] Date 3/23/92

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device Multimeter Range Various
Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force 200 lbs.

Clamp force 200 lbs.

Clamp force 200 lbs.

RL #13

RETEST RL17
440 LBS
385 LBS
400 LBS

Input Voltage = 10V

Output Voltage - $6 \times 10^{-3} \text{ mV/lb. force}$

CE 14x14

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[illegible]

*for #1
KEH
8-11-92*

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor W.B. Haynes

Date 12-17-91

QA

L. Mulvaney

Date 3/23/92

7. The above steps have been completed.

Test Conductor W.B. Haynes

Date 12-17-91

8.3 System Verification for the B&W 15 x 15 PWR Fuel Type

The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the B&W 15 x 15 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the B&W 15 x 15 PWR fuel type and the PWR FAHF has been installed in place of the BWR FAHF.

Test Conductor W.B. Haynes

Date 12-16-91

8.3.1 Sensor Operation Verification Test

WARNING

Stay clear of the test load during overhead movement.

Verify the operation of the staging/cutting table load cells as follows:

1. Open upper (M-104Q) and lower (M-104P) clamps.
2. Set control system to "JOG" mode.
3. Using the RBT and FAHF, pickup the B&W 15 x 15 mockup fuel from the storage rack and move over the No. 1 staging station.
4. Lower the mockup fuel at 30% full speed until fully seated. Verify control system acknowledges receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

Acceptance Criteria:

- Fuel assembly mockup was positioned via the RBT and FAHF.
- Control system indicates fuel at station No. 1 and no fuel at all other stations.

Test Conductor W.B. Haynes

Date 12-16-91

QA

J. G. [Signature]

Date 12-16-91

5. Raise mockup fuel at 30% full speed from staging station No. 1 and lower on staging station No. 3. Verify control system acknowledges receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Acceptance Criteria:

- Fuel assembly mockup was positioned via the RBT and FAHF.
- Control system indicates fuel at station No. 3 and no fuel at all other stations.

Test Conductor MB Hayes

Date 12-16-91

QA

JA Goss

Date 12-16-91

6. Raise mockup fuel at 30% full speed from staging station No. 3 and lower on cutting station. Verify control system acknowledges receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Acceptance Criteria:

- Fuel assembly mockup was positioned via the RBT and FAHF.
- Control system indicates fuel at cutting station and no fuel at all other stations.

Test Conductor MB Hayes

Date 12-16-91

QA

JA Goss

Date 12-16-90 91 JAG

7. Raise mockup fuel at full speed from cutting station and move to storage racks.

8. Position mockup fuel at 30% full speed in storage rack and release once seated.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

9. Switch control system to the "HAND" mode and send the FAHF back to the "HOME" position or laydown area (whichever is more convenient).

10. The above steps have been completed.

Test Conductor MB Hayes

Date 12-16-91

8.3.2 Drive System Operation Verification Test

WARNING

Stay clear of clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

Type of Measuring Device Dial Caliper Range 0-12 in.
Identification No. NUS-001 Calibration Due Date 4-29-92

Upper clamp opening (open position) 10.798 inch RL # 12
Lower clamp opening (open position) 10.835 inch

Acceptance Criteria:

- Clamp jaws separated by 10.30 ~~11.00 ± .03~~ inches.

Test Conductor MB Jagers Date 12-16-91
QA [Signature] Date 12-16-91

3. Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device Dial Caliper Range 0-12 in.
Identification No. NUS-001 Calibration Due Date 4-29-92

Upper clamp opening (closed position) 8.480 inch 8.41
Lower clamp opening (closed position) 8.470 inch 8.43
Closing time 11 seconds

Acceptance Criteria:

- Clamp jaws separated by 8.40 ~~8.50 ± .03~~ inches.

- Time to close is between ⁵11 sec. and ²⁷27 sec.

Test Conductor W B Hayes Date 12-16-91

QA Joe Hunt Date 12-16-91

4. Repeat Steps 2 and 3 two additional times.

Type of Measuring Device	<u>Dial Caliper</u>	Range	<u>0-12 in</u>
Identification No.	<u>NUS-001</u>	Calibration Due Date	<u>4-29-92</u>

Upper clamp opening (open position)	<u>10.790</u>	inch	
Lower clamp opening (open position)	<u>10.786</u>	inch	
Upper clamp opening (closed position)	<u>8.492</u>	inch	8.43
Lower clamp opening (closed position)	<u>8.485</u>	inch	8.39
Closing time	<u>12</u>	seconds	

Upper clamp opening (open position)	<u>10.801</u>	inch	
Lower clamp opening (open position)	<u>10.790</u>	inch	
Upper clamp opening (closed position)	<u>8.510</u>	inch	8.41
Lower clamp opening (closed position)	<u>8.500</u>	inch	8.40
Closing time	<u>12</u>	seconds	

Acceptance Criteria:

- Clamp jaws separated by ^{> 10.30}~~11.00~~ ± .03 inches. RL # 12
- Clamp jaws separated by ^{5.40}~~8.50~~ ± .03 inches.
- Time to close is between ⁵11 sec. and ²⁷27 sec.

Test Conductor W B Hayes Date 12-16-91

QA Joe Hunt Date 12-16-91

5. The above steps have been completed.

Test Conductor W B Hayes Date 12-16-91

8.3.3 Interlock Verification Test

WARNING

Stay clear of clamps while in operation

8.3.3.1 Verify the lower clamp (M-104P) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the lower clamp can be opened. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

Test	A	B	C	D	System Operates			Expected Result
i	0	0	0	0	☐	yes	☒ no	no
ii	1	0	0	0	☒	yes	☐ no	yes
iii	0	1	0	0	☐	yes	☒ no	no
iv	0	0	1	0	☐	yes	☒ no	no
v	0	0	0	1	☐	yes	☒ no	no
vi	1	1	0	0	☒	yes	☐ no	yes
vii	1	0	1	0	☒	yes	☐ no	yes
viii	1	0	0	1	☒	yes	☐ no	yes
ix	0	1	1	0	☐	yes	☒ no	no
x	0	1	0	1	☐	yes	☒ no	no
xi	0	0	1	1	☐	yes	☒ no	no
xii	1	1	1	0	☒	yes	☐ no	yes
xiii	1	1	0	1	☒	yes	☐ no	yes
xiv	1	0	1	1	☒	yes	☐ no	yes
xv	0	1	1	1	☒	yes	☐ no	yes
xvi	1	1	1	1	☒	yes	☐ no	yes

Acceptance Criteria:

- System does not operate unless the following conditions are satisfied: A or (B + C + D).

 Test Conductor MB Wagner Date 12-16-91

 QA JP Date 12-16-91

- The above steps have been completed.

 Test Conductor MB Wagner Date 12-16-91

- 8.3.3.2 Verify the upper clamp (M-104Q) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

- Place the control system in the HAND mode.

- Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the upper clamp can be opened. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

NOTE

 Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

Test	A	B	C	D	System Operates			Expected Result
i	0	0	0	0	☐	yes	☒	no
ii	1	0	0	0	☒	yes	☐	yes
iii	0	1	0	0	☐	yes	☒	no
iv	0	0	1	0	☐	yes	☒	no
v	0	0	0	1	☐	yes	☒	no
vi	1	1	0	0	☒	yes	☐	yes
vii	1	0	1	0	☒	yes	☐	yes
viii	1	0	0	1	☒	yes	☐	yes
ix	0	1	1	0	☐	yes	☒	no
x	0	1	0	1	☐	yes	☒	no
xi	0	0	1	1	☐	yes	☒	no
xii	1	1	1	0	☒	yes	☐	yes
xiii	1	1	0	1	☒	yes	☐	yes
xiv	1	0	1	1	☒	yes	☐	yes
xv	0	1	1	1	☒	yes	☐	yes
xvi	1	1	1	1	☒	yes	☐	yes

Acceptance Criteria:

- System does not operate unless the following conditions are satisfied: A or (B + C + D).

Test Conductor MB Hays Date 12-16-91

QA GA Gant Date 12-16-91

3. The above steps have been completed.

Test Conductor MB Hays Date 12-16-91

8.3.4 Single Mode Verification Test

Place the Cutting/Staging System in SINGLE mode and verify system automatic sequence.

WARNING

Stay clear of the cutting table clamps system while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

8.3.4.1 Verify receipt of fuel at the cutting/staging system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

1. Simulate fuel placement on the cutting table by temporarily forcing the data register and verify receipt of fuel.

2

Acceptance Criteria:

- Request made for fuel assembly transfer.
- Transfer verified.

Test Conductor MB Hays Date 12-16-91

QA GA Gant Date 12-16-91

2. The above step has been completed.

Test Conductor MB Hays Date 12-16-91

8.3.4.2 Verify clamping operations ~~as follows~~ receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. ~~Press "Continue" to position and close clamps.~~

Acceptance Criteria:

- Both upper and lower*
• ~~When "Continue" is touched on the screen, clamps close automatically.~~

Test Conductor MB Haynes Date 12-16-91

QA JA Gant Date 12-16-91

2. ~~The above step has been completed.~~

~~Test Conductor _____ Date _____~~

step not
required

KH 12-16-91

8.3.5 Auto Mode Verification Test

Place the Cutting/Staging System in AUTO mode and verify system automatic sequence.

WARNING

Stay clear of the cutting table clamps while in operation.

NOTE

Operator must press "CONTINUE" after each "HOLD POINT" to complete automatic operation.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Simulate fuel placement on the cutting table as performed in Section 8.3.4.1 and press GO to initiate the automatic fuel clamping process. Verify the process was automatically completed.

Acceptance Criteria:

- Request made for fuel assembly transfer.
• Transfer verified.
Both upper and lower
• ~~When "Continued" is touched on the screen, clamps close automatically.~~

Test Conductor MB Haynes Date 12-16-91

QA JA Gant Date 12-16-91

2. The above step has been completed.

Test Conductor MB Haynes Date 12-16-91

2

KH

12-16-91

TPCN#6

2

KH 12-16-91

TPCN#6

8.3.6 Clamp Drive Fault Test

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

WARNING

Stay clear of the cutting table clamps while in operation

1. Place the cutting/staging system in the "SINGLE" mode and initiate operations to close the cutting table clamps (M-104P, M-104 Q). HAND KIT 12-16-91 TPCN 4
2. Temporarily alter the control system software to implement an overcurrent fault with either clamp drive motor.
3. Press "CONTINUE" to drive the clamps close and verify the drive motor stops and registers a fault in the control room. GD KIT 12-16-91 TPCN 5

Acceptance Criteria:

- Motor stops when fault condition is implemented.
- Alarm system is activated.
- Alarm is silenced when acknowledged by operator.
- Control system displays fault condition on control screen.
- A report is printed defining the fault condition when commanded by the operator.

Test Conductor MB Hayes

Date 12-16-91

QA

J. Williams
4 KIT 12-16-91 RL #11

Date 12-16-91

4. Verify cameras No. 3 and No. 10 are activated and view the cutting/staging system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- Video images from cameras No. 3 and NO. 10 are displayed on monitors when "CAMERA CALL" is touched on control screen.
- Camera No. 3 and No. 10 can be positioned to provide an unobstructed view of the cutting table clamps. 4 KIT 12-16-91 RL #11

Test Conductor MB Hayes

Date 12-16-91

QA

J. Williams

Date 12-16-91

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

HAND KH 12-16-91 TPCN #4

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

HAND TPCN #4
KH 12-16-91

Test Conductor MB Hayes

Date 12-16-91

QA

JA Yates

Date 12-16-91

6. The above steps have been completed.

Test Conductor MB Hayes

Date 12-16-91

8.3.7 Clamp Force Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the force exerted by both cutting table clamps as follows:

- Place cutting/staging system in "JOG" mode.
- Open both upper (M-104Q) and lower (M-104P) clamps.
- Set up load cell fixture (9315-M-0012) to a width of 8.56 ±.03 inches and place between the upper clamps.
- Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

HAND 12-17-91

KH TPCN #2

Type of Measuring Device Dial Caliper Range 0-12 in various
Multimeter 10-30
Identification No. NUS-002 Calibration Due Date 4-29-92

KH

12-17-91

Clamp force 1.6kN = 267 lbs.

RETEST RL 30
440 LBS

RL #13

Acceptance Criteria:

- Clamping force greater than ³⁵⁰450 lbs. but less than 500 lbs.

Test Conductor MB Hayes

Date 12-16-91

QA

JA Yates

Date 3/23/92

TPCN #1
KH
8-4-92

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device	<u>Dial Caliper</u> <u>Multimeter</u>	Range	<u>0-12 in</u> <u>Various</u>	KH
Identification No.	<u>NWS-002</u>	Calibration Due Date	<u>4-24-92</u> <u>10-30</u>	12-17-92

Clamp force 267 lbs.

Clamp force 267 lbs.

RETEST RL 20
420 LBS
440 LBS

RL #13

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor JB Hayes Date 12-17-91

QA J. J. [unclear] Date 3/23/92

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device	<u>Dial Caliper</u> <u>Multimeter</u>	Range	<u>0-12 in</u> <u>Various</u>	KH
Identification No.	<u>NWS-002</u>	Calibration Due Date	<u>4-29-92</u> <u>10-30</u>	12-17-92

Clamp force 133 lbs.

Clamp force 133 lbs.

Clamp force 133 lbs.

RETEST RL 20
435 LBS
375 LBS
445 LBS

RL #13

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor JB Hayes Date 12-17-91

QA J. J. [unclear] Date 3/23/92

7. The above steps have been completed.

Test Conductor JB Hayes Date 12-17-91

TICK #7
KBH
8-4-92

TICK #7
KBH
8-4-92

8.3.8 Fuel Centering Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the ability of the cutting table clamps to center off-center fuel as follows:

1. Place control system in "JOG" mode.
2. Using the RBT and FAHF, pick up the B&W 15 x 15 Type 1, Class 1 mockup fuel from the fuel storage rack and center it over the cutting table station.
3. Lower the mockup fuel on the cutting station and close both upper (M-104Q) and lower (M-104P) clamps to center fuel.
4. Mark the fuel position on the south side of the cutting table surfaces with pencil or some other type of non-permanent markers.
5. Drive cutting table clamps fully open and raise mockup fuel 2 inches off table surface.
6. Move the mockup fuel a maximum of 0.75 inches north and lower until seated on the cutting table surface.
7. Open FAHF clamps fully then drive cutting table clamps closed until motor automatically stops. Measure and record distance from reference mark made in Step 4 to the fuel surface.

Type of Measuring Device Dial Caliper Range 0-12 in
Identification No. NUS-001 Calibration Due Date 4-29-92

Distance < .005 inch

Acceptance Criteria:

- Clamps were able to center fuel to within ± 0.030 inch.

Test Conductor MB Haynes

Date 12-16-91

QA

G. Alfano

Date 12-16-91

8. Repeat Steps 5 to 7 an additional two (2) times.

Type of Measuring Device	<u>Dial Caliper</u>	Range	<u>0-12 in.</u>
Identification No.	<u>Nus-001</u>	Calibration Due Date	<u>4-29-92</u>
	<u>KT 12-16-91</u>		

Distance <.005 inch

Distance <.005 inch

Acceptance Criteria:

- Clamps were able to center fuel to within ± 0.030 inch.

Test Conductor BB Hargnes Date 12-16-91

QA FL Yates Date 12-16-91

9. Open cutting table clamps fully, lift mockup fuel using the RBT and FAHF and replace fuel in the fuel storage rack.

10. The above steps have been completed.

Test Conductor BB Hargnes Date 12-16-91

8.4 System Verification for the W 17 x 17 PWR Fuel Type

The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the W 17 x 17 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the W 17 x 17 PWR fuel type.

Test Conductor BB Hargnes Date 12-17-91

8.4.1 Drive System Operation Verification Test

WARNING

Stay clear of clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

Type of Measuring Device Dial Caliper Range 0-12 in.
Identification No. NUS-001 Calibration Due Date 4-29-92

Upper clamp opening (open position) 10.803 inch

Lower clamp opening (open position) 10.799 inch

RL #12

Acceptance Criteria:

- Clamp jaws separated by ^{10.30}~~11.00~~ ± .03 inches.

Test Conductor MB Hayes Date 12-17-91

QA JA Gunt Date 12-17-91

- Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device Dial Caliper Range 0-12 in.
Identification No. NUS-001 Calibration Due Date 4-29-92

Upper clamp opening (closed position) 8.370 inch ^{8.30}

Lower clamp opening (closed position) 8.392 inch ^{8.28}

Closing time 11 seconds

RETEST RL 21/22

Acceptance Criteria:

- Clamp jaws separated by ^{8.34}~~8.39~~ ± .03 inches.
- Time to close is between ⁵~~11~~ sec. and ²⁶~~27~~ sec.

Test Conductor MB Hayes Date 12-17-91

QA JA Gunt Date 12-17-91

TPC #7
KBH
8-4-92

TPC #7
KBH
8-4-92

4. Repeat Steps 2 and 3 two additional times.

Type of Measuring Device	<u>Dial Caliper</u>	Range	<u>0-12 in.</u>
Identification No.	<u>NUS-001</u>	Calibration Due Date	<u>4-29-92</u>

Upper clamp opening (open position)	<u>10.797</u>	inch	
Lower clamp opening (open position)	<u>10.800</u>	inch	
Upper clamp opening (closed position)	<u>8.365</u>	inch	8.29
Lower clamp opening (closed position)	<u>8.388</u>	inch	8.29
Closing time	<u>12</u>	seconds	
Upper clamp opening (open position)	<u>10.810</u>	inch	
Lower clamp opening (open position)	<u>10.810</u>	inch	
Upper clamp opening (closed position)	<u>8.362</u>	inch	8.29
Lower clamp opening (closed position)	<u>8.340</u>	inch	8.30
Closing time	<u>11</u>	seconds	

Acceptance Criteria:

- Clamp jaws separated by 11.00 ± .03 inches. ^{710.30} RL #12
- Clamp jaws separated by 8.29 ± .03 inches. ^{8.29}
- Time to close is between 11 sec. and 27 sec. ^{5 170}

Test Conductor MD Hayes Date 12-17-91

QA J. L. Yates Date 12-17-91

5. The above steps have been completed.

Test Conductor MD Hayes Date 12-17-91

T/CN #7
KPH
8-4-92

8.4.2 Interlock Verification Test

WARNING

Stay clear of clamps while in operation

8.4.2.1 Verify the lower clamp (M-104P) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the lower clamp can be opened. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

<u>Test</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>System Operates</u>			<u>Expected Result</u>
i	0	0	0	0	☐	yes	☒ no	no
ii	1	0	0	0	☒	yes	☐ no	yes
iii	0	1	0	0	☐	yes	☒ no	no
iv	0	0	1	0	☐	yes	☒ no	no
v	0	0	0	1	☐	yes	☒ no	no
vi	1	1	0	0	☒	yes	☐ no	yes
vii	1	0	1	0	☒	yes	☐ no	yes
viii	1	0	0	1	☒	yes	☐ no	yes
ix	0	1	1	0	☐	yes	☒ no	no
x	0	1	0	1	☐	yes	☒ no	no
xi	0	0	1	1	☐	yes	☒ no	no
xii	1	1	1	0	☒	yes	☐ no	yes
xiii	1	1	0	1	☒	yes	☐ no	yes
xiv	1	0	1	1	☒	yes	☐ no	yes
xv	0	1	1	1	☒	yes	☐ no	yes
xvi	1	1	1	1	☒	yes	☐ no	yes

Acceptance Criteria:

- System does not operate unless the following conditions are satisfied: A or (B + C + D).

Test Conductor MB Hayes Date 12-17-91

QA [Signature] Date 12-17-91

3. The above steps have been completed.

Test Conductor MB Hayes Date 12-17-91

- 8.4.2.2 Verify the upper clamp (M-104Q) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the upper clamp can be opened. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

Test	A	B	C	D	System Operates			Expected Result
i	0	0	0	0	<u>—</u>	yes	<u>✓</u> no	no
ii	1	0	0	0	<u>✓</u>	yes	<u>—</u> no	yes
iii	0	1	0	0	<u>—</u>	yes	<u>✓</u> no	no
iv	0	0	1	0	<u>—</u>	yes	<u>✓</u> no	no
v	0	0	0	1	<u>—</u>	yes	<u>✓</u> no	no
vi	1	1	0	0	<u>✓</u>	yes	<u>—</u> no	yes
vii	1	0	1	0	<u>✓</u>	yes	<u>—</u> no	yes
viii	1	0	0	1	<u>✓</u>	yes	<u>—</u> no	yes
ix	0	1	1	0	<u>—</u>	yes	<u>✓</u> no	no
x	0	1	0	1	<u>—</u>	yes	<u>✓</u> no	no
xi	0	0	1	1	<u>—</u>	yes	<u>✓</u> no	no
xii	1	1	1	0	<u>✓</u>	yes	<u>—</u> no	yes
xiii	1	1	0	1	<u>✓</u>	yes	<u>—</u> no	yes
xiv	1	0	1	1	<u>✓</u>	yes	<u>—</u> no	yes
xv	0	1	1	1	<u>✓</u>	yes	<u>—</u> no	yes
xvi	1	1	1	1	<u>✓</u>	yes	<u>—</u> no	yes

Acceptance Criteria:

- System does not operate unless the following conditions are satisfied: A or (B + C + D).

Test Conductor MB Hayes Date 12-17-91

QA JA Yates Date 12-17-91

3. The above steps have been completed.

Test Conductor MB Hayes Date 12-17-91

8.4.3 Single Mode Verification Test

Place the Cutting/Staging System in SINGLE mode and verify system automatic sequence.

WARNING

Stay clear of the cutting table clamps system while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

8.4.3.1 Verify receipt of fuel at the cutting/staging system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

1. Simulate fuel placement on the cutting table by temporarily forcing the data register and verify receipt of fuel.

2

Acceptance Criteria:

- Request made for fuel assembly transfer.
- Transfer verified.

Test Conductor MB Hayes Date 12-17-91

QA JA Yates Date 12-17-91

2. The above step has been completed.

Test Conductor MB Hayes Date 12-17-91

8.4.3.2 Verify clamping operations ~~as follows:~~ receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

~~1. Press "Continue" to position and close clamps.~~

Acceptance Criteria:

- ~~Both upper and lower~~
~~When "Continue" is touched on the screen, clamps close automatically.~~

Test Conductor B B Hayna Date 12-17-91

QA GA Date 12-17-91

~~2. The above step has been completed.~~

~~Test Conductor _____ Date _____~~

step not
required
KH 12-17-91

8.4.4 Auto Mode Verification Test

Place the Cutting/Staging System in AUTO mode and verify system automatic sequence.

WARNING

Stay clear of the cutting table clamps while in operation.

NOTE

Operator must press "CONTINUE" after each "HOLD POINT" to complete automatic operation.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Simulate fuel placement on the cutting table as performed in Section 8.4.3.1 and press GO to initiate the automatic fuel clamping process. Verify the process was automatically completed.

Acceptance Criteria:

- Request made for fuel assembly transfer.
- Transfer verified.

- ~~Both upper and lower~~
~~When "Continue" is touched on the screen, clamps close automatically.~~

Test Conductor B B Hayna Date 12-17-91

QA GA Date 12-17-91

2. The above step has been completed.

Test Conductor B B Hayna Date 12-17-91

2
KH
12-17-91
TPCN #6

2

2

KH 12-17-91
TPCN #6

8.4.5 Clamp Drive Fault Test

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

WARNING

Stay clear of the cutting table clamps while in operation

- HAND KH 12-17-91 TPCN #4
1. Place the cutting/staging system in the "SINGLE" mode and initiate operations to close the cutting table clamps (M-104P, M-104 Q).
 2. Temporarily alter the control system software to implement an overcurrent fault with either clamp drive motor.
 3. Press "GO" KH 12-17-91 TPCN #5 "CONTINUE" to drive the clamps close and verify the drive motor stops and registers a fault in the control room.

Acceptance Criteria:

- Motor stops when fault condition is implemented.
- Alarm system is activated.
- Alarm is silenced when acknowledged by operator.
- Control system displays fault condition on control screen.
- A report is printed defining the fault condition when commanded by the operator.

Test Conductor MD Hays Date 12-17-91

QA J. A. Gant Date 12-17-91

- 4 KH 12-17-91 RL #11
4. Verify cameras No. 3 and No. 10 are activated and view the cutting/staging system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- 4 KH 12-17-91 RL #11
- Video images from cameras No. 3 and NO. 10 are displayed on monitors when "CAMERA CALL" is touched on control screen.
 - Camera No. 3 and No. 10 can be positioned to provide an unobstructed view of the cutting table clamps.

Test Conductor MD Hays Date 12-17-91

QA J. A. Gant Date 12-17-91

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

HAND KH 12-17-91 TPCN #4

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

HAND TPCN #4
KH 12-17-91

Test Conductor W.D. Hays Date 12-17-91

QA [Signature] Date 12-17-91

6. The above steps have been completed.

Test Conductor W.D. Hays Date 12-17-91

8.4.6 Clamp Force Test

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

WARNING

Stay clear of the cutting table clamps while in operation

Verify the force exerted by both cutting table clamps as follows:

- Place cutting/staging system in "JOG" mode.
- Open both upper (M-104Q) and lower (M-104P) clamps.
- Set up load cell fixture (9315-M-0012) to a width of 8.45 ±.03 inches and place between the upper clamps.
- Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

HAND 12-17-91 TPCN #2
KH

Type of Measuring Device Dial Caliper Range 0-12 in Various
Multimeter 10-30
Identification No. NUS-002 Calibration Due Date 4-29-92

KH
12-17-91

Clamp force 333 lbs. RL #13

RETEST RL 23
470 LBS

Acceptance Criteria:

- Clamping force greater than 300 lbs. but less than 500 lbs.

Test Conductor W.D. Hays Date 12-17-91

QA [Signature] Date 3/23/92

TPCN #7
KBH
8-2-92

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device	<u>Dial Caliper</u> Multimeter	Range	<u>0-12 in</u> Various	KH
Identification No.	<u>NUS-002</u>	Calibration Due Date	<u>4-24-92</u>	12-17-91

Clamp force 267 lbs.

Clamp force 267 lbs.

RETEST 2.3
400 LBS
500 LBS

Acceptance Criteria:

- Clamping force greater than ³⁰⁰450 lbs. but less than 500 lbs.

Test Conductor TD Hayes Date 12-17-91

QA L. Mulgrew Date 3/23/92

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device	<u>Dial Caliper</u> Multimeter	Range	<u>0-12 in</u> Various	KH
Identification No.	<u>NUS-002</u>	Calibration Due Date	<u>4-24-92</u>	12-17-91

Clamp force 133 lbs.

Clamp force 67 lbs.

Clamp force 67 lbs.

RETEST RL 23
450 LBS
400 LBS
385 LBS

Acceptance Criteria:

- Clamping force greater than ³⁰⁰450 lbs. but less than 500 lbs.

Test Conductor TD Hayes Date 12-17-91

QA L. Mulgrew Date 3/23/92

7. The above steps have been completed.

Test Conductor TD Hayes Date 12-17-91

T/CR #7
KBH
B-4-92

RL #13

T/CR #7
KBH
B-4-92

RL #13

SPECIFICATION 9315-TP-209A

REVISION 2

PAGE 4

Upper Clamp

Lower Clamp

Mode of Operation	Load Cell Fixture Width	Voltage at max Force	Max Force	Voltage After Backdriven	Force After Backdriven	Comments
HAND	8.45	2.0	333 lbs.	1.3	217 lbs.	clamps at correct resolver
"	"	1.6	267 lbs.	1.2	200 lbs.	setting, clamps closed on
"	"	1.6	267 lbs.	1.2	200 lbs.	position not current
"	"	3.6	600 lbs.	0.7	117 lbs.	Resolver changed 2 count to close clamps further.
"	"	3.2	533 lbs.	0.7	117 lbs.	couldn't tell if closed on current or position.
"	"	2.8	467 lbs.	1.0	167 lbs.	Resolver changed 1 count to close clamps further.
"	"	2.8	467 lbs.	1.0	167 lbs.	couldn't tell if closed on current or position
X	X	X	X	X	X	X
HAND	8.45	0.8	133 lbs.	0.3	50 lbs.	Clamps at correct resolver
"	"	0.4	67 lbs.	0.4	67 lbs.	setting, clamps closed on
"	"	0.4	67 lbs.	0.4	67 lbs.	position not current.
"	"	1.6	267 lbs.	1.4	233 lbs.	Clamps at 2 counts from correct resolver
"	"	2.0	333 lbs.	1.5	250 lbs.	setting, clamps closed on
"	"	1.6	267 lbs.	1.3	217 lbs.	position not current.
"	"	2.8	467 lbs.	1.3	217 lbs.	Resolver changed 4 counts to close clamps further.
"	"	2.4	400 lbs.	1.3	217 lbs.	clamps closed on position not current
"	"	2.8	467 lbs.	1.3	217 lbs.	Resolver changed 6 counts to close clamps further.
"	"	8.8	1467 lbs.	0.2	33 lbs.	clamps closed on current.
"	"	6.0	1000 lbs.	0.2	33 lbs.	

8.5 System Verification for the W 15 x 15 PWR Fuel Type

The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the W 15 x 15 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the W 15 x 15 PWR fuel type.

Test Conductor MB Hayes Date 12-17-91

8.5.1 Drive System Operation Verification Test

WARNING

Stay clear of clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

Type of Measuring Device Dial Caliper Range 0-12 in.
Identification No. Nus-001 Calibration Due Date 4-29-92

Upper clamp opening (open position) 10.70 inch

Lower clamp opening (open position) 10.798 inch

Acceptance Criteria:

RL #12

- Clamp jaws separated by ^{> 10.10} ~~11.00 ± .03~~ inches.

Test Conductor MB Hayes Date 12-17-91

QA J. A. Yantis Date 12-17-91

TPC#7
KBH
8-4-92

3. Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device	<u>Dial Caliper</u>	Range	<u>0-12 in.</u>
Identification No.	<u>Nus-001</u>	Calibration Due Date	<u>4-29-92</u>

Upper clamp opening (closed position)	<u>8.390</u>	inch ✓
Lower clamp opening (closed position)	<u>8.410</u>	inch ✓
Closing time	<u>12</u>	seconds

✓ 100% #7
KBIT
8-11-92

Acceptance Criteria:

- Clamp jaws separated by ^{8.29}~~8.39~~ ± .03 inches.
- Time to close is between ⁵~~11~~ sec. and ⁴⁰~~27~~ sec.

Test Conductor	<u>JB Hayes</u>	Date	<u>12-17-91</u>
QA	<u>GLH</u>	Date	<u>12-17-91</u>

4. Repeat Steps 2 and 3 two additional times.

Type of Measuring Device	<u>Dial Caliper</u>	Range	<u>0-12 in.</u>
Identification No.	<u>Nus-001</u>	Calibration Due Date	<u>4-29-92</u>

Upper clamp opening (open position)	<u>10.813</u>	inch
Lower clamp opening (open position)	<u>10.815</u>	inch
Upper clamp opening (closed position)	^{KH} 8.370	inch ✓
Lower clamp opening (closed position)	<u>8.412</u>	inch ✓
Closing time	<u>11</u>	seconds

Upper clamp opening (open position)	<u>10.802</u>	inch
Lower clamp opening (open position)	<u>10.814</u>	inch
Upper clamp opening (closed position)	<u>8.379</u>	inch ✓
Lower clamp opening (closed position)	<u>8.400</u>	inch ✓
Closing time	<u>12</u>	seconds

RL#12

7/CM #7
K814
8-4-92

Acceptance Criteria:

- Clamp jaws separated by ^{710.30}~~11.00~~ ± .03 inches.
- Clamp jaws separated by ^{8.29}~~8.39~~ ± .03 inches.
- Time to close is between ⁵~~11~~ sec. and ⁴⁰~~27~~ sec.

Test Conductor MB Hayes

Date 12-17-91

QA J. G. [Signature]

Date 12-17-91

5. The above steps have been completed.

Test Conductor MB Hayes

Date 12-17-91

8.5.2 Interlock Verification Test

WARNING

Stay clear of clamps while in operation

- 8.5.2.1 Verify the lower clamp (M-104P) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the lower clamp can be opened. Mark the appropriate column per the test result.

2

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

NOTE

Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

Test	A	B	C	D	System Operates			Expected Result
i	0	0	0	0	—	yes	✓	no
ii	1	0	0	0	✓	yes	—	yes
iii	0	1	0	0	—	yes	✓	no
iv	0	0	1	0	—	yes	✓	no
v	0	0	0	1	—	yes	✓	no
vi	1	1	0	0	✓	yes	—	yes
vii	1	0	1	0	✓	yes	—	yes
viii	1	0	0	1	✓	yes	—	yes
ix	0	1	1	0	—	yes	✓	no
x	0	1	0	1	—	yes	✓	no
xi	0	0	1	1	—	yes	✓	no
xii	1	1	1	0	✓	yes	—	yes
xiii	1	1	0	1	✓	yes	—	yes
xiv	1	0	1	1	✓	yes	—	yes
xv	0	1	1	1	✓	yes	—	yes
xvi	1	1	1	1	✓	yes	—	yes

Acceptance Criteria:

- System does not operate unless the following conditions are satisfied: A or (B + C + D).

 Test Conductor HB Hays

 Date 12-17-91

 QA GA [Signature]

 Date 12-17-91

- The above steps have been completed.

 Test Conductor HB Hays

 Date 12-17-91

- 8.5.2.2 Verify the upper clamp (M-104Q) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

- Place the control system in the HAND mode.
- Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the upper clamp can be opened. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

2

2

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

Test	A	B	C	D	System Operates			Expected Result
i	0	0	0	0	☐	yes	☒ no	no
ii	1	0	0	0	☒	yes	☐ no	yes
iii	0	1	0	0	☐	yes	☒ no	no
iv	0	0	1	0	☐	yes	☒ no	no
v	0	0	0	1	☐	yes	☒ no	no
vi	1	1	0	0	☒	yes	☐ no	yes
vii	1	0	1	0	☒	yes	☐ no	yes
viii	1	0	0	1	☒	yes	☐ no	yes
ix	0	1	1	0	☐	yes	☒ no	no
x	0	1	0	1	☐	yes	☒ no	no
xi	0	0	1	1	☐	yes	☒ no	no
xii	1	1	1	0	☒	yes	☐ no	yes
xiii	1	1	0	1	☒	yes	☐ no	yes
xiv	1	0	1	1	☒	yes	☐ no	yes
xv	0	1	1	1	☒	yes	☐ no	yes
xvi	1	1	1	1	☒	yes	☐ no	yes

Acceptance Criteria:

- System does not operate unless the following conditions are satisfied: A or (B + C + D).

Test Conductor MB Hayes

Date 12-17-91

QA

[Signature]

Date 12-17-91

3. The above steps have been completed.

Test Conductor MB Hayes

Date 12-17-91

8.5.3 Single Mode Verification Test

Place the Cutting/Staging System in SINGLE mode and verify system automatic sequence.

WARNING

Stay clear of the cutting table clamps system while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

8.5.3.1 Verify receipt of fuel at the cutting/staging system as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

1. Simulate fuel placement on the cutting table by temporarily forcing the data register and verify receipt of fuel.

Acceptance Criteria:

- Request made for fuel assembly transfer.
- Transfer verified.

Test Conductor BB Hayes

Date 12-17-91

QA

Fuller

Date 12-17-91

2. The above step has been completed.

Test Conductor BB Hayes

Date 12-17-91

8.5.3.2 Verify clamping operations ~~as follows~~ receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

KH

12-18-91

2

TRN

#6

- ~~1. Press "Continue" to position and close clamps.~~

Acceptance Criteria:

- ~~When "Continue" is touched on the screen, clamps close automatically.~~
Both upper and lower

Test Conductor BB Hayes

Date 12-17-91

QA

Fuller

Date 12-17-91

- ~~2. The above step has been completed.~~

~~Test Conductor~~

~~Date~~

step not
required
12-17-91

8.5.4 Auto Mode Verification Test

Place the Cutting/Staging System in AUTO mode and verify system automatic sequence.

WARNING

Stay clear of the cutting table clamps while in operation.

NOTE

Operator must press "CONTINUE" after each "HOLD POINT" to complete automatic operation.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

1. Simulate fuel placement on the cutting table as performed in Section 8.5.3.1 and press GO to initiate the automatic fuel clamping process. Verify the process was automatically completed.

Acceptance Criteria:

- Request made for fuel assembly transfer.
- Transfer verified.
- Both upper and lower ~~when "Continue" is touched on the screen,~~ clamps close automatically. KH 12-17-91
TPCN #6

Test Conductor MB Haynes Date 12-17-91

QA JA Gant Date 12-17-91

2. The above step has been completed.

Test Conductor MB Haynes Date 12-17-91

8.5.5 Clamp Drive Fault Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Place the cutting/staging system in the "SINGLE" mode and initiate operations to close the cutting table clamps (M-104P, M-104 Q). KH 12-17-91
HAND TPCN #4
2. Temporarily alter the control system software to implement an overcurrent fault with either clamp drive motor.
3. Press "CONTINUE" to drive the clamps close and verify the drive motor stops and registers a fault in the control room. GO KH 12-17-91 TPCN #5

Acceptance Criteria:

- Motor stops when fault condition is implemented.
- Alarm system is activated.
- Alarm is silenced when acknowledged by operator.
- Control system displays fault condition on control screen.
- A report is printed defining the fault condition when commanded by the operator.

Test Conductor MB Haynes Date 12-17-91

QA JA Gant Date 12-17-91

- 4 KH 12-17-91 RL#11
4. Verify cameras No. 3 and No. 10 are activated and view the cutting/staging system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- 4 KH 12-17-91 RL#11
- Video images from cameras No. 3 and NO. 10 are displayed on monitors when "CAMERA CALL" is touched on control screen.
 - 4 KH 12-17-91 RL#11
 - Camera No. 3 and No. 10 can be positioned to provide an unobstructed view of the cutting table clamps.

Test Conductor MB Stanger Date 12-17-91

QA JL Yates Date 12-17-91

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

HAND KH 12-17-91 TPCN #4

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

HAND
TPCN #4
KH 12-17-91

Test Conductor MB Stanger Date 12-17-91

QA JL Yates Date 12-17-91

6. The above steps have been completed.

Test Conductor MB Stanger Date 12-17-91

8.5.6 Clamp Force Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the force exerted by both cutting table clamps as follows:

- HAND 12-17-91 KH
1. Place cutting/staging system in "JOG" mode. TPCN #2
 2. Open both upper (M-104Q) and lower (M-104P) clamps.

3. Set up load cell fixture (9315-M-0012) to a width of 8.45 ± 0.03 inches and place between the upper clamps. K4 12-17-91
4. Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

Type of Measuring Device Multimeter Range Various
Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force 267 lbs. RL #13

RETEST RL 25
500 LBS

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor MD Hayes Date 12-17-91

QA K. K. K. K. Date 3/23/92

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device Multimeter Range Various
Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force 333 lbs.

Clamp force 267 lbs.

RL #13

RETEST RL 25
500 LBS
500 LBS

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor MD Hayes Date 12-17-91

QA K. K. K. K. Date 3/23/92

TICK #7
KBH
8-4-92

TICK #7
KBH
8-4-92

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device	<u>multimeter</u>	Range	<u>Various</u>
Identification No.	<u>NUS-002</u>	Calibration Due Date	<u>10-30-92</u>

Clamp force 67 lbs.

Clamp force 133 lbs.

Clamp force 133 lbs.

RETEST RL 25

470 LBS

RL #13

480 LBS

420 LBS

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor HB Jager Date 12-17-91

QA H. Jager Date 3/23/92

7. The above steps have been completed.

Test Conductor HB Jager Date 12-17-91

TP 9315-TP-209A
KBH
B-4-92

Input Voltage - 10V

Output Voltage - 6×10^{-3} mV/lb. force

SPECIFICATION 9315-TP-209A

REVISION 2

PAGE 5

[illegible]

9.0 POST PERFORMANCE REVIEW AND APPROVAL

The following signatures certify that the completed test, with all data collected, has been reviewed, and that the system has passed the requirements for system operational test.

MB Hansen 9-21-92
Test Engineer Date

W. T. Johnson 9/21/92
Quality Assurance Date

P. V. Judd 9/21/92
Project Engineer Date

[Signature] 9/23/92
Test Director Date

10.0 RETENTION OF TEST RECORDS

The original working copy, including test exceptions and resolution and acceptance signatures, are to be maintained by the Test Director and stored at the NUS Gaithersburg building, Document Control Center. One copy of the original working document shall be sent to the DOE representative for their use and retention.

11.0 REFERENCES

- 11.1 "Fuel Rod Consolidation Project, Phase II Final Report Volume 1".
- 11.2 "Fuel Rod Consolidation Project, Phase II Final Report Volume 2", Appendix G (9.2).
- 11.3 9315-E-601, "Software Functional Specifications."
- 11.4 1096-M-11, "Cutting Table and Off-Normal Station Clamp Assembly".
- 11.5 Specification 9315-TAC-209A, System Operational Test Acceptance Criteria for the Cutting/Staging System, latest revision.
- 11.6 9315-P-120 Test Administration Manual for Systems Operational Testing and Integrated Systems Testing, latest revision.

KH
12-4-91

APPENDIX A
EQUIPMENT SETUP

1.0 Equipment Set-Up

1.1 GE 8 x 8 BWR Fuel Type

1.1.1 Set upper clamp (M-104Q) openings as follows:

1. Verify the control system is set for the GE 8 x 8 BWR fuel type.
2. Drive clamps open to a distance of ^{10.30}~~11.00~~ ± 0.03 inches.
3. Record and store in control system the resolver reading corresponding to this opening.
4. Drive clamps close to a distance of 5.19 ± 0.03 inches.
5. Record and store in control system the resolver reading corresponding to this opening.

1.1.2 Set lower clamp (M-104P) openings as follows:

1. Drive clamps open to a distance of ^{10.30}~~11.00~~ ± 0.03 inches.
2. Record and store in control system the resolver reading corresponding to this opening.
3. Drive clamps close to a distance of 5.19 ± 0.03 inches.
4. Record and store in control system the resolver reading corresponding to this opening.
5. Upload part-program to supervisory program to store setpoints of both upper and lower clamps.

		Open	Close
104 Q	1	10.896	5.342
	2	10.894	5.330
	3		
104 P	1	10.780	5.255
	2	10.750	5.223
	3	10.770	5.238

1.2 CE 14 x 14 PWR Fuel Type

1.2.1 Set upper clamp (M-104Q) openings as follows:

1. Verify the control system is set for the CE 14 x 14 PWR fuel type.
2. Drive clamps open to a distance of ^{7.0, 30} ~~11.00 ± 0.03~~ inches.
3. Record and store in control system the resolver reading corresponding to this opening.
4. Drive clamps close to a distance of 8.21 ± 0.03 inches.
5. Record and store in control system the resolver reading corresponding to this opening.

1.2.2 Set lower clamp (M-104P) openings as follows:

1. Drive clamps open to a distance of ^{> 10, 30} ~~11.00 ± 0.03~~ inches.
2. Record and store in control system the resolver reading corresponding to this opening.
3. Drive clamps close to a distance of 8.21 ± 0.03 inches.
4. Record and store in control system the resolver reading corresponding to this opening.
5. Upload part-program to supervisory program to store setpoints of both upper and lower clamps.

	Open	Close
104Q	1 10.89	8.219
	2 10.89	8.236
	3	8.224
104P	1	8.055
	2	8.130
	3	8.19
	4	8.21
	5	8.219

1.3 B&W 15 x 15 PWR Fuel Type

1.3.1 Set upper clamp (M-104Q) openings as follows:

1. Verify the control system is set for the B&W 15 x 15 PWR fuel type.
2. Drive clamps open to a distance of ^{7.10.30} ~~11.00 ± 0.03~~ inches.
3. Record and store in control system the resolver reading corresponding to this opening.
4. Drive clamps close to a distance of ^{8.40} ~~8.50~~ ± 0.03 inches.
5. Record and store in control system the resolver reading corresponding to this opening.

1.3.2 Set lower clamp (M-104P) openings as follows:

1. Drive clamps open to a distance of ^{7.10.30} ~~11.00 ± 0.03~~ inches.
2. Record and store in control system the resolver reading corresponding to this opening.
3. Drive clamps close to a distance of ^{8.40} ~~8.50~~ ± 0.03 inches.
4. Record and store in control system the resolver reading corresponding to this opening.
5. Upload part-program to supervisory program to store setpoints of both upper and lower clamps.

		Open	Close
104 Q	1		8.530
	2		8.518
	3		8.518
104 P	1		8.490
	2		8.500
	3		

1.4 W 17 x 17 PWR Fuel Type

1.4.1 Set upper clamp (M-104Q) openings as follows:

1. Verify the control system is set for the W 17 x 17 PWR fuel type.
2. Drive clamps open to a distance of ^{11.30}~~11.00~~ ± 0.03 inches.
3. Record and store in control system the resolver reading corresponding to this opening.
4. Drive clamps close to a distance of ^{8.29}~~8.39~~ ± 0.03 inches.
5. Record and store in control system the resolver reading corresponding to this opening.

1.4.2 Set lower clamp (M-104P) openings as follows:

1. Drive clamps open to a distance of ^{10.30}~~11.00~~ ± 0.03 inches.
2. Record and store in control system the resolver reading corresponding to this opening.
3. Drive clamps close to a distance of ^{8.29}~~8.39~~ ± 0.03 inches.
4. Record and store in control system the resolver reading corresponding to this opening.
5. Upload part-program to supervisory program to store setpoints of both upper and lower clamps.

		Open	Close
104Q	1		8.396
	2		8.366
	3		8.323
104P	1		8.340
	2		8.368
	3		8.374

1.5 W 15 x 15 PWR Fuel Type

1.5.1 Set upper clamp (M-104Q) openings as follows:

1. Verify the control system is set for the W 15 x 15 PWR fuel type.
2. Drive clamps open to a distance of ^{10.30}~~11.00~~ ± 0.03 inches.
3. Record and store in control system the resolver reading corresponding to this opening.
4. Drive clamps close to a distance of ^{8.29}~~8.39~~ ± 0.03 inches.
5. Record and store in control system the resolver reading corresponding to this opening.

1.5.2 Set lower clamp (M-104P) openings as follows:

1. Drive clamps open to a distance of ^{10.30}~~11.00~~ ± 0.03 inches.
2. Record and store in control system the resolver reading corresponding to this opening.
3. Drive clamps close to a distance of ^{8.29}~~8.39~~ ± 0.03 inches.
4. Record and store in control system the resolver reading corresponding to this opening.
5. Upload part-program to supervisory program to store setpoints of both upper and lower clamps.

	Open	Close
104Q	1	8.450
	2	
	3	
104P	1	8.376
	2	
	3	

APPENDIX B
SAFETY PROCEDURES

SYSTEMS OPERATIONS TEST SAFETY CONSIDERATIONS

Performance of the SOTs in a manner which precludes the injury of personnel involved in the test performance or working in the Test Facility is of paramount importance. The following steps shall be taken to minimize the possibility of personnel being injured during the performance of SOTs:

1. Contraves and NUS will advise their employees and any subcontractors to stay clear of the Test Facility when tests are being conducted unless they are involved in the test performance or have another work assignment in the Test Facility.
2. Contraves will post a warning sign at the entrance to the Test Facility when testing is in progress advising personnel of the need to stay away unless involved in the testing or have some authorized work assignment in the area.
3. When feasible and deemed advisable by the Test Conductor the machine being tested will be surrounded by a portable barrier (ropes and posts) with a Caution Sign warning individuals to stay clear of the area unless authorized to enter by the Test Conductor.
4. When machines are being moved by installed motors the NUS electrical engineer operating the motor or the Test Conductor will be located in a position which permits him/her to observe the machine operation so that the equipment can be stopped if a dangerous situation appears to be developing. Such situations could involve unanticipated machine performance or personnel entering the test area and placing themselves in jeopardy.
5. When an SOT is in progress the Test Conductor will remain in the vicinity of the test so the all personnel involved in the test are under his observation and will perform any required test support activities directly under his supervision.
6. Only Contraves personnel who have been qualified to the DOE Hoisting and Rigging Manual Rev. 10-88 will operate the Test Facility overhead crane.
7. Only NUS test engineers will operate the Robotic Bridge Transporter (RBT), the Manipulator Transporter (MT), and the RM-10A Robot Arms.
8. Slings, hooks, and chains utilized with the Test Facility overhead crane or with the RBT will be those purchased specifically for use on the DOE project and have been certified to meet the requirements of ANSI 830.9.
9. The making of all electrical connections to the various equipment will be supervised by an NUS electrical engineer.

10. Protective headgear will be worn in the Test Facility when ever the Robotic Bridge Transporter (RBT) the Manipulator Transporter (MT) are being utilized or at any time the Test Conductor deems the use of protective head gear is appropriate.
11. The NUS Test Conductor is responsible to see that all the above safety requirements are implemented during the performance of the test for which he has responsibility.
12. The Test Conductor will verify that all test specific safety prerequisites identified in test procedures are satisfied and that any precautions identified in specific procedure steps as followed.
13. The NUS Test Director will perform frequent informal surveillance of the testing operations to verify the safety requirements are being adhered to by the personnel performing the test or other work in the test area.

APPENDIX C
PHOTO DOCUMENTATION REQUIREMENTS

Photo Documentation Requirements

Photographs are required to be taken of all System Operational Tests (SOTs). The following is a bulletized list which identifies when these photographs must be taken, as a minimum. Additional photographs may be taken at any other time during the test, as specified by the Test Conductor.

- Photographs must be taken of the initial setup for each test sequence.
- Photographs must be taken of the following critical interfaces between system, as a minimum,
 - Excell Crane/Downender (Loading of Fuel)
 - RBT/Fuel Assembly Storage Rack
 - RBT/Downender
 - RBT/Staging and Cutting Station
 - RBT/Clamping Table
 - FAHF/Mockup Fuel Assembly
 - Pull-Head Gripper/Fuel Rods
 - Rod Loader/Canister
 - NFBC Loader/Canister
 - RBT/Off-Normal Table
 - MT/Off-Normal Table
 - Fuel Canister/Storage Rack
 - NFBC Canister/Storage Rack
 - RBT/FAHF and RM-10A
 - Excell Crane/Fuel Canister Upender (Loading and Unloading)
 - Excell Crane/NFBC Canister Upender (Loading and Unloading)
 - MT/RM-10A
- Photographs must be taken of any equipment damaged during testing.
- Photographs must be taken of any damage to mockup fuel rods and/or mockup fuel assemblies.
- Photographs must be taken of the cutter to fuel assembly interfaces as follows:
 - In position prior to cut
 - During cutting operation
 - Cut area of end fitting after cut operation
 - Cut area of fuel assembly after cut operation
- Photographs must be taken of each "Hold Point".
- Photographs must be taken of the problem areas of any subsystem which does not perform its expected function.
- Photographs must be taken of any component, subsystem, or system, determined by the test conductor to be operating out of the normal/expected condition (i.e., excessive deflection, vibration, etc.).

**FUEL ROD CONSOLIDATION PROJECT
PHOTOGRAPHIC LOG**

TEST PROCEDURE NO. 9315-TP-209A CUTTING/STAGING

ENTRY NO.	FILM ROLL #	FRAME NO.	DATE/TIME	STEP NUMBER	EQUIPMENT/PURPOSE
1	1	1--25 2--24	12-10-91 2:00 p.m.	8.1.1.4	GE 8x8 mock-up on station 1
2	1	3--23	12-10-91 2:00 p.m.	8.1.1.6	GE 8x8 mock-up on station 3
3	1	4--22	12-10-91 2:00 p.m.	8.1.1.7	GE 8x8 mock-up on cutting system
4	1	5--21	12-11-91 9:00 a.m.	8.1.1.5	GE 8x8 mock-up station 2
5	1	6--20	12-11-91 2:05 p.m.	8.1.2	Clamps open
6	1	7--19 8--18	12-11-91 2:05 p.m.	8.1.3.1	Interlock tests, clamps close
7	1	9--17	12-11-91 6:25 p.m.	8.1.3.2	Interlock tests clamps close
8	1	10--16	12-12-91 7:50 a.m.	8.1.7	Clamp force test lower clamp
9	1	11--15	12-12-91 10:05 a.m.	8.1.7	Clamp force test upper clamp
10	1	12--14	12-13-91 3:10 p.m.	8.1.6	Clamp drive fault test, clamp close
11	1	13--13	12-13-91 3:10 p.m.	8.2.5	Clamp drive fault test, clamp close
12	1	14--12	12-14-91 8:10 a.m.	8.2.2.1	Interlock tests, clamp close
13	1	15--11	12-14-91 12:00 p.m.	8.2.2.2	Interlock tests, clamp close
14	1	19--7	12-16-91 2:50 p.m.	8.1.4.1	Single mode, clamp close

15	1	20--6	12-16-91 2:50 p.m.	8.1.4.2	Single mode, clamp close
16	1	21--5	12-16-91 2:50 p.m.	8.1.5	Auto mode, clamp open
17	1	22--4	12-16-91 3:30 p.m.	8.2.2.1	Interlock tests, clamp open
18	1	23--3	12-16-91 3:30 p.m.	8.2.2.2	Interlock tests, clamp open
19	1	24--2	12-16-91 3:30 p.m.	8.2.3	Single mode, clamp open
20	1	25--1	12-16-91 3:30 p.m.	8.2.4	Auto mode, clamp open
21	2	1--24	12-16-91 4:40 p.m.	N/A	Broken clamp assembly
22	2	2--23	12-16-91	8.3.3	Interlock test
23	2	3--22	12-16-91	8.3.4	Single mode test
24	2	4--21	12-16-91	8.3.5	Auto mode test
25	2	5--20	12-16-91	8.3.6	Clamp drive fault test
26	2	6--19	12-16-91 6:35 p.m.	8.3.2	Clamp open measurement
27	2	7--18	12-16-91 7:20 p.m.	8.3.1.4	B&W 15x15 mock-up on station 1
28	2	8--17	12-16-91 7:20 p.m.	8.3.1.6	B&W 15x15 mock-up on cutting station
29	2	9--16	12-16-91 7:45 p.m.	8.3.8	B&W 15x15 mock-up centering test
30	2	10--15	12-17-91 8:40 a.m.	8.3.7	Clamp force test
31	2	11--14	12-17-91 10:05 a.m.	8.4.1	Clamp open measurment
32	2	12--13	12-17-91 10:35 a.m.	8.4.2	Interlock tests

33	2	13--12	12-17-91 12:45 p.m.	8.4.3	Single mode test
34	2	14--11	12-17-91 12:45 p.m.	8.4.4	Auto mode test
35	2	15--10	12-17-91 12:45 p.m.	8.4.5	Clamp drive fault test
36	2	16--9	12-17-91 12:45 p.m.	8.4.6	Clamp force test
37	2	17--8	12-17-91 2:10 p.m.	8.5.2	Interlock tests
38	2	18--7	12-17-91 3:45 p.m.	8.5.3	Single mode test
39	2	19--6	12-17-91 3:45 p.m.	8.5.4	Auto mode test
40	2	20--5	12-17-91 3:45 p.m.	8.5.5	Clamp drive fault test
41	2	21--4	12-17-91 3:45 p.m.	8.5.1	Clamp measurement
42	2	22--3	12-17-91 4:15 p.m.	8.5.6	Clamp force test
43	2	23-- 2 ₂	12-17-91 4:50 p.m.	8.2.1	Clamp measurement
44	2	24--1	12-17-91 5:10 p.m.	8.2.6	Clamp force test

APPENDIX D

TEMPORARY PROCEDURE CHANGE NOTICE AND REPAIR LOG

APPENDIX D-2

NU'S 340 REVISED 1200

TEST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 12-12-91

TPCN # 2

PROCEDURE NO. 9315-TP-209A REV. 2

TITLE Cutting/Staging SOT

PROCEDURE SECTION(S) 8.1.7.1, 8.2.6.1, 8.3.7.1, 8.4.6.1, 8.5.6.1

PROCEDURE CHANGE: (Use reverse side if necessary.)

"JOG" should be changed to "HAND"

REASON FOR CHANGE:

In order to stop clamps at predetermined set points, the HAND mode must be used instead of JOG.

CLASSIFICATION OF CHANGE

MINOR ☒ YES ☒ NO ☐

MAJOR ☐ YES ☐ NO ☒

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES ☐ NO

APPROVALS

MB Hays 12-12-91 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 12-12-91

TPCN # 3

PROCEDURE NO. 9315-TP-209A REV. 2

TITLE Cutting/Staging SET

PROCEDURE SECTION(S) 8.1.7.3

PROCEDURE CHANGE: (Use reverse side if necessary.)

Change load cell fixture width from $5.25 \pm .03$ inches to $5.52 \pm .03$ inches.

REASON FOR CHANGE:

Fuel drawings show the GE 8x8 width to be 5.52 inches not 5.25 inches. In addition the clamps do not close down to 5.25 inches and therefore will not apply a clamp force unless the fixture width is increased.

CLASSIFICATION OF CHANGE

MINOR ☒ YES ☒ NO ☐

MAJOR ☐ YES ☐ NO ☒

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES ☐ NO

APPROVALS

M.D. Hagan 12-12-91 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- Notes: (1) Required for minor changes
(2) Required for major changes

5 of 7

APPENDIX D-2

NUS 346 REVISED 1200

TEST PROCEDURE 9315-TP-209A REVISION 2 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 12-13-91

TPCN # 5

PROCEDURE NO. 9315-TP-209A REV. 2 TITLE Cutting/Staging SGT

PROCEDURE SECTION(S) 8.1.1.3, 8.2.5.3, 8.3.6.3, 8.4.5.3, 8.5.5.3

PROCEDURE CHANGE: (Use reverse side if necessary.)

Change direction to press "Continue" to press "Go".

REASON FOR CHANGE:

"Continue" is used for the SINGLE mode, since control system mode was changed to the HAND mode, "GO" would be the correct way to activate clamps.

CLASSIFICATION OF CHANGE

MINOR X YES X NO

MAJOR YES NO X

REVISION TO ORIGINAL PROCEDURE REQUIRED X YES NO

APPROVALS

A/B Tagnor 12-13-91 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE 12-16-91

TPCN # 6

PROCEDURE NO. 9315-TP-2094 REV. 2 TITLE Cutting / Staging SCT

PROCEDURE SECTION(S) 8.1.4.2, 8.1.5.1, 8.2.3.2, 8.2.4.1, 8.3.4.2, 8.3.5.1, 8.4.3.2,
8.4.4.1, 8.5.3.2, 8.5.4.2

PROCEDURE CHANGE: (Use reverse side if necessary.)

Reword steps to delete "continue" from clamping operation.

REASON FOR CHANGE:

Clamps automatically close in the Single and Auto mode after receipt of fuel. Pressing "Continue" is not required and therefore was deleted.

CLASSIFICATION OF CHANGE

MINOR X YES X NO

MAJOR _____ YES _____ NO X

REVISION TO ORIGINAL PROCEDURE REQUIRED X YES NO

APPROVALS

W B Hayes 12-16-91 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE _____ DATE _____ (2)

PROJECT ENGINEER _____ DATE _____ (2)

TEST DIRECTOR _____ DATE _____ (2)

Notes: (1) Required for minor changes
(2) Required for major changes

APPENDIX D-2

TPCN # 7

8.4.6.6, 8.5.1.2, 8.5.1.3, 8.5.1.4, 8.5.6.4, 8.5.6.5,
8.5.6.6, A2, A3, A4, A5, A6

PROCEDURE NO. 9315-TP-209A REV. 2 TITLE CUTTING/STAGING SDT

PROCEDURE SECTION(S) 2.6, 3.2, 3.3, 3.5, 8.1.2.2, 8.1.2.3, 8.1.2.4, 8.1.7.4, 8.1.7.5,
8.1.7.6, 8.2.1.2, 8.2.1.3, 8.2.1.4, 8.2.6.4, 8.2.6.5, 8.2.6.6, 8.3.2.2, 8.3.2.3,
8.3.2.4, 8.3.7.4, 8.3.7.5, 8.3.7.6, 8.4.1.2, 8.4.1.3, 8.4.1.4, 8.4.6.4, 8.4.6.5,

PROCEDURE CHANGE: (Use reverse side if necessary.)

PROCEDURE CHANGE: (Use reverse side if necessary.)

- PROCEDURE CHANGE: (USE REVERSE SIDE IF NECESSARY.)
1. SECTION 2.6 Change "Reference 11.1" to "Reference 11.6"
 2. SECTION 3.2 Add "or test cell accessible to the FAHF."
 3. SECTION 3.3 Delete "with crosshair alignment verified."
 4. SECTION 3.5 Add "and driven to the fully retracted position."
 5. SECTION 8.1.2.2 Change acceptance criteria " $11.00 \pm .03$ " to >10.30 (See TACCN 03)

continued on Pg 2

REASON FOR CHANGE: INCORPORATE MINOR PERCENT CHANGES NOT
DIRECT ACCEPTANCE CRITERIA TO REFLECT FAC CHANGES.

APPROVALS

TEST DIRECTOR _____ DATE _____ (2)

- NOUS 100 REVISED 1200**

PROCEDURE CHANGE: cont.

6. SECTION 8.1.2.3 PAGE 9 of 59 Change "11 sec. and 27 sec." to "5 sec. and 40 sec." (See TACCN 02)
7. SECTION 8.1.2.4 Change acceptance criteria " $11.00 \pm .03$ " to " > 10.30 " (See TACCN 03) and "11 sec. and 27 sec." to "5 sec. and 40 sec." (See TACCN 02)
8. SECTION 8.1.7.4 Change acceptance criteria "450 LBS" to "300 LBS" (See TACCN 02)
9. SECTION 8.1.7.5 SAME AS ABOVE
10. SECTION 8.1.7.6 SAME AS ABOVE
11. SECTION 8.2.1.2 Change acceptance criteria " $11.00 \pm .03$ " to " > 10.30 " (See TACCN 03)
12. SECTION 8.2.1.3 Change acceptance criteria "11 sec. and 27 sec." to "5 sec. and 40 sec."
13. SECTION 8.2.1.4 Change acceptance criteria " $11.00 \pm .03$ " to " > 10.30 " (See TACCN 03) and "11 sec. and 27 sec." to "5 sec. and 40 sec." (See TACCN 02)
14. SECTION 8.2.6.4 Change acceptance criteria "450 LBS" to "300 LBS" (See TACCN 02)
15. SECTION 8.2.6.5 SAME AS ABOVE
16. SECTION 8.2.6.6 SAME AS ABOVE
17. SECTION 8.3.2.2 Change acceptance criteria " $11.00 \pm .03$ " to " > 10.30 "

PROCEDURE CHANGE; cont.

18. SECTION 8.3.2.3 Change acceptance criteria " $8.50 \pm .03$ "
to " $8.40 \pm .03$ " (See TACCN 04) and
"11 sec and 27 sec" to "5 sec and 40 sec"
(See TACCN 02) .

19. SECTION 8.3.2.4 Change acceptance criteria " $11.00 \pm .03$ "
to " > 10.30 " (See TACCN 03)
Change acceptance criteria " $8.50 \pm .03$ "
to " $8.40 \pm .03$ " (See TACCN 04)
Change acceptance criteria "11 sec and
27 sec" to "5 sec and 40 sec" (See
TACCN 02)

20 SECTION 8.3.7.4 Change acceptance criteria "150 LBS to
"300 LBS" (See TACCN 02)

21 SECTION 8.3.7.5 SAME AS ABOVE

22 SECTION 8.3.7.6 SAME AS ABOVE

23 SECTION 8.4.1.2 Change acceptance criteria " $11.00 \pm .03$ "
to " > 10.30 " (See TACCN 03)

24 SECTION 8.4.1.3 Change acceptance criteria " $8.39 \pm .03$ " to
" $8.29 \pm .03$ " (See TACCN 05)
Change acceptance criteria "11 sec and 27 sec"
to "5 sec and 40 sec" (See TACCN 02)

TAC CHANGE NOTICE

DATE: 3/18/92

CHANGE NOTICE NO. 002

TAC NO: 9315-TAC-209A REV 3

TITLE: TAC FOR THE
STAGING/CUTTING SYSTEM

TAC CHANGES AND REASON FOR CHANGE

1. Change Section ^{1.4} ~~1.2~~ Clamping Force Criteria:

Old Criteria	450 to 500 lbs
New Criteria	300 to 500 lbs

This change affects all fuel types and all clamps.

Reason for Change:

Difficulty was encountered in getting reproducible results with the load cell during SOT testing. An investigation showed that the cause was related to the slow sampling frequency (0.1 second) of the computer which samples the clamp motor current and stops the motor when the set point is exceeded. Because motor current rises very rapidly when the clamps become loaded, there can be a substantial variance between the set point current and the current when sampled that exceeds the set point and trips the motor. Testing in the load range of the acceptance criteria indicated that a variance of 200 lbs. could be seen between readings.

Requirements on the clamping force are that it be sufficient to center the fuel in the clamps and that it not be capable of causing deformation to the fuel assembly grid structure. These requirements can be met with the wider acceptance ban. 300 lbs is sufficient to center the fuel assembly by moving it across the clamp surface. The 500 lb limit has not been changed.

ENGINEER

ERB Forest

3/18/92

Date

QUALITY ASSURANCE

W. D. Dalton

3/18/92

Date

PROJECT MANAGER

Ob. Mills

3/18/92

1

CHANGE NOTICE NO. 003

TITLE: TAC FOR SPACING/CUTTING
STATION

.....

Old Criteria	11.00 +/- .03 inches
New Criteria	> 10.30 without engaging hard stop

Clamp design does not permit the achievement of an 11 inch opening. In addition, shim plates have been added on the inside of the clamp to permit achievement of opening requirement in the closed position.

An opening of greater than 10.30 inches is sufficient to allow acceptance of all fuel types with 1.5 inch bow and a .125 inch positioning deviation of the RBT. This is based upon the B&W fuel assembly (8.53 inch across grid) being the largest fuel type. The new criteria will confirm clamp opening acceptability.

(If more space is needed, use additional sheets.)

203 Forest 3/19/92
Date

Nikomas G. N. Kuyper 3/19/92
Date:

\$ M M allo 3/19/92

TAC NO:

Page 2 of 2

CHANGE NOTICE NO: 003

TAC CHANGE NOTICE (Cont'd)

2. Change closure time for clamps in section 1.3.2

Old Criteria	11 to 27 seconds
New Criteria	5 to 40 seconds

Reason for Change:

This criteria is not critical to the performance of the system. The original criteria was based on theoretical motor speeds and clamp movements. Since then the motors have been refurbished with brakes which slow the closure time. Also, due the addition of shim plates, clamps are not open to 11.00 inches as was assumed in the original assessment. The new range provides a more reasonable acceptance band without compromising any features of the system.

TAC CHANGE NOTICE

DATE: 3/24/92

CHANGE NOTICE NO. 004

TAC NO: 9315 TAC 207 A

TITLE: STAGING AND CUTTING SYSTEM

=====

TAC CHANGES AND REASON FOR CHANGE

1. Change the jaw opening distance in the closed position for the B&W fuel type from 8.50 +/- .03 inches to 8.40 +/- .03 inches in sections 1.32 and 1.34.

Reason for change:

With the 8.5 inch dimension, there is the possibility that the clamp motor will trip on close position before preloading the fuel with a clamp force in the range of 300 to 500 lbs. This was experienced during testing. Using the lower 8.40 inch criteria will assure that the clamp motors trip on current that corresponds to a clamp force in the desired 300 to 500 lb range.

(If more space is needed, use additional sheets)

ENGINEER

E.B. Forrest

3/24/92

Date

QUALITY ASSURANCE

J. M. Hall

3/24/92

Date

PROJECT MANAGER

J. M. Hall

3/24/92

TAC CHANGE NOTICE

DATE: 3/24/92

CHANGE NOTICE NO. 005

TAC NO: 9315 TAC 209A

TITLE: STAGING + CUTTING

=====

TAC CHANGES AND REASON FOR CHANGE

1. Change the jaw opening distance in the closed position for the W17x17 and W15x15 fuel types from 8.39 +/- .03 inches to 8.29 +/- .03 inches in sections 1.32 and 1.34.

Reason for change:

With the 8.39 inch dimension, there is the possibility that the clamp motor will trip on close position before preloading the fuel with a clamp force in the range of 300 to 500 lbs. This was experienced during testing. Using the lower 8.29 inch criteria will assure that the clamp motors trip on current that corresponds to a clamp force in the desired 300 to 500 lb range.

(If more space is needed, use additional sheets)

ENGINEER

E. B. Farnest3/24/92

Date

QUALITY ASSURANCE

A. A. Dugan3/24/92

Date

PROJECT MANAGER

P. D. Dalbo3/25/92

Department of Energy

Idaho Field Office
785 DOE Place
Idaho Falls, Idaho 83401-1562

April 17, 1992

Peter V. Judd
NUS Project
c/o Contraves-USA
620 Epsilon Drive
Pittsburgh, PA 15238

Gibson
Original copy 4.7
DCC

FOUO
SWS 209 A
SOT 209 A
Ed Forest

SUBJECT: Review of Halliburton NUS System Operation Test (SOT) TAC Change Notices (TCN), No. 002, 003, 004, and 005, for the Staging and Cutting System

TP-209 A

Sy SWS Ed Forest

REFERENCE: Halliburton NUS Corporation Transmittal to DOE-ID, ED-DOE-PVJ-92-2316, dated March 30, 1992

Dear Mr. Judd:

DOE-ID has reviewed the subject TCNs under the REVIEW/APPROVAL provision of the contract and finds them acceptable. The TCNs are approved for implementation.

If you have further questions, please contact me (208) 526-1466 or Mr. D. C. Koelsch (208) 526-5930.

Sincerely,

Margaret W. Fisher
Margaret W. Fisher, Chief
Civilian Rad-Waste Branch

cc: F. G. Gallo, NUS
J. H. Clark, EG&G

TPCN-7A-7

910 CLOPPER ROAD • P O BOX 602 • GAITHERSBURG, MARYLAND 20877-0962 • (301) 258-6000

ED-DOE-PVJ-92-2316

March 30, 1992

**Ms. M.W. Fisher, Chief
Civilian Rad-Waste Branch
U. S. Department of Energy
Idaho Field Office
785 DOE Place
Idaho Falls, ID 83401-1562**

Subject: Contract DE-AC07-86ID12651 - Rod Consolidation Project
Systems Operational Test--Staging and Cutting System
Change Notice (TCN) Approval

Reference: 1. 9315-TAC-209A Rev 3

Dear Ms. Fisher:

Attached are TCNs 002, 003, 004, and 005 to reference 1 for your approval action.

If you have any questions, please contact the undersigned on (412) 967-7304.

Very truly yours,

Peter V. Judd
Project Manager

ht

Attachments:

TCNs 002, 003, 004, and 005 to TAC 209A Rev. 3

cc: D.C. Koelsch--DOE-ID
J.H. Clark--EG&G

DCC: F. Gallig
2. Form (Record - x-2)
T. F. Mulgrew (Dec)
Subj 4.1
Cnion

pgn

SOT BOOK
DOE UNION
~~THE~~ UNION

rees for a cleaner and safer world

TEST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE # B

DATE B-26-92

PROCEDURE NO. 9315-TP-209A REV. 2 TITLE Cutting/Staging SOT

PROCEDURE SECTION(S) 6.1

PROCEDURE CHANGE: (Use reverse side if necessary.)

Delete Dwg. reference in section 6.1.

REASON FOR CHANGE:

A different compression load test fixture will be used.

CLASSIFICATION OF CHANGE

MINOR ☒ YES ☒ NO ☐

MAJOR ☐ YES ☐ NO ☒

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES ☐ NO

APPROVALS

HB Hagen 8-26-92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- es: (1) Required for minor changes
(2) Required for major changes

ST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 12-4-91

LOG # 1

PROCEDURE NO. 9315-TP-209A REV. 2

TITLE Cutting/staging SOT

PROCEDURE SECTION(S) 2.3 ^{2.9} CONF, 12/1/91

CLASSIFICATION OF CHANGE: REPAIR N/A REDESIGN N/A TPCN# N/A

PROBLEM AND CAUSE:

1. Section 7.2 (CRT) of _A FAT has not been completed.
cutting/staging

TEST CONDUCTOR Kenneth B. Hayes

SOLUTION/CORRECTIVE ACTION:

The above item will not impact SO Testing, and is only required for off-Normal and maintenance during Integrated Testing.

TEST CONDUCTOR Kenneth B. Hayes

DATE 12-10-91

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR Peter J. Judd

DATE 12-10-91 (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE None Required

TRANSFERRED TO OPEN ITEMS
LIST (FOR TRACKING) AB 0122.

MFC 3/4/12

TEST CONDUCTOR Kenneth B. Hayes

DATE 12-10-91

ST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 12-4-91 LOG # 2

PROCEDURE NO. 9315-TP-209A REV. 2 TITLE Cutting/Staging SUT

PROCEDURE SECTION(S) 2.15

CLASSIFICATION OF CHANGE: REPAIR n/a REDESIGN n/a TPCN# n/a

PROBLEM AND CAUSE:

1. FAHF has not been accepted by its FAT.

TEST CONDUCTOR Thermet B. Haynes

SOLUTION/CORRECTIVE ACTION:

The FAHF is operational and safe for transfer of fuel, and can be safely used during this test.

ST CONDUCTOR W B Haynes DATE 12-4-91

QUALITY ASSURANCE _____ DATE _____ (1)

OBJECT ENGINEER _____ DATE _____ (1)

ST DIRECTOR [Signature] DATE 12-10-91 (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE No action required

ST CONDUCTOR E B Forrest DATE 3/23/92

ST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 12-9-91

LOG # 3

PROCEDURE NO. 9315-TP-209A

REV. 2

TITLE Cutting/Staging OUT

PROCEDURE SECTION(S) 2.1

CLASSIFICATION OF CHANGE: REPAIR n/a

REDESIGN n/a

TPCN# n/a

PROBLEM AND CAUSE:

Clamps would not open as wide as listed in Appendix A (System Setup) for all fuel types. Clamps would not close down to specified opening for BWR (GE 8x8) fuel.

TEST CONDUCTOR Kenneth B. Hayes

CORRECTIVE ACTION:

The clamp open position recorded in Appendix A is sufficient to accept all fuel types with a 1.5 inch bow and ± 1.25 RBT positioning (≥ 10.25 in.) and therefore is acceptable. The BWR closed position will ~~be to be operated~~ require shims to tighten down on a fuel. The clamps were originally designed to close down to 5.52 inches as indicated on fuel drawings.

TEST CONDUCTOR Kenneth B. Hayes

DATE 12-10-91

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR

Robert J. Juhl

DATE 12-10-91 (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

INFORMATION HAS BEEN REDOCUMENTED ON RL # 7

TEST CONDUCTOR E.B. Farner

DATE 3/18/92

Since mockup fuel dimensions are less than the 5.52 inches called for on fuel drawings, the clamps will be operated as is or use shims if a clamp force is needed. This will not impact so testing.

TEST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 12-9-91

LOG #4

PROCEDURE NO. 9315-TP-209A

REV. 2

TITLE Cutting/Staging SUT

PROCEDURE SECTION(S) 2.4

CLASSIFICATION OF CHANGE: REPAIR

n/a

REDESIGN

n/a

TPCN#

n/a

PROBLEM AND CAUSE:

The QA/QC Data Package has not been fully completed.

TEST CONDUCTOR

Kenneth B. Haynes

SOLUTION/CORRECTIVE ACTION:

Open items in the QA/QC Data Package will not affect SUT Testing.

TEST CONDUCTOR

DATE

QUALITY ASSURANCE

DATE

(1)

PROJECT ENGINEER

DATE

(1)

TEST DIRECTOR

[Signature]

DATE

12-10-91

(1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

Data package to be tracked on Open Items Log. Number 0121.

TEST CONDUCTOR

EB Forest

DATE

3/23/92

REVIEW OF CUTTING TABLE SYSTEM
Data Package
ASSEMBLY PROCEDURE SECTIONS 3.3 THRU 3.3.3.8

The review of the Cutting Table System Data Package was completed on 2/19/92. This system was identified as being complete by Contraves QA. The following open items were identified:

Contraves Identified Open Items

- Need NCR C-151 from NUS
- Inspection per FCR 155
- Assembly procedure sign off for 3.3.1.11, 3.3.2.27, and 3.3.2.38

NUS Identified Open Items

ASSEMBLY PROCEDURE

- Steps 3.3.1.11, 3.3.1.12, 3.3.2.37 and 3.3.2.38 to Assembly Procedure not signed off.
- Comment: There is no CALIBRATED EQUIPMENT USE form after section 3.3.3.8

DCN'S

The following DCN'S are missing from the Data Package:

Dwg. 1501 - D085, D432
Dwg. 1502 - D433

There is no objective evidence that the following DCN'S were completed:

Dwg. 1501 - D085, D432
Dwg. 1502 - D433
Dwg. 1628 - D112, D205, D272, D505, D660, D679
Dwg. 1639 - D634

TEST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 12-9-91

LOG # 5

PROCEDURE NO. 9315-TP-209A REV. 2 TITLE Cutting / Staging SUT

PROCEDURE SECTION(S) 2.10

CLASSIFICATION OF CHANGE: REPAIR n/a REDESIGN n/a TPCN# n/a

PROBLEM AND CAUSE:

The load cell test fixture called out in Section 6.1 has been calibrated but requires modifications to be used for testing.

TEST CONDUCTOR Kenneth B. Haynes

SOLUTION/CORRECTIVE ACTION:

Steps requiring the test fixture (Sections B.1.7, B.2.5, B.3.7, B.4.6, B.5.6) will not be performed until the test fixture has been completed.

TEST CONDUCTOR Kenneth B. Haynes

DATE 12-10-91

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR Peter V. Juhl

DATE 12-10-91 (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE N/A

TEST CONDUCTOR Kenneth B. Haynes

DATE 12-10-91

TEST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 12-9-91

LOG # 6

PROCEDURE NO. 9315-TP-209A

REV. 2

TITLE Cutting/Staging SOT

PROCEDURE SECTION(S) 2.7

CLASSIFICATION OF CHANGE: REPAIR

n/a

REDESIGN

n/a

TPCN#

n/a

PROBLEM AND CAUSE:

Control System SOT checklist can not be completed because the globe motor (104 Q, P) brakes were not included with motor and therefore can not be tested.

TEST CONDUCTOR

Kenneth B. Haynes

SOLUTION/CORRECTIVE ACTION:

No motor brake tests are performed in this SOT. Testing will determine if brakes are required. If brakes are required based on test results, additional testing will be specified.

TEST CONDUCTOR

Kenneth B. Haynes

DATE

12-10-91

QUALITY ASSURANCE

DATE

(1)

PROJECT ENGINEER

DATE

(1)

TEST DIRECTOR

John J. Juhl

DATE

12-10-91

(1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

Motors were retested with brakes. See Repair Log # 22 of SOT 601

TEST CONDUCTOR

EB Forrest

DATE

3/18/92

EXCEPTION/REPAIR LOG

DATE 12-10-91 LOG #7
PROCEDURE NO. 9315-TP-209A REV. 2 TITLE Cutting/Staging SOT
PROCEDURE SECTION(S) 8.1.2.2, .3, .4
CLASSIFICATION OF CHANGE: REPAIR n/a REDESIGN n/a TPCN# n/a

PROBLEM AND CAUSE:
Clamps hit hardstop before opening to 11.00 inches. An opening of 11.00 inches can not be achieved.
Clamps hit hardstop before closing to 5.19 inches. A closed opening of 5.19 inches can not be achieved.
TEST CONDUCTOR Herbert B. Pagnon

SOLUTION/CORRECTIVE ACTION:
A clamp opening of 11.00 inches is not necessary, openings of ≥ 10.25 are acceptable.
Shims will have to be used to tightly clamp down on BWR fuels.

ST CONDUCTOR HB Pagnon DATE 12-10-91
QUALITY ASSURANCE _____ DATE _____ (1)
PROJECT ENGINEER _____ DATE _____ (1)
ST DIRECTOR _____ DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE TAC Change 003 REDUCES OPENING REQUIREMENT TO > 10.30 IN. IN OPEN POSITION. SHIMS ON INSIDE OF CLAMP HAVE BEEN ADDED SO THAT "CLOSED" OPENING REQUIREMENT CAN BE ACHIEVED.
ST CONDUCTOR ETS Forrest DATE 3/19/92

8.1.2 Drive System Operation Verification Test

GE
BWR

WARNING

Stay clear of clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

Type of Measuring Device CALIPER Range 0-12"
Identification No. NUS-001 Calibration Due Date 4-27-92

RETEST
RL # 7

Upper clamp opening (open position) 10.505 inch RL # 7
Lower clamp opening (open position) 10.50 inch SDF 3/11/92

Acceptance Criteria:

- Clamp jaws separated by >10.30 inches. RL # 7

Test Conductor SDF Date 3/11/92
QA [Signature] Date 3/11/92

3. Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device CALIPER Range 0-12"
Identification No. NUS-001 Calibration Due Date 4-27-92

RETEST
RL # 7

Upper clamp opening (closed position) 5.16 inch
Lower clamp opening (closed position) 5.27 inch * 5.20
Closing time 31.68 / 31.8 seconds SDF 3/11/92
UPPER LOWER

Acceptance Criteria:

- Clamp jaws separated by 5.19 ± .03 inches. RL # 14

* REMOVE SHIM RETESTED LOWER CLAMP SDF 3/11/92

- Time to close is between $\frac{5}{11}$ sec. and $\frac{40}{27}$ sec. *TPCN #7*

Test Conductor EMF Farnest Date 3/11/92

QA 11/11/92 Date 3/11/92

- Repeat Steps 2 and 3 two additional times.

Type of Measuring Device CALIPER Range 0-12"
Identification No. NUS-001 Calibration Due Date 4-29-92

Upper clamp opening (open position) 10.45 inch
Lower clamp opening (open position) 10.53 inch
Upper clamp opening (closed position) 5.16 inch
Lower clamp opening (closed position) 5.26 inch * 5.16
Closing time 31.43/32.32 seconds *RL #14*

Upper clamp opening (open position) 10.48 inch *EMF 3/11/92*
Lower clamp opening (open position) 10.52 inch
Upper clamp opening (closed position) 5.17 inch
Lower clamp opening (closed position) 5.267 inch * 5.17
Closing time 31.49/32. seconds

RETEST
RL #7

Acceptance Criteria:

- Clamp jaws separated by $\frac{10.30}{11.00} \pm .03$ inches. *TPCN #7*
- Clamp jaws separated by $5.19 \pm .03$ inches.
- Time to close is between $\frac{5}{11}$ sec. and $\frac{40}{27}$ sec. *TPCN #7*

Test Conductor EMF Farnest Date 3/11/92

QA 11/11/92 Date 3/11/92

- The above steps have been completed.

Test Conductor EMF Farnest Date 3/11/92

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 12-11-91

LOG #8

PROCEDURE NO. 9315-TP-209A REV. 2

TITLE Cutting/Staging SPT

PROCEDURE SECTION(S) 8.1.3.1 (xv) 8.2.2.1 (xv)
8.1.3.2 (xv) 8.2.2.2 (xv)

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN n/a TPCN# n/a

PROBLEM AND CAUSE:

Interlock XV did not function, clamp would not open due to a problem with interlock software.

TEST CONDUCTOR M/B Haynes

SOLUTION/CORRECTIVE ACTION:

Interlock software will have to be checked to verify if correct.

TEST CONDUCTOR M/B Haynes

DATE 12-11-91, 12-14-91

QUALITY ASSURANCE

DATE _____ (1)

PROJECT ENGINEER

DATE _____ (1)

TEST DIRECTOR

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE Software was corrected to agree with procedure, interlock was retested.

TEST CONDUCTOR M/B Haynes

DATE 12-16-91

ST PROCEDURE 9315-TP-209A REVISION 2 APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 12-12-91 LOG # 9

PROCEDURE NO. 9315-TP-209A REV. 2 TITLE Cutting/Staging SOT

PROCEDURE SECTION(S) 8.1.7 - 4, 5, 6

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN ☐ TPCN# n/a

PROBLEM AND CAUSE:

Minimum initial clamp force for both clamps exceeds 500 lbs with Control System current monitor set at the lowest setting to maintain clamp movement. In addition, clamps backdrive when motor shuts off, then maintains a constant clamp force of approximately 200 lbs for the lower clamp and 300 lbs for the upper clamp due to the absence of motor brakes.

TEST CONDUCTOR AB Hayer

See Supplementary Sheets 1+2 for Test Results

SOLUTION/CORRECTIVE ACTION: Clamp motors need to be reevaluated to determine optimum fix, then retested.

TEST CONDUCTOR	<u>AB Hayer</u>	DATE	<u>12-12-91</u>
QUALITY ASSURANCE	_____	DATE	_____ (1)
PROJECT ENGINEER	_____	DATE	_____ (1)
TEST DIRECTOR	_____	DATE	_____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE MOTORS WERE EQUIPPED WITH BRAKES AND REINSTALLED. CLAMP FORCE TEST WAS BE REPEATED. ~~SEE~~ RE-TESTED 3/11/92

TEST CONDUCTOR SAB Fanejt DATE 3/19/92

CORRELATION: READINGS WERE VERIFIED FOR APPARATUS NUMBER 6 RECALIBRATION AND ARE ACCEPTABLE PER TAC ON 002.

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

Test Conductor SAF 3/11/92 Date _____

QA _____ Date _____

6. The above steps have been completed.

Test Conductor _____ Date _____

8.1.7 Clamp Force Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the force exerted by both cutting table clamps as follows:

- Place cutting/staging system in "JOG" mode.
- Open both upper (M-104Q) and lower (M-104P) clamps.
- Set up load cell fixture (9315-M-0012) to a width of $5.25 \pm .03$ inches and place between the upper clamps.
- Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

5.52 TPCN #3

Type of Measuring Device MULTIMETER Range VARIOUS
Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force 483 lbs lbs. 2.9 mm

Acceptance Criteria:

- Clamping force greater than 300 ~~450~~ lbs. but less than 500 lbs.

Test Conductor S. Farrest Date 3/11/92

QA G. G. G. G. Date 3/11/92

TPCN #7

RETEST
RL #9

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device MULTIMETER Range VARIOUS
Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force 500 lbs lbs. 3.0

Clamp force 466 lbs lbs. 2.8

Acceptance Criteria:

- Clamping force greater than 450 lbs. but less than 500 lbs.

Test Conductor END Forest Date 3/11/92

QA [Signature] Date 3/11/92

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device MULTIMETER Range VARIOUS
Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force 450 lbs. 2.8 * 2.7

Clamp force 450 lbs. 2.9 * 2.7

Clamp force 483 lbs. 2.5 * 2.9

Acceptance Criteria:

- Clamping force greater than ³⁰⁰450 lbs. but less than 500 lbs. T/CN #7

Test Conductor END Forest Date 3/11/92

QA [Signature] Date 3/11/92

7. The above steps have been completed.

Test Conductor END Forest Date 3/11/92

* adjusted set point and retested.

RETEST
RL #9

RL
15
200P
3/11/92

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 12-13-91

LOG # 10

PROCEDURE NO. 9315-TP-209A REV. 2

TITLE Cutting/Staging SOT

PROCEDURE SECTION(S) 8.1.6.3, 8.2.5.3

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN n/a TPCN# n/a

PROBLEM AND CAUSE:

~~Audio alarm was not activated when fault was implemented due to audio alarm not being installed.~~
Audio alarm was not activated when fault was implemented due to audio alarm not being ~~installed~~ hooked up.

TEST CONDUCTOR MB Hayes

SOLUTION/CORRECTIVE ACTION:

Activate fault alarm system.

TEST CONDUCTOR MB Hayes

DATE 12-16-91

QUALITY ASSURANCE

DATE _____ (1)

PROJECT ENGINEER

DATE _____ (1)

TEST DIRECTOR

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

TEST CONDUCTOR MB Hayes

DATE 12-16-91

FST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 12-13-91

LOG # 11

PROCEDURE NO. 9315-TP-209A REV. 2 TITLE Cutting/Staging SOT

PROCEDURE SECTION(S) 8.1.6.4, 8.2.5.4, 8.3.6.4, 8.4.5.4, 8.5.5.4

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN n/a TPCN# n/a

PROBLEM AND CAUSE:

When "call camera" was activated, cameras 4 and 10 came ~~up~~ on line when the upper or lower clamp was faulted. According to electrical, cameras 3 and 10 should have been activated for the upper system and 4 and 10 for the lower system.

TEST CONDUCTOR PB Higgins

SOLUTION/CORRECTIVE ACTION:

Fix VIDEO ALARM PROCESSOR TO PRODUCE
CORRECT CAMERA CALL

TEST CONDUCTOR SP Fanet

DATE 3/11/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE VIDEO ALARM PROCESSOR WAS FIXED.
RETEST REQUIRED

TEST CONDUCTOR SP Fanet

DATE 3/19/92

Void, see
RL #27

KDH 9-16-92

EXCEPTION/REPAIR LOG

DATE 12-16-91 LOG # 12
PROCEDURE NO. 9315-TP-209A REV. 2 TITLE Cutting/Staging SOT
PROCEDURE SECTION(S) B.3.2.2, 4; 8.4.1.2, 4; 8.2.1.2, 4; 8.5.1.2, 4
CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN n/a TPCN# n/a

PROBLEM AND CAUSE:
Clamps would not open as wide as specified in acceptance criteria due to hardstop engagement.

TEST CONDUCTOR JB Haynes

SOLUTION/CORRECTIVE ACTION:

Clamp opening is sufficient to accept all fuel types using the following criteria:

largest fuel width	8.54	No corrective action is required -
max fuel bow	1.50	
RBT position accuracy	.25	

10.29 in.

TEST CONDUCTOR	<u>JB Haynes</u>	DATE	<u>12-16-91</u>
QUALITY ASSURANCE	_____	DATE	_____ (1)
PROJECT ENGINEER	_____	DATE	_____ (1)
TEST DIRECTOR	_____	DATE	_____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE CRITERIA HAS BEEN CHANGED VAC CHANGE NOTICE 003. OPENINGS ARE ACCEPTABLE RETEST IS FOR INFORMATION SINCE STIM PLATES

TEST CONDUCTOR JB Finest DATE 3/19/92

→ WERE ADDED TO INSIDE OF CLAMP.

8.2 System Verification for the CE 14 x 14 PWR Fuel Type (#3) ^{2AC 3/12/92}

CE
14x14

The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the CE 14 x 14 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the CE 14 x 14 PWR fuel type.

Test Conductor _____ Date _____

8.2.1 Drive System Operation Verification Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

Type of Measuring Device CALIPER Range 0-12"
Identification No. NUS-001 Calibration Due Date 4/29/92

Upper clamp opening (open position) ^{2E 10.46} ~~10.48~~ inch ^{2E 3/16/92}
Lower clamp opening (open position) ^{2E 10.48} ~~8.22~~ inch ^{2E 3/16/92}

Acceptance Criteria:

- Clamp jaws separated by ^{> 10.30} ~~11.00 ± .03~~ inches. ^{TICK 17}

Test Conductor J J Coleman Date 3/16/92

QA SVT Baghem Date 3/12/92

RETEST
RL #12

^{2E 3/16/92}
RL #716

3. Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device	CALIPER	Range	0-12"
Identification No.	NUS-001	Calibration Due Date	4/29/92

Upper clamp opening (closed position) 8.23 inch
~~17.18~~
 Lower clamp opening (closed position) 8.22 inch
 Closing time 16.59 / 17.18 seconds
 lower upper

Acceptance Criteria:

- Clamp jaws separated by $8.21 \pm .03$ inches.
- Time to close is between 11 sec. and 27 sec. TRIP #7

Test Conductor FJ Coleman Date 3/12/92

QA W. H. Hagan Date 3/12/92

4. Repeat Steps 2 and 3 two additional times.

Type of Measuring Device	CALIPER	Range	0-12"
Identification No.	NUS-001	Calibration Due Date	4/29/92

Upper clamp opening (open position) 10.50 inch R.L. #16
~~10.50~~
 Lower clamp opening (open position) 10.50 inch
 Upper clamp opening (closed position) 10.49 inch
 Lower clamp opening (closed position) 8.20 inch
 Closing time 16.09 / 17.76 seconds
 lower upper

Upper clamp opening (open position) 10.48 inch
 Lower clamp opening (open position) 10.49 inch R.L. #16
 Upper clamp opening (closed position) 8.23 inch
 Lower clamp opening (closed position) 8.23 inch
 Closing time 16.57 / 16.99 seconds
 lower upper

RETEST
RL #12

Acceptance Criteria:

- Clamp jaws separated by ^{7 10.30} ~~11.00~~ ± .03 inches. TFC #7
- Clamp jaws separated by 8.21 ± .03 inches.
- Time to close is between ⁵ ~~18~~ sec. and ⁴⁰ ~~27~~ sec. TFC #7

Test Conductor 78 Coleman

Date 3/15/92

QA

W. D. Dugan

Date 3/12/92

5. The above steps have been completed.

Test Conductor 78 Coleman

Date 3/12/92

8.2.2 Interlock Verification Test

WARNING

Stay clear of clamps while in operation

- 8.2.2.1 Verify the lower clamp (M-104P) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the lower clamp can be opened. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

RETEST
FL #12

8.3.2 Drive System Operation Verification Test

WARNING

Stay clear of clamps while in operation.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

Type of Measuring Device CALIPER Range 0-12"
Identification No. NUS-001 Calibration Due Date 4/29/92

Upper clamp opening (open position) 10.49 inch

Lower clamp opening (open position) 10.49 inch

Acceptance Criteria:

- Clamp jaws separated by ^{10.30}~~11.00 ± .03~~ inches. T/CN #7

Test Conductor JJ Coleman Date 3/13/92 RL 18

QA [Signature] Date 3/13/92

3. Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device CALIPER Range 0-12"
Identification No. NUS-001 Calibration Due Date 4/29/92

Upper clamp opening (closed position) 8.34 inch

Lower clamp opening (closed position) 8.63 inch

Closing time 12.25 / 9.26 seconds
upper lower

Acceptance Criteria:

- Clamp jaws separated by ^{8.40}~~8.50 ± .03~~ inches. T/CN #7

RETEST
RL #12

8.8
P.64

- Time to close is between ⁵~~11~~ sec. and ⁴⁰~~27~~ sec. TPCN #7

Test Conductor J D Coleman

Date 3/13/92

RL #19

QA

A. Murphy

Date 3/13/92

4. Repeat Steps 2 and 3 two additional times.

Type of Measuring Device	<u>CALIPER</u>	Range	<u>0-12"</u>
Identification No.	<u>NUS-001</u>	Calibration Due Date	<u>4/28/92</u>

Upper clamp opening (open position) 10.49 inch

Lower clamp opening (open position) 10.30 inch

Upper clamp opening (closed position) 8.33 inch

Lower clamp opening (closed position) 8.64 inch

Closing time 12.35/9.13 seconds
Upper lower

Upper clamp opening (open position) 10.48 inch

Lower clamp opening (open position) 10.36 inch

Upper clamp opening (closed position) 9.27 inch

Lower clamp opening (closed position) 8.32 inch

Closing time 12.29/9.27 seconds
Upper lower

Acceptance Criteria:

- Clamp jaws separated by ^{> 10.30}~~11.00 ± .03~~ inches.
- Clamp jaws separated by ^{8.40}~~8.50 ± .03~~ inches.
- Time to close is between ⁵~~11~~ sec. and ⁴⁰~~27~~ sec.

TPCN #7

Test Conductor J D Coleman

Date 3/13/92

RL 18, 19

QA

A. Murphy

Date 3/13/92

5. The above steps have been completed.

Test Conductor J D Coleman

Date 3/13/92

RETEST
RL #12

8. Repeat Steps 5 to 7 an additional two (2) times.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Distance _____ inch

Distance _____ inch

Acceptance Criteria:

- Clamps were able to center fuel to within ± 0.030 inch.

Test Conductor _____ Date _____

QA _____ Date _____

9. Open cutting table clamps fully, lift mockup fuel using the RBT and FAHF and replace fuel in the fuel storage rack.

10. The above steps have been completed.

Test Conductor _____ Date _____

8.4 System Verification for the W 17 x 17 PWR Fuel Type

W 17x17

The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the W 17 x 17 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the W 17 x 17 PWR fuel type.

Test Conductor _____ Date _____

8.4.1 Drive System Operation Verification Test

WARNING

Stay clear of clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

312 4412

Type of Measuring Device CALIPER Range 0-12"
Identification No. NUS-001 Calibration Due Date 4/29/92

Upper clamp opening (open position) 10.49 inch

Lower clamp opening (open position) 10.37 inch

8.39*
275C 3/14

RL 21
275C 3/14

Acceptance Criteria:

- Clamp jaws separated by > 10.30 inches. TPC #7

Test Conductor JJ Coleman Date 3/14/92

QA _____ Date _____

- Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device Caliper Range 0-12"
Identification No. NUS-001 Calibration Due Date 4/29/92

Upper clamp opening (closed position) 8.38 inch

Lower clamp opening (closed position) 8.39* inch

Closing time 11.96 / 11.98 seconds
Upper lower

RL 21
275C 3/14/92

RL 22

Acceptance Criteria:

- Clamp jaws separated by 8.29 inches. TPC #7

- Time to close is between 5 sec. and 40 sec. TPC #7

Test Conductor JJ Coleman Date 3/14/92

QA 11/14/92 Date 3/14/92

* First reading was 9.57" (S.F. = 112). Reset set point to 154. Acceptance criteria met.

RETEST
RL # 12

4. Repeat Steps 2 and 3 two additional times.

Type of Measuring Device	<u>CALIPER</u>	Range	<u>0-12"</u>
Identification No.	<u>NUS-001</u>	Calibration Due Date	<u></u>

Upper clamp opening (open position)	<u>10.47</u>	inch
Lower clamp opening (open position)	<u>10.38</u>	inch
Upper clamp opening (closed position)	<u>8.38</u>	inch
Lower clamp opening (closed position)	<u>8.38</u>	inch
Closing time	<u>12.71</u> / <u>12.20</u>	seconds
	upper lower	
Upper clamp opening (open position)	<u>10.49</u>	inch
Lower clamp opening (open position)	<u>10.38</u>	inch
Upper clamp opening (closed position)	<u>8.39</u>	inch
Lower clamp opening (closed position)	<u>8.37</u>	inch
Closing time	<u>12.12</u> / <u>12.05</u>	seconds
	upper lower	

Acceptance Criteria:

- Clamp jaws separated by 11.00 ± .03 inches.
 - Clamp jaws separated by 8.39 ± .03 inches.
 - Time to close is between 5 sec. and 40 sec.
- } T.P. # 7.

Test Conductor	<u>J. Coleman</u>	Date	<u>3/14/92</u>
QA	<u>[Signature]</u>	Date	<u>3/14/92</u>

5. The above steps have been completed.

Test Conductor	<u>J. Coleman</u>	Date	<u>3/14/92</u>
----------------	-------------------	------	----------------

RETEST
RL #12

8.5 System Verification for the W 15 x 15 PWR Fuel Type

The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the W 15 x 15 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the W 15 x 15 PWR fuel type.

Test Conductor _____ Date _____

8.5.1 Drive System Operation Verification Test

WARNING

Stay clear of clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

Type of Measuring Device _____ Range _____

Identification No. _____ Calibration Due Date _____

Upper clamp opening (open position) _____ inch

Lower clamp opening (open position) _____ inch

Acceptance Criteria:

- Clamp jaws separated by $11.00 \pm .03$ inches. *> 10.30 TPC # 7*

Test Conductor _____ Date _____

QA _____ Date _____

RETEST AL #12

3. Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Upper clamp opening (closed position) _____ inch

Lower clamp opening (closed position) _____ inch

Closing time _____ seconds

Acceptance Criteria:

- Clamp jaws separated by $8.24 \pm .03$ inches. } *then # 7*
- Time to close is between 11 sec. and 27 sec. }

Test Conductor _____ Date _____

QA _____ Date _____

4. Repeat Steps 2 and 3 two additional times.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Upper clamp opening (open position) _____ inch

Lower clamp opening (open position) _____ inch

Upper clamp opening (closed position) _____ inch

Lower clamp opening (closed position) _____ inch

Closing time _____ seconds

Upper clamp opening (open position) _____ inch

Lower clamp opening (open position) _____ inch

Upper clamp opening (closed position) _____ inch

Lower clamp opening (closed position) _____ inch

Closing time _____ seconds

RETEST R2 # 12

Acceptance Criteria:

- Clamp jaws separated by ^{7.0, 30} ~~11.00~~ ± .03 inches.
- Clamp jaws separated by ^{8.29} ~~8.39~~ ± .03 inches.
- Time to close is between ⁵ ~~11~~ sec. and ⁷⁰ ~~27~~ sec.

TPC # 7

Test Conductor _____ Date _____

QA _____ Date _____

5. The above steps have been completed.

Test Conductor _____ Date _____

8.5.2 Interlock Verification Test

WARNING

Stay clear of clamps while in operation

8.5.2.1 Verify the lower clamp (M-104P) open position interlocks as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test by temporarily forcing the data register and verify if the lower clamp can be opened. Mark the appropriate column per the test result.

2

Condition

- A. No fuel present
- B. Lower saw carriage back
- C. Upper X-Axis (M-104J) back (east)
- D. Upper Y-Clamp Axis (M-104N) back (south)

R07251
RL # 12

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 12-17-91

LOG # 13

PROCEDURE NO. 9315-TP-209A REV. 2 TITLE Cutting/staging SOT

PROCEDURE SECTION(S) 8.3.7, 8.4.6, 8.2.6, 8.5.6

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN n/a TPCN# _____

PROBLEM AND CAUSE:

With upper and lower clamps set at openings per Appendix A, clamp force is lower than the 450-500 lb acceptance criteria. When the clamps are set to close down further, a greater than 500 lb. force is obtained.

TEST CONDUCTOR MB Hayes

See Supplementary Sheet 3,4,5,6 for Test Results

SOLUTION/CORRECTIVE ACTION:

A clamp force of 450-500 lbs is not required to center and restraint fuel (see procedural section 8.3.8). Forces of 200-300 lbs. are sufficient to center fuel, and backdrive, less than forces greater than 200-300 lbs. clamp motors require reevaluation and retesting.

TEST CONDUCTOR MB Hayes DATE 12-17-91

QUALITY ASSURANCE _____ DATE _____ (1)

PROJECT ENGINEER _____ DATE _____ (1)

TEST DIRECTOR _____ DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

CLAMP FORCES WILL BE RETESTED. RANGE HAS BEEN INCREASED FROM 300 TO 500 LBS BY DAC CHANGE NOTICE 002

TEST CONDUCTOR EB Forest DATE 3/17/92

THE RETEST PAGES ATTACHED ARE INVALID SINCE TESTING WAS DONE IN JOG MODE AND IS REQUIRED TO BE DONE IN HAND MODE BY ITEM #2. AN ADDITIONAL RETEST WILL BE DONE

4. Verify cameras No. 3 and No. 10 are activated and view the cutting/staging system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- Video images from cameras No. 3 and NO. 10 are displayed on monitors when "CAMERA CALL" is touched on control screen.
- Camera No. 3 and No. 10 can be positioned to provide an unobstructed view of the cutting table clamps.

Test Conductor _____ Date _____

QA _____ Date _____

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

Test Conductor _____ Date _____

QA _____ Date _____

6. The above steps have been completed.

Test Conductor _____ Date _____

8.2.5 Clamp Force Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

Verify the force exerted by both cutting table clamps as follows:

1. Place cutting/staging system in "JOG" mode.
2. Open both upper (M-104Q) and lower (M-104P) clamps.
3. Set up load cell fixture (9315-M-0012) to a width of 8.27 ± 0.03 inches and place between the upper clamps.

RETEST
RL #13

4. Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

Type of Measuring Device MULTIMETER Range VARIOUS
Identification No. NUS-002 Calibration Due Date 10/30/92

Clamp force 467 lbs. 2.8 mV

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. TPC #7

Test Conductor J. Coleman Date 3/12/92 RL #17

QA AVADAGHAN Date 3/12/92

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device MULTIMETER Range VAR.
Identification No. NUS-002 Calibration Due Date 10/30/92

Clamp force ³⁰⁰~~3.3~~ lbs. 3.3 mV 300
RL #17

Clamp force ³⁰⁰~~2.~~ 383 lbs. 2.3 mV 300
RL #17

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. TPC #7

Test Conductor J. Coleman Date 3/12/92 RL #17

QA AVADAGHAN Date 3/12/92

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device MULTIMETER Range VAR
Identification No. NUS-002 Calibration Due Date 10/30/92

Clamp force 483 lbs. ⁹~~2.8~~ mV

Clamp force 550 lbs. 3.3

Clamp force 383 lbs. ³~~2.4~~ mV

RETEST
RL #13

RETEST
RL #13

Acceptance Criteria:

- Clamping force greater than 450 lbs. but less than 500 lbs.

Test Conductor J. Coleman Date 3/12/92 RL #17

QA M. Dargatzis Date 3/12/92

7. The above steps have been completed.

Test Conductor J. Coleman Date 3/12/92

8.3 System Verification for the B&W 15 x 15 PWR Fuel Type

B&W

The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the B&W 15 x 15 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the B&W 15 x 15 PWR fuel type and the PWR FAHF has been installed in place of the BWR FAHF.

Test Conductor _____ Date _____

8.3.1 Sensor Operation Verification Test

WARNING

Stay clear of the test load during overhead movement.

Verify the operation of the staging/cutting table load cells as follows:

1. Open upper (M-104Q) and lower (M-104P) clamps.
2. Set control system to "JOG" mode.
3. Using the RBT and FAHF, pickup the B&W 15 x 15 mockup fuel from the storage rack and move over the No. 1 staging station.
4. Lower the mockup fuel at 30% full speed until fully seated. Verify control system acknowledges receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Acceptance Criteria:

- Fuel assembly mockup was positioned via the RBT and FAHF.
- Control system indicates fuel at station No. 1 and no fuel at all other stations.

Test Conductor _____ Date _____

QA _____ Date _____

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

Test Conductor _____ Date _____

QA _____ Date _____

6. The above steps have been completed.

Test Conductor _____ Date _____

8.3.7 Clamp Force Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the force exerted by both cutting table clamps as follows:

- Place cutting/staging system in "JOG" mode.
- Open both upper (M-104Q) and lower (M-104P) clamps.
- Set up load cell fixture (9315-M-0012) to a width of $8.56 \pm .03$ inches and place between the upper clamps.
- Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

Type of Measuring Device MULTIMETER Range VARIOUS

Identification No. NUS-002 Calibration Due Date 10-30-92

Clamp force 483 lbs. 2.9 mv

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. ^{TPC #7}

Test Conductor J. S. Coleman Date 3/12/92

QA [Signature] Date 3/13/92

351
#13

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device MULTIMETER Range VARIOUS
Identification No. NUS-002 Calibration Due Date 6/30/92

Clamp force _____ lbs. 2.8 mV

Clamp force _____ lbs. 2.9 mV

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. *TRC #7*

Test Conductor FH Coleman Date 3/13/92

QA A. Mulgrew Date 3/13/92

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device MULTIMETER Range VARIOUS
Identification No. NUS-002 Calibration Due Date 10/30/92

Clamp force 500 lbs. 3.0 mV

Clamp force 483 lbs. ^{3.0}~~2.9~~ mV *6.7*

Clamp force ^{TRC 3/13}~~2.8~~ 467 lbs. 2.8 mV

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. *TRC #7*

Test Conductor FH Coleman Date 3/13/92 *RL #20*

QA A. Mulgrew Date 3/13/92

7. The above steps have been completed.

Test Conductor FH Coleman Date 3/13/92

*RETEST
#13
RL*

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

Test Conductor _____ Date _____

QA _____ Date _____

6. The above steps have been completed.

Test Conductor _____ Date _____

8.4.6 Clamp Force Test

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

WARNING

Stay clear of the cutting table clamps while in operation

Verify the force exerted by both cutting table clamps as follows:

- Place cutting/staging system in "JOG" mode.
- Open both upper (M-104Q) and lower (M-104P) clamps.
- Set up load cell fixture (9315-M-0012) to a width of $8.45 \pm .03$ inches and place between the upper clamps.
- Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

Type of Measuring Device Multimeter Range Variou
Identification No. NUS-002 Calibration Due Date _____

Clamp force 500 ^{22 314} lbs. ³⁰ ~~2.1~~ ~~20~~ ~~RL 20~~

Acceptance Criteria:

- Clamping force greater than ³⁰⁰ ~~450~~ lbs. but less than 500 lbs. RL # 7

Test Conductor J. J. [Signature] ^{22 314} Date 3/14/92

QA _____ Date _____

~~* set point changed from 161 (2.0) to 185 (2.1) RL # 20~~
^{22 314}

TEST
RL # 13

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Clamp force _____ lbs. ^{72 3/14}
~~2.8 mv~~

Clamp force _____ lbs. ^{72 7/14}
~~2.7 mv~~

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. ⁷² TPCW #7

Test Conductor 72 Coleman Date 3/1

QA _____ Date _____

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Clamp force 500 * lbs. ^{3.0}
~~2.9 mv~~ ^{72 3/14} RL 23

Clamp force _____ lbs. ^{2.8 mv}

Clamp force _____ lbs. ^{2.7 mv}

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. ⁷² TPCW #7

Test Conductor 72 Coleman Date 3/15/92

QA _____ Date _____

7. The above steps have been completed.

Test Conductor 72 Coleman ^{72 3/14} Date 3/15/92

* set point changed from 161 (2.0) to 185 (2.9 mv)
R.L. #23

Met acceptance criteria

R67235 RL #13

4. Verify cameras No. 3 and No. 10 are activated and view the cutting/staging system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- Video images from cameras No. 3 and NO. 10 are displayed on monitors when "CAMERA CALL" is touched on control screen.
- Camera No. 3 and No. 10 can be positioned to provide an unobstructed view of the cutting table clamps.

Test Conductor _____ Date _____

QA _____ Date _____

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

Test Conductor _____ Date _____

QA _____ Date _____

6. The above steps have been completed.

Test Conductor _____ Date _____

8.5.6 Clamp Force Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the force exerted by both cutting table clamps as follows:

1. Place cutting/staging system in "JOG" mode.
2. Open both upper (M-104Q) and lower (M-104P) clamps.

RETEST
RL # 13

RL # 25

3. Set up load cell fixture (9315-M-0012) to a width of 5.45 ± 0.03 inches and place between the upper clamps.
4. Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Clamp force _____ lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. *TRC #7*

Test Conductor _____ Date _____

QA _____ Date _____

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Clamp force _____ lbs.

Clamp force _____ lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. *TRC #7*

Test Conductor _____ Date _____

QA _____ Date _____

RV 13

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Clamp force _____ lbs.

Clamp force _____ lbs.

Clamp force _____ lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. TRid #7

Test Conductor _____ Date _____

QA _____ Date _____

7. The above steps have been completed.

Test Conductor _____ Date _____

R✓
13
X

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3/11/92

LOG RL 14

PROCEDURE NO. 9315 TP 209A REV. 2

TITLE Staging & Cutting

PROCEDURE SECTION(S) 8.1.2344

CLASSIFICATION OF CHANGE: REPAIR _____ REDESIGN _____ TPCN# _____

PROBLEM AND CAUSE:

Closure time of both upper and lower clamps exceeded 27 sec. criteria. Times were 31 sec and 32 sec

TEST CONDUCTOR SB Forest

SOLUTION/CORRECTIVE ACTION:

Accept as is. The closure time is not critical to clamp performance. TAC change notice will address this requirement

TEST CONDUCTOR SB Forest DATE 3/11/92

QUALITY ASSURANCE _____ DATE _____ (1)

PROJECT ENGINEER _____ DATE _____ (1)

TEST DIRECTOR _____ DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE TAC change notice 002 issued to expand acceptable range

TEST CONDUCTOR SB Forest DATE 3/11/92

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3/11/92

LOG RL 15

PROCEDURE NO. 9315-TP-209A REV. 2 TITLE STAGING / CUTTING

PROCEDURE SECTION(S) 8.17.6, RL#9

CLASSIFICATION OF CHANGE: REPAIR / REDESIGN TPCN#

PROBLEM AND CAUSE: CLAMP FORCE MEASUREMENTS DID
NOT MEET ACCEPTANCE CRITERIA

TEST CONDUCTOR E.B. Farrest

SOLUTION/CORRECTIVE ACTION:

CLAMP LOAD WAS ADJUSTED (DO NOT BE WRITTEN)
AND MEASUREMENTS MADE VERIFYING PROPER
LOAD RANGE

TEST CONDUCTOR E.B. Farrest DATE 3/11/92

QUALITY ASSURANCE DATE (1)

PROJECT ENGINEER DATE (1)

TEST DIRECTOR DATE (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE Load range increased to 300-500 lbs by
TCN change notice 006 No additional testing
required.

TEST CONDUCTOR E.B. Farrest DATE 3/11/92

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3-12-92

LOG # 16

PROCEDURE NO. 9315-TP-209A REV. 2

TITLE Cutting/Staging SOT

PROCEDURE SECTION(S) 8.2.1.4, 8.3.2.4 (RL 12)

CLASSIFICATION OF CHANGE: REPAIR N/A REDESIGN N/A TPCN# N/A

PROBLEM AND CAUSE:

^{7c} ~~Close~~ Upper and lower clamps failed to open to 11.00" $\pm$ 0.03" requirement for all ~~three~~ ^{SIX} test runs.
~~xxx~~
3/12

TEST CONDUCTOR Fred G. Coleman

SOLUTION/CORRECTIVE ACTION:

A clamp opening of 11.00" is not necessary to successfully clamp fuel. Fuel width is 8.25".
79k 3/12

TEST CONDUCTOR Fred G. Coleman

DATE 3/12/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE TAC change n/a 003 changes acceptance criteria. No testing required

TEST CONDUCTOR Ed Starnes

DATE 3/13/92

TEST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3-12-92 LOG # 17

PROCEDURE NO. 9315- REV. 2 TITLE WTTNG/STAGING SOT

PROCEDURE SECTION(S) 8.2.X5 (RL#13)

CLASSIFICATION OF CHANGE: REPAIR N/A REDESIGN N/A TPCN# N/A

PROBLEM AND CAUSE:

Upper and lower clamp face measurements did not meet either lower (450 #) or higher (500 #) acceptance criteria requirements.

TEST CONDUCTOR JG Coleman

SOLUTION/CORRECTIVE ACTION:

Make required adjustments

TEST CONDUCTOR	<u>JG Coleman</u>	DATE	<u>3/12/92</u>
QUALITY ASSURANCE	_____	DATE	_____ (1)
PROJECT ENGINEER	_____	DATE	_____ (1)
TEST DIRECTOR	_____	DATE	_____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE Load cell range has been increased from 300 to 500 lbs. by JAC on 001. Adjust mnts to be made and retested

TEST CONDUCTOR JB Farnett DATE 3/12/92

RETEST PAGES ATTACHED.

RETEST
12/14
3/11/12
50X
3/21/92

4. Verify cameras No. 3 and No. 10 are activated and view the cutting/staging system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- Video images from cameras No. 3 and NO. 10 are displayed on monitors when "CAMERA CALL" is touched on control screen.
- Camera No. 3 and No. 10 can be positioned to provide an unobstructed view of the cutting table clamps.

Test Conductor _____ Date _____

QA _____ Date _____

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

Test Conductor _____ Date _____

QA _____ Date _____

6. The above steps have been completed.

Test Conductor _____ Date _____

8.2.5⁶

Clamp Force Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the force exerted by both cutting table clamps as follows:

1. Place cutting/staging system in "JOG" mode. TPEN #2

2. Open both upper (M-104Q) and lower (M-104P) clamps.

3. Set up load cell fixture (9315-M-0012) to a width of 8.27 ±.03 inches and place between the upper clamps.

RETEST
RL #17
20F
3/23/12

4. Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

Type of Measuring Device Force Gauge Range 0-2000 lbs
Identification No. _____ Calibration Due Date 7/10/92

Clamp force 450 lbs. SP 179

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. TRC #7

Test Conductor E. J. Farnot Date 3/24/92

QA AVM Dagnun Date 3/24/92

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device Force Gauge Range 0-2000 lb
Identification No. _____ Calibration Due Date 7/10/92

Clamp force 440 lbs.

Clamp force 440 lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. TRC #7

Test Conductor E. J. Farnot Date 3/24/92

QA AVM Dagnun Date 3/24/92

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device Force Gauge Range 0-2000 lb
Identification No. _____ Calibration Due Date 7/10/92

Clamp force 440 lbs.

Clamp force 385 lbs.

Clamp force 500 lbs.

SP 170
170

RETEST
AL 17
3/23/92
209E

100

Acceptance Criteria:

- Clamping force greater than ~~450~~ ³⁰⁰ lbs. but less than 500 lbs. TRA # 7

Test Conductor EB Faust

Date 3/24/92

QA

M. B. Duggan

Date 3/24/92

7. The above steps have been completed.

Test Conductor EB Faust

Date 3/24/92

8.3 System Verification for the B&W 15 x 15 PWR Fuel Type

The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the B&W 15 x 15 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the B&W 15 x 15 PWR fuel type and the PWR FAHF has been installed in place of the BWR FAHF.

Test Conductor _____

Date _____

8.3.1 Sensor Operation Verification Test

WARNING

Stay clear of the test load during overhead movement.

Verify the operation of the staging/cutting table load cells as follows:

1. Open upper (M-104Q) and lower (M-104P) clamps.
2. Set control system to "JOG" mode.
3. Using the RBT and FAHF, pickup the B&W 15 x 15 mockup fuel from the storage rack and move over the No. 1 staging station.
4. Lower the mockup fuel at 30% full speed until fully seated. Verify control system acknowledges receipt of fuel.

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

Acceptance Criteria:

- Fuel assembly mockup was positioned via the RBT and FAHF.
- Control system indicates fuel at station No. 1 and no fuel at all other stations.

Test Conductor _____

Date _____

QA

Date _____

REVIS
RL
17
SMF
3/24/92

TRA change 002
SMF 3/24/92

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3/13/92

LOG RL #18

PROCEDURE NO. 9315-TP-209A REV. 2

TITLE Cutting / Slagging SOT

PROCEDURE SECTION(S) 8.3.2 (RL#12)

CLASSIFICATION OF CHANGE: REPAIR N/A REDESIGN N/A TPCN# N/A

PROBLEM AND CAUSE:

Lower - Upper clamp opening/closing ^{per 3/13} positions of 11.00" did not meet acceptance requirements of 11.00"; 8.50"

TEST CONDUCTOR JG Coleman

SOLUTION/CORRECTIVE ACTION:

A clamp opening of 11.00" is not necessary to successfully clamp fuel cell.

TEST CONDUCTOR JG Coleman

DATE 3/13/92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE Clamp opening in open position is acceptable per site change notice 002. Clamp opening out point in closed position will be adjusted and retested.

TEST CONDUCTOR EB Farnest

DATE 3/19/92

RETEST PAGES (2 sheets) attached

8.3.2 Drive System Operation Verification Test

WARNING

Stay clear of clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

Type of Measuring Device _____ Range _____
Identification No. _____ Calibration Due Date _____

Upper clamp opening (open position) _____ inch

Lower clamp opening (open position) _____ inch

Acceptance Criteria:

- Clamp jaws separated by $11.00 \pm .03$ inches.

Test Conductor _____ Date _____

QA _____ Date _____

3. Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device Caliper Range 0-12 in
Identification No. NUS-001 Calibration Due Date 3/29/92

Upper clamp opening (closed position) 8.41 inch SP 183

Lower clamp opening (closed position) 8.40 inch SP 163

Closing time _____ seconds

Acceptance Criteria:

- Clamp jaws separated by $8.50 \pm .03$ inches.

TPCN #7
TAC CN 004
SMF
3/24/92

RETEST
RL #18
SOF
3/23/92

- Time to close is between ~~11~~⁵ sec. and ~~27~~⁴⁰ sec. TICK 27

Test Conductor _____ Date _____

QA _____ Date _____

4. Repeat Steps 2 and 3 two additional times.

Type of Measuring Device Caliper ~~Force Gauge~~ Range 0-12000 lbs
Identification No. NUS-001 Calibration Due Date 2/29/92

Upper clamp opening (open position) _____ inch

Lower clamp opening (open position) _____ inch

Upper clamp opening (closed position) 8.43 inch

Lower clamp opening (closed position) 8.39 inch

Closing time _____ seconds

Upper clamp opening (open position) _____ inch

Lower clamp opening (open position) _____ inch

Upper clamp opening (closed position) 8.41 inch

Lower clamp opening (closed position) 8.40 inch

Closing time _____ seconds

Acceptance Criteria:

- ~~Clamp jaws separated by 11.00 ± .03 inches.~~ > 10.30 TICK 27
- Clamp jaws separated by 8.40 ± .03 inches. N/A FOR RETEST 3/23/92
- Time to close is between 5 sec. and 40 sec. TICK 27

Test Conductor EB Farnest Date 3/24/92

QA M. D. H. H. H. Date 3/24/92

5. The above steps have been completed.

Test Conductor EB Farnest Date 3/24/92

RETEST
RL 18
SMP
3/23/92

RETEST
Repair Log 18
SMP
3/23/92

RETEST
RL 18
SMP
3/23/92

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3/13/92

LOG R.L. #19

PROCEDURE NO. 9315-TP-209A

REV. 2

TITLE Cutting/Staging SOT

PROCEDURE SECTION(S) 8.3.2.3/4

CLASSIFICATION OF CHANGE: REPAIR N/A

REDESIGN N/A

TPCN# N/A

PROBLEM AND CAUSE:

Lower clamp closing time did not meet acceptance criteria of 11 sec lower limit. Times to close were 9.13, 9.26, 9.27 sec.

TEST CONDUCTOR

F J Coleman

SOLUTION/CORRECTIVE ACTION:

Evaluate. Suggest accepting as is. Closure time is not critical to clamp performance.

TEST CONDUCTOR

F J Coleman

DATE

3/13/92

QUALITY ASSURANCE

DATE

(1)

PROJECT ENGINEER

DATE

(1)

TEST DIRECTOR

DATE

(1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

Backstage Notice 003 changes range to 5-40 sec. These times are acceptable.

TEST CONDUCTOR

S J Farwell

DATE

3/23/92

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3/13/92

LOG RL #20

PROCEDURE NO. 9315-TP-209A REV. 2

TITLE Cutting / Staging SOT

PROCEDURE SECTION(S) 8.3.7 (RL#13)

CLASSIFICATION OF CHANGE: REPAIR N/A REDESIGN ✓ TPCN# N/A

PROBLEM AND CAUSE:

Clamp force on lower clamp found below acceptable ⁴⁵⁰ ~~350~~ # lower limit.

TEST CONDUCTOR F J Coleman

SOLUTION/CORRECTIVE ACTION:

¹⁸⁵ ~~161~~ ^{78°C} ~~185~~ Set point raised from 161 to ~~185~~. Test passed. DCN to be written to establish new set point

TEST CONDUCTOR <u>F J Coleman</u>	DATE <u>3/13/92</u>
QUALITY ASSURANCE _____	DATE _____ (1)
PROJECT ENGINEER _____	DATE _____ (1)
TEST DIRECTOR _____	DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE CLAMP FORCE ACCEPTANCE RANGE was changed by JTC CN # 001 to 300-500 lb. load cell cells re calibrated. Clamp force will be written to verify acceptability

TEST CONDUCTOR ES Forest DATE 3/19/92

RETEST PAGES 2 SHEETS ATTACHED

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

Test Conductor _____ Date _____

QA _____ Date _____

6. The above steps have been completed.

Test Conductor _____ Date _____

8.3.7 Clamp Force Test

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the force exerted by both cutting table clamps as follows:

- Place cutting/staging system in "100" mode. ^{ITM D} ^{TPCN #2} ^{2AF 3/23/92}
- Open both upper (M-104Q) and lower (M-104P) clamps.
- Set up load cell fixture (9315-M-0012) to a width of 8.56 ±.03 inches and place between the upper clamps.
- Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

RETEST
RL #20
3/23/92
2AF

Type of Measuring Device FORCE GAUGE Range 0-2000 lb

Identification No. 891438 Calibration Due Date 7/10/92

Clamp force 440 lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰ ~~450~~ lbs. but less than 500 lbs. ^{TPCN #7}

Test Conductor EB Farnest Date 3/24/92

QA W. J. Dargatzis Date 3/24/92

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device Force Gauge Range 0-2000 lb
Identification No. 891438 Calibration Due Date 7/10/92

Clamp force 420 lbs.

Clamp force 440 lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. *TRON #7*

Test Conductor EB Forest Date 3/24/92

QA W. R. Dugan Date 3/24/92

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device Force Gauge Range 0-2000 lb
Identification No. 891438 Calibration Due Date 7/10/92

Clamp force 435 lbs.

Clamp force 375 lbs.

Clamp force 445 lbs.

*58.1
170*

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs. *TRON #7*

Test Conductor EB Forest Date 3/24/92

QA W. R. Dugan Date 3/24/92

7. The above steps have been completed.

Test Conductor EB Forest Date 3/24/92

*RETEST
RL 20
3/23/92*

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3/13/92

LOG PL #21

PROCEDURE NO. 9315-TP-209A REV. 2

TITLE Cutting / Staging SET

PROCEDURE SECTION(S) 8.41 (124 12) 13

CLASSIFICATION OF CHANGE: REPAIR N/A ☒ REDESIGN X ☒ TPCN# N/A

PROBLEM AND CAUSE:

Upper clamp closing measurement did not meet acceptance criteria of 8.36

TEST CONDUCTOR J. G. Coleman

SOLUTION/CORRECTIVE ACTION:

Set point ^{lowered} ~~raised~~ from 191 to 185. Test passed. DCN to be written to establish new set point

TEST CONDUCTOR J. G. Coleman DATE 3/13/92

QUALITY ASSURANCE _____ DATE _____ (1)

PROJECT ENGINEER _____ DATE _____ (1)

TEST DIRECTOR _____ DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE RETEST. SET POINTS WILL BE VERIFIED DURING RETEST. NO DCN REQUIRED AT THIS TIME.

TEST CONDUCTOR J. G. Coleman DATE 3/13/92

RETEST PAGES 39 & 40 ATTACHED

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

Upper clamp opening (open position) _____ inch

Lower clamp opening (open position) _____ inch

Acceptance Criteria:

- Clamp jaws separated by ^{7.10.30} ~~11.00 ± .03~~ inches. ^{TICK #7}

Test Conductor _____ Date _____

QA _____ Date _____

- Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device _____	Range _____
Identification No. _____	Calibration Due Date _____

RETEST

RL 21

RL 22

NAF 3/23/92

Upper clamp opening (closed position) 8.30 inch SP 187

Lower clamp opening (closed position) 8.28 inch SP 157

Closing time _____ seconds

NA FOR RETEST NAF 3/23/92

Acceptance Criteria:

- Clamp jaws separated by ^{8.27} ~~8.39 ± .03~~ inches. ^{VAC CN 8245 TICK #7}

- Time to close is between 11 sec. and 27 sec. ^{NA FOR RETEST 3/23/92}

Test Conductor ESF Date 3/24/92

QA ALM Date 3/24/92

4. Repeat Steps 2 and 3 two additional times.

Type of Measuring Device	<u>Caliper</u>	Range	<u>0-12 in</u>
Identification No.	<u>NUS-021</u>	Calibration Due Date	<u>7/29/92</u>

Upper clamp opening (open position)	_____	inch
Lower clamp opening (open position)	_____	inch
Upper clamp opening (closed position)	<u>8.29</u>	inch
Lower clamp opening (closed position)	<u>8.29</u>	inch
Closing time	_____	seconds

RETEST
RL 21
RL 22
3/24/92

Upper clamp opening (open position)	_____	inch
Lower clamp opening (open position)	_____	inch
Upper clamp opening (closed position)	<u>8.29</u>	inch
Lower clamp opening (closed position)	<u>8.30</u>	inch
Closing time	_____	seconds

RETEST
RL 21
RL 22
3/24/92

Acceptance Criteria:

• Clamp jaws separated by ^{> 10.30} ~~11.00 ± .03~~ inches.

• Clamp jaws separated by ^{8.29} ~~8.39 ± .03~~ inches.

• Time to close is between ⁵ ~~11~~ sec. and ²⁶ ~~27~~ sec.

TRC # 7

TRC CN 005 TRC # 7
3/24/92

TRC # 7

Test Conductor E. B. Farwell Date 3/24/92

QA A. W. Jackson Date 3/24/92

5. The above steps have been completed.

Test Conductor E. B. Farwell Date 3/24/92

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3/14/92

LOG RL #22 22 *spot 3/13/92*

PROCEDURE NO. 9315-TP-209A

REV. 2

TITLE Attling / Stepping MOT

PROCEDURE SECTION(S) 8.4.1.3

CLASSIFICATION OF CHANGE: REPAIR N/A

REDESIGN N/A

TPCN# N/A

PROBLEM AND CAUSE:

~~Lower damp~~ Lower damp closed at 9.57". Did not meet acceptance criteria of $8.39 \pm .03$ ". Set point adjustment required.

TEST CONDUCTOR

JJ Coleman

SOLUTION/CORRECTIVE ACTION:

Adjust set point from 112 (9.57") to 154. Acceptance criteria met. Write DCN to establish new set point.

TEST CONDUCTOR

JJ Coleman

DATE

3/14/92

QUALITY ASSURANCE

DATE

(1)

PROJECT ENGINEER

DATE

(1)

TEST DIRECTOR

DATE

(1)

Notes: (1) Required for redesign

CORRECTIVE ACTION:

COMPLETE

New set point to be established and retested.

TEST CONDUCTOR

Ed Forest

DATE

3/19/92

RETEST PAGES 39 & 40 ATTACHED
TO RL 21

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3/14/92

LOG RL #23

PROCEDURE NO. 9315-TP-209A REV. 2

TITLE Cutting/Staging HOT

PROCEDURE SECTION(S) 8.46.6 (RL #13)

CLASSIFICATION OF CHANGE: REPAIR N/A REDESIGN N/A TPCN# N/A

PROBLEM AND CAUSE:

Lower clamp did not meet accept. criteria of 450-500#
clamp force. Raise set point

TEST CONDUCTOR J J Coleman

SOLUTION/CORRECTIVE ACTION:

Set point raised from 161 (2.0 mV) to 185 (2.9 mV)
Acceptance criteria met. Write DCN to establish new
set point

TEST CONDUCTOR J J Coleman

DATE 3/14/92

QUALITY ASSURANCE

DATE _____ (1)

PROJECT ENGINEER

DATE _____ (1)

TEST DIRECTOR

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE LOAD CELL WAS RECALIBRATED
RANGE CHANGED BY VAC CN 002
RETEST

TEST CONDUCTOR STF

DATE 3/23/92

RETEST PAGES 46 + 47 ATTACHED

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

Test Conductor _____ Date _____

QA _____ Date _____

6. The above steps have been completed.

Test Conductor _____ Date _____

8.4.6 Clamp Force Test

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

WARNING

Stay clear of the cutting table clamps while in operation

Verify the force exerted by both cutting table clamps as follows:

- Place cutting/staging system in ^{1711ND} "JOG" mode. ^{TRCN #2} ^{WOF 3/23/92}
- Open both upper (M-104Q) and lower (M-104P) clamps.
- Set up load cell fixture (9315-M-0012) to a width of 8.45 ±.03 inches and place between the upper clamps.
- Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

Type of Measuring Device Force Gauge Range 0-2000 lb
Identification No. 891438 Calibration Due Date 7/10/92

Clamp force 470 lbs. ^{SHP 167}

Acceptance Criteria:

- Clamping force greater than ³⁰⁰ ~~450~~ lbs. but less than 500 lbs. ^{TRCN #7}

Test Conductor Ed Farnest Date 3/24/92

QA W.D. Aspin Date 3/24/92

RETEST
RL 23
EMF
3/23/92

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device Force Gauge Range 0-2000
Identification No. 891438 Calibration Due Date 2/10/12

Clamp force 400 lbs.

Clamp force 500 lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor E. J. Farnest Date 3/24/12

QA A. A. Dugan Date 3/24/12

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device Force Gauge Range 0-2000 ¹⁶
Identification No. 891438 Calibration Due Date 7/10/12

Clamp force 480 lbs.

Clamp force 400 lbs.

Clamp force 385 lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor E. J. Farnest Date 3/24/12

QA A. A. Dugan Date 3/24/12

7. The above steps have been completed.

Test Conductor E. J. Farnest Date 3/24/12

RETEST
RL 23
3/25/12

TAC #7
TAC CN 002
3/24/12

TAC CN 002
3/24/12

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3/14/92

LOG R.L. # 23 ^{4 re 3/14}

PROCEDURE NO. 9315-TP-209A

REV. 2

TITLE Cutting / Stepping SOT

PROCEDURE SECTION(S) 8.4.6.6

CLASSIFICATION OF CHANGE: REPAIR ☒

REDESIGN N/A

TPCN# N/A

PROBLEM AND CAUSE:

MV readings not reproducible at same set point for upper clamp (150). Could not obtain consistent results within acceptance criteria limits of 450 - 500 #

TEST CONDUCTOR FZ Coleman

SOLUTION/CORRECTIVE ACTION:

Evaluate performance of load cell

TEST CONDUCTOR FZ Coleman

DATE 3/14/92

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR

DATE (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE ^{Load cell has been recalibrated. Load acceptance range increased by TAC CN .002}
^{Upper Load will be retested under RL 23}

TEST CONDUCTOR SJB Forrest

DATE 3/11/92

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 3/23/92

LOG RL # 25

PROCEDURE NO. 8.5.6 ^{9315-TP-209A} ~~RL # 13~~

REV. 2

TITLE STAGING & CUTTING

PROCEDURE SECTION(S) 8.5.6 RL # 13

CLASSIFICATION OF CHANGE: REPAIR

REDESIGN

TPCN#

PROBLEM AND CAUSE:

SECTION NOT RETESTED UNDER RL # 13
DUE TO LOAD CELL PROBLEMS

TEST CONDUCTOR EP Farrell

SOLUTION/CORRECTIVE ACTION:

LOAD CELL PERFORMANCE WAS EVALUATED
AND RE-CALIBRATED. SECTION WILL BE RETESTED
PER THIS RL

TEST CONDUCTOR

EP Farrell

DATE

3/23/92

QUALITY ASSURANCE

DATE

(1)

PROJECT ENGINEER

DATE

(1)

TEST DIRECTOR

DATE

(1)

Notes: (1) Required for redesign

CORRECTIVE ACTION:

COMPLETE

RETESTED
ATTACHED.

PAGES 55, 56, and 57

TEST CONDUCTOR

EP Farrell

DATE

3/24/92

*Revised
Revised
3/23/92
SMF
3/31/92*

4. Verify cameras No. 3 and No. 10 are activated and view the cutting/staging system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- Video images from cameras No. 3 and NO. 10 are displayed on monitors when "CAMERA CALL" is touched on control screen.
- Camera No. 3 and No. 10 can be positioned to provide an unobstructed view of the cutting table clamps.

Test Conductor _____ Date _____

QA _____ Date _____

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

Test Conductor _____ Date _____

QA _____ Date _____

6. The above steps have been completed.

Test Conductor _____ Date _____

8.5.6 Clamp Force Test

*2/25/92
SMF
2/23/92*

WARNING

Stay clear of the cutting table clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

Verify the force exerted by both cutting table clamps as follows:

1. Place cutting/staging system in ^{HAND} "JOG" mode. *TPC N # 2*
2. Open both upper (M-104Q) and lower (M-104P) clamps. *SMF 3/23/92*

3. Set up load cell fixture (9315-M-0012) to a width of 8.45 ± 0.03 inches and place between the upper clamps.
4. Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

Type of Measuring Device Force Gauge Range 0-2000 lb
Identification No. 891438 Calibration Due Date 7/10/92

Clamp force 500 lbs.

Acceptance Criteria:

- Clamping force greater than 450 lbs. but less than 500 lbs.

Test Conductor ER Forest Date 3/24/92

QA AVI Dagnan Date 3/24/92

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device Force Gauge Range 0-2000
Identification No. 891438 Calibration Due Date 7/10/92

Clamp force 500 lbs.

Clamp force 500 lbs.

Acceptance Criteria:

- Clamping force greater than 450 lbs. but less than 500 lbs.

Test Conductor ER Forest Date 3/24/92

QA AVI Dagnan Date 3/24/92

RETEST
RL #25
SMF
3/23/92

300 TAC CN 002
SMF 3/24/92

300 TAC CN 002
SMF 3/24/92

6. Drive clamps open, remove load cell fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device Force Gauge Range 0 - 2000 lb
Identification No. 891438 Calibration Due Date 7/10/24

Clamp force 470 lbs. SP 158

Clamp force 480 lbs.

Clamp force 420 lbs. #7

Acceptance Criteria:

- Clamping force greater than ~~450~~ ³⁰⁰ lbs. but less than ~~500~~ ⁵⁰⁰ lbs.

Test Conductor Ed Faneit Date 3/24/92

QA JV Pagan Date 3/24/92

7. The above steps have been completed.

Test Conductor Ed Faneit Date 3/24/92

RET 5
RL
#25
MP
3/23/92

TAC CN 002
EMP 3/24/92

TEST PROCEDURE	9315-TP-209A	REVISION	2	APPENDIX D-3
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EXCEPTION/REPAIR LOG

DATE 8/12/92 LOG RL# 26

PROCEDURE NO. 9315-TP-209A REV. 2 TITLE STAGING & CUTTING

PROCEDURE SECTION(S) 1.0, 2.0, ~~3.0~~ 4.0, 5.0, 6.0, 7.0, 8.4, 8.4.1, 8.4.5, & 8.4.6, E2 & F2

CLASSIFICATION OF CHANGE: REPAIR ✓ REDESIGN TPCN#

PROBLEM AND CAUSE:

IT COULD NOT BE VERIFIED BY REVIEW OF THE TEST DOCUMENTATION THAT THE RETESTING CONDUCTED THROUGH MARCH 24, 1992 WAS PERFORMED IN THE "HAND" MODE AS REQUIRED BY TPCN #2. RETEST OF CAMERA CALL REQUIRED BY RFI1 WAS NOT PERFORMED.

TEST CONDUCTOR _____

RESOLUTION/CORRECTIVE ACTION:

CONDUCT RETEST OF PADRET - SECTIONS IDENTIFIED ABOVE.
AND DOCUMENT ON PAGES 1, 2, 3, 4, 5, 38, 39, 40, 45, 46, 47, E2+F2

ST CONDUCTOR BD Hayes DATE 9-16-92
ALITY ASSURANCE _____ DATE _____ (1)
OJECT ENGINEER _____ DATE _____ (1)
ST DIRECTOR _____ DATE _____ (1)

Notes: (1) Required for redesign

RECTIVE ACTION: COMPLETE Retesting complete (see attached sheets)

ST CONDUCTOR JD Hayes DATE 9-16-92

1.0 OBJECTIVE OF TEST

The objective of this Test Procedure is to demonstrate the acceptability of the Staging/Cutting System. These detailed test steps will demonstrate the acceptability of the equipment to satisfy design requirements.

2.0 PREREQUISITES

- 2.1 System set-up has been performed per the instruction of Appendix A.

Test Conductor JB Hagan Date 8-26-92 RL#3

QA JA Mulgrew Date 8/26/92

- 2.2 Camera, film, lighting and personnel are available to take photographs per the instruction of Appendix C and the detailed procedure steps (Section 8.0).

Test Conductor JB Hagan Date 8-26-92

QA JA Mulgrew Date 8/26/92

- 2.3 The QA/QC Data Package has been prepared in accordance with Specification 9315-M-200, and the applicable Bill of Material, and is acceptable.

Test Conductor JB Hagan Date 8-26-92

QA JA Mulgrew Date 8/26/92

- 2.4 The system has been assembled in accordance with all applicable Drawings, DCNs and FCRs of the QA/QC Data Package.

Test Conductor JB Hagan Date 8-26-92

QA JA Mulgrew Date 8/26/92

- 2.5 The Test Engineer/Conductor has been qualified and certified in accordance with QAP 2.0.

Test Conductor JB Hagan Date 8-26-92

QA JA Mulgrew Date 8/26/92

- 2.6 All test personnel participating in this test have been trained per the instruction of Section 6.4 of Reference 11.X. ⁶ | ^{KH} 12-4-91

Test Conductor KB Hays Date 8-26-92
QA W. M. Pulgarin Date 8/26/92

- 2.7 The checklist contained in the Control System SOT (9315-TP-601) applicable to this system must be completed and the results accepted prior to the initiation of testing under this procedure.

Test Conductor KB Hays Date 8-26-92
QA W. M. Pulgarin Date 8/26/92

- 2.8 A limited access area with warning signs has been established around the equipment being tested.

Test Conductor KB Hays Date 8-26-92
QA W. M. Pulgarin Date 8/26/92

- 2.9 The system FAT has been completed and accepted by NUS.

Test Conductor KB Hays Date 8-26-92
QA W. M. Pulgarin Date 8/26/92

- 2.10 All equipment required to support this test as defined in Section 6.0 of this procedure is operational and calibrated as required.

Test Conductor Frank M. Mello Date 9/9/92
QA W. M. Pulgarin Date 9/9/92

- 2.11 A visual inspection of the system being tested has been performed to verify there are no obstructions and/or damage to the equipment that may impact testing.

Test Conductor Frank M. Mello Date 9/9/92
QA W. M. Pulgarin Date 9/9/92

- 2.12 The environmental conditions as defined in Section 4.0 are met.

Test Conductor KB Hays Date 8-26-92
QA W. M. Pulgarin Date 8/26/92

RL #1

- 2.13 Procedures for changeover of fuel types for the Control System are in place in the Control Room.

Test Conductor KB Hayes Date 8-26-92
QA A. Mulgrew Date 8/26/92

- 2.14 The RBT has been accepted by its FAT and is operational.

Test Conductor KB Hayes Date 8-26-92
QA A. Mulgrew Date 8/26/92

- 2.15 The Fuel Assembly Handling Fixture (FAHF) has been accepted by its FAT and is operational.

Test Conductor KB Hayes Date 8-26-92
QA A. Mulgrew Date 8/26/92

- 2.16 As a minimum, cameras 3 and 10 are installed and operational.

Test Conductor P. M. Davis Date 9/9/92
QA A. Mulgrew Date 9/9/92

3.0 INITIAL TEST CONDITIONS

- 3.1 The RBT is coupled both electrically and mechanically to the BWR FAHF and is operational.

Test Conductor N/A Date _____

- 3.2 The following fuel assembly mockups must be available and loaded in the storage rack, ~~and test cell access to the FAHF.~~

- General Electric 8 x 8 Type 1, P2.
- Babcock & Wilcox 15 x 15 Type 1, Class 1.

Test Conductor N/A Date _____

- 3.3 TV monitors are "ON" with ~~crosshair alignment verified.~~

Test Conductor KB Hayes Date 8-26-92

- 3.4 All slides of the upper cutting system in the "HOME" position.

Test Conductor N/A Date _____

2

RL
#2

RL
7

RL
7

3.5 Band saw of the lower cutting system in the fully raised position *and driven to the fully retracted position.*

Test Conductor N/A Date _____

TRN
7

4.0 ENVIRONMENTAL CONDITIONS

At least One HVAC unit for the control room and the air circulation system for the Test Cell should be operating and maintaining the test cell and control room temperatures in the ranges 60° to 90°F and 65° to 85°F respectively.

Test Conductor BB Hayes Date 8-26-92

5.0 SPECIAL PRECAUTIONS

All precautions, warnings and notes are addressed in the Detail Test Steps (Section 8.0), prior to the step to which they apply.

6.0 SPECIAL EQUIPMENT REQUIRED

6.1 Compression Load Test Fixture - ~~Dwg. 9315-M-0012~~ (calibration required).

TRN
2 #8

6.2 Inside micrometer or measuring device with a range of 5-12 inches (calibration required).

2

6.3 Stopwatch (calibration not required)

7.0 TEST DATA RECORDING

7.1 Test Data Records

The test conductor shall designate one copy of the test procedure and its attachments as the "Record Copy" and shall ensure that this copy is maintained current. All test data, significant events, and observations must be recorded in this document. Additional sheets may be used as necessary, but must be permanently affixed to this report by staples and/or tape.

7.2 Test Procedure Modification

This section addresses the process for making modifications to the approved Test Procedure. These modifications will fall into one of three categories, as follows:

- Corrections are modifications to the procedure due to typos or incorrect information.
- Minor Changes are modifications which do not affect functional intent or acceptance criteria of the test.

- Major Changes are changes that affect functional intent or acceptance criteria.

Each of these modifications will be handled differently. If a correction is required to the procedure, it will be made with pen and ink in the "Record Copy", as they are found. The test conductor will make the appropriate change. Once the change is made, he will initial and date the change for future reference. All modifications which are considered minor changes must be documented on "Temporary Procedure Change Notice" (TPCN) forms (refer to Appendix D). This change shall be approved by the test conductor by annotating that the test procedures are using the TPCN form. All modifications which are considered a major change must also be documented on the TPCN form. However, when a major change is required, testing shall be halted until the TPCN is approved by the responsible Test Engineer, Test Conductor, Quality Assurance and Project Engineer.

7.3 Repairs/Retesting

This section addresses the process for making necessary repairs to the equipment and retesting of the system. If during testing a problem is observed which requires repair or rework of the equipment, testing shall be halted. If the repair/rework is minor, the Test Conductor will document the problem, cause, and corrective action implemented, the faulty system will be retested. All remaining tests will continue on until conclusion. If the problem requires redesign of the faulty system, all testing of this equipment will be halted. The problem and recommended solution will be documented and submitted to the Test Review Group (TRG) for approval. Once approval and the repair is complete, testing of the equipment will be accomplished in accordance with this procedure.

8.0 DETAILED TEST STEPS

The following sequences of tests are arranged per fuel type. All tests pertaining to a certain fuel are performed, then repeated for the next consecutive fuel type. The order in which these tests are performed will not have an impact on the results and can therefore be performed in any order as deemed appropriate by the test conductor.

8.1 ~~System Verification for the GE 8 x 8 BWR Fuel Type~~

~~The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the GE 8 x 8 BWR fuel type. Prior to initiating testing, verify the control system is programmed for the GE 8 x 8 BWR fuel type.~~

~~Test Conductor~~

~~Date~~

~~8. Repeat Steps 5 to 7 an additional two (2) times.~~

Type of Measuring Device _____ Range _____
Identification No. _____ Calibration Due Date _____

Distance _____ inch

Distance _____ inch

Acceptance Criteria:

- Clamps were able to center fuel to within ± 0.030 inch.

Test Conductor _____ Date _____

QA _____ Date _____

9. Open cutting table clamps fully, lift mockup fuel using the RBT and FAHF and replace fuel in the fuel storage rack.

10. The above steps have been completed.

Test Conductor _____ Date _____

8.4 System Verification for the W 17 x 17 PWR Fuel Type

The following series of tests is performed to verify the operability of the Staging/Cutting System specific to the W 17 x 17 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the W 17 x 17 PWR fuel type.

Test Conductor HB Hayes Date 9-11-92

8.4.1 Drive System Operation Verification Test

WARNING

Stay clear of clamps while in operation

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

Verify the operation of the cutting table clamps as follows:

1. Place control system in "HAND" mode.
2. Open upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening.

Type of Measuring Device Dial Caliper Range 0-12"
Identification No. NUS-001 Calibration Due Date 5-26-92

Upper clamp opening (open position) 10.53 inch

Lower clamp opening (open position) 10.53 inch

Acceptance Criteria:

- Clamp jaws separated by ^{10.30} ~~11.00~~ $\pm .03$ inches.

Test Conductor HD Hayes Date 9-11-92

QA PR Juhl Date 9-11-92

3. Close upper (M-104Q) and lower (M-104P) clamps. Measure and record minimum clamp opening and time to close clamps.

Type of Measuring Device Dial Caliper Range 0-12"
Identification No. NUS 001 Calibration Due Date 5-26-92

Upper clamp opening (closed position) 8.32 inch

Lower clamp opening (closed position) 8.31 inch

Closing time 12.5 upper seconds
12.6 lower

Acceptance Criteria:

- Clamp jaws separated by ^{8.29} ~~8.39~~ $\pm .03$ inches.
• Time to close is between ⁵ ~~11~~ sec. and ⁴⁰ ~~27~~ sec.

Test Conductor HD Hayes Date 9-11-92

QA PR Juhl Date 9-11-92

TPC# 7

file #7

8.29

4. Repeat Steps 2 and 3 two additional times.

Type of Measuring Device	<u>Dial Caliper</u>	Range	<u>0-12"</u>
Identification No.	<u>NUS-001</u>	Calibration Due Date	<u>5-26-93</u>

Upper clamp opening (open position)	^{KH} <u>10.5</u> <u>10.53</u>	inch
Lower clamp opening (open position)	<u>10.53</u>	inch
Upper clamp opening (closed position)	<u>8.32</u>	inch
Lower clamp opening (closed position)	<u>8.32</u>	inch
Closing time	<u>13.0 lower</u> <u>12.5 upper</u>	seconds
Upper clamp opening (open position)	<u>10.53</u>	inch
Lower clamp opening (open position)	<u>10.53</u>	inch
Upper clamp opening (closed position)	<u>8.32</u>	inch
Lower clamp opening (closed position)	<u>8.32</u>	inch
Closing time	<u>13.2 lower</u>	seconds

Acceptance Criteria:

- Clamp jaws separated by ^{>10.30} ~~11.00~~ [±] ~~.03~~ inches.
- Clamp jaws separated by ^{8.39} ~~8.39~~ [±] .03 inches.
- Time to close is between ⁵ ~~11~~ sec. and ⁴⁰ ~~27~~ sec.

Test Conductor MD Hager

Date 9-11-92

QA

RV Jones

Date 9-11-92

5. The above steps have been completed.

Test Conductor MD Hager

Date 9-11-92

TPCW#7

8.4.5 Clamp Drive Fault Test

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

WARNING

Stay clear of the cutting table clamps while in operation

1. Place the cutting/staging system in the "SINGLE" mode and initiate operations to close the cutting table clamps (M-104P, M-104 Q).
2. Temporarily alter the control system software to implement an overcurrent fault with either clamp drive motor.
3. Press "CONTINUE" to drive the clamps close and verify the drive motor stops and registers a fault in the control room.

TACN
#4

Acceptance Criteria:

- Motor stops when fault condition is implemented.
- Alarm system is activated.
- Alarm is silenced when acknowledged by operator.
- Control system displays fault condition on control screen.
- A report is printed defining the fault condition when commanded by the operator.

Test Conductor JB Haynes

Date 9-16-92

QA

TV Juchel

Date 9-16-92

4. Verify cameras No. 3 and No. 10 are activated and view the cutting/staging system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

RL#11

RL#2-

Acceptance Criteria:

- Video images from cameras No. 3 and NO. 10 are displayed on monitors when "CAMERA CALL" is touched on control screen.
- Camera No. 3 and No. 10 can be positioned to provide an unobstructed view of the cutting table clamps.

Failed,
see RL#27

Test Conductor JB Haynes

Date 9-16-92

QA

TV Juchel

Date 9-16-92

5. Correct fault condition and verify clamps (M-104P, M-104Q) can be closed in the "SINGLE" mode.

HAND

TRCN
#4

Acceptance Criteria:

- The system can be recovered from fault condition and "SINGLE" mode operations continued.

HAND

Test Conductor JB Hays

Date 9-16-92

QA

PR Juhl

Date 9-16-92

6. The above steps have been completed.

Test Conductor JB Hays

Date 9-16-92

8.4.6 Clamp Force Test

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

2

WARNING

Stay clear of the cutting table clamps while in operation

Verify the force exerted by both cutting table clamps as follows:

1. Place cutting/staging system in "JOG" mode.

HAND

TRCN
#2

2. Open both upper (M-104Q) and lower (M-104P) clamps.

3. Set up compression load test fixture (9315-M-0012) to a width of 8.45 ±.03 inches and place between the upper clamps.

TRCN
#8

4. Drive upper clamp close until motor shuts off. Measure and record clamp force exerted on load cell fixture.

Type of Measuring Device Dillon Force Gauge Range 0-2000 lbs

Identification No. S/n X92274 Calibration Due Date 9-2-93

Clamp force _____ lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰450 lbs. but less than 500 lbs.

TRCN
#7

Test Conductor JB Hays

Date 9-16-92

QA

PR Juhl

Date 9-16-92

Failed,
see Test
Log pages
42+43

5. Drive clamps open then repeat Step 4 two (2) additional times.

Type of Measuring Device Dillon Force Gauge Range 0-2000 lbs.
Identification No. s/n X92274 Calibration Due Date 9-2-93

Clamp force _____ lbs.

Clamp force _____ lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor MB Hayes Date 9-16-92

QA Mr. J. J. J. Date 9-16-92
compression load test

6. Drive clamps open, remove ~~load cell~~ fixture and position between the lower clamps. Repeat Steps 4 and 5.

Type of Measuring Device Dillon Force Gauge Range 0-2000 lbs.
Identification No. s/n X92274 Calibration Due Date 9-2-93

Clamp force _____ lbs.

Clamp force _____ lbs.

Clamp force _____ lbs.

Acceptance Criteria:

- Clamping force greater than ³⁰⁰~~450~~ lbs. but less than 500 lbs.

Test Conductor MB Hayes Date 9-16-92

QA Mr. J. J. J. Date 9-16-92

7. The above steps have been completed.

Test Conductor MB Hayes Date 9-16-92

Failed,
see Test Log
pages 42+43

Failed
see Test
Log pages
42+43

TPCN
#7

TPCN
#8

TPCN
#7

CCTV Assessment

1. Operation: (describe type of operation here)

Clamp drive fault test (section B.4.5) of cutting/staging clamps

2. Camera Assessment

Camera No.

Evaluation

(describe the view that the camera is capable of providing)

10	Provides an unobstructed view of both clamps
4	Provides an unobstructed view of the lower clamp and a partial view of upper due to the upper cutting system.
3	Provides an unobstructed view of the upper clamp and a partial view of lower due to lower cutting system

3. Recommendations: (Recommend cameras that provide the best view of the system)

Leave cameras 4 & 10 assigned to both clamps since separate camera sets for both clamps are not possible at this time. Camera 3 or 4 can be called up manually if needed to provide an unobstructed view.

Test Conductor

MB Hays

Date 9-16-92

QA

PR Juhl

Date 9-16-92

EST PROCEDURE 9315-TP-209A

REVISION 2

APPENDIX D-3

EXCEPTION/REPAIR LOG #27

DATE 9-16-92

LOG # 27

PROCEDURE NO. 9315-TP-209A

REV. 2

TITLE Cutting/Staging SOT

PROCEDURE SECTION(S) 8.4.5

CLASSIFICATION OF CHANGE: REPAIR X

REDESIGN _____

TPCN# _____

PROBLEM AND CAUSE:

It had been previously noted by RL #11 that camera's 4+10 came up when a fault was implemented and that the video processor was fixed to assign cameras 4+10 to the lower clamp and 3+11 to the upper clamp. When test retested on 9-16-92 cameras 4+10 were still assigned to both clamps.

TEST CONDUCTOR NB Hayes

SOLUTION/CORRECTIVE ACTION:

It is recommended that cameras 4+10 be left assigned to both clamps on the basis that camera 10 can view both clamps and that other cameras can be called manually by the operator if desired. At this time it is not possible to assign a separate set of cameras to each drive motor.

TEST CONDUCTOR NB Hayes

DATE 9-16-92

QUALITY ASSURANCE _____

DATE _____ (1)

PROJECT ENGINEER _____

DATE _____ (1)

TEST DIRECTOR _____

DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE None

TEST CONDUCTOR NB Hayes

DATE 9-16-92

APPENDIX E
CCTV ASSESSMENT FORM

CCTV Assessment

1. Operation: (describe type of operation here)

- a. Step 8.1.6.4 - Clamp Drive Fault Test
- b. Step 8.2.5.4 - " " " "
- c. Step 8.3.6.4 - " " " "
- d. Step 8.4.5.4 - " " " "
- e. Step 8.5.5.4 - " " " "

2. Camera Assessment

Camera No.

Evaluation

(describe the view that the camera is capable of providing)

- a. 4+10 The entire contaminated side of the cell, and a clear view of both clamps
- b. 4+10 " " " " " " " "
- c. 4+10 " " " " " " " "
- d. 4+10 " " " " " " " "
- e. 4+10 " " " " " " " "

3. Recommendations: (Recommend cameras that provide the best view of the system)

- a. Cameras 3+10 for the upper clamp, Cameras 4+10 for the lower clamp
- b. " " " " "
- c. " " " " "
- d. " " " " "
- e. " " " " "

Test Conductor

B.B. Haynes

Date 12-13-91

QA

J.A. Gant

Date 12-13-91

6 of 7

APPENDIX F
TRAINING SIGN-OFF SHEET

NAME (Print)

GORDON J. COLE

JOSEPH A. YOST

GUY JEAN-PHILIPPE

E. B. FORREST

W. A. DAGUEN

T. F. MURKREW

FRED G. COLEMAN

SIGNATURE

Gordon J. Cole

Joseph A. Yost

E. B. Forrest 3/11/92

W. A. Daguén 3/11/92

T. F. Murkrew 3/11/92

F. G. Coleman 3/12/92

NAME (Print)

Ken Haynes
Guy Jean-Philippe

SIGNATURE

APPENDIX I-4.11

UPPER CUTTING SYSTEM

(WBS 1.3.1.4)

TEST RESULTS AND ANALYSIS REPORT

1.0 INTRODUCTION

This appendix addresses the System Operational Testing (SOT) for the Upper Cutting System (Ref. the record copy of 9315-TP-209D, Attachment I to this appendix). It provides an overview of the function of the equipment, procedures used during testing, results obtained, and conclusions and recommendations. The purpose of the SOT was to verify that the as-built condition of the system met or exceeded the associated performance requirements. The primary objectives of this testing were as follows:

- Verification of system mechanical operation under loaded and unloaded conditions.
- Verification of system part-program operations with the equipment under loaded and unloaded conditions.
- Verification of software interlocks.
- Verification of motor fault response.
- Verification of system interfaces.
- Verification of internal diameter tube cutter performance.

The Upper Cutting System has been judged acceptable and released for normal Integrated Systems Testing (IST).

2.0 EQUIPMENT FUNCTION

The purpose of the Upper Cutting System (UCS) is to restrain and cut the Upper End Fitting (UEF) free from the fuel assembly to allow access for fuel rod extraction. This is performed by a number of different tools and processes which depend on the fuel type. After the fuel assembly is deposited on the Cutting Station by the Fuel Assembly Handling Fixture (FAHF), the Cutting Station clamps close to center and secure the fuel while the FAHF moves to a safe position. The UCS is then called to clamp the UEF or begin cutting. The order of this sequence is dependent on fuel type. After the UEF is cut, the clamp moves east to separate the UEF from the fuel assembly; then it moves south and west to a point where the clamp is opened to release the UEF. The UCS slides then move to a receive fuel configuration, which positions the slides in a safe configuration for fuel removal and depositing. The Cutting Station clamps then open to release the fuel, and the FAHF is called in for fuel removal.

The UCS consists of five Gilman slides, a three spindle position

turret, and a clamp assembly (Ref. Dwg. 9315-M-1644). The main slide (X-1) is mounted to a steel weldment which is fastened to the cell floor. The slide is orientated in the east-west direction (X) and driven through a gearbox by a 2.5 hp. servo-drive motor (M-104F). Mounted to the X-1 saddle are two slides orientated in the north-south (Y) direction. The westernmost of these two slides is the Y-clamp slide. This slide is driven in the Y direction through a gearbox by a 1.4 hp. servo-drive motor (M-104N). Attached to the Y-clamp saddle is a steel weldment with the UEF clamp assembly mounted on the upper end. The clamp assembly consists of two L-shaped pads mounted through a central pivot point. A clamp arm is mounted from the pivot point to a linear actuator (M-104H). By extending the linear actuator, the clamp arm drives the L-shaped pads inward and down against both sides of the UEF, causing the UEF to be forced against a lower clamp surface. The second slide mounted on the east side of the X-1 saddle is the Y-turret slide. This slide is driven in the Y direction through a 2.5 hp. servo-drive motor (104-G). Attached to the Y-turret saddle is the X-2 slide, which is driven in the X direction through a gearbox by a 2.5 hp. servo-drive motor (M-104J). Attached to the X-2 saddle is a steel weldment, which consists of a Z-slide, a three position turret, and the spindle drive. The Z-slide is driven up and down through a gearbox by a 1.4 hp. servo-drive motor (M-104K). Attached to the Z-slide saddle are the turret assembly, spindles, and associated drives. The turret has three spindle assemblies mounted 120 degrees apart. The spindle assemblies are used to hold the cutting tools or removed to accept the High Speed Spindle (HSS). The turret is rotated about a central shaft to position a given spindle into the active position. The turret is rotated by a DC motor (M-104L) directly coupled to the rotational shaft. Once the turret is rotated to the active position, the Z-slide must be lowered to engage the spindle drive (M-104I) and the turret locking pin.

Positioning and speed control of the servo-drive motors are possible through built-in resolvers. In addition to positioning by the resolver, proximity sensors are installed at both ends of travel to prevent the saddles from being overdriven into hardstops. The proximity sensors are also used to "HOME" the saddles or send the resolvers back to a zero position. Thus, a total of 10 proximity sensors are used on the UCS. The turret drive (M-104L) uses an absolute resolver which is directly mounted to the drive for positioning. Positioning of the UEF clamp is controlled through an internally mounted potentiometer inside the linear actuator (M-104H). Overtravel is controlled through built-in limit switches.

Visual assessment of the cutting operation and fuel alignment verification is possible through camera 6, which is designated

strictly for viewing the cutting operation. A microphone is mounted to the Z-slide weldment for audio assessment of the cutting operation.

Water is supplied to the chip collection hopper during cutting operations to catch the cutting fines and chips and to wash them into a removable filter basket. The filter basket remains immersed in water to prevent contained Zircalloy chips from pyrophorically igniting. No water is supplied to the tools during the cutting operation. The chip collection hopper and associated parts belong to the Fines Collection System and will not be discussed here in detail.

3.0 TEST PROCEDURE

The test procedure (Ref. Attachment I to this appendix) was organized to test the UCS and software specific to the Westinghouse (W) 17x17 and B&W 15x15 type fuels. The test was broken up into two major sections. The first section tested the software and equipment set up for processing the W 17x17 fuel. The second section was organized to test the software and equipment set up for the B&W 15x15 fuel.

The restructured test program was organized to perform the IST on only the W 17x17 fuel. Since only two mock-up W 17x17 fuel assemblies were available, cutting tests could not be performed during both the SOT and the IST. Therefore, cutting tests involving the W 17x17 were not performed during the SOT. Instead, the B&W 15x15 was cut to verify the performance of the Internal Diameter Tube Cutter (IDTC) during the SOT prior to using it on the W 17x17 during the IST. The W 17x17 test section was organized as follows:

- Limit Switch Verification - Proximity sensors were tested by driving the five slides to each end of travel and verifying that hardstops were not engaged and that the Control System indicated that end of travel had been reached.
- Drive System Verification - This section verified that all set point positions required for processing the fuel were within tolerance. All slides, the turret, and the clamp were tested by utilizing the process Control System HAND mode of operation.
- Interlock Verification - Control System interlocks were tested to verify that specific drive motors could not be energized if interfacing drive systems or machines were positioned to undesired locations in the HAND mode.

- SINGLE Mode Verification - The process sequence of the UCS was tested in this section to verify that the single step control function performed as desired and in the correct order. Mock-up tools were installed in the spindles during this test sequence to verify that equipment interferences did not exist.
- AUTO Mode Verification - This section, much like the SINGLE mode test, verified the automatic process sequence operated in the correct and uninterrupted order.
- Servo-Drive Fault Test - This section tested a servo-drive motor to verify that if a fault was implemented, the alarm system would deactivate the motor, notify the operator which motor was affected and the cause of fault, print out a report of the condition, signal an audio alarm, and activate specific cameras to be called up on the control console. Additionally, this test verified that the system could be recovered from the fault condition.
- Mock-Up Fuel Cutting Test - This section simulated cutting operations in the SINGLE mode using the mock-up IDTC and a mock-up W 17x17 fuel. The mock-up IDTC was inserted within the fuels guide tubes during this test sequence to verify fuel alignment and the equipment's set point positions.

The software part-program associated with the B&W 15x15 fuel was not tested as thoroughly as the W 17x17 fuel type due to the restructured test program. Set point positions and the process sequence were verified prior to cutting, however, to ensure that equipment interferences would not be encountered. The B&W 15x15 test section was organized as follows:

- Drive System Verification - This section verified that all set point positions required for processing the fuel were within tolerance. All slides, the turret, and the clamp were tested by utilizing the HAND mode.
- SINGLE Mode Verification - The process sequence of the UCS was tested in this section to verify that the single step control function performed as desired and in the correct order. Mock-up tools were installed in the spindles during this test sequence to verify that equipment interferences did not exist.
- AUTO Mode Verification - This section, much like the SINGLE mode test, verified the automatic process sequence

operated in the correct and uninterrupted order.

- Mock-Up Fuel Cutting Test - This section was organized into three subsections. The first section simulated cutting operations in the SINGLE mode, utilizing the mock-up IDTC and type 2 mock-up B&W 15x15 fuel. The second section performed actual cutting operations in the SINGLE mode. The third section performed actual cutting operations in the AUTO mode.

The test results and data for each of these test sections are contained within the record copy of the test procedure (Ref. Attachment 1). Each test step has been signed by appropriate personnel as required for final disposition of this SOT. Section 4.0 of this volume provides a typical format for the test procedure and includes an explanation and reference as to the location of the test data included in the various sections of the test procedure.

Two processes were implemented for making all necessary changes to the official test procedure and/or equipment. The first process is a Temporary Procedure Change Notice (TPCN). The TPCNs were used to make changes to the test procedure. For this test procedure, seven TPCNs were issued as follows:

- TPCNs #1, 2, 3 and 4 were issued to delete or revise prerequisites, test steps, and acceptance criteria which could not be performed as written.
- TPCN #7 was issued to correct errors in the test procedure.
- TPCNs #5 and 6 were issued to add or clarify test procedure steps.

Each TPCN identified the change, reason for change, and final disposition for approval of the test results. A copy of each TPCN is included in Attachment 1.

The second process is an Exception/Repair Log (ERL). The ERLs were used to document either fixes to the equipment required to meet acceptance criteria or to justify acceptance of the test results that did not meet the test criteria. For this test, nine ERLs were issued as follows:

- ERLs #2, 3, 7, 8 and 9 were issued to accept results which did not meet either the requirements or acceptance criteria of the test.
- ERLs #1, 4, 5 and 6 were issued to implement fixes to the

equipment or software in order to meet the acceptance criteria.

Each of these ERLs identified a problem encountered during testing, the proposed solution to the problem, and the final disposition (accept as is or fix) to close out the ERL. A copy of each ERL is included in Attachment 1.

If a change to the acceptance criteria was required, a Test Acceptance Criteria (TAC) Change Notice (TCN) was issued against the TAC document. A TPCN would then be issued to reflect changes to the procedure. For this procedure, one TCN was issued against the TAC. The TCNs issued against the TAC documents can be found in the Test Section of the QA Records Package, which is a Phase III deliverable.

4.0 TEST RESULTS

As previously mentioned in Section 3 of this report, the test was divided into two sections. The first section was organized to test the equipment and software for the W 17x17 fuel, while the second section was organized to test the equipment and software for the B&W 15x15 fuel. Actual cutting tests were performed only on the B&W 15x15 mock-up fuel.

Prior to initiating this test, a list of prerequisites had to be satisfied (Ref. Section 2.0 of Attachment 1). These prerequisites identified all of the requirements for initiating this test sequence and served as an informal Operational Readiness Review (ORR). As a result of this informal ORR, it was determined that all prerequisites were satisfied and that testing could be initiated.

Due to the similarity of the tests associated with both fuel types, the test results below will be combined wherever possible, and applicable fuels will be identified.

4.1 LIMIT SWITCH VERIFICATION (W 17x17)

The purpose of this test was to verify that the five slide drives were disabled by the proximity sensors prior to hardstop engagement. Additionally, the Control System end-of-travel indicators were verified to be functioning upon sensor activation. All tests were performed in the JOG mode of operation, which allowed full travel of each drive system. Each drive was operated a minimum of three times to verify repeatability. Due to multiple interferences between the UCS and adjacent equipment, extreme caution and slide repositioning were required to prevent equipment damage. All sensors and indicators functioned as designed. Based

on these results, this test section was judged acceptable.

4.2 DRIVE SYSTEM VERIFICATION (W 17x17 & B&W 15x15)

The purpose of this test was to verify that all slides, the turret, and clamp were within tolerance of the programmed set point positions by utilizing the HAND mode of operation. Prior to initiating this test, the UCS was "HOMED" to zero the resolvers and send the equipment to safe positions. During the homing sequence, the X-2 proximity sensor failed to stop the drive. This resulted in shearing the hardstop bolts before the emergency stop could be activated (Ref. ERL #1). The cause was attributed to an axis card failure in the Control System. The axis card was replaced and the system rehomed to verify that the sensor was functioning. The sheared bolts were replaced after testing was complete. The lack of a hardstop during the test did not impact testing or the results obtained.

All programmed positions were tested for the five slides to verify if positioning was within tolerance. Tolerances for slide positioning varied from $\pm 1/64$ inch to $\pm 1/16$ inch. This was dependent on the axis being tested. Smaller tolerances were required for the tool positioning axes (Y-turret, Z), where larger tolerances were used on the remaining axes (X-1, Y-clamp, X-2). Additional set point positions were added after the test procedure was written (Ref. TPCN #1) and others deleted. This was due to last-minute revisions to the cutting sequence. Only one position on the Z-axis was out of tolerance (Ref. ERL #2). This was not considered a critical tool position; therefore, the position was accepted "as is". All other set points were within tolerance and judged acceptable.

The turret and spindle drives were then tested upon completion of the slide set point verification tests. The turret was driven to each of the three positions; then the Z saddle was lowered to verify that the turret lock pin and the spindle drive coupling were engaged. The spindle rotational direction was also verified to agree with the direction selected at the control console. The procedure called for an initial spindle direction of counter clockwise. This was not possible without software changes. The spindle was programmed to rotate clockwise during the engagement sequence. Directional changes were made after the couplings were engaged. The procedure was changed to reflect the programmed direction (Ref. TPCN #2); then testing was initiated. This test was identical for both fuel types tested. However, when spindle coupling engagement was checked during the B&W 15x15 test sequence, the couplings would slip at high rpms in the number 1 and 2 spindle positions and not engage in the number 3 spindle position (Ref. ERL #7). There were no problems encountered during the W 17x17 tests

because the spindle drive is programmed to rotate at a slower rpm. The problems encountered with coupling slippage only occurred at the programmed engagement position. Once the Z saddle was lowered further, full engagement was achieved. The programmed engagement position could not be lowered because of the top skirt cutting position on the B&W 15x15 fuel. The Z-axis could be raised by shimming to alleviate this problem. However, since slippage occurred only with the B&W 15x15 program, no action was taken due to the restructured test plan. The turret rotated to all the programmed positions, and the lockpin functioned as designed. Based on these results, the drives were judged acceptable.

The UEF clamp was the last piece of equipment tested during this test section. The programmed travel range of the actuator (M-104H) was measured and compared to calculated values. The programmed travel range was less than the calculated acceptance criteria (Ref. ERL #3). However, the travel range was more than sufficient for clearing the fuel in the open position and clamping the fuel in the closed position. Therefore, the acceptance criteria were changed (Ref. TCN 002) for the actuator travel and the results were judged acceptable.

4.3 INTERLOCK VERIFICATION (W 17x17)

The purpose of this test was to verify that the drives associated with the UCS could not be energized if interfacing drives or equipment were positioned to undesired locations. This test was performed using the HAND mode. In most cases, the interfacing equipment was positioned through temporary changes to the Control System data registers rather than physically moving the equipment.

After initial setup was performed, the interlock tests were initiated. The test consisted of either applying or not applying various interface conditions through temporary changes in the Control System data registers. Once these interface conditions were set up, an attempt was made to operate the appropriate drive system in the HAND mode. This test series continued until every possible combination of these interfaces was tested to verify that each drive system would operate only under the proper conditions.

The X-1 back interlock was found to be missing a hold point when tested (Ref. ERL #4). Software changes were made and verified to be correct. Both the Y-clamp and X-2 interlocks required set point changes to function correctly (Ref. ERLs #4 and 5). Once the changes were made, the interlocks were verified to be correct. Additionally, the clamp close interlock required revisions to the procedure (Ref. TPCN #3 and TCN 002). The interlock was changed prior to the test; therefore, the TAC document and procedure required updating. After the problems were identified and

corrective action was taken, all interlocks functioned as intended. Based on these results, this test section was judged acceptable.

4.4 SINGLE MODE VERIFICATION (W 17x17 & B&W 15x15)

The purpose of the SINGLE mode test was to verify that the UCS auto process sequence was correct for both fuel types and that the single step function operated as designed. Additionally, the system was verified not to have any interferences with the tools or adjacent equipment. Setup of the SINGLE mode test was similar to that of the interlock tests. Control System data registers were temporarily modified to "fake out" the equipment into thinking that all interlocks were satisfied and that interfacing machines were either safe or in the proper position. This was not always a straightforward task. Once initial setup was complete and the mock-up tools installed, the single step test sequence was operated to verify proper sequential order.

During the W 17x17 test, several corrections were required. The first involved the turret rotating to an incorrect position. The set point was changed and verified to be correct. The second correction involved the Y-clamp not going to the full back position. This correction required software changes. After this change was made, it was also verified to be correct.

During the B&W 15x15 test, several problems were encountered. While lowering the Z saddle for the initial skirt cutting operation, the controllers would shut down. Several retries were required before the process would function on its own. The cause of the problem was not known, nor did it reoccur. A second problem was encountered when the clamp was called to close on the fuel. The clamp would not close automatically. This problem required set point changes called up by an interlock. Changes were made and the process was verified to be correct.

After corrections were made to both the W 17x17 and B&W 15x15 part-programs, all drives positioned the equipment to the proper position, at the correct speeds, and in the correct sequential order. All hold points were generated and functioned at the correct process step. No equipment interferences were encountered.

Camera assessment was also part of this test sequence. Cameras were called up during the test sequence and verified to provide an adequate view of the equipment and processing sequence. For this test, cameras 6 and 9 came on line as assigned and provided a sufficient view of the equipment.

The SINGLE mode was judged acceptable for both fuel types based on

these test results.

4.5 AUTO MODE VERIFICATION (W 17x17 & B&W 15x15)

Similar to the SINGLE mode test, the purpose of the AUTO mode test was to verify that the UCS process sequence was correct and that the automatic function operated as designed. Since the SINGLE mode test had been operated prior to this test, temporary changes to the Control System data registers remained the same; therefore, Control System setup was minimal.

The automatic sequence operated as anticipated without encountering any problems. The only operator intervention required was during hold points. All drives moved to the proper position, at the correct speed, and in the proper sequential order. Based on these results, the AUTO mode was judged acceptable for both fuel types.

4.6 SERVO-DRIVE FAULT TEST (W 17x17)

This test sequence consisted of implementing an end-of-travel fault during the operation of one of the drive systems. The purpose of this test was to verify that the equipment properly responded to the fault condition and that the proper signals and error messages were displayed at the Control System. The test was executed by operating the X-1 axis (M-104F) in the SINGLE mode and creating an end-of-travel fault condition by activating one of the end-of-travel sensors. The system performed as follows:

- Motors were automatically deactivated when the fault condition was applied.
- Audio alarm was automatically activated and deactivated by the operator.
- Fault condition was displayed on the control console.
- Fault condition was printed out on the printer.
- Cameras 3 and 10 were activated when called up by the operator.
- System was recovered and processing continued.

Cameras 3 and 10 provided a sufficient view of the entire UCS. Camera 10 could be repositioned to optimize the viewing angle by moving the RBT. Based on the results of the fault response, this test sequence was judged to be acceptable.

4.7 MOCK-UP FUEL CUTTING TEST (W 17x17 & B&W 15x15)

As previously mentioned, actual mock-up fuel cutting tests were not performed on the W 17x17 due to a shortage of mock-ups. The cutting operation was simulated using a mock-up fuel and mock-up IDTC. Actual cutting operations were performed on the B&W 15x15 mock-up to verify the performance of the IDTC.

4.7.1 W 17x17

For this test sequence a mock-up W 17x17 fuel was used to verify equipment positioning by utilizing a mock-up IDTC. The mock-up tool was inserted in the number 2 spindle position, and no tools were installed in the number 1 or 3 spindle positions. The drill was left out of the number 1 spindle position to prevent drilling of the UEF for instrument tube access. Temporary software changes were required to enable the mock-up IDTC to bypass the center instrument tube position since no access hole was present. The test was operated in the SINGLE mode for increased safety and control.

Testing was initiated with the UCS starting at the receive fuel configuration. The fuel was centered by the cutting station clamps and the UEF restrained by the UCS clamp. After the drilling operation was simulated, the turret rotated to the number 2 position to engage the mock-up IDTC. Tool positioning within the first 12 guide tubes was exact. Unfortunately, when the thirteenth (instrument tube) position was bypassed, all tool insertion moves thereafter were absent. This problem was caused by the temporary software change that was made to bypass the instrument tube. Corrections were made to the software, and the test was reinitiated from the beginning. Problems were then encountered in bringing the system back on line. This problem was diagnosed as a bug in the software. Once again, corrections were made and the test restarted. Testing was initiated without any difficulties, all slides positioned the equipment as before. Alignment between the mock-up IDTC and guide tubes was exact for the first 12 guide tubes as before, the instrument tube position was skipped over as intended, and the remaining 12 guide tubes were verified. Alignment between the last 12 guide tubes and mock-up IDTC was slightly off as compared to the first 12 tubes that were checked. Insertion of the tool was possible with a slight rubbing of the tool against the inner wall surface of the guide tube. Since a diametral clearance of 0.040 inch existed between the tool and guide tube, the tool rubbing against one side indicated an alignment error of 0.020 inch. This was acceptable and was probably caused by a combination of manufacturing tolerance and positioning error. The cutting process was completed and verified to be correct. The UEF clamp was opened prior to the step that

separates the end fitting from the fuel assembly. This was done to prevent damaging the uncut UEF.

The SINGLE step process was repeated one more time up to the first guide tube alignment position (Ref. TPCN #5). This process was performed to verify the repeatability of the Cutting Station clamps to center the fuel and to verify the repeatability of tool positioning. The fuel was manually shifted off center on the Cutting Station, and the test sequence was repeated. The fuel was centered by the clamps, and the cutting process was initiated. Equipment positioning was performed as before. Unfortunately, a controller shut off during the drilling sequence, thus shutting down the equipment. The controller was reactivated and the system restored to complete the test. All slide and tool positioning was verified to be correct. This concluded testing associated with the W 17x17 fuel. Based on these test results, the system and software were judged acceptable and ready for the IST.

4.7.2 B&W 15x15

This test sequence was organized into three sections as follows:

- Simulated cutting in SINGLE mode with mock-up IDTC and fuel.
- Actual cutting in SINGLE mode with IDTC and mock-up fuel.
- Actual cutting in AUTO mode with IDTC and mock-up fuel.

The first test section was similar to the simulated cutting test performed on the W 17x17 fuel. The purpose of the test was to verify equipment positioning utilizing a mock-up IDTC. The B&W 15x15 type 2 mock-up fuel was placed on the Cutting Station, the mock-up IDTC installed in the number 2 spindle position, and the HSS without a cut-off wheel was installed in the number 1 spindle position. Testing was initiated in the SINGLE mode for increased safety and control. After the fuel was centered by the Cutting Station clamps, the skirt cutting operation was performed, beginning with the bottom skirt surface. Cutting of all four sides of the skirt was simulated using the HSS. After the final (north) side was cut, the Z-axis faulted out while being raised. The problem was attributed to the shutting down of drive amplifiers controlling the axis. The drive amps were reset and the test was resumed. The turret rotated to the mock-up IDTC to engage the number 2 spindle, and then the clamping operation was initiated. During the clamping operation, the Y-clamp failed to position the clamp far enough north to clamp the UEF. Corrections were made to the software and the test was resumed. The UEF was clamped and the mock-up IDTC positioned at the first guide tube. The tool to guide

tube alignment required corrections. The mock-up tool required three incremental moves (0.060 inch total) north for proper alignment. After the alignment correction was made, the positioning of the tool within the guide tubes was verified to be correct for all 16 guide tube positions. This concluded the first cutting test. Based on the results, the equipment positioning was found to be acceptable to continue on to the actual cutting tests.

The second test section performed cutting operations in the SINGLE mode. The B&W 15x15 type 2 mock-up remained on the Cutting Station for this test. The mock-up IDTC was removed and replaced with the actual tool setup for the B&W fuel type using a cryogenic hardened M-2 tool steel blade. A nominal 3 inch diameter Norton A60-OBNA2 cut-off wheel (3.04 inch diameter measured) was installed on the HSS. Testing was initiated by closing the Cutting Station clamps and activating the Fines Collection System. The cut-off wheel was then positioned to contact the bottom north surface of the skirt. The cut depth was set for 0.060 inch, and then the automatic feed was activated. The rotational speed was fixed at 5737 rpm and the feedrate at 3.0 ipm. These cutting parameters were established from prior bench tests (Ref. UEF Cutting Test Report 9315-M-219). The bottom skirt surface was cut; however, it was not known if the cut was complete. The other three sides were cut in a similar fashion with the cut depth set for 0.060 inch for all sides except the top. The cut depth was set for 0.080 inch on the top surface. This allowed for a complete cut but also nicked the fuel rods.

Inconel fines and abrasive grit were directed into the fines collection hopper while cutting the south surface only. Most of the fines and grit were directed into the hopper while cutting the bottom surface; however, a small percentage was directed north over the hopper wall. The fines and grit were directed south into the storage rack while cutting the top surface and up while cutting the north surface. Upon completion of the skirt cutting sequence, the Z-axis faulted while being raised. This same problem occurred at the same point in the process during the previous test. The drive amps were reset and the test resumed. The skirt was inspected and found to have been cut most of the way on three sides and completely on the top side. Only a paper thin layer of Inconel remained on the three uncut sides.

The turret was then rotated to the IDTC and the UCS clamp positioned on the UEF. The IDTC was positioned in front of the first guide tube and moved north by three incremental moves (0.060 inch) as done before to correct the tool alignment. The IDTC was then inserted in the Zircalloy guide tube and compressed against the striker plate at a feedrate of 0.25 ipm and at a rotational speed of 200 rpm. These parameters were established from previous bench tests (Ref. UEF Cutting Test Report 9315-M-219). The

remaining 15 guide tubes were cut in a similar manner with no difficulties encountered. Because it was questionable as to whether the end fitting was completely cut, the UCS clamp was opened prior to the UEF removal step (Ref. #ERL 8). The cutting process was completed and the system shut down to remove and inspect the UEF. The UEF was not cut completely free; therefore, it was removed manually from the fuel bundle. Upon inspection, only a paper-thin layer of Inconel and four to five partially cut guide tubes held the UEF to the fuel bundle. The skirt was cut at a section where the Inconel sheet was a double thickness; thus making it difficult to obtain a complete cut. By moving either the X-2 further west or the fuel further east by 5/64 inch, a single layer of 0.018 inch thick Inconel would be cut.

Zircalloy fines generated during the cutting process were collected mainly within the skirt, inside the guide tubes, and around the fuel rods. When the UEF was removed, all loose fines fell into the collection hopper and were washed into the water-filled filter basket. A number of turnings from the cutting operation were also found to be in the guide tubes. These turnings were removed and placed in the collection hopper and washed into the water-filled filter basket. At no time did pyrophoric ignition of the fines occur.

The cut-off wheel diameter was measured and found to have decreased from 3.04 inches to 2.83 inches. The guide tubes were inspected; of the 16 tubes cut, 11 to 12 were completely and cleanly cut. The remaining four or five tubes were cut most of the way through with only a portion of the wall remaining. As a result of this, it was necessary to increase the tool blade extension to ensure a complete cut. The blade was originally set to extend 0.010 inch past the outer guide tube wall. This required a 0.203 inch tool compression. Since this was not enough for a complete cut, a blade extension of 0.026 inch past the outer guide tube wall was selected for the next cut. This yielded a tool compression of 0.250 inch. No wear to the IDTC blade or cuts to the fuel rods were observed when inspected.

The final test section was performed by utilizing the AUTO mode of operation. The mock-up fuel used in the previous test was lifted clear of the Cutting Station clamps and rotated 180 degrees to utilize the other end. The mock-up was shifted 5/64 inch east from the previous location to position the cut-off wheel over the single layer of Inconel. In addition to this, the IDTC blade extension was increased to produce a compression of 0.250 inch. A new cut-off wheel was installed on the HSS; however, the same IDTC blade from the previous test was used. The cutting operation was timed during this test sequence. The points at which the start and finish times were recorded were changed (Ref. TPCN #6) from

depositing and removing of the fuel by the RBT, to clamping and unclamping by the Cutting Station. This provided a better reference to record elapsed time since the RBT was not completely programmed to deposit and pick up fuel at the time of this test. The cutting sequence operated as before except without the need for operator intervention at every process step. Operator intervention was required at hold points and tool adjustments.

The cut-off wheel cut the skirt completely with an initial cut depth of 0.060 inch for each side. Upon completion of the skirt cutting sequence, the Z-axis faulted out as before. This was later corrected and verified. The reoccurrence of this problem was attributed to the acceleration and deceleration values for the spindle drive (M-104I) being too high.

The guide tube cutting sequence was performed next without any difficulties. Complete guide tube cuts were verified when the UEF was pulled. The UEF was pulled clear from the fuel bundle without any hesitation or slippage of the UEF in the clamp. The UEF was held secure in the clamp as it was positioned to be deposited. The clamp was opened at the deposit position, but the UEF remained balanced within the clamp. This problem could be easily corrected by reducing the bottom contact area of the clamp; however, because of the restructured test plan, it was not addressed.

The UEF was inspected after removal from the clamp. The skirt was found to have been cut continuously through the single wall of Inconel. The cut was performed at the single wall layer, which was measured to be 2.61 inches down from the upper skirt attachment point to the end fitting. The fuel rods at the cut zone were nicked by the cut-off wheel. The cut depth in the fuel rods ranged from 0 inch to 0.063 inch. The depth of the cuts progressively got deeper toward the end of each side. This indicated that either the cutting station was not level or the UEF was out of square. The UEF was measured and found to be out of square a maximum of 0.080 inch over 8.54 inches, which caused the fuel rods to be cut. The cut-off wheel diameter was found to have decreased from 3.04 inches initially to a final diameter of 2.92 inches. The Zircalloy guide tubes were then inspected and found to have been completely cut without any evidence of burrs. The fuel rods adjacent to the guide tubes were untouched by the IDTC. The IDTC blade was inspected and found to have minimal wear after performing 32 cuts. At no time during the cutting operation did pyrophoric ignition of the Zircalloy fines occur. As occurred with the previous cutting operation, Zircalloy chips and turnings were found remained in the guide tubes. They were removed and put into the collection hopper by the Test Conductor.

As previously mentioned, the cutting operation process time for the

automatic sequence was recorded. Process times were found to be as follows:

- Total elapsed time from when the Cutting Station clamps close to when they open after the assembly is cut = 110 min.
- Skirt cutting time per side (does not include repositioning) = 4 min.
- Typical guide tube cutting times per tube:
 - IDTC insertion into tube = 32 sec.
 - Tool compression (cutting) = 65 sec.
 - Blade retraction = 25 sec.
 - IDTC withdrawal from tube = 32 sec.

Total elapsed time did not meet the acceptance criterion of 75.5 minutes (Ref. ERL #9). The elapsed time was accepted on the basis that the cutting test was performed to verify the performance of the IDTC for the IST. The increased cutting time for the B&W 15x15 will be evaluated during the throughput analysis study. Based on the results of the cutting tests and other test sections, the UCS has been judged acceptable for the IST.

When the filter was removed from the Fines Collection System, it was noted that the total quantity of chips and turnings, generated when 32 B&W 15x15 fuel assembly guide tubes had been cut, amounted to less than 1 ounce of material. The total amount of material that had been left in the guide tubes was estimated to be four times greater than the amount of loose material that fell directly into the collection hopper.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

In general, the UCS performed as designed. Actual cutting tests were not performed on the W 17x17 mock-up fuel; however, positioning of the fuel and tools was verified to be correct for the IST. The performance and cutting parameters for the IDTC were verified through cutting tests performed on the B&W 15x15 mock-up fuel. The following conclusions are drawn from the UCS SOT:

- All drives operated as designed under unloaded and loaded conditions.
- All control modes of operation (JOG, HAND, SINGLE, and AUTO) performed as designed.

- The interlocks performed as designed.
- The servo-fault alarm system performed as designed.
- The IDTC and associated cutting parameters were acceptable for cutting Zircalloy guide tubes.
- The fines collection hopper functioned adequately to collect Zircalloy fines generated by the cutting process and to contain the fines submerged in a water-filled filter basket. However, a large percentage of the fines remained trapped within the guide tubes and fuel rods.

Based on these conclusions, the UCS has been judged acceptable for the normal IST.

5.2 RECOMMENDATIONS

As a result of the SOT performed, several recommendations have been made. These recommendations, along with those identified in Section 7.0 of the main body of this report, should be implemented for the next generation system. These recommendations are as follows:

- Provide capabilities for remote tool changeout.
- Provide each drive system with an absolute resolver for position control. This will eliminate the need to "HOME" the system periodically and thus eliminate the error introduced by the homing process.
- Reevaluate the use of proximity sensors for end-of-travel limit switches. These sensors require extensive setup time, making them impractical for remote applications.
- Raise Z-axis by approximately 0.5 inch to allow for spindle coupling engagement at a higher elevation.
- Reduce UEF clamp bottom surface to prevent UEFs from remaining balanced within the clamp once opened.
- Increase height of fines collection hopper or provide a means to shield adjacent equipment from airborne abrasives and fines.
- Provide a larger cell to allow adequate spacing between equipment. Due to space limitations, multiple interferences with adjacent equipment exist. Additionally, tool travel around the north side of the fuel is limited and cut-off wheel diameter is restricted

to approximately 3.0 inches.

- Provide a means to cut out-of-square UEF skirts without cutting fuel rods. Due to the close proximity of the fuel rods to the Inconel skirt on B&W 15x15 type fuels, the depth of cut is critical. Therefore, a cutting system that tracks the skirt surface is required for out of square cutting.
- Provide an improved means to remove the chips and turnings left in the guide tubes from the internal diameter guide tube cutting operations so that the waste is transferred to the Fines Collection System where it can be immersed in water to preclude the possibility of a fire from pyrophoric ignition of the Zircalloy material.

ATTACHMENT 1
SYSTEM OPERATIONAL TEST PROCEDURE
FOR THE
UPPER CUTTING SYSTEM
(WBS 1.3.1.4)
DOCUMENT NO. 9315-TP-209D

HALLIBURTON NUS
Environmental Corporation

Record Copy

Signature

Peter V. Jull

Date 9/14/92

TEST PROCEDURE

CLIENT: DOE/Rod Consolidation

PROCEDURE NO.:

9315-TP-2090

LOCATION: Cold Test Facility

REVISION NO.:

0

TITLE: System Operational Test Procedure - Upper Cutting System

RELEASED FOR:

☐

REVIEW

☒

TEST

SYSTEM OPERATIONAL TEST PROCEDURE
FOR
UPPER CUTTING SYSTEM
(WBS 1.3.1.4)

APPROVED

Peter V. Jull

DATE

8-3-92

PROJECT MANAGER

APPROVED

D. H. [Signature]

DATE

8-3-92

QUALITY ASSURANCE

APPROVED

Peter V. Jull

DATE

8-3-92

DISCIPLINE MANAGER

APPROVED

Kenneth D. [Signature]

DATE

8-3-92

AUTHOR

REV	PREPARED	DATE	APPROVED	DATE	APPROVED	DATE	APPROVED	DATE	APPROVED	DATE

NUS CORPORATION

TEST PROCEDURE	9315-TP-209D	REVISION	0	PAGE	i
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REVISION CONTROL SHEET

Revised Page No.

Latest Revision

Date

Original

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6-12-92

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1.0 OBJECTIVE OF TEST

The objective of this test procedure is to list the test operations and associated acceptance criteria to demonstrate that the cutting system meets design requirements. Specifically, this test and acceptance criteria is aimed at demonstrating the following:

- That the cutting system can make the required cuts on the fuel assemblies to permit extraction of the spent fuel rods.
- That the cutting tools can be positioned accurately over the full travel range.
- That the turret assembly can be controlled remotely to position the proper cutting tools as needed.
- That the clamp assembly can be guided to, and clamp onto, the fuel assembly.
- That the support slides can provide the required rigidity to the cutting tools under the anticipated loading conditions.
- That all interlocks function properly to prevent mechanical interferences and/or erroneous motions.

2.0 PREREQUISITES

- 2.1 System set-up has been performed per the instruction of Appendix A.

Test Conductor JB Hargreaves Date 9-22-92

QA W. M. Hargreaves Date 9/22/92

- 2.2 Camera, film, lighting and personnel are available to take photographs per the instruction of Appendix C.

Test Conductor JB Hargreaves Date 9-22-92

QA W. M. Hargreaves Date 9/22/92

- 2.3 The QA/QC Data Package has been prepared in accordance with Specification 9315-M-200, and the applicable Bill of Material, and is acceptable.

Test Conductor JB Hargreaves Date 9-22-92

QA W. M. Hargreaves Date 9/22/92

- 2.4 The system has been assembled in accordance with all applicable Drawings, DCNs and FCRs of the QA/QC data package.

Test Conductor JB Hargreaves Date 9-22-92

QA W. M. Hargreaves Date 9/22/92

- 2.5 The Test Conductor has been qualified and certified in accordance with QAP 2.0.

Test Conductor JB Hargreaves Date 9-22-92

QA W. M. Hargreaves Date 9/22/92

- 2.6 All test personnel participating in this test have been trained per the instruction of Section 6.4 of Reference 11.11.

Test Conductor RB Hargreaves Date 9-22-92
QA W. Mulgrew Date 9/22/92

- 2.7 The checklist contained in the Control System SOT (9315-TP-601) applicable to this system must be completed and the results accepted prior to the initiation of testing under this procedure.

Test Conductor RB Hargreaves Date 9-22-92
QA W. Mulgrew Date 9/22/92

- 2.8 A limited access area with warning signs has been established around the equipment being tested.

Test Conductor RB Hargreaves Date 9-22-92
QA W. Mulgrew Date 9/22/92

- 2.9 The system FAT has been completed and accepted by NUS.

Test Conductor RB Hargreaves Date 9-22-92
QA W. Mulgrew Date 9/22/92

- 2.10 All equipment required to support this test as defined in Section 6.0 of this procedure is operational and calibrated as required.

Test Conductor RB Hargreaves Date 9-22-92
QA W. Mulgrew Date 9/22/92

- 2.11 A visual inspection of the system being tested has been performed to verify there are no obstructions and/or damage to the equipment that may impact testing.

Test Conductor RB Hargreaves Date 9-22-92
QA W. Mulgrew Date 9/22/92

- 2.12 The environmental conditions as defined in Section 4.0 are met.

Test Conductor RB Hargreaves Date 9-22-92
QA W. Mulgrew Date 9/22/92

- 2.13 The cutting table must be installed with clamps in place and have completed FATs (9315-TP-230-1316/1317).

Test Conductor JB Hayes Date 9-22-92

QA W. Mulgrew Date 9/22/92

- 2.14 As a minimum, cameras 3, 6, 9 and 10 are installed and operational.

Test Conductor JB Hayes Date 9-22-92

QA W. Mulgrew Date 9/22/92

- 2.15 Section 7.1 of the fines and crud collection system FAT must be completed (9315-TP-230-1316/1317).

Test Conductor JB Hayes Date 9-22-92

QA W. Mulgrew Date 9/22/92

- 2.16 The upper fines collection hopper must be installed with coolant available to the hopper.

Test Conductor JB Hayes Date 9-22-92

QA W. Mulgrew Date 9/22/92

3.0 INITIAL TEST CONDITIONS

3.1 TV monitors are "ON".

Test Conductor MB Hayes Date 9-22-92

3.2 Saw truck in stowed position.

Test Conductor MB Hayes Date 9-22-92

3.3 All slides of upper cutting system in the "HOME" position.

Test Conductor MB Hayes Date 9-22-92

3.4 Band saw of the lower cutting system in the fully raised position.

Test Conductor MB Hayes Date 9-22-92

3.5 Upper cutting system turret empty of tools.

Test Conductor MB Hayes Date 9-22-92

3.6 The following fuel assembly mockups must be available to perform the applicable test sections:

- Westinghouse 17x17 Type 1
- Babcock & Wilcox 15x15 Type 2

Test Conductor MB Hayes Date 9-22-92

4.0 ENVIRONMENTAL CONDITIONS

At least One HVAC unit for the control room and the air circulation system for the Test Cell should be operating and maintaining the test cell and control room temperatures in the ranges 60° to 90° and 65° to 85° respectively.

Test Conductor MB Hays Date 9-22-92

5.0 SPECIAL PRECAUTIONS

- 5.1 All precautions, warnings and notes are addressed in the Detail Test Steps (Section 8.0), prior to the step to which they apply.
- 5.2 Care must be taken to ensure that the upper cutting system and adjacent equipment (if installed) do not collide while performing test operations.
- 5.3 Safety glasses shall be worn during all machining operations.

6.0 SPECIAL EQUIPMENT REQUIRED

- 6.1 The following upper cutting system tools:
 - Nobur ID tube cutter, associated pilots and blades
 - Stepdrill
 - Abrasive cut-off wheels
- 6.2 Stopwatch
- 6.3 Scales with 1/64 inch increments
 - 0-6 inch
 - 0-12 inch
 - 0-18 inch
- 6.4 Mockup ID tube cutters, 2 total.

7.0 TEST DATA RECORDING

7.1 Test Data Records

The test conductor shall designate one copy of the test procedure and its attachments as the "Record Copy" and shall ensure that this copy is maintained current. All test data, significant events, and observations must be recorded in this document. Additional sheets may be used as necessary, but must be permanently affixed to this report by staples and/or tape.

7.2 Test Procedure Modification

This section addresses the process for making modifications to the approved Test Procedure. These modifications will fall into one of three categories, as follows:

- Corrections are modifications to the procedure due to typos or incorrect information.
- Minor Changes are modifications which do not affect functional intent or acceptance criteria of the test.
- Major Changes are changes that affect functional intent or acceptance criteria.

Each of these modifications will be handled differently. If a correction is required to the procedure, it will be made with pen and ink in the "Record Copy", as they are found. The test conductor will make the appropriate change. Once the change is made, he will initial and date the change for future reference. All modifications which are considered minor changes must be documented on "Temporary Procedure Change Notice" (TPCN) forms (refer to Appendix D). This change shall be approved by the test conductor by annotating that the test procedures are using the TPCN form. All modifications which are considered a major change must also be documented on the TPCN form. However, when a major change is required, testing shall be halted until the TPCN is approved by the responsible Test Engineer, Test Conductor, Quality Assurance and Project Engineer.

7.3 Repairs/Retesting

This section addresses the process for making necessary repairs to the equipment and retesting of the system. If during testing a problem is observed which requires repair or rework of the equipment, testing shall be halted. If the repair/rework is minor, the Test Conductor will document the problem, cause, and corrective action implemented, the faulty system will be retested. All remaining tests will continue on until conclusion. If the problem requires redesign of the faulty system, all testing of this equipment will be halted. The problem and recommended solution will be documented and submitted to the Test Review Group (TRG) for approval. Once approval and the repair is complete, testing of the equipment will be accomplished in accordance with this procedure.

8.0 DETAILED TEST STEPS

The following tests pertain to the Westinghouse 17x17 and B&W 15x15 fuel types only. Mockup fuels will be required for applicable test sections, however, cutting tests will be performed only on the B&W 15x15 Type 2 mockup. Section 8.1 shall be completed before starting Section 8.2. This is due to the extensive software and mechanical tests associated with Section 8.1.

8.1 System Verification for the W 17 x 17 PWR Fuel Type

The following series of tests is performed to verify the operability of the Upper Cutting System specific to the W 17 x 17 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the W 17 x 17 PWR fuel type, and the PWR FAHF has been installed.

Test Conductor MB Hays Date 9-22-92

8.1.1 Sensor Operation Verification Test

WARNING

Stay clear of the upper cutting system while in operation.

NOTE

Axes not being tested may require repositioning to avoid collision with adjacent equipment.

- 8.1.1.1 Verify the operation of the X-1 Axis (M-104F) travel sensors as follows:

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

1. Switch the control system to the JOG mode at full speed and drive the X-1 saddle to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.
3. Drive the X-1 saddle east until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated.
- Hard stops were not engaged.

Test Conductor JB HangerDate 9-22-92QA W. M. MyersDate 9/22/92

4. Drive the X-1 saddle west until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated.
- Hard stops were not engaged.

Test Conductor JB HangerDate 9-22-92QA W. M. MyersDate 9/22/92

5. Repeat steps 3. and 4. two additional times.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated in each direction.
- Hard stops were not engaged.

Test Conductor JB Hayes Date 9-22-92

QA W. M. Alper Date 9/22/92

6. The above steps have been completed.

Test Conductor JB Hayes Date 9-22-92

8.1.1.2 Verify the operation of the Y-Turret Axis (M-104G) travel sensors as follows:

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

1. Switch the control system to the JOG mode at full speed and drive the Y-Turret saddle to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.
3. Drive the Y-Turret saddle south until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated.
- Hard stops were not engaged.

Test Conductor JB Hayes Date 8-22-92

QA W. M. Alper Date 9/22/92

4. Drive the Y-Turret saddle north until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated.
- Hard stops were not engaged.

Test Conductor JB Taylor Date 9-22-92

QA A. M. [signature] Date 9/22/92

5. Repeat steps 3. and 4. two additional times.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated in each direction.
- Hard stops were not engaged.

Test Conductor JB Taylor Date 9-22-92

QA A. M. [signature] Date 9/22/92

6. The above steps have been completed.

Test Conductor JB Taylor Date 9-22-92

8.1.1.3 Verify the operation of the Y-Clamp Axis (M-104N) travel sensors as follows:

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

1. Switch the control system to the JOG mode at full speed and drive the Y-Clamp saddle to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.
3. Drive the Y-Clamp saddle south until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated.
- Hard stops were not engaged.

Test Conductor MB Hayes Date 9-22-92QA A. M. [signature] Date 9/22/92

4. Drive the Y-Clamp saddle north until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated.
- Hard stops were not engaged.

Test Conductor MB Hayes Date 9-22-92QA A. M. [signature] Date 9/22/92

5. Repeat steps 3. and 4. two additional times.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated in each direction.
- Hard stops were not engaged.

Test Conductor MB Hayes Date 9-22-92QA A. M. [signature] Date 9/22/92

6. The above steps have been completed.

Test Conductor MB Hayes Date 9-22-92

- 8.1.1.4 Verify the operation of the X-2 Axis (M-104J) travel sensors as follows:

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

1. Switch the control system to the JOG mode at full speed and drive the X-2 saddle to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.
3. Drive the X-2 saddle east until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated.
- Hard stops were not engaged.

Test Conductor JB HayesDate 9-22-92QA W. MulgrewDate 9/22/92

4. Drive the X-2 saddle west until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated.
- Hard stops were not engaged.

Test Conductor JB HayesDate 9-22-92QA W. MulgrewDate 9/22/92

5. Repeat steps 3. and 4. two additional times.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated in each direction.
- Hard stops were not engaged.

Test Conductor MB Hayes Date 9-22-92
QA A. Williams Date 9/22/92

6. The above steps have been completed.

Test Conductor MB Hayes Date 9-22-92

8.1.1.5 Verify the operation of the Z-Turret Axis (M-104K) travel sensors as follows:

CAUTION

Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

1. Switch the control system to the JOG mode at full speed and drive the Z-Turret saddle to a position approximately midway between stops.
2. Reset the JOG speed to 50% of full speed.
3. Drive the Z-Turret saddle up until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated.
- Hard stops were not engaged.

Test Conductor MB Hayes Date 9-22-92
QA A. Williams Date 9/22/92

4. Drive the Z-Turret saddle down until it automatically shuts off.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated.
- Hard stops were not engaged.

Test Conductor MB Hays Date 9-22-92

QA H. M. Hays Date 9/22/92

5. Repeat steps 3. and 4. two additional times.

Acceptance Criteria:

- The control system indicates that the end of travel sensor has been activated in each direction.
- Hard stops were not engaged.

Test Conductor MB Hays Date 9-22-92

QA H. M. Hays Date 9/22/92

6. The above steps have been completed.

Test Conductor MB Hays Date 9-22-92

8.1.2 Drive System Operation Verification Test

WARNING

Stay clear of the upper cutting system while in operation

NOTE

Axes not being tested may require repositioning to avoid collision with adjacent equipment. Simultaneous movement in opposite directions will occur between the X-1 and X-2 slides when the X-1 slide is moved.

8.1.2.1 Verify the X-1 Axis (M-104F) drive system as follows:

1. Switch the control system to the HAND mode and send the X-1 saddle to the "Home" position (west).
2. Measure and record the following slide positions and verify the measured distances are within tolerance of the setpoint distances. Measurements are to be taken from the "home" end of slide to the saddle (with wiper removed).

Position	Setpoint Distance	Measured Distance	Within Tolerance
Forward (Home)	$1 \frac{22}{32}$	$1 \frac{22}{32}$	yes
Intermediate	$2 \frac{28}{32}$	$2 \frac{28}{32}$	yes
Back	$8 \frac{8}{32}$	$8 \frac{8}{32}$	yes

Acceptance Criteria

- Measured distance is within $\pm 1/32$ inch.

Test Conductor JB Hagan Date 9-22-92
 QA A. Williams Date 9/22/92

8.1.2.2 Verify the Y-Clamp (M-104N) drive system as follows:

1. Switch the control system to the HAND mode and send the Y-Clamp saddle to the "Home" position (south).
2. Measure and record the following slide positions and verify the measured distances are within tolerance of the setpoint distances. Measurements are to be taken from the "home" end of slide to the saddle (with wiper removed).

Position	Setpoint Distance	Measured Distance	Within Tolerance
Back (Home)	$1 \frac{2}{32}$	$1 \frac{1}{32}$	yes
Forward	$16 \frac{14}{32}$	$16 \frac{15}{32}$	yes
Intermediate	$5 \frac{3}{32}$	$5 \frac{2}{32}$	yes

Acceptance Criteria

- Measured distance is within $\pm 1/16$ inch.

Test Conductor JB Hagan Date 9-22-92
 QA A. Williams Date 9/22/92

TPC
001
KBH
9-15-9

8.1.2.3 Verify the Y-Turret (M-104G) drive system as follows:

1. Switch the control system to the HAND mode and send the Y-Turret saddle to the "Home" position (south).
2. Measure and record the following slide positions and verify the measured distances are within tolerance of the setpoint distances. Measurements are to be taken from the "home" end of slide to the saddle (with wiper removed).

Position	Setpoint Distance	Measured Distance	Within Tolerance
South (Home)	1 ³² / ₆₄	1 ³³ / ₆₄	yes
Center of Assy	8 ²⁵ / ₆₄	8 ²⁵ / ₆₄	yes
IDTC Incr. Sth 6	5 ²⁷ / ₆₄	5 ²⁷ / ₆₄	yes
IDTC Incr. Nth 1	5 ⁵⁸ / ₆₄	5 ⁵⁸ / ₆₄	yes
IDTC Incr. Nth 2	6 ⁵⁸ / ₆₄	6 ⁵⁸ / ₆₄	yes
IDTC Incr. Nth 3	8 ²⁵ / ₆₄	8 ²⁵ / ₆₄	yes
IDTC Incr. Nth 3	9 ⁵⁶ / ₆₄	9 ⁵⁶ / ₆₄	yes
IDTC Incr. Nth 2	10 ⁵⁶ / ₆₄	10 ⁵⁶ / ₆₄	yes
IDTC Incr. Nth 1	11 ²⁴ / ₆₄	11 ²⁴ / ₆₄	yes

Acceptance Criteria

- Measured distance is within $\pm 1/64$ inch.

 Test Conductor BT Hays Date 9-23-92

 QA [Signature] Date 9/23/92

8.1.2.4 Verify the X-2 (M-104J) drive system as follows:

1. Switch the control system to the HAND mode and send the X-2 saddle to the "Home" position (east).
2. Measure and record the following slide positions and verify the measured distances are within tolerance of the setpoint distances. Measurements are to be taken from the "home" end of slide to the saddle (with wiper removed).

Position	Setpoint Distance	Measured Distance	Within Tolerance
East (Home)	$1 \frac{13}{32}$	$1 \frac{13}{32}$	yes
INTRM West Pos.	$8 \frac{26}{32}$	$8 \frac{26}{32}$	yes
Full West Pos.			
Drill West Pos.	$12 \frac{21}{32}$	$12 \frac{21}{32}$	yes
SMLDIA DRL Incr.	$13 \frac{14}{32}$	$13 \frac{14}{32}$	yes
LRGDIA DRL Incr.	$14 \frac{10}{32}$	$14 \frac{10}{32}$	yes
Drill West Pos.	$12 \frac{21}{32}$	$12 \frac{21}{32}$	yes
IDTC West Pos.	$3 \frac{10}{32}$	$3 \frac{10}{32}$	yes
IDTC Insert Incr.	$12 \frac{20}{32}$	$12 \frac{20}{32}$	yes
IDTC Comp Incr.	$12 \frac{26}{32}$	$12 \frac{26}{32}$	yes
IDTC West Pos.	$3 \frac{10}{32}$	$3 \frac{10}{32}$	yes

 TPCN
 001
 KBH
 9-15-92

Acceptance Criteria

- Measured distance is within $\pm 1/32$ inch.

 Test Conductor JB Hansen Date 9-23-92

 QA Di. M. Lyner Date 9/23/92

8.1.2.5 Verify the Z-Turret (M-104K) drive system as follows:

1. Switch the control system to the HAND mode and send the Z-Turret saddle to the "Home" position (up).
2. Measure and record the following slide positions and verify the measured distances are within tolerance of the setpoint distances. Measurements are to be taken from the "home" end of slide to the saddle (with wiper removed).

Position	Setpoint Distance	Measured Distance	Within Tolerance
Up (Home)	1 ³² / ₆₄	1 ³¹ / ₆₄	yes
Engage Spindle	3 ³⁷ / ₆₄	3 ³⁴ / ₆₄	no
Center of Assy.	9 ²⁰ / ₆₄	9 ³⁵ / ₆₄	yes
IDTC Incr. Up 6	6 ⁴⁰ / ₆₄	6 ³⁹ / ₆₄	yes
IDTC Incr. Dn 1	7 ⁷ / ₆₄	7 ⁶ / ₆₄	yes
IDTC Incr. DN 2	8 ⁶ / ₆₄	8 ⁵ / ₆₄	yes
IDTC Incr. Dn 3	9 ²⁰ / ₆₄	9 ³⁵ / ₆₄	yes
IDTC Incr. Dn 3	11 ¹ / ₆₄	11 ¹ / ₆₄	yes
IDTC Incr. Dn 2	12 ⁰ / ₆₄	12 ⁰ / ₆₄	yes
IDTC Incr. Dn 1	12 ²² / ₆₄	12 ³¹ / ₆₄	yes

RL = 2

Acceptance Criteria

- Measured distance is within $\pm 1/64$ inch.

 Test Conductor JB Harper

 Date 9-23-92

QA

W. M. Myers

 Date 9/23/92

8.1.2.6 Verify the spindle (M-104I) drive system and Turret (M-104L) drive system as follows:

1. Switch the control system to the HAND mode and send the Z-Turret Home and Turret to the No. 1 position if not already done so.
2. Activate spindle ^{CW}~~CCW~~ at engagement speed, then send the Z-Turret to the "Engage Spindle" position and verify the turret lock pin aligns and seats. In addition, verify the spindle drive couplings align and engage.

TPCW
2

Acceptance Criteria

- Turret lock pin (9315-M-1643, Item 51) inserts to prevent turret rotation.
- Spindle drive couplings align and engage.
- Spindle rotates in a ^{CW}~~CCW~~ direction when viewed from the west.

TPCW
2

Test Conductor W.D. Hargreaves Date 9-23-92

QA A. J. [Signature] Date 9/23/92

3. Deactivate spindle drive and change spindle direction to ^{CCW}~~CW~~. Activate spindle drive and verify spindle turns ^{CCW}~~CW~~.

TPCW
2

Acceptance Criteria

- Spindle rotates in a ^{CCW}~~CW~~ direction when viewed from the west.

Test Conductor W.D. Hargreaves Date 9-23-92

QA A. J. [Signature] Date 9/23/92

4. Deactivate spindle drive, send Z-Turret home and verify turret lock pin is fully retracted.

Acceptance Criteria

- Turret lock pin (9315-M-1643, Item 51) retracts to free turret for rotation.

Test Conductor W.D. Hargreaves Date 9-23-92

QA A. J. [Signature] Date 9/23/92

5. Repeat steps 2 through 4 for the No. 2 and 3 Turret positions.

Acceptance Criteria

- Turret lock pin (9315-M-1643, Item 51) inserts to prevent turret rotation.
- Spindle drive couplings align and engage.
- Spindle rotates in a CCW direction when viewed from the west.
- Spindle rotates in a CW direction when viewed from the west.
- Turret lock pin (9315-M-1643, Item 51) retracts to free turret for rotation.

Test Conductor JB Hayes Date 1-23-92
QA [Signature] Date 9/23/92

8.1.2.7 Verify the Clamp drive system as follows:

1. With the clamps in the full open position, activate clamp drive system (M-104H) to close clamps until they automatically shut off.
2. Measure and record actuator (M-104H) travel.

Actuator travel 1 1/8 inches

Acceptance Criteria

- Actuator moves through its full travel range of 2 inches.

Test Conductor JB Hayes Date 9-23-92
QA [Signature] Date 9/23/92

3. The above steps have been completed.

Test Conductor JB Hayes Date 1-23-92

8.1.3 Interlock Verification Test

WARNING

Stay clear of the upper cutting system while in operation

8.1.3.1 Verify the X-1 Axis (M-104F) forward (west) interlocks as follows:

1. Place the control system in the HAND mode.

RL
#3

2. Impose the following combination of conditions as identified in the test and verify if the X-1 saddle can be moved forward (west). Mark the appropriate column per the test result.

Condition

A. No fuel present.

B. Upper Clamp (M-104H) open.

C. Upper Y-Clamp Axis (M-104N) back (south).

NOTE

Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

<u>Test</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>System Operates</u>				<u>Expected Result</u>
i	0	0	0	—	yes	✓	no	no
ii	1	0	0	✓	yes	—	no	yes
iii	0	1	0	✓	yes	—	no	yes
iv	0	0	1	✓	yes	—	no	yes
v	1	1	0	✓	yes	—	no	yes
vi	0	1	1	✓	yes	—	no	yes
vii	1	0	1	✓	yes	—	no	yes
viii	1	1	1	✓	yes	—	no	yes

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A or B or C.

Test Conductor MB Hayes Date 9-23-92

QA AL McLaughlin Date 9/23/92

3. The above steps have been completed.

Test Conductor MB Hayes Date 9-23-92

8.1.3.2 Verify the X-1 Axis (M-104F) back (east) interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the X-1 saddle can be moved back (east). Mark the appropriate column per the test result.

Condition

- A. Fuel is present.
- B. End fitting clamp M-104H is closed.
- C. Y-clamp drive M-104N is forward (north).

NOTE

Zero (0) signifies condition is not applied.
 One (1) signifies that condition is applied.

Test	A	B	C	System Operates	Expected Result
1	1	1	1	☐ yes ☒ no ☐ hold	hold point
2	1	1	0	☒ yes ☐ no ☐ hold	yes
3	1	0	0	☒ yes ☐ no ☐ hold	yes
4	1	0	1	☒ yes ☐ no ☐ hold	yes
5	0	1	1	☒ yes ☐ no ☐ hold	yes
6	0	1	0	☒ yes ☐ no ☐ hold	yes
7	0	0	0	☒ yes ☐ no ☐ hold	yes
8	0	0	1	☒ yes ☐ no ☐ hold	yes

RL
#4

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: NOT A or NOT B or NOT C or operator selects CONTINUE at Hold Point.

Test Conductor JB Payne Date 9-23-92

QA W. M. Payne Date 9/23/92

3. The above steps have been completed.

Test Conductor JB Payne Date 9-23-92

8.1.3.3 Verify the Y-Clamp Axis (M-104N) forward (north) interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the Y-Clamp saddle can be moved forward (north). Mark the appropriate column per the test result.

Condition

- A. No fuel present
 B. X-1 Axis back (east)

NOTE

Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

<u>Test</u>	<u>A</u>	<u>B</u>	<u>System Operates</u>				<u>Expected Result</u>
i	0	0	☐	yes	☒	no	no
ii	1	0	☒	yes	☐	no	yes
iii	0	1	☒	yes	☐	no	yes
iv	1	1	☒	yes	☐	no	yes

see RL #5

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A or B.

Test Conductor JB Hayes

Date 9-23-92

QA

[Signature]

Date 9/23/92

3. The above steps have been completed.

Test Conductor JB Hayes

Date 9-23-92

8.1.3.4 Verify the Y-Clamp Axis (M-104N) back (south) interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the Y-Clamp saddle can be moved back (south). Mark the appropriate column per the test result.

Condition

- A. No fuel present
 B. X-1 Axis back (east)

NOTE

Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

<u>Test</u>	<u>A</u>	<u>B</u>	<u>System Operates</u>				<u>Expected Result</u>
i	0	0	☐	yes	☒	no	no
ii	1	0	☒	yes	☐	no	yes
iii	0	1	☒	yes	☐	no	yes
iv	1	1	☒	yes	☐	no	yes

see RL #5

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A or B.

Test Conductor KB Hayes Date 9-23-92

QA [Signature] Date 9/23/92

3. The above steps have been completed.

Test Conductor KB Hayes Date 9-23-92

8.1.3.5 Verify the Y-Turret Axis (M-104G) forward (north) interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the Y-Turret saddle can be moved forward (south). Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Upper cutter X-2 Axis (M-104J) back (east)

NOTE

Zero (0) signifies condition not-applied.
 One (1) signifies condition applied.

<u>Test</u>	<u>A B</u>		<u>System Operates</u>				<u>Expected Result</u>
i	0	0	☒	yes	☒	no	no
ii	1	0	☒	yes	☐	no	yes
iii	0	1	☒	yes	☐	no	yes
iv	1	1	☒	yes	☐	no	yes

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A or B.

Test Conductor 96B Hagan Date 9-23-92

QA [Signature] Date 9/23/92

3. The above steps have been completed.

Test Conductor 96B Hagan Date 9-23-92

8.1.3.6 Verify the Y-Turret Axis (M-104G) back (south) interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the Y-Turret saddle can be moved back (north). Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Upper cutter X-2 Axis (M-104J) back (east)

<u>Test</u>	<u>A</u>	<u>B</u>	<u>System Operates</u>				<u>Expected Result</u>
i	0	0	☒	yes	☒	no	no
ii	1	0	☒	yes	☐	no	yes
iii	0	1	☒	yes	☐	no	yes
iv	1	1	☒	yes	☐	no	yes

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A or B.

Test Conductor KB Hager Date 9-23-92

QA W. H. Hager Date 9/23/92

3. The above steps have been completed.

Test Conductor KB Hager Date 9-23-92

8.1.3.7 Verify the X-2 Axis (M-104J) forward (west) interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the X-2 saddle can be moved forward (west). Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Z-Axis drive (M-104K) down
- C. Y-Turret Axis (M-104G) back (south)
- D. Spindle drive on

NOTE

Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

<u>Test</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>System Operates</u>		<u>Expected Result</u>
i	0	0	0	0	☒	yes	no
ii	1	0	0	0	☒	yes	yes
iii	0	1	0	0	☒	yes	yes
iv	0	0	1	0	☒	yes	yes
v	1	1	0	0	☒	yes	yes
vi	0	1	1	0	☒	yes	yes
vii	1	0	1	0	☒	yes	yes
viii	1	1	1	0	☒	yes	yes
ix	0	0	0	1	☒	yes	yes
x	1	0	0	1	☒	yes	yes
xi	0	1	0	1	☒	yes	yes
xii	0	0	1	1	☒	yes	yes
xiii	1	1	0	1	☒	yes	yes
xiv	0	1	1	1	☒	yes	yes
xv	1	0	1	1	☒	yes	yes
xvi	1	1	1	1	☒	yes	yes

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A or B or C or D.

Test Conductor 94B Hays

Date 9-23-92

QA

4. [Signature]

Date 9/23/92

3. The above steps have been completed.

Test Conductor KB Hays Date 9-23-92

8.1.3.8 Verify the X-2 Axis (M-104J) back (east) interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the X-2 saddle can be moved back (east). Mark the appropriate column per the test result.

Condition

A. X-1 Axis (M-104F) forward (west)

NOTE

Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

Test	A	System Operates		Expected Result	
i	0	☐ yes	☒ no	☐ no	
ii	1	☒ yes	☐ no	☐ yes	

see RL 48
4

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A.

Test Conductor KB Hays Date 9-23-92

QA [Signature] Date 9/23/92

3. The above steps have been completed.

Test Conductor KB Hays Date 9-23-92

8.1.3.9 Verify the Z Axis (M-104K) down interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the Z saddle can be moved down. Mark the appropriate column per the test result.

Condition

- A. Upper cutter X-2 Axis (M-104J) back ^{east} ~~(west)~~
B. Spindle drive on

typo KBH
9-24-92

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

Test	A	B	System Operates				Expected Result
i	0	0	—	yes	✓	no	no
ii	1	0	—	yes	✓	no	no
iii	0	1	—	yes	✓	no	no
iv	1	1	✓	yes	—	no	yes

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A + B.

Test Conductor MB Hays

Date 9-24-92

QA

[Signature]

Date 9-24-92

3. The above steps have been completed.

Test Conductor MB Hays

Date 9-24-92

8.1.3.10 Verify the Z Axis (M-104K) up interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following condition as identified in the test and verify if the Z saddle can be moved up. Mark the appropriate column per the test result.

Condition

A. Upper cutter X-2 Axis (M-104J) back (east)

NOTE

Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

Test	A	<u>System Operates</u>		<u>Expected Result</u>
i	0	<u> </u>	yes <u>✓</u> no	no
ii	1	<u>✓</u>	yes <u> </u> no	yes

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A.

Test Conductor BB Hayes

Date 9-24-92

QA [Signature]

Date 9-24-92

3. The above steps have been completed.

Test Conductor BB Hayes

Date 9-24-92

8.1.3.11 Verify the Turret drive (M-104L) CW interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the Turret can be moved CW. Mark the appropriate column per the test result.

Condition

- A. Z-Axis drive (M-104K) up
- B. Upper cutter X-2 Axis (M-104J) back (east)

NOTE

Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

<u>Test</u>	<u>A</u>	<u>B</u>	<u>System Operates</u>				<u>Expected Result</u>
i	0	0	—	yes	✓	no	no
ii	1	0	—	yes	✓	no	no
iii	0	1	—	yes	✓	no	no
iv	1	1	✓	yes	—	no	yes

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A + B.

 Test Conductor JB Hayden

 Date 9-24-92

QA

 Date 9-24-92

3. The above steps have been completed.

 Test Conductor JB Hayden

 Date 9-24-92

8.1.3.12 Verify the Turret drive (M-104L) CCW interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the Turret can be moved CCW. Mark the appropriate column per the test result.

Condition

- A. Z-Axis drive up
- B. Upper cutter X-2 Axis (M-104J) back (east)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

<u>Test</u>	<u>A</u>	<u>B</u>	<u>System Operates</u>			<u>Expected Result</u>
i	0	0	—	yes	✓	no
ii	1	0	—	yes	✓	no
iii	0	1	—	yes	✓	no
iv	1	1	✓	yes	—	yes

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A + B.

Test Conductor MB Hayes Date 9-24-92

QA [Signature] Date 9-24-92

3. The above steps have been completed.

Test Conductor MB Hayes Date 9-24-92

8.1.3.13 Verify the clamp (M-104H) open interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the clamp can be opened. Mark the appropriate column per the test result.

Condition

- A. No fuel present
- B. Y-Clamp Axis (M104N) back (south)

NOTE

Zero (0) signifies condition not applied.
One (1) signifies condition applied.

<u>Test</u>	<u>A</u>	<u>B</u>	<u>System Operates</u>				<u>Expected Result</u>
i	0	0	☐	yes	☒	no	no
ii	1	0	☒	yes	☐	no	yes
iii	0	1	☒	yes	☐	no	yes
iv	1	1	☒	yes	☐	no	yes

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A or B.

Test Conductor W.D. Hager Date 9-24-92

QA [Signature] Date 9-21-92

3. The above steps have been completed.

Test Conductor W.D. Hager Date 9-24-92

8.1.3.14 Verify the clamp (M-104H) close interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the clamp can be closed. Mark the appropriate column per the test result.

Condition

- A. No fuel present
~~B. X-1 Axis (M-104F) forward (west)~~
~~B-C. Upper Y-clamp Axis (M-104N) forward (north)~~

NOTE

Zero (0) signifies condition not applied.
 One (1) signifies condition applied.

Test	A	B	C	System Operates			Expected Result
i	0	0	0	—	yes	✓ no	no
ii	1	0	0	✓	yes	— no	yes
iii	0	1	0	✓	yes	— no	no yes
iv	0	0	1	✓	yes	— no	no yes
v	1	1	0	—	yes	— no	yes
vi	0	1	1	—	yes	— no	yes
vii	1	0	1	—	yes	— no	yes
viii	1	1	1	—	yes	— no	yes

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: A or ~~{B + C}~~

 Test Conductor BD Hayer

 Date 9-24-92

QA

 Date 9-24-92

3. The above steps have been completed.

 Test Conductor BD Hayer

 Date 9-24-92

TPCN

#3

TCN

#002

8.1.4 Single Mode Verification Test

Place the Upper Cutting System in SINGLE mode and verify system automatic sequence. This test verifies operation of cutting system motions and does not include actual cutting operations or mock-up fuel. Install the drill in the No. 1 spindle and the West. 17x17 mock-up ID tube cutter in the No. 2 spindle prior to beginning test.

WARNING

Stay clear of the upper cutting system while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

8.1.4.1 Verify receipt of fuel at the upper cutting system as follows:

1. Simulate fuel placement on the cutting table through temporary changes to the software and verify receipt of fuel.

Acceptance Criteria

- Signal received that fuel assembly is on cutting station.

Test Conductor MD Hayer Date 9-25-92

QA [Signature] Date 9-25/92

2. The above step has been completed.

Test Conductor MD Hayer Date 9-25-92

8.1.4.2 Verify end fitting clamping operations as follows:

1. Press "Continue" to position and close clamps, verify "Hold Point" and view from cameras when "Call Camera" is activated on control screen. Fill out CCTV assessment form in Appendix E.

Acceptance Criteria

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- Clamp positioned and "Hold Point" generated for operator verification of clamp position.
- Video images from cameras No. 6 and No. 9 displayed on monitors when "Call Camera" is touched on screen.

- Pan, tilt and zoom are functional for camera 9, and both cameras achieve an unobstructed view of the fuel assembly upper end fitting.

Test Conductor RD Hays Date 9-25-92

QA [Signature] Date 9-25-92

2. The above step has been completed.

Test Conductor RB Hays Date 9-25-92

- 8.1.4.3 Verify drill positioning and end fitting drilling operation as follows:

1. Press "Continue" until the drill is positioned at the center instrument tube. Verify "HOLD POINT" and view from cameras when "CALL CAMERA" is activated on control screen.

Acceptance Criteria

- ✓ • Drill tool is positioned at center tube to make first cut.
- "Hold Point" for operator verification of cutting position.
- Video images from cameras No. 6 and No. 9 displayed on monitors when "Call Camera" is touched on screen.
- ✓ • Pan, tilt and zoom are functional for camera 9, and both cameras achieve an unobstructed view of the fuel assembly upper end fitting.
- When "Continue" is touched on the screen, next step in cutting procedure is performed.

Test Conductor RD Hays Date 9-25-92

QA [Signature] Date 9/25/92

2. Press "Continue" to simulate drilling the center instrument tube and verify the drilling process was performed.

Acceptance Criteria

- When "Continue" is touched on the screen, drilling process is performed

Test Conductor RB Hays Date 9-25-92

QA [Signature] Date 9/25/92

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left out
during
typing
TPCN
7

3. The above steps have been completed.

Test Conductor TB Hayes Date 9-25-92

8.1.4.4 Verify turret rotation to a new spindle position as follows:

1. Press "Continue" to raise turret and rotate to the No. 2 spindle location.

Acceptance Criteria

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- Turret is repositioned to place ID tube cutter in active position.

Test Conductor TB Hayes Date 9-25-92

QA Date 9-25-92

2. The above step has been completed.

Test Conductor TB Hayes Date 9-25-92

8.1.4.5 Verify tube cutter positioning and guide tube cutting operation as follows:

1. Press "Continue" until tube cutter is positioned at the first guide tube to be cut. Verify "HOLD POINT" and view from cameras when "CALL CAMERA" is activated on control screen.

Acceptance Criteria

- ✓ • When "Continue" is touched on the screen, next step in cutting procedure is performed.
- ✓ • Cutter positioned at cut point
- ✓ • "Hold Point" for operator verification of cutting position.
- ✓ • Video images from cameras No. 6 and No. 9 displayed on monitors when "CAMERA CALL" is touched on screen.
- ✓ • Pan, tilt and zoom are functional for camera 9, and both cameras achieve an unobstructed view of the fuel assembly upper end fitting.

Test Conductor TB Hayes Date 9-25-92

QA Date 9-25-92

2. Press "Continue" to simulate cutting the guide tubes and verify the cutting process was performed.

Acceptance Criteria

- When "Continue" is touched on the screen, cutting process is performed.

Test Conductor MB Hayes Date 9-25-92

QA [Signature] Date 9-25-92

3. Repeat steps 1 and 2 twenty-four (24) more times for the remaining guide tubes.

Acceptance Criteria

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- Cutter positioned at cut point.
- "Hold Point" for operator verification of cutting position.
- Video images from cameras No. 6 and No. 9 displayed on monitors when "Call Camera" is touched on screen.
- Pan, tilt and zoom are functional for camera 9 and both cameras achieve an unobstructed view of the fuel assembly upper end fitting.
- Cutter positioned for next cut point and repeated 24 times.
- When "Continue" is touched on the screen, cutting process is performed.

Test Conductor MB Hayes Date 9-25-92

QA [Signature] Date 9-25-92

4. The above steps have been completed.

Test Conductor MB Hayes Date 9-25-92

8.1.4.6 Verify end fitting pulling and disposal operations as follows:

1. Press "Continue" to simulate pulling the end fitting.

Acceptance Criteria

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- Upper end fitting is disposed.

Test Conductor ND Haynes Date 9-25-92

QA [Signature] Date 9-25-92

2. Press "Continue" to complete cutting process and to initiate upper cutting system homing sequence.

Acceptance Criteria:

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- System goes to HOME position.

Test Conductor ND Haynes Date 9-25-92

QA [Signature] Date 9-25-92

3. The above steps have been completed.

Test Conductor ND Haynes Date 9-25-92

8.1.5 Auto Mode Verification Test

Place the Upper Cutting System in AUTO mode and verify system automatic sequence. This test verifies operation of cutting system motions and does not include actual cutting operations or mock-up fuels.

WARNING

Stay clear of the upper cutting system while in operation.

NOTE

Operator must press "CONTINUE" after each "HOLD POINT" to complete automatic operation.

1. Simulate fuel placement on the cutting table as performed in Section 8.1.4.1 and press GO to initiate the automatic fuel cutting process. Verify the process was automatically completed.

Acceptance Criteria:

- ✓ • Signal received that fuel assembly is on cutting station.
- ✓ • When "Continue" is touched on the screen, next step in cutting procedure is performed.
- ✓ • Clamp positioned and "Hold Point" generated for operator verification of clamp position.
- ✓ • Drill tool is positioned at center tube to make first cut.
- ✓ • When "Continue" is touched on screen, drilling process is performed.
- ✓ • Turret is repositioned to place ID tube cutter in active position.
- ✓ • Cutter positioned at cut points.
- ✓ • "Hold Point" for operator verification of cutting position.
- ✓ • When "Continue" is touched on the screen, cutting process is performed.
- ✓ • Cutter positioned for next cut point and repeated 24 times.
- ✓ • Upper end fitting is disposed.
- ✓ • System goes to HOME position.

Test Conductor AD Hays

Date 9-29-92

QA [Signature]

Date 9-25-92

2. The above step has been completed.

8.1.6

Test Conductor AD Hays
Servo Drive Fault Test

Date 9-29-92

WARNING

Stay clear of the upper cutting system while in operation

1. Place the upper cutting system in the "HAND" mode and initiate operations to move the X-1 Axis (M-104F).

2. Temporarily alter the control system software to implement an end-of-travel fault with the X-1 drive motor (M-104F).
3. Press "CONTINUE" to drive the X-1 Axis and verify the X-1 drive motor stops and registers a fault in the control room.

Acceptance Criteria:

- Motor stops when fault condition is implemented.
- Alarm system is activated.
- Alarm is silenced when acknowledged by operator.
- Control system displays fault condition on control screen.
- A report is printed defining the fault condition when commanded by the operator.

Test Conductor MB Hayes

Date 9-29-92

QA [Signature]

Date 9-25-92

4. Verify cameras No. 3 and No. 10 are activated and view the upper cutting system when the "CAMERA CALL" button is touched. Fill out a CCTV Assessment Form in Appendix E.

Acceptance Criteria:

- Video images from cameras No. 3 and NO. 10 are displayed on monitors when "CAMERA CALL" is touched on control screen.
- Camera No. 3 and No. 10 can be positioned to provide an unobstructed view of the upper cutting system and its various drive subassemblies.

Test Conductor MB Hayes

Date 9-29-92

QA [Signature]

Date 9-25-92

5. Correct fault condition and verify the X-1 Axis (M-104F) can be moved in the "HAND" mode.

Acceptance Criteria:

- The system can be recovered from fault condition and "HAND" mode operations continued.

Test Conductor MB Hayes

Date 9-29-92

QA [Signature]

Date 9-25-92

6. The above steps have been completed.

Test Conductor MB Hayes Date 9-29-82

8.1.7 Cutting Operation Verification Test

This test verifies the operation of the cutting system using mockup fuel. This test sequence is to be performed in the "SINGLE" mode to allow for increased control and verification of the cutting operation using a mockup ID tube cutter. Actual cutting operations are not performed on the W 17 x 17 mockup fuel.

WARNING

Stay clear of the upper cutting system while in operation.

8.1.7.1 Verify cutting operations in the "SINGLE" mode using the mockup ID tube cutter as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

NOTE

The operator must press "CONTINUE" to perform the next consecutive operation.

NOTE

The mockup ID tube cutter has been fabricated to verify tube to ID tube cutter axes alignment. This tool has been sized such that if it can be automatically positioned within the guide/instrument tubes, the tool to tube axes alignment is within tolerance.

1. Insert the W 17 x 17 mockup ID tube cutter in the No. 2 spindle. Tighten the collet enough to hold the tool firmly, ~~yet allow some movement.~~ Do not install any tools in the No. 1 or No. 3 spindles.
2. Load a W 17 x 17, Type 1 mockup fuel on the cutting table and initiate cutting operations in the "SINGLE" mode.
3. Perform clamping operation and simulate drilling by pressing "CONTINUE."
4. Position mockup tube cutter at the first cutting position "HOLD POINT" and stop. Visually inspect preliminary tube cutter/guide tube axes alignment before next step. Correct alignment if required.

CAUTION

If mockup tube cutter hits guide tube ~~or causes tool slippage in spindle collet,~~ stop all movement immediately.

TPCN
#4

TPCN
#4

5. "CONTINUE" tool insertion and verify tube cutter/guide tube axes alignment.

Acceptance Criteria:

- Mockup tube cutter fits within guide tube.

Test Conductor PB Hayes Date 9-30-92

QA [Signature] Date 9-30-92

6. Repeat steps 4 and 5 an additional 24 times for the remaining guide tubes. Remove mockup tool for the center instrument tube or bypass since no hole has been drilled for access.

Acceptance Criteria:

- Mockup tube cutter fits within guide tubes.

Test Conductor PB Hayes Date 10-1-92

QA [Signature] Date 10-1-92

7. Stop cutting operations by selecting the "OFF" mode on the control panel after the tube cutter has withdrawn from the last guide tube.

8. Open all clamps and ~~remove the fuel assembly from the cutting table in the Jog mode. Place fuel assembly back in the storage rack and Repeat steps 2 through 5 one additional time, checking the first guide tube only.~~ Turn system off after first guide tube

Acceptance Criteria: alignment is verified and remove fuel from table.

- Mockup tube cutter fits within guide tubes.

Test Conductor PB Hayes Date 10-1-92

QA [Signature] Date 10-1-92

9. The above steps have been completed.

Test Conductor PB Hayes Date 10-1-92

TPCW

5

8.2 System Verification for the B&W 15 x 15 PWR Fuel Type

The following series of tests is performed to verify the operability of the Upper Cutting System specific to the B&W 15 x 15 PWR fuel type. Prior to initiating testing, verify the control system is programmed for the B&W 15 x 15 PWR fuel type, and the PWR FAHF has been installed.

Test Conductor RB Hayes Date 10-1-92

8.2.1 Drive System Operation Verification Test

WARNING

Stay clear of the upper cutting system while in operation

NOTE

Axes not being tested may require repositioning to avoid collision with adjacent equipment. Simultaneous movement in opposite directions will occur between the X-1 and X-2 slides when the X-1 slide is moved.

8.2.1.I Verify the X-1 Axis (M-104F) drive system as follows:

1. Switch the control system to the HAND mode and send the X-1 saddle to the "Home" position (west).
2. Measure and record the following slide positions and verify the measured distances are within tolerance of the setpoint distances. Measurements are to be taken from the "Home" end of slide to the saddle (with wiper removed).

Position	Setpoint Distance	Measured Distance	Within Tolerance
Forward (HOME)	$1 \frac{22}{32}$	$1 \frac{22}{32}$	yes
Intermediate	$2 \frac{28}{32}$	$2 \frac{28}{32}$	yes
Back	$8 \frac{8}{32}$	$8 \frac{8}{32}$	yes

Acceptance Criteria:

- Measured distance is within $\pm 1/32$ inch

Test Conductor RB Hayes Date 10-6-92
 QA [Signature] Date 10/6/92

8.2.1.2 Verify the Y-Clamp (M-104N) drive system as follows:

1. Switch the control system to the HAND mode and send the Y-clamp saddle to the "HOME" position (south).
2. Measure and record the following slide positions and verify the measured distances are within tolerance of the setpoint distances. Measurements are to be taken from the "HOME" end of slide to the saddle (with wiper removed).

Position	Setpoint Distance	Measured Distance	Within Tolerance
Back (HOME)	$1 \frac{2}{32}$	$1 \frac{2}{32}$	yes
Forward	$16 \frac{18}{32}$	$16 \frac{19}{32}$	yes
Intermediate	$5 \frac{2}{32}$	$5 \frac{2}{32}$	yes

Acceptance Criteria:

- Measured distance is within $\pm 1/16$ inch

 Test Conductor MD Hysa

 Date 10-6-92

 QA [Signature]

 Date 10/6/92

 TPCN
001
KOH
9-16-92

8.2.1.3 Verify the Y-Turret (M-104G) drive system as follows:

1. Switch the control system to the Hand mode and send the Y-Turret saddle to the "HOME" position (south).
2. Measure and record the following slide positions and verify the measured distances are within tolerance of the setpoint distances. Measurements are to be taken from the "HOME" end of slide to the saddle (with wiper removed).

Position	Setpoint Distance	Measured Distance	Within Tolerance
South (Home)	1 ³² / ₆₄	1 ³² / ₆₄	yes
IDTC North Pos	9 ³⁷ / ₆₄	9 ³⁷ / ₆₄	yes
IDTC Incr. Sth 7	5 ⁴⁰ / ₆₄	5 ³⁹ / ₆₄	yes
IDTC Incr. Nth 1	6 ¹² / ₆₄	6 ¹² / ₆₄	yes
IDTC Incr Nth 2	7 ²⁰ / ₆₄	7 ²⁰ / ₆₄	yes
IDTC Incr Nth 4	9 ³⁷ / ₆₄	9 ³⁷ / ₆₄	yes
IDTC Incr. Nth 2	10 ⁴⁶ / ₆₄	10 ⁴⁶ / ₆₄	yes
IDTC Incr. Nth 1	11 ¹⁸ / ₆₄	11 ¹⁸ / ₆₄	yes
Wheel Cut North	12 ⁴⁰ / ₆₄	12 ⁴⁰ / ₆₄	yes
Wheel Cut Incr. (south)	2 ³³ / ₆₄	2 ³³ / ₆₄	yes
Wheel Adj. Incr. Sskirt	4 ⁷ / ₆₄	4 ⁷ / ₆₄	yes
Wheel Pos. Incr.			

 TPCW
 001
 KBH
 9-16-92

Acceptance Criteria:

- Measured distance is within $\pm 1/64$ inch.

 Test Conductor PSB Hanger Date 10-6-92

 QA A. Hanger Date 10/6/92

8.2.1.4 Verify the X-2 (M-104J) drive system as follows:

- Switch the control system to the HAND mode and send the X-2 saddle to the "Home" position (east).
- Measure and record the following slide positions and verify the measured distances are within tolerance of the setpoint distances. Measurements are to be taken from the "Home" end of slide to the saddle (with wiper removed).

Position	Setpoint Distance	Measured Distance	Within Tolerance
East (Home)	$1 \frac{13}{32}$	$1 \frac{13}{32}$	yes
INTRM West Pos	$8 \frac{26}{32}$	$8 \frac{26}{32}$	yes
Full West Pos			
IDTC West Pos	$3 \frac{10}{32}$	$3 \frac{10}{32}$ KH	yes
IDTC Insert Incr.	$12 \frac{21}{32}$	$12 \frac{21}{32}$	yes
IDTC Compr. Incr.	$12 \frac{28}{32}$	$12 \frac{28}{32}$	yes
IDTC West Pos.	$3 \frac{10}{32}$	$3 \frac{10}{32}$	yes
Wheel Cut West	$10 \frac{19}{32}$	$10 \frac{19}{32}$	yes

 TPCN
 001
 KB14
 9-16-92

Acceptance Criteria:

- Measured distance is within $\pm 1/32$ inch.

 Test Conductor JB Hayes Date 10-6-92

 QA [Signature] Date 10/6/92

8.2.1.5 Verify the Z-Turret (M-104K) drive system as follows:

- Switch the control system to the HAND mode and send the Z-Turret saddle to the "Home" position (up).
- Measure and record the following slide positions and verify the measured distances are within tolerance of the setpoint distances. Measurements are to be taken from the "Home" end of slide to the saddle (with wiper removed).

Position	Setpoint Distance	Measured Distance	Within Tolerance
Up (Home)	1 ³² / ₆₄	1 ³² / ₆₄	yes
Engage spindle	3 ³⁷ / ₆₄	3 ³⁴ / ₆₄	no
IDTC Top Pos	6 ⁴³ / ₆₄	6 ⁴² / ₆₄	yes
IDTC Incr. Dn 1	7 ¹⁵ / ₆₄	7 ¹⁴ / ₆₄	yes
IDTC Incr. Dn 2	8 ²⁴ / ₆₄	8 ²³ / ₆₄	yes
IDTC Incr. Dn 4	10 ⁴¹ / ₆₄	10 ⁴⁰ / ₆₄	yes
IDTC Incr. Dn 2	11 ⁵⁰ / ₆₄	11 ⁴⁹ / ₆₄	yes
IDTC Incr Dn 1	12 ²³ / ₆₄	12 ²² / ₆₄	yes
Wheel Cut Down	15 ⁴⁰ / ₆₄	15 ⁴⁰ / ₆₄	yes
Wheel Cut Incr. (up)	3 ³⁴ / ₆₄	3 ³³ / ₆₄	yes
Wheel Adj. Incr. BSkirt	13 ⁴³ / ₆₄	13 ⁴² / ₆₄	yes
Wheel Pos. Incr. (up)	15 ¹³ / ₆₄	15 ¹³ / ₆₄	yes
TSkirt	5 ⁷ / ₆₄	5 ⁶ / ₆₄	yes

RL #2

 TPCN
001
KBH
9-16-92

 Note: Must
be performed
in following
order

- 1.
- 4.
- 3.
- 2.
- 5.

Acceptance Criteria:

- Measured distance is within $\pm 1/64$ inch.

 Test Conductor J.B. Stagner

 Date 10-6-92

QA

[Signature]

 Date 10/6/92

8.2.1.6 Verify the spindle (M-104I) drive system and Turret (M-104L) drive system as follows:

1. Switch the control system to the HAND mode and send the Z-Turret Home and Turret to the No. 1 position if not already done so.
2. Activate spindle ^{ccw}~~ccw~~ at engagement speed, then send the Z-Turret to the "Engage Spindle" position and verify the Turret lock pin aligns and seats. In addition, verify the spindle drive couplings align and engage. TPCN
#2

Acceptance Criteria:

- Turret lock pin (9315-M-1643, Item 51) inserts to prevent turret rotation.
- Spindle drive couplings align and engage.
- Spindle rotates in a ^{ccw}~~ccw~~ direction when viewed from the west. TPCN
#2

Test Conductor JB Hargen

Date 10-6-92

QA

A. M. [Signature]

Date 10/6/92

3. Deactivate spindle drive and change spindle direction to ^{ccw}~~ccw~~. Activate spindle drive and verify spindle turns ~~ccw~~. TPCN
#2

Acceptance Criteria:

- Spindle rotates in a ^{ccw}~~ccw~~ direction when viewed from the west.

Test Conductor JB Hargen

Date 10-6-92

QA

A. M. [Signature]

Date 10/6/92

4. Deactivate spindle drive, send Z-Turret home and verify turret lock pin is fully retracted.

Acceptance Criteria:

- Turret lock pin (9315-M-1643, Item 51) retracts to free turret for rotation.

Test Conductor JB Hargen

Date 10-6-92

QA

A. M. [Signature]

Date 10/6/92

5. Repeat steps 2 thru 4 for the No. 2 and 3 turret positions.

Acceptance Criteria:

- Turret lock pin (9315-M-1643, Item 5) inserts to prevent turret rotation.
- Spindle drive couplings align and engage.
- Spindle rotates in a CCW direction when viewed from the west.
- Spindle rotates in a CW direction when viewed from the west.
- Turret lock pin (9315-M-1643, Item 51) retracts to free turret for rotation.

RL
#7

Test Conductor JD, Hargen

Date 10-6-92

QA

W. M. Hargen

Date 10/6/92

8.2.1.7 Verify the Clamp drive system as follows:

1. With the clamps in the full open position, activate clamp drive system (M-104H) to close clamps until they automatically shut off.
2. Measure and record actuator (M-104H) travel.

Actuator travel 1 1/8 inches

RL
#3

Acceptance Criteria:

- Actuator moves through its full travel range of 2 inches.

Test Conductor JD, Hargen

Date 10-6-92

QA

W. M. Hargen

Date 10/6/92

3. The above steps have been completed.

Test Conductor JD, Hargen

Date 10-6-92

8.2.2 Single Mode Verification Test

Place the Upper Cutting System in SINGLE mode and verify system automatic sequence. This test verifies operation of cutting system motions and does not include actual cutting operations or mockup fuel.

WARNING

Stay clear of the upper cutting system while in operation.

NOTE

Operator must press "CONTINUE" between each successive motion to complete operation

8.2.2.1 Verify receipt of fuel at the upper cutting system as follows:

1. Simulate fuel placement on the cutting table through temporary changes to the software and verify receipt of fuel.

Acceptance Criteria:

- Signal received that fuel assembly is on cutting station.

Test Conductor MSB Wagner

Date 10-1-92

QA [Signature]

Date 10-2-92

2. The above step has been completed.

Test Conductor MSB Wagner

Date 10-1-92

8.2.2.2 Verify skirt cutter positioning and skirt cutting operation as follows:

1. Press "Continue" until skirt cutter is positioned at skirt lower surface. Verify "HOLD POINT" and view from cameras when "CALL CAMERA" is activated on control screen. Fill out CCTV assessment form in Appendix E.

Acceptance Criteria:

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- Cutter positioned at cut point "HOLD POINT" to verify cutoff wheel position.

- Video images from cameras No. 6 and No. 9 displayed on monitors when "Call Camera" is touched on screen.
- Pan, tilt and zoom are functional for camera 9, and both cameras achieve an unobstructed view of the fuel assembly upper end fitting.

Test Conductor W B Hayes

Date 10-1-92

QA [Signature]

Date 10-2-92

2. Press "Continue" to simulate cutting the lower skirt and verify the cutting process was performed.

Acceptance Criteria:

- When "Continue" is touched on the screen, cutting process is performed.

Test Conductor W B Hayes

Date 10-1-92

QA [Signature]

Date 10-2-92

3. Repeat steps 1 and 2 for the south, upper and north skirt surfaces.

Acceptance Criteria:

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- Cutter positioned at cut point "HOLD POINT" to verify cutoff wheel position.
- Video images from cameras No. 6 and No. 9 displayed on monitors when "Call Camera" is touched on screen.
- Pan, tilt and zoom are functional for camera 9, and both cameras achieve an unobstructed view of the fuel assembly upper end fitting.
- When "Continue" is touched on the screen, cutting process is performed.
- Cutter cuts skirt starting at bottom position on skirt and travels in CW direction (when viewed looking west) after "HOLD POINT" acknowledged.

Test Conductor MB Hayes

Date 10-1-92

QA [Signature]

Date 10-2-92

4. The above steps have been completed.

Test Conductor MB Hayes

Date 10-1-92

8.2.2.3 Verify turret rotation to a new spindle position as follows:

1. Press "Continue" to raise turret and rotate to the No. 2 spindle location.

Acceptance Criteria:

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- Turret positioned to tube cutter.

Test Conductor MB Hayes

Date 10-1-92

QA [Signature]

Date 10-2-92

2. The above step has been completed.

Test Conductor MB Hayes

Date 10-1-92

8.2.2.4 Verify end fitting clamping operations as follows:

1. Press "Continue" to position and close clamps, verify "Hold Point" and view from cameras when "Call Camera" is activated on control screen.

Acceptance Criteria:

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- Clamp positioned and "Hold Point" generated for operator verification of clamp position.
- Video images from cameras No. 6 and No. 9 displayed on monitors when "Call Camera" is touched on screen.

- Pan, tilt and zoom are functional for camera 9, and both cameras achieve an unobstructed view of the fuel assembly upper end fitting.

Test Conductor MD HagenDate 10-1-92QA [Signature]Date 10-2-92

2. The above step has been completed.

Test Conductor MD HagenDate 10-1-92

8.2.2.5 Verify tube cutter positioning and guide tube cutting operation as follows:

1. Press "Continue" until tube cutter is positioned at the first guide tube to be cut. Verify "Hold Point" and view from cameras when "Call Camera" is activated on control screen.

Acceptance Criteria:

- When "Continued" is touched on the screen, next step in cutting procedure is performed.
- Cutter positioned at cut point for ID tube cut.
- "Hold Point" for operator verification of cutting position.
- Video images from cameras No. 6 and No. 9 displayed on monitors when "Call Camera" is touched on screen.

- Pan, tilt and zoom are functional for camera 9, and both cameras achieve an unobstructed view of the fuel assembly upper end fitting.

Test Conductor W B HayesDate 10-1-92QA [Signature]Date 10-2-92

2. Press "Continue" to simulate cutting the guide tube and verify the cutting process was performed.

Acceptance Criteria:

- When "Continue" is touched on the screen, cutting process is performed.

Test Conductor W B HayesDate 10-1-92QA [Signature]Date 10-2-92

3. Repeat Steps 1 and 2 fifteen (15) more times for the remaining guide tubes.

Acceptance Criteria:

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- Cutter positioned at cut point for ID tube cut.
- "Hold Point" for operator verification of cutting position.
- Video images from cameras No. 6 and No. 9 displayed on monitors when "Call Camera" is touched on screen.
- Pan, tilt and zoom are functional for camera 9, and both cameras achieve an unobstructed view of the fuel assembly upper end fitting.
- When "Continue" is touched on the screen, cutting process is performed.
- Cutter positioned for next cut point (ID tube cut) and repeated 15 times.

Test Conductor W B HayesDate 10-1-92QA [Signature]Date 10-2-92

4. The above steps have been completed.

Test Conductor W B HayesDate 10-1-92

8.2.2.6 Verify end fitting pulling and disposal operations as follows:

1. Press "Continue" to simulate pulling the end fitting and to perform the disposal operation.

Acceptance Criteria:

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- Upper end fitting is disposed.

Test Conductor JB Harper

Date 10-1-92

QA [Signature]

Date 10-2-92

2. Press "Continue" to complete cutting process and to initiate upper cutting system homing sequence.

Acceptance Criteria:

- When "Continue" is touched on the screen, next step in cutting procedure is performed.
- System goes to HOME position.

Test Conductor JB Harper

Date 10-1-92

QA [Signature]

Date 10-2-92

3. The above steps have been completed.

Test Conductor JB Harper

Date 10-1-92

8.2.3 Auto Mode Verification Test

Place the Upper Cutting System in AUTO mode and verify system automatic sequence. This test verifies operation of cutting system motions and does not include actual cutting operations of mockup fuels.

WARNING

Stay clear of the upper cutting system while in operation.

NOTE

Operator must press "CONTINUE" after each "HOLD POINT" to complete, automatic operation.

1. Simulate fuel placement on the cutting table as performed in Section 8.2.2.1 and press GO to initiate the automatic fuel cutting process. Verify the process was automatically completed.

Acceptance Criteria:

- ✓ • Signal received that fuel assembly is on cutting station.
- ✓ • Cutter positioned at cut point "HOLD POINT" to verify cutoff wheel position.
- ✓ • When "Continue" is touched on the screen, next step in cutting process is performed.
- ✓ • Cutter cuts skirt starting at bottom position on skirt and travels CW direction (when viewed looking west) after "HOLD POINT" acknowledged.
- ✓ • Clamp positioned and "Hold Point" generated for operator verification of clamp position.
- ✓ • Cutter positioned at cut point for ID tube cut.
- ✓ • "Hold Point" for operator verification of cutting position.
- ✓ • When "Continue" is touched on the screen, cutting process is performed.
- ✓ • Cutter positioned for next cut point (ID tube cut) and repeated 15 times.
- ✓ • Upper end fitting is disposed.

- System goes to HOME position.

Test Conductor W.D. Hayes

Date 10-2-92

QA [Signature]

Date 10-2-92

2. The above step has been completed.

Test Conductor W.D. Hayes

Date 10-2-92

8.2.4 Cutting Operation Verification Test

This test verifies the operation of the cutting system using mockup fuel. The first test sequence is to be performed in the "SINGLE" mode to allow for increased control and verification of the cutting operation using a mockup ID tube cutter. After verification of the cutting operation using a mockup ID tube cutter, the actual tube cutter will be used for cutting the fuel in the "SINGLE" mode. After successful completion of the cutting operating in the "SINGLE" mode, the test is to be performed in the "AUTO" mode.

WARNING

Stay clear of the upper cutting system while in operation.

- 8.2.4.1 Verify cutting operations in the "SINGLE" mode using the mockup ID tube cutter as follows:

TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG

NOTE

The operator must press "CONTINUE" to perform the next consecutive operation.

NOTE

The mockup ID tube cutter has been fabricated to verify tube to ID tube cutter axes alignment. This tool has been sized such that if it can be automatically positioned within the guide/instrument tubes the tool to tube axes alignment is within tolerance.

1. Insert the B&W 15 x 15 mockup ID tube cutter in the NO. 2 spindle. Tighten the collet enough to hold the tool firmly ~~yet allow some movement.~~ Do not install a cutoff wheel in the high speed spindle (No. 1 spindle) until completion of Section 8.2.4.1.

TPC
#4

2. Load a B&W 15 x 15, Type 2 mockup fuel on the cutting table (flared guide tube ends towards tube cutter) and initiate cutting operations in the "SINGLE" mode.
3. Perform skirt cutting (simulated) then clamping operation by pressing "CONTINUE."
4. Position mockup tube cutter at the first cutting position "HOLD POINT" and stop. Visually inspect preliminary tube cutter/guide tube axes alignment before next step. Correct alignment if required.

CAUTION

If mockup tube cutter hits guide tube ~~or causes tool slippage in spindle collet~~, stop all movement immediately.

TRC
4

5. "CONTINUE" tool insertion and verify tube cutter/guide tube axes alignment.

Acceptance Criteria:

- Mockup tube cutter fits within guide tube.

Test Conductor JB Haynes

Date 10-6-92

QA

A. M. G. 10/6/92

Date 10/6/92

6. Repeat steps 4 and 5 an additional 15 times for the remaining guide tubes.

Acceptance Criteria:

- Mockup tube cutter fits within guide tubes.

Test Conductor JB Haynes

Date 10-6-92

QA

A. M. G. 10/6/92

Date 10/6/92

7. Stop cutting operations by selecting the "OFF" mode on the control panel after the tube cutter has withdrawn from the last guide tube.
8. Remove the mockup tube cutter from the spindle and send all slides back to the "HOME" position.
9. The above steps have been completed.

Test Conductor JB Haynes

Date 10-6-92

8.2.4.2 Verify cutting operations in the "SINGLE" mode as follows:

NOTE

The operator must press "CONTINUE" to perform the next consecutive operation.

1. Insert the ID tube cutter in the No. 2 spindle location and tighten collet firmly. Install an abrasive cutoff wheel on the high speed spindle and initiate cutting operations in the "SINGLE" mode.

WARNING

Do not stand in the rotational path of the cutoff wheel in case failure of the cutoff wheel occurs.

2. Position cutoff wheel at the skirt lower surface surface "HOLD POINT" and set initial cut depth.

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

3. Initiate skirt cutting operations by pressing "CONTINUE."
Visually verify the cut was complete.

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

Acceptance Criteria:

- Skirt was cut completely

Test Conductor MB Hayes Date 10-7-92

QA W. S. [signature] Date 10/7/92

4. Repeat steps 2 and 3 for the south, upper and north skirt surfaces.

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

Acceptance Criteria:

- Skirt was cut completely

Test Conductor W.D. Hayer Date 10-7-92

QA W. E. Hayer Date 10/7/92

5. Raise turret and rotate to the ID tube cutter (No. 2 spindle).
6. Position clamp (M-104H) on the upper end fitting.

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

7. Position tube cutter at the first guide tube and initiate cutting operations by pressing "CONTINUE". Visually verify tube cutter/guide tube axis alignment.

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

Acceptance Criteria:

- Tube cutter fits within guide tube.

Test Conductor W.D. Hayer Date 10-7-92

QA W. E. Hayer Date 10/7/92

8. Repeat step 7 an additional 15 times for the remaining guide tubes.

Acceptance Criteria:

- Tube cutter fits within guide tube.

Test Conductor W.D. Hayer Date 10-7-92

QA W. E. Hayer Date 10/7/92

9. Verify end fitting was removed and disposed of.

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

Acceptance Criteria:

- End fitting was pulled clear of the fuel assembly.

Test Conductor MB Hayes Date 10-7-92

QA MB Hayes Date 10/7/92

10. Verify guide tubes were successfully cut.

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

Acceptance Criteria:

- Guide tubes were cut at least 0.5 inch past fuel rods without damaging adjacent rods.

Test Conductor MB Hayes Date 10-7-92

QA MB Hayes Date 10/7/92

11. The above steps have been completed.

Test Conductor MB Hayes Date 10-7-92

8.2.4.3 Verify cutting operations in the "AUTO" mode as follows:

NOTE

The operator must press "CONTINUE" at "HOLD POINTS" for automatic operations to resume.

*** TAKE PHOTOGRAPHS AND RECORD INFORMATION IN LOG ***

1. Rotate the B&W Type 2 assembly 180 degrees to reposition the uncut UEF on the cutting table and initiate cutting operations in the "AUTO" mode. Record start time below when the fuel is placed on the cutting table. KH ~~placed~~ ^{clamped}

Start Time 1530⁴

Test Conductor MB Hayes Date 10-7-92

2. Record finish time below when the mockup fuel is ~~picked up~~ ^{unclamped} from the cutting table. Verify all cutting operations were successfully performed in the "AUTO" mode.

Finish Time 1724

Start Time 1534

Elapsed Time 1 hr. 50 min.

RL
#8

TPCN
#6

Acceptance Criteria:

- ✓ Skirt was cut completely.
- ✓ Tube cutter fits within guide tube.
- ✓ End fitting was pulled clear of the fuel assembly.
- ✓ Guide tubes were cut at least 0.5 inch past fuel rods without damaging adjacent rods.
- ✓ Total elapsed cutting time did not exceed 75.5 minutes.
- ✓ Automatic operations did not require operator intervention except at "HOLD POINTS".

RL
#9

Test Conductor BD Hager

Date -10-7-92

QA

Ed McQuinn

Date 10/7/92

NOTE

If additional cutting tests are to be performed, the B&W Type 2 Assembly must be rebuilt to reattach the UEF prior to performing Step 3.

3. Repeat steps 1 and 2 using another B&W 15 x 15 Type 2 mockup fuel.

Finish Time N/A

Start Time N/A

Elapsed Time N/A

Acceptance Criteria:

- Tube cutter fits within guide tube.
- End fitting was pulled clear of the fuel assembly.
- Guide tubes were cut at least 0.5 inch past fuel rods without damaging adjacent rods.
- Total elapsed cutting time did not exceed 75.5 minutes.

- Automatic operations did not require operator intervention except at "HOLD POINTS".

Test Conductor N/A Date N/A

QA N/A Date N/A

NOTE

Upon completion of cutting tests, clean all chips and fines from the machinery and floor area as required. Dispose of chips, fines and collection hopper filter bag into a water filled sealable container to prevent pyrophoric ignition.

- 4. The above steps have been completed.

Test Conductor MB Hagen Date 10-7-92

Step 3 not performed since two end fittings were cut and one end fitting cut successfully.

9.0 POST PERFORMANCE REVIEW AND APPROVAL

The following signatures certify that the completed test, with all data collected, has been reviewed, and that the system has passed the requirements for system operational test.

MD Haynes 10-13-92
Test Engineer Date

A. Mulgrees 10/13/92
Quality Assurance Date

Frank M. Bell 10/13/92
Project Engineer Date

Peter V Judd 10/13/92
Test Director Date

10.0 RETENTION OF TEST RECORDS

The original working copy, including test exceptions and resolution and acceptance signatures, are to be maintained by the Test Director and stored at the NUS Gaithersburg building, Document Control Center. One copy of the original working document shall be sent to the DOE representative for their use and retention.

11.0 REFERENCES

- 11.1 "Fuel Rod Consolidation Project, Phase II Final Report Volume 1."
- 11.2 Upper Cutting System - Load and Stress Analyses. Calc. No.1096-M-06 Rev. 0.
- 11.3 9316-88-46 NUS ltr to DOE. March 13, 1988.
- 11.4 Russel Gilman Company Cat. No. 748B.
- 11.5 9315-E-601 "Software Functional Specification" Pgs D-98 to D-116.
- 11.6 Globe Motors, Cat. No. D-500.
- 11.7 Drawing 9315-M-1643.
- 11.8 Drawing 9315-M-1602.
- 11.9 Phoncon 20MAR91 Dennis von Eschen (HUB CITY) and J. C. Vaughan (NUS).
- 11.10 Specification 9315-TAC-209B, System Operational Test Acceptance Criteria for the Upper Cutting System, latest revision.
- 11.11 Document 9315-P-120, Test Administration Manual for System Operational Test and Integrated Systems Tests, latest revision.

APPENDIX A
EQUIPMENT SETUP

1.0 Equipment Set-Up

Prepare the Axes (Drive Servo Controls) for Operation

Note: Each of the drive motors and its controls are required to be adjusted and tuned/calibrated, one-by-one as detailed below, prior to all other system testing. In the steps described in Sections 1.1 through 1.9, ensure that only the axis under consideration in that step is being driven.

1.1 X-1 Axis

Ensure that the slide is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

- 1 Verify that the X-1 Axis Drive Motor (M-104F) is mechanically and electrically coupled after completion of the Control System SOT.
- 2 Adjust the motor control parameters for (M-104F) per instructions from Modicon, and as recorded in the following X-Axis Slide Drive Axis (M-104F) personality record form.

CAUTION

Ensure that the X-2 Axis (M-104J) and X-2 Axis (M-104F) saddles are located to avoid collision of the Z-Axis mount and the slip sheet assembly.

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7 of 7

Axis personality record form:

 Machine Name/Number: X-1 Axis

 Axis Number: M-104F

Personality Variable	Projected Value	Final Value
Number of Motor Poles (NPOLES)	6	
Resolution (RES)	1000	
Rate Loop Proportional Gain (RPG)	40	
Rate Loop Integral Gain (RIG)	250	
Acceleration Time Constant (ATC)	90	
Following Error Limit (FE_LIM)	100,000	
Peak Current Limit (IMAX)	100	
Average Current Trip Level (IAVG_LIM)	40	
CW End-of-Travel Limit (+EOT)	0	
CCW End-of-Travel Limit (-EOT)	0	
In-Position Tolerance Band (POS_TOL)	20	
In-Sync Tolerance Band (SYNC_TOL)	500	
Linear Acceleration (ACCEL)	20,000	
Linear Deceleration (DECEL)	20,000	
Position Cmd Time Constant (PCTC)	N/A	
Velocity Feed Forward (VFF) on/off	N/A	
Motor Base Speed (BASE_SPD)	3600	

- 3 Record resolver counts/turn for the resolver GE-104F and enter into the Control System the maximum speed for JOG mode in Resolver Counts/Sec. as noted below:

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-104F	995 1000	1000	16666

- 4 Select X-1 Axis (M-104F) at the Control Console and set JOG speed at approximately 10% of maximum JOG Speed. JOG the X-Axis to a position $0.55 \pm .05$ inch from the East mechanical stop. Adjust the sensor (ZE-104G) by physically moving the sensor so that it "trips on" with the wiper in that position. JOG toward and away from the sensor and verify sensor position.

CAUTION: Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

- 5 Repeat Step 4 at the West mechanical stop (HOME) by adjusting sensor ZE-104H at $0.55 \pm .05$ inch.
- 6 Create and verify an Axis Homing Sequence (AHS) for the X-1 Axis Drive Motor (M-104F) and resolver (GE-104F). (See "Start Program" in the Software Detail Design Document by Modicon.) AHS parameters to be as given below. At completion of AHS, record "Home Offset" and "Final Home Position" in the chart below.

Motor Tag No: M-104F Home Direction: CW

Resolver Tag No.: GE-104F Resolver Counts/Turn: 1000

Home Speed: ⁶⁰
100 RPM 1000 counts/sec.

Home Offset: 33000 Resolver Counts

Final Home Position: 1.00 $\pm$.03 inch (end of saddle to end of slide)

7 Return the AHS for the X-1 Axis Drive Motor, M-104F, to "Home-As-Is".

1.2 Y-Turrent Axis

Ensure that the slide is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

- 1 Verify that the Y-Turret Axis Drive Motor (M-104G) is mechanically and electrically coupled after completion of the Control System SOT.
- 2 Adjust the motor control parameters for (M-104G) per instructions from Modicon, and as recorded in the following Y- Turret Axis Slide Drive Axis (M-104G) personality record form.

Axis personality record form:

Machine Name/Number: Y-Turret Axis

Axis Number: M-104G

Personality Variable	Projected Value	Final Value
Number of Motor Poles (NPOLES)	6	
Resolution (RES)	1000	
Rate Loop Proportional Gain (RPG)	40	
Rate Loop Integral Gain (RIG)	250	
Acceleration Time Constant (ATC)	98	
Following Error Limit (FE_LIM)	100,000	
Peak Current Limit (IMAX)	100	
Average Current Trip Level (IAVG_LIM)	40	
CW End-of-Travel Limit (+EOT)	0	
CCW End-of-Travel Limit (-EOT)	0	
In-Position Tolerance Band (POS_TOL)	20	
In-Sync Tolerance Band (SYNC_TOL)	500	
Linear Acceleration (ACCEL)	20,000	
Linear Deceleration (DECEL)	20,000	
Position Cmd Time Constant (PCTC)	N/A	
Velocity Feed Forward (VFF) on/off	N/A	
Motor Base Speed (BASE_SPD)	3600	

- 3 Record resolver counts/turn for the resolver GE-104G and enter into the Control System the maximum speed for JOG mode in Resolver Counts/Sec. as noted below:

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-104G	998 1000	1000	16666

- 4 Select Y-Turret Axis (M-104G) at the Control Console and set JOG speed at approximately 10% of maximum JOG Speed. JOG the Y-Axis to a position $0.55 \pm .05$ inch from the South mechanical stop (HOME). Adjust the sensor (ZE-104J) by physically moving the sensor so that it "trips on" with the wiper in that position. JOG toward and away from the sensor and verify sensor position.

CAUTION: Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

- 5 Repeat Step 4 at the North mechanical stop by adjusting sensor ZE 104I at $0.55 \pm .05$ inch.
- 6 Create and verify an Axis Homing Sequence (AHS) for the Y-Turret Axis Drive Motor (M-104G) and resolver (GE-104G). (See "Start Program" in the Software Detail Design Document by Modicon.) AHS parameters to be as given below. At completion of AHS, record "Home Offset" and "Final Home Position" in the chart below.

Motor Tag No: M-104G Home Direction: CCW

Resolver Tag No.: GE-104G Resolver Counts/Turn: 1000

Home Speed: ⁶⁰100 RPM 1000 counts/sec.

Home Offset: 23,000 Resolver Counts

Final Home Position: 1.00 ± .03 inch (end of saddle to end of slide)

7 Return the AHS for the Y-Turret Axis Drive Motor, M-104G, to "Home-As-Is".

1.3 Y-Clamp Axis

Ensure that the slide is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

- 1 Verify that the Y-Clamp Axis (M-104N) is mechanically and electrically coupled after completion of the Control System SOT.
- 2 Adjust the motor control parameters for (M-104N) per instructions from Modicon, and as recorded in the following Y-Clamp Axis (M-104N) personality record form.

Axis personality record form:

 Machine Name/Number: Y-Clamp Axis

 Axis Number: M-104N

Personality Variable	Projected Value	Final Value
Number of Motor Poles (NPOLES)	6	
Resolution (RES)	1000	
Rate Loop Proportional Gain (RPG)	18	
Rate Loop Integral Gain (RIG)	270	
Acceleration Time Constant (ATC)	100	
Following Error Limit (FE_LIM)	100,000	
Peak Current Limit (IMAX)	100	
Average Current Trip Level (IAVG_LIM)	40	
CW End-of-Travel Limit (+EOT)	0	
CCW End-of-Travel Limit (-EOT)	0	
In-Position Tolerance Band (POS_TOL)	20	
In-Sync Tolerance Band (SYNC_TOL)	500	
Linear Acceleration (ACCEL)	20,000	
Linear Deceleration (DECEL)	20,000	
Position Cmd Time Constant (PCTC)	N/A	
Velocity Feed Forward (VFF) on/off	N/A	
Motor Base Speed (BASE_SPD)	3600	

- 3 Record resolver counts/turn for the resolver GE-104N and enter into the Control System the maximum speed for JOG mode in Resolver Counts/Sec. as noted below:

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-104N	995 1000	1000	16 666

- 4 Select Y-Clamp Axis (M-104N) at the Control Console and set JOG speed at approximately 10% of maximum JOG Speed. JOG the Slide to a position $0.55 \pm .05$ inch from the South mechanical stop (HOME). Adjust the sensor (ZE-104U) by physically moving the sensor so that it "trips on" with the wiper in that position. JOG toward and away from the sensor and verify sensor position.

CAUTION: Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

- 5 Repeat Step 4 at the North mechanical stop by adjusting sensor ZE-104T at $1.55 \pm .05$ inch.
- 6 Create and verify an Axis Homing Sequence (AHS) for the Y-Clamp Axis Motor (M-104N) and resolver (GE-104N). (See "Start Program" in the Software Detail Design Document by Modicon.) AHS parameters to be as given below. At completion of AHS, record "Home Offset" and "Final Home Position" in the chart below.

Motor Tag No: M-104N Home Direction: CW

Resolver Tag No.: GE-104N Resolver Counts/Turn: 1000

Home Speed: ⁶⁰~~100~~ RPM 1000 counts/sec.

Home Offset: 45,000 Resolver Counts

Final Home Position: 1.00 ± .03 inch (end of saddle to end of slide)

7 Return the AHS for the Y-Clamp Axis Drive Motor, M-104N, to "Home-As-Is".

1.4 X-2 Axis

Ensure that the slide is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

- 1 Verify that the X-2 Axis Drive Motor (M-104J) is mechanically and electrically coupled after completion of the Control System SOT.
- 2 Adjust the motor control parameters for (M-104J) per instructions from Modicon, and as recorded in the following X-2 Axis Drive Axis (M-104J) personality record form.

Axis personality record form:

Machine Name/Number: X-2 Axis

Axis Number: M-104J

Personality Variable	Projected Value	Final Value
Number of Motor Poles (NPOLES)	6	
Resolution (RES)	1000	
Rate Loop Proportional Gain (RPG)	40	
Rate Loop Integral Gain (RIG)	250	
Acceleration Time Constant (ATC)	98	
Following Error Limit (FE_LIM)	100,000	
Peak Current Limit (IMAX)	100	
Average Current Trip Level (IAVG_LIM)	40	
CW End-of-Travel Limit (+EOT)	0	
CCW End-of-Travel Limit (-EOT)	0	
In-Position Tolerance Band (POS_TOL)	30	
In-Sync Tolerance Band (SYNC_TOL)	500	
Linear Acceleration (ACCEL)	20,000	
Linear Deceleration (DECEL)	20,000	
Position Cmd Time Constant (PCTC)	N/A	
Velocity Feed Forward (VFF) on/off	N/A	
Motor Base Speed (BASE_SPD)	3600

- 3 Record resolver counts/turn for the resolver GE-104J and enter into the Control System the maximum speed for JOG mode in Resolver Counts/Sec. as noted below:

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-104J	995 1000	1000	16.666

- 4 Select X-2 Axis (M-104J) at the Control Console and set JOG speed at approximately 10% of maximum JOG Speed. JOG the X-Axis to a position $0.55 \pm .05$ inch from the West mechanical stop. Adjust the sensor (ZE-104N) by physically moving the sensor so that it "trips on" with the wiper in that position. JOG toward and away from the sensor and verify sensor position.

CAUTION: Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

- 5 Repeat Step 4 at the East mechanical stop (HOME) by adjusting sensor ZE-104M at $0.55 \pm .05$ inch.
- 6 Create and verify an Axis Homing Sequence (AHS) for the X-2 Axis Drive Motor (M-104J) and resolver (GE-104J). (See "Start Program" in the Software Detail Design Document by Modicon.) AHS parameters to be as given below. At completion of AHS, record "Home Offset" and "Final Home Position" in the chart below.

Motor Tag No: M-104J Home Direction: CW

Resolver Tag No.: GE-104J Resolver Counts/Turn: 1000

Home Speed: ⁶⁰100 RPM 1000 counts/sec.

Home Offset: -12500 Resolver Counts

Final Home Position: 1.00 $\pm$.03 inch (end of saddle to end of slide)

7 Return the AHS for the X-2 Axis Drive Motor, M-104J, to "Home-As-Is".

1.5 Z-Turret Axis

Ensure that the slide is approximately at mid travel. (Since machine motion will occur in a following step, this precaution is given in order to locate the equipment in a safe position.)

- 1 Verify that the Z-Turret Axis Drive Motor (M-104K) is mechanically and electrically coupled after completion of the Control System SOT.
- 2 Adjust the motor control parameters for (M-104K) per instructions from Modicon, and as recorded in the following Z-Turret Axis (M-104K) personality record form.

Axis personality record form:

 Machine Name/Number: Z-Turret Axis

 Axis Number: M-104K

Personality Variable	Projected Value	Final Value
Number of Motor Poles (NPOLES)	6	
Resolution (RES)	1000	
Rate Loop Proportional Gain (RPG)	18	
Rate Loop Integral Gain (RIG)	270	
Acceleration Time Constant (ATC)	106	
Following Error Limit (FE_LIM)	200,000	
Peak Current Limit (IMAX)	100	
Average Current Trip Level (IAVG_LIM)	50	
CW End-of-Travel Limit (+EOT)	0	
CCW End-of-Travel Limit (-EOT)	0	
In-Position Tolerance Band (POS_TOL)	20	
In-Sync Tolerance Band (SYNC_TOL)	500	
Linear Acceleration (ACCEL)	20,000	
Linear Deceleration (DECEL)	20,000	
Position Cmd Time Constant (PCTC)	N/A	
Velocity Feed Forward (VFF) on/off	N/A	
Motor Base Speed (BASE_SPD)	3600	

- 3 Record resolver counts/turn for the resolver GE-104K and enter into the Control System the maximum speed for JOG mode in Resolver Counts/Sec. as noted below:

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-104K	996 1000	1000	16,666

- 4 Select Z-Turret Axis (M-104K) at the Control Console and set JOG speed at approximately 10% of maximum JOG Speed. JOG the Z-Axis to a position $15.56 \pm .05$ inch from the Upper mechanical stop. Adjust the sensor (ZE-104Q) by physically moving the sensor so that it "trips on" with the wiper in that position. JOG toward and away from the sensor and verify sensor position.

CAUTION: Observe carefully as the machine moves and be prepared to activate emergency stop if necessary.

- 5 Repeat Step 4 at the Upper mechanical stop by adjusting sensor ZE-104P at $0.50 \pm .05$ inch (HOME).
- 6 Create and verify an Axis Homing Sequence (AHS) for the Z-Turret Axis Drive Motor (M-104K) and resolver (GE-104K). (See "Start Program" in the Software Detail Design Document by Modicon.) AHS parameters to be as given below. At completion of AHS, record "Home Offset" and "Final Home Position" in the chart below.

Motor Tag No: M-104K Home Direction: CCW

Resolver Tag No.: GE-104K Resolver Counts/Turn: 1000

Home Speed: ~~100~~ 60 RPM 1000 counts/sec.

Home Offset: 9000 Resolver Counts

Final Home Position: 1.00 $\pm$.03 inch (end of saddle to end of slide)

TEST PROCEDURE 9315-TP-209D

REVISION 0

PAGE A-17

7 Return the AHS for the Z-Turret Axis Drive Motor, M-104K, to "Home-As-Is".

1.6 Spindle Drive

- 1 Verify that the Spindle Drive Motor (M-104I) is mechanically and electrically coupled after completion of the Control System SOT. Ensure that the turret assembly is positioned so that no damage will be caused by spindle motion which will occur in subsequent steps.

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-104I	2800 1000	1000	16,666

- 2 Adjust the motor control parameters for (M-104I) per instructions from Modicon, and as recorded in the following Spindle Drive Axis (M-104I) personality record form.

Axis personality record form:

 Machine Name/Number: Spindle Drive

 Axis Number: M-104I

Personality Variable	Projected Value	Final Value
Number of Motor Poles (NPOLES)	6	
Resolution (RES)	1000	
Rate Loop Proportional Gain (RPG)	42	
Rate Loop Integral Gain (RIG)	230	
Acceleration Time Constant (ATC)	160	
Following Error Limit (FE_LIM)	500,000	
Peak Current Limit (IMAX)	100	
Average Current Trip Level (IAVG_LIM)	40	
CW End-of-Travel Limit (+EOT)	0	
CCW End-of-Travel Limit (-EOT)	0	
In-Position Tolerance Band (POS_TOL)	20	
In-Sync Tolerance Band (SYNC_TOL)	500	
Linear Acceleration (ACCEL)	20,000	10,000
Linear Deceleration (DECEL)	20,000	10,000
Position Cmd Time Constant (PCTC)	N/A	
Velocity Feed Forward (VFF) on/off	N/A	
Motor Base Speed (BASE_SPD)	3600

- 3 Set resolver counts/turn for the resolver GE-104I and enter into the Control System the maximum speed for JOG mode in Resolver Counts/Sec. as noted below.

RESOLVER NUMBER	JOG SPD. (RPM)	RESOLVER COUNTS/TURN	MAX JOG SPD COUNTS/SEC
GE-104I	1000		

1.7 Upper Cutting System, Clamp

- 1 Verify that the Upper Cutting System, Clamp Actuator (M-104H) is mechanically and electrically coupled after completion of the Control System SOT. Ensure that the actuator limit switches trip and actuator stops before the clamp cam followers reach the ends of the cam slot. Full actuator travel (3.0 inches) should be available.
- 2 Place compression load test fixture on bed of clamp. Close clamp and verify that actuator trips when actuator drive current reaches a value corresponding to greater than 180 lb. compression force on test fixture. Adjust the trip point of current sensor (IT-104H) as necessary to achieve clamping force and retest as required. Verify that power is removed from the actuator after clamp has closed.

Clamp force varies from 200-450 lbs.

Max open, register # 47055 = 2917, clamp opening $\approx 11\frac{3}{8}$ "

Max close, register # 47054 = 3075, clamp opening $\approx 7\frac{5}{8}$ "

Max torque, register # 47220 = 2300

1.8 Turret

- 1 Verify that turret drive motor/resolver assembly has been remounted to turret base after Control System SOT.
- 2 In JOG mode, drive the Z-Axis saddle to the full up position and verify that the turret lock pin is disengaged.
- 3 While rotating the turret in JOG mode, observe through lock pin hole number one in the turret face and stop turret rotation when lock pin just comes into view. After all components have stopped, carefully determine the direction of backlash between the turret and gearmotor. If turret can be advanced slightly, continue to drive the turret with the motor until just prior to centering the pin and hole. Ensure that tapered end of pin can engage hole in turret face. If backlash direction is such that turret can be moved in a retrograde direction, then drive turret slightly past the hole-pin centered position. Ensure that backlash will allow alignment of hole and pin before proceeding. Lower Z-Axis in JOG mode approximately 3 inches and observe as lock pin is inserted into hole. Backlash should allow turret to rotate enough to align body of lock pin with hole.

CAUTION: Misalignment between pin and hole should not be great enough to damage gears in drive motor through "backdriving" of gearbox
--

4. Cause Control System to "remember" the resolver setting corresponding to turret position number one. Record in Table 1.9.
5. Raise Z-Axis in JOG mode to full up position and verify that lock pin withdraws from hole.
6. Repeat Step 3 for turret position number two.
7. Repeat Step 4 for turret position number two.
8. Repeat Step 5 for turret position number two.

9 Repeat Step 3 for turret position number three.

10 Repeat Step 4 for turret position number three.

11 Repeat Step 5 for turret position number three.

~~12 Repeat Steps~~

TABLE 1.9

TURRET POSITION NO.	1	2	3	4
Resolver Setting	reg. # 47186 = 0006	reg. # 47187 = 0248	reg. # 47188 = 0128	reg. # 47189 = 0040 0278

W 17 x 17

KH
9-24-92

B+W 15x15

The following signature certifies that the equipment set-up contained in Appendix A has successfully been completed.

Signature

Date

9-22-92

APPENDIX B
SAFETY PROCEDURES

SYSTEMS OPERATIONS TEST SAFETY CONSIDERATIONS

Performance of the SOTs in a manner which precludes the injury of personnel involved in the test performance or working in the Test Facility is of paramount importance. The following steps shall be taken to minimize the possibility of personnel being injured during the performance of SOTs:

1. Contraves and NUS will advise their employees and any subcontractors to stay clear of the Test Facility when tests are being conducted unless they are involved in the test performance or have another work assignment in the Test Facility.
2. Contraves will post a warning sign at the entrance to the Test Facility when testing is in progress advising personnel of the need to stay away unless involved in the testing or have some authorized work assignment in the area.
3. When feasible and deemed advisable by the Test Conductor the machine being tested will be surrounded by a portable barrier (ropes and posts) with a Caution Sign warning individuals to stay clear of the area unless authorized to enter by the Test Conductor.
4. When machines are being moved by installed motors the NUS electrical engineer operating the motor or the Test Conductor will be located in a position which permits him/her to observe the machine operation so that the equipment can be stopped if a dangerous situation appears to be developing. Such situations could involve unanticipated machine performance or personnel entering the test area and placing themselves in jeopardy.
5. When an SOT is in progress the Test Conductor will remain in the vicinity of the test so the all personnel involved in the test are under his observation and will perform any required test support activities directly under his supervision.
6. Only Contraves personnel who have been qualified to the DOE Hoisting and Rigging Manual Rev. 10-88 will operate the Test Facility overhead crane.
7. Only NUS test engineers will operate the Robotic Bridge Transporter (RBT), the Manipulator Transporter (MT), and the RM-10A Robot Arms.
8. Slings, hooks, and chains utilized with the Test Facility overhead crane or with the RBT will be those purchased specifically for use on the DOE project and have been certified to meet the requirements of ANSI B30.9.
9. The making of all electrical connections to the various equipment will be supervised by an NUS electrical engineer.

10. Protective headgear will be worn in the Test Facility when ever the Robotic Bridge Transporter (RBT) the Manipulator Transporter (MT) are being utilized or at any time the Test Conductor deems the use of protective head gear is appropriate.
11. The NUS Test Conductor is responsible to see that all the above safety requirements are implemented during the performance of the test for which he has responsibility.
12. The Test Conductor will verify that all test specific safety prerequisites identified in test procedures are satisfied and that any precautions identified in specific procedure steps as followed.
13. The NUS Test Director will perform frequent informal surveillance of the testing operations to verify the safety requirements are being adhered to by the personnel performing the test or other work in the test area.

APPENDIX C
PHOTO DOCUMENTATION REQUIREMENTS

Photo Documentation Requirements

Photographs are required to be taken of all System Operational Tests (SOTs). The following is a bulletized list which identifies when these photographs must be taken, as a minimum. Additional photographs may be taken at any other time during the test, as specified by the Test Conductor.

- Photographs must be taken of the initial setup for each test sequence.
- Photographs must be taken of the following critical interfaces between system, as a minimum,
 - Excell Crane/Downender (Loading of Fuel)
 - RBT/Fuel Assembly Storage Rack
 - RBT/Downender
 - RBT/Staging and Cutting Station
 - RBT/Clamping Table
 - FAHF/Mockup Fuel Assembly
 - Pull-Head Gripper/Fuel Rods
 - Rod Loader/Canister
 - NFBC Loader/Canister
 - RBT/Off-Normal Table
 - MT/Off-Normal Table
 - Fuel Canister/Storage Rack
 - NFBC Canister/Storage Rack
 - RBT/FAHF and RM-10A
 - Excell Crane/Fuel Canister Upender (Loading and Unloading)
 - Excell Crane/NFBC Canister Upender (Loading and Unloading)
 - MT/RM-10A
- Photographs must be taken of any equipment damaged during testing.
- Photographs must be taken of any damage to mockup fuel rods and/or mockup fuel assemblies.
- Photographs must be taken of the cutter to fuel assembly interfaces as follows:
 - In position prior to cut
 - During cutting operation
 - Cut area of end fitting after cut operation
 - Cut area of fuel assembly after cut operation
- Photographs must be taken of each "Hold Point".
- Photographs must be taken of the problem areas of any subsystem which does not perform its expected function.
- Photographs must be taken of any component, subsystem, or system, determined by the test conductor to be operating out of the normal/expected condition (i.e., excessive deflection, vibration, etc.).

**FUEL ROD CONSOLIDATION PROJECT
PHOTOGRAPHIC LOG**

TEST PROCEDURE No. 9315-TP-209D

ENTRY NO.	FILM ROLL #	FRAME NO.	DATE/TIME	STEP NUMBER	EQUIPMENT/PURPOSE
1	17	23	9-22-92/1800	N/A	Damage to X-2 east hardstop
2	17	21	9-24-92/1545	N/A	Damage to clamp
3	17	20	9-30-92/0915	B.1.7.1.2	W 17x17 fuel on cutting station
4	17	19	9-30-92/1005	B.1.7.1.3	Clamping op. on end fitting
5	17	18	9-30-92/1020	B.1.7.1.4	Mock up IDTC in 1st guide tube
6	17	17	10-6-92/1530	B.2.4.1 ^{#2}	B+W 15x15 mockup loaded on cutting station
7	17	16	10-6-92/1540	B.2.4.1 ^{#3}	HSS positioned at beginning point for skirt cutting
8	17	15	10-6-92/1625	B.2.4.1 ^{#3}	Position clamp forward
9	17	14	10-6-92/1830	B.2.4.1 ^{#5}	Mock-up IDTC in guide tubes
10	17	13	10-7-92/1035	B.2.4.2	Reieve fuel configuration
11	17	12	10-7-92/1040	"	First skirt cut position
12	17	11	10-7-92/1112	"	Cutting south skirt surface
13	17	10	10-7-92/1124	"	Cutting top skirt surface
14	17	9	10-7-92/1134	"	Cutting north skirt surface
15	17	8	" / 1210	"	Cutting first guide tube
16	17	7	" / 1305	"	Cutting last guide tube
17	17	6	" / 1305	"	" " " "
18	17	5	" / 1410	"	End fitting removed
19	17	4	" / 1725	"	Pulling end fitting
20	17	3	" / "	"	Transferring end fitting
21	17	2	" / "	"	Releasing end fitting
22	17	1	" / "	"	Cutting tip after 2 assemblies

TEST PROCEDURE 9315-TP-209D

REVISION 0

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APPENDIX D

TEMPORARY PROCEDURE CHANGE NOTICE AND REPAIR LOG

APPENDIX D-2

1

NUS 340 REVISED 1208

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE #2

DATE 9-23-92

PROCEDURE NO. 9315-TP-209D REV. 0 TITLE UCS SOT

PROCEDURE SECTION(S) 8.1.2.6, 8.2.1.6

PROCEDURE CHANGE: (Use reverse side if necessary.)

Change "ccw" to "cw" in step 2, and "cw" to "ccw" in step 3.

REASON FOR CHANGE:

Spindle is programmed to rotate cw at engage speed.

CLASSIFICATION OF CHANGE

MINOR ☒ YES ☒ NO ☐

MAJOR ☐ YES ☐ NO ☒

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES ☐ NO

APPROVALS

HB Hanes 9-23-92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE # 3

DATE 9-24-92

PROCEDURE NO. 9315-TP-209D REV. 0 TITLE UCS SDT

PROCEDURE SECTION(S) 8.1.3.14

PROCEDURE CHANGE: (Use reverse side if necessary.)

Delete X-1 axis as a condition, make Y-clamp axis condition B, change acceptance criteria from A or (B+C) to A or B. Change tests accordingly.

REASON FOR CHANGE:

It was decided that the X-1 axis was not required as part of the interlock since the X-1 is no longer in the forward position.

CLASSIFICATION OF CHANGE

MINOR YES NO ☒

See TCN # 002

MAJOR ☒ YES ☒ NO YES

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES NO

APPROVALS

MB Hanger 9-24-92 (1)(2)
TEST ENGINEER DATE

11/10/92 10/8/92 (2)
QUALITY ASSURANCE DATE

Frank M. Sullo 10/8/92 (2)
PROJECT ENGINEER DATE

[Signature] 10/8/92 (2)
TEST DIRECTOR DATE

- Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE #4

DATE 9-30-92

PROCEDURE NO. 9315-TP-209D REV. 0 TITLE UCS SOT

PROCEDURE SECTION(S) B.1.7.1, B.24.1

PROCEDURE CHANGE: (Use reverse side if necessary.)

Delete reference to allow tool slippage as marked up in steps 1 and caution statements for the above sections.

REASON FOR CHANGE:

Spindle will be rotating, therefore tool requires to be held secure in collet.

CLASSIFICATION OF CHANGE

MINOR ☒ YES ☒ NO ☐

MAJOR ☐ YES ☐ NO ☒

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES ☐ NO

APPROVALS

MB Haynes 9-30-92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE #5

DATE 9-30-92

PROCEDURE NO. 9315-TP-209D REV. 0 TITLE UCS SOT

PROCEDURE SECTION(S) B.1.7 step 8

PROCEDURE CHANGE: (Use reverse side if necessary.)

change step #8 to leave fuel on cutting station, move the fuel north by 0.5 to 1.0 inch, then repeat steps 2-5. See step 8 of Record copy for exact markup.

REASON FOR CHANGE: The purpose of this step is to verify the clamps can reposition the fuel within accuracy to allow IDTC alignment. Moving the fuel with the RBT would waste time. Additionally it is not necessary to check all guide tube positions, only the first guide tube position is critical.

CLASSIFICATION OF CHANGE

MINOR ☒ YES ☒ NO ☐

MAJOR ☐ YES ☐ NO ☒

REVISION TO ORIGINAL PROCEDURE REQUIRED ☐ YES ☒ NO

APPROVALS

JB Hayes 9-30-92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE #6

DATE 10-8-92

PROCEDURE NO. 9315-TP-209D REV. 0 TITLE UCS SOT

PROCEDURE SECTION(S) 8.2.4.3 steps 1+2

PROCEDURE CHANGE: (Use reverse side if necessary.)

Change starting and completion points of timed process to when the fuel assembly is clamped to unclamped by the cutting station clamps.

REASON FOR CHANGE:

The RBT was not programmed at the time of this test to pickup and deposit fuel, therefore, the cutting process could not be timed from the deposit to pickup points in the process.

CLASSIFICATION OF CHANGE

MINOR ☒ YES ☒ NO ☐

MAJOR ☐ YES ☐ NO ☒

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES ☐ NO

APPROVALS

JD Hayer 10-8-92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

- Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE

9315-TP-209D

REVISION

0

APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE # 7

DATE 10-13-92

PROCEDURE NO. 9315-TP-209D REV. 0 TITLE UCS SBT

PROCEDURE SECTION(S) B.1.4.3 step 2

PROCEDURE CHANGE: (Use reverse side if necessary.)

Add the following to the acceptance criteria area of the above step:
• when "continue" is touched on the screen, the drilling process is performed.

REASON FOR CHANGE:

The acceptance criteria for the the above step was inadvertently left out during typing, and missed during review.

CLASSIFICATION OF CHANGE

MINOR ☒ YES ☒ NO ☐

MAJOR ☐ YES ☐ NO ☒

REVISION TO ORIGINAL PROCEDURE REQUIRED ☒ YES ☐ NO

APPROVALS

MB / tayer 10-13-92 (1)(2)
TEST ENGINEER DATE

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-209D REVISION 0 APPENDIX D-2

TEMPORARY PROCEDURE CHANGE NOTICE

DATE _____

PROCEDURE NO. _____ REV. _____ TITLE _____

PROCEDURE SECTION(S) _____

PROCEDURE CHANGE: (Use reverse side if necessary.) _____

REASON FOR CHANGE: _____

CLASSIFICATION OF CHANGE

MINOR _____ YES _____ NO _____

MAJOR _____ YES _____ NO _____

REVISION TO ORIGINAL PROCEDURE REQUIRED _____ YES _____ NO

APPROVALS

TEST ENGINEER DATE (1)(2)

QUALITY ASSURANCE DATE (2)

PROJECT ENGINEER DATE (2)

TEST DIRECTOR DATE (2)

Notes: (1) Required for minor changes
(2) Required for major changes

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 9-22-92

LOG # 1

PROCEDURE NO. 9315-TP-209D

REV. 0

TITLE UGS SGT

PROCEDURE SECTION(S) 8.1.2

CLASSIFICATION OF CHANGE: REPAIR ☒

REDESIGN ☐

TPCN#

PROBLEM AND CAUSE:

Bolts attaching east hardstop on X-2 slide were sheared during homing sequence. Proximity sensor failed to shut motor off in time.

TEST CONDUCTOR

MB Hayes

SOLUTION/CORRECTIVE ACTION:

Axis card that controls proximity sensor was replaced, sensor now functions, however; bolts will need removing + replacing in order to reinstall hardstop. Additionally, motor max current should be reevaluated to see if it can be lowered to prevent this from happening again.

TEST CONDUCTOR MB Hayes

DATE 9-22-92

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR

DATE (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE

Peak current values will be lowered and hardstop will be replaced; transferred to DITL # 278 + 279

TEST CONDUCTOR MB Hayes

DATE 10-8-92

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 9-23-92

LOG #2

PROCEDURE NO. 9315-TP-209D

REV. 0

TITLE UCS SOT

PROCEDURE SECTION(S) B.1.2.5, B.2.1.5

CLASSIFICATION OF CHANGE: REPAIR N/A REDESIGN N/A TPCN# N/A

PROBLEM AND CAUSE:

"Engage Spindle" position on Z-slide was not within tolerance. Resolver setpoints were checked and found to be correct, cause is not known

TEST CONDUCTOR JB Haynes

SOLUTION/CORRECTIVE ACTION:

Since the "Engage Spindle" ~~position~~ setpoint is not a critical position, it is recommended that the "as is" position be accepted. Correct action was discussed with projects. Projects agrees with "Accept as is". No change to TAC is required.

TEST CONDUCTOR JB Haynes

DATE 9-23-92

QUALITY ASSURANCE At Mulgrew

DATE 10/8/92 (1)

PROJECT ENGINEER Frank Stello

DATE 10/8/92 (1)

TEST DIRECTOR [Signature]

DATE 10/8/92 (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE None required

TEST CONDUCTOR ^{KH} ~~JB Haynes~~ JB Haynes

DATE 10-8-92

TEST PROCEDURE 9315-TP-209D REVISION 0 APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 9-23-92 LOG #3
PROCEDURE NO. 9315-TP-209D REV. 0 TITLE UCS SOT
PROCEDURE SECTION(S) B.1.2.7, B.2.1.7
CLASSIFICATION OF CHANGE: REPAIR N/A REDESIGN N/A TPCN# N/A

PROBLEM AND CAUSE:

Recorded actuator travel was less than acceptance criteria for clamp drive.

TEST CONDUCTOR JB Hayes

SOLUTION/CORRECTIVE ACTION:

Clamp travel is sufficient for clearing fuel and clamping fuel, as is, therefore, no corrective action is required, however a TCN is required to change the TAC.

TEST CONDUCTOR JB Hayes DATE 9-23-92
QUALITY ASSURANCE _____ DATE _____ (1)
PROJECT ENGINEER _____ DATE _____ (1)
TEST DIRECTOR _____ DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE ^{KH} ~~TCN~~ TCN 002 changes TAC. See note below: prg 10/13/92

TEST CONDUCTOR JB Hayes DATE 10-8-92

prg 10/13/92 | Note
TCN 002 was sent to DOE-ID for approval by Hrus letter # 2474 and is being tracked on the OITL as item #281

Energy Group
910 CLOPPER ROAD
P.O. BOX 6032
GAITHERSBURG, MARYLAND
20877-0962
(301) 258-6000
FAX (301) 258-2434

ED-DOE-PVJ-92-2474
October 9, 1992

Mr. W.J. Mings, Chief
Civilian Rad-Waste Branch
U. S. Department of Energy
Idaho Field Office
785 DOE Place MS-1136
Idaho Falls, ID 83401-1562

Subject: Contract DE-AC07-86ID12651 - Rod Consolidation Project
Systems Operational Test--Upper Cutting System TAC
Change Notice Approval (TCN)

Reference: 1. 9315-TAC-209B Rev 3

Dear Mr. Mings:

Attached is TCN 002 to reference 1 for your approval.

If you have any questions, please contact the undersigned on
(412) 967-7304.

Very truly yours,

Peter V. Judd
Peter V. Judd
Project Manager

ht

Attachment:
TCN 002

cc: D.C. Koelsch--DOE-ID
J.H. Clark--EG&G

ccc Subj U.I - wlat
enron - wlat
ncc - wlat

Agg Doe enron - wlat
Judd enron - wlat
SOT 209B back - wlat
Tracking Log - wlat
K. Haynes - wlat

TAC CHANGE NOTICE

DATE: 10-8-92

CHANGE NOTICE NO. 002

TAC NO: 9315-TAC-20AB Rev. 3

TITLE: System Operational Test Acceptance Criteria for the Upper Cutting System

=====

TAC CHANGES AND REASON FOR CHANGE

1. Change section 1.3.14 as follows:

Delete the condition "X-1 Axis forward (east)"
and make condition "c" into condition "B".

Additionally, change logic from A or (B+c) to A or
B.

Reason for change:

The X-1 is in an intermediate position when the
clamp closes on the fuel, it is no longer in
the forward position. Therefore, the X-1 is
not required as a condition for the interlock
to function safely.

(If more space is needed, use additional sheets)

ENGINEER

RD Hayer

10-8-92

Date

QUALITY ASSURANCE

W. M. L. L. L.

10/8/92

Date

PROJECT MANAGER

J. J. J.

11/2/92

TAC NO: 9315-TAC-209B REV. 3 Page 2 of 2CHANGE NOTICE NO. OD2

TAC CHANGE NOTICE (Cont'd)

NO.

2. Change section 1.1.7 to read:

- Actuator moves through a travel range of 1 to 2 inches

Reason for change:

Since this test is performed in the Hand mode, the open and closed setpoints are less than the range of travel available between limit switches. The existing range of travel is sufficient to open the clamp enough to clear the end fitting and to hold the end fitting secure.

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 9-23-92

LOG # 4

PROCEDURE NO. 9315-TP-209D

REV. 0

TITLE UCS SOT

PROCEDURE SECTION(S) 8.1.3.2, 8.1.3.8

CLASSIFICATION OF CHANGE: REPAIR ☒

REDESIGN ☐

TPCN#

PROBLEM AND CAUSE:

Interlocks did not function as anticipated.

TEST CONDUCTOR W.D. Hayes

SOLUTION/CORRECTIVE ACTION:

Problem requires further evaluation to whether a correction is required.

Setpoint changes are required.
and software

TEST CONDUCTOR W.D. Hayes

DATE 9-23-92

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR

DATE (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE New setpoint added for interlock of section 8.1.3.8 (ref. DCN 45), interlock verified.

Software changes made for section 8.1.3.2 (ref. DCN 45), interlocks retested + verified.

TEST CONDUCTOR W.D. Hayes

DATE 9-24-92

8.1.3.2 Verify the X-1 Axis (M-104F) back (east) interlocks as follows:

1. Place the control system in the HAND mode.
2. Impose the following combination of conditions as identified in the test and verify if the X-1 saddle can be moved back (east). Mark the appropriate column per the test result.

Condition

- A. Fuel is present.
- B. End fitting clamp M-104H is closed.
- C. Y-clamp drive M-104N is forward (north).

NOTE

Zero (0) signifies condition is not applied.
One (1) signifies that condition is applied.

Test	A	B	C	System Operates	Expected Result
1	1	1	1	☐ yes ☐ no ☒ hold	hold point
2	1	1	0	☒ yes ☐ no ☐ hold	yes
3	1	0	0	☒ yes ☐ no ☐ hold	yes
4	1	0	1	☒ yes ☐ no ☐ hold	yes
5	0	1	1	☒ yes ☐ no ☐ hold	yes
6	0	1	0	☒ yes ☐ no ☐ hold	yes
7	0	0	0	☒ yes ☐ no ☐ hold	yes
8	0	0	1	☒ yes ☐ no ☐ hold	yes

Acceptance Criteria

- System does not operate unless the following conditions are satisfied: NOT A or NOT B or NOT C or operator selects CONTINUE at Hold Point.

Test Conductor 24B Hayes

Date 9-24-92

QA

[Signature]

Date 9-24-92

3. The above steps have been completed.

Test Conductor 24B Hayes

Date 9-24-92

45

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 9-23-92

LOG # 5

PROCEDURE NO. 9315-TP-209D REV. 0 TITLE UCS SBT

PROCEDURE SECTION(S) B.1.3.3, B.1.3.4, B.1.3.8 EH

CLASSIFICATION OF CHANGE: REPAIR ☒ REDESIGN ☐ TPCN#

PROBLEM AND CAUSE:

Interlocks function correctly if X-1 back setpoint indication (reg. # 47150) ~~is set at~~ comes on, however, the X-1 slide must be in a full back position which doesn't exist for this to occur.

TEST CONDUCTOR JB Hayes

SOLUTION/CORRECTIVE ACTION:

Change setpoint to recognize the existing "back" position on the X-1 slide.

TEST CONDUCTOR JB Hayes DATE 9-23-92

QUALITY ASSURANCE DATE (1)

PROJECT ENGINEER DATE (1)

TEST DIRECTOR DATE (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE The correct setpoint was entered into register 47150 (Ref. DEN 45) and the interlock retested on original test sheets (see pgs. 24+25)

TEST CONDUCTOR JB Hayes DATE 9-24-92

TEST PROCEDURE 9315-TP-209D REVISION 0 APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 9-29-92 LOG #6

PROCEDURE NO. 9315-TP-209D REV. 0 TITLE UCS SOT

PROCEDURE SECTION(S) B.1.6

CLASSIFICATION OF CHANGE: REPAIR X REDESIGN TPCN#

PROBLEM AND CAUSE:

Clamp arm was bent by ~~max~~ a drill in turret position 1 during a simultaneous move between X-1 and X-2.

TEST CONDUCTOR MD Hayes

SOLUTION/CORRECTIVE ACTION:

Straighten clamp prior to continuing the test.

TEST CONDUCTOR <u>MD Hayes</u>	DATE <u>9-29-92</u>
QUALITY ASSURANCE <u> </u>	DATE <u> </u> (1)
PROJECT ENGINEER <u> </u>	DATE <u> </u> (1)
TEST DIRECTOR <u> </u>	DATE <u> </u> (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE Clamp was straightened and verified to move freely without binding.

TEST CONDUCTOR MD Hayes DATE 9-30-92

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 10-6-92

LOG # 7

PROCEDURE NO. 9315-TP-209D REV. 0

TITLE UCS SOT

PROCEDURE SECTION(S) 8.2.1.6

CLASSIFICATION OF CHANGE: REPAIR N/A REDESIGN N/A TPCN# N/A

PROBLEM AND CAUSE:

Spindle coupling does not engage No. 3 spindle while at the "Engage Position," and slips at high rpm's at the No. 1 + 2 spindle positions.

TEST CONDUCTOR JB Hayes

SOLUTION/CORRECTIVE ACTION:

Shim Z-axis up higher so the slide can travel down further to a full engagement position, yet still be above B+W skirt surface. Further testing is required to verify if the top skirt surface can be cut without the coupling slipping. After this a ~~decision~~ ^{the top} decision will have to be made whether modifications are required.

TEST CONDUCTOR JB Hayes DATE 10-6-92

QUALITY ASSURANCE _____ DATE _____ (1)

PROJECT ENGINEER _____ DATE _____ (1)

TEST DIRECTOR _____ DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE None

TEST CONDUCTOR JB Hayes DATE 10-8-92

During cutting tests (section 8.2.4.2 + 8.2.4.3), manual engagement of the spindle couplings were required to prevent slippage while skirt cutting the top surface. If the B+W 15x15 fuel was part of the Refocused Test Program then the Z-axis would require shimming up to allow full coupling engagement. However, the Z-axis is not raised this far up during cutting operations on the Westinghouse 17x17 fuel, full coupling engagement is achieved, therefore, no corrective action is required.

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 10-8-92

LOG # 8

PROCEDURE NO. 9315-TP-209D REV. 0 TITLE UCS SOT

PROCEDURE SECTION(S) B.2.4.2 step 9

CLASSIFICATION OF CHANGE: REPAIR N/A REDESIGN N/A TPCN# N/A

PROBLEM AND CAUSE:

Due to incomplete guide tube cuts, the end fitting could not be separated from the fuel assembly during the test.

TEST CONDUCTOR JB Haynes

SOLUTION/CORRECTIVE ACTION:

The end fitting was removed from ^{the} fuel assembly manually after completion of the test. No corrective action is required.

TEST CONDUCTOR JB Haynes DATE 10-8-92

QUALITY ASSURANCE _____ DATE _____ (1)

PROJECT ENGINEER _____ DATE _____ (1)

TEST DIRECTOR _____ DATE _____ (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE Proper removal of end fitting was verified during section B.2.4.3, no corrective action required.

TEST CONDUCTOR JB Haynes DATE 10-8-92

TEST PROCEDURE 9315-TP-209D

REVISION 0

APPENDIX D-3

EXCEPTION/REPAIR LOG

DATE 10-8-92

LOG #4

PROCEDURE NO. 9315-TP-209D

REV. 0

TITLE UCS SUT

PROCEDURE SECTION(S) 8.2.4.3 step 2

CLASSIFICATION OF CHANGE: REPAIR N/A

REDESIGN N/A

TPCN# N/A

PROBLEM AND CAUSE:

The acceptance criteria involving the cutting time of 75.5 minutes could not be met, a cutting time of 110 minutes was recorded.

TEST CONDUCTOR JB Hayer

SOLUTION/CORRECTIVE ACTION:

No corrective action is required. Due to the refocused test plan, the B+W fuel is not being processed. The B+W 15x15 fuel was selected for this test because of the limited supply (2) of Westinghouse 17x17 mock-ups, therefore ~~the~~ another fuel was required in order to test the ID tube cutter.

TEST CONDUCTOR JB Hayer

DATE 10-8-92

QUALITY ASSURANCE

DATE (1)

PROJECT ENGINEER

DATE (1)

TEST DIRECTOR

DATE (1)

Notes: (1) Required for redesign

CORRECTIVE ACTION: COMPLETE Cutting times for the B+W 15x15 will be evaluated in the Throughput Report.

TEST CONDUCTOR JB Hayer

DATE 10-8-92

TEST PROCEDURE 9315-TP-209D

REVISION 0

PAGE E-1

APPENDIX E
CCTV ASSESSMENT FORM

CCTV Assessment

1. Operation: (describe type of operation here)

- step 8.1.4.2 clamping end fitting
- " 8.1.4.3 Drilling end fitting
- " 8.1.6.4 Servo fault test
- " 8.2.2.2 Skirt cut

2. Camera Assessment

Camera No.

Evaluation

(describe the view that the camera is capable of providing)

- step 8.1.4.2 (6+9) Good view of end fitting except inside end fitting.
- " 8.1.4.3 (6+9) Can not see inside of end fitting, only outer surface.
- " 8.1.6.4 (3+10) Good view of entire UCS, RBT can be positioned to optimize views using camera 10
- " 8.2.2.2 (6+9) Good view of starting point, upper + north skirt surfaces only, south + bottom surfaces can not be seen

3. Recommendations: (Recommend cameras that provide the best view of the system)

- step 8.1.4.2 ~~None~~, Sufficient as is.
- step 8.1.4.3 No camera will provide a view of drilling operation or ID tube cutting.
- step 8.1.6.4 Sufficient as is.
- " 8.2.2.2 No camera will provide a view of the bottom, camera 10 ^{will} ~~might~~ provide a view of the south surface.

Test Conductor JB Hargues

Date 9-30-92

QA

Date _____

APPENDIX F
TRAINING SIGN-OFF SHEET

NAME (Print)

GUY JEANTAIL, JR.

Gordon J. Cole

THOMAS F. MULGREW

SIGNATURE

**DATE
FILMED**

11/01/93

END