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Procedure Contains NMM ECH eB REFLIB Forms: YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
Procedure Revision Type: New <input type="checkbox"/> NON-Editorial <input type="checkbox"/> Editorial <input checked="" type="checkbox"/> TC <input type="checkbox"/> Cancellation <input type="checkbox"/>

HQN Effective Date 4/2/15	Procedure Owner: Title: Site:	Roy Miller Manager, RP GGNS	Governance Owner: Title: Site:	David Moore Manager, Fleet RP HQN
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Site	Site Procedure Champion	Title
ANO	Donnie Marvel	Manager, RP
BRP	N/A	N/A
CNS	Bob Beilke	Manager, RP
GGNS	Roy Miller	Manager, RP
IPEC	Frank Mitchell	Manager, RP
JAF	Robert Heath	Manager, RP
PLP	Doug Watkins	Manager, RP
PNPS	Alan Zelig	Manager, RP
RBS	Brad Cole	Manager, RP
W3	Daniel Frey	Manager, RP
HQN	David Moore	Manager, Fleet RP

For site implementation dates see ECH eB REFLIB using site tree view (Navigation panel).

<u>Site and NMM Procedures Canceled or Superseded By This Revision</u> None
<u>Process Applicability Exclusion:</u> All Sites: <input type="checkbox"/> Specific Sites: ANO <input type="checkbox"/> BRP <input type="checkbox"/> CNS <input type="checkbox"/> GGNS <input checked="" type="checkbox"/> IPEC <input type="checkbox"/> JAF <input type="checkbox"/> PLP <input checked="" type="checkbox"/> PNPS <input checked="" type="checkbox"/> RBS <input type="checkbox"/> W3 <input type="checkbox"/>

<u>Change Statement</u> Editorial revision to remove reference to specific version of RADMAN software per CR-HQN-2015-00069 <ul style="list-style-type: none"> Removed VY from coversheet Changed title of section 5.6 as recommended by CR-HQN-2015-00069 Reworded steps 5.3[2](b) and 5.4[3](b) to align with change being made to title of section 5.6 	
Associated PRHQN #: 2015-00080	Procedure Writer: Ron Schwartz
Contains Proprietary Information: YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	



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1.0 PURPOSE


This procedure provides instruction for developing scaling factors for difficult to measure radionuclides, including waste stream identification, waste stream sampling frequency, independent laboratory waste stream sample screening and evaluation, and independent laboratory waste stream sample disposition.

2.0 REFERENCES

- [1] Title 10 of the Code of Federal Regulations, Part 61
- [2] Title 10 of the Code of Federal Regulations, Part 20 Appendix G
- [3] Title 49 of the Code of Federal Regulations, Parts 107, 171-177
- [4] Branch Technical Position on Radioactive Waste Classification, 11 May 1983
- [5] Final Branch Technical Position on Concentration Averaging and Encapsulation, Revision in Part to Waste Classification Technical Position, issued 17 Jan. 1995
- [6] RADMAN-A Computer Code to Classify and Document Package LLW in accordance with 10CFR Part 61, Main Topical Report, May 1983
- [7] RADMAN Operating Procedure, WMG-P-065 (version 8.2)
- [8] RC-101 Introduction to RADMAN and Regulatory Compliance
- [9] RADMAN Operating Procedure, WMG-P-103 (version 9.0)

3.0 DEFINITIONS

- [1] Annual - Once per calendar year (based on sample date)
- [2] Biennial - Once every second calendar year (based on sample date)
- [3] Difficult to Measure Radionuclide – Isotopes such as alpha and low energy beta emitters, which are beyond the capability of routine plant analysis
- [4] Plant or Process Change – Changes to the plant or waste stream process that may alter the waste stream characteristics. This can include, but is not limited to changes to filter media or process equipment
- [5] Radioactive Liquid Waste - Radioactive waste that exists primarily in a liquid form and includes, but is not limited to, such items as water, oils, EHC fluids, etc.

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- [6] Radioactive Solid Waste - Radioactive waste that exists primarily in a non-liquid form and includes, but is not limited to, such items as dry materials, metals, resins, filter media, and sludge
- [7] Scaling Factors - Known ratios of radionuclides in waste streams which are used to calculate the quantity of difficult to measure radionuclides
- [8] Surrogate Waste Stream - A substitute waste stream that has essentially the same radionuclide concentration or distribution as an existing waste stream.
- [9] Primary Waste Stream – For PWRs this is defined as Primary System resin and/or filters and for BWRs this is defined as the Reactor Water Clean Up System resin and/or filters
- [10] LLD – Lower limit of detection. For the purposes of this procedure, LLD is the a priori value representing the lowest value a counting system can detect based on instrument setup, calibration, background, decay time and sample volume.
- [11] Real – Isotope was determined to be above the LLD and is present in the waste
- [12] Not present – isotope was not seen above the LLD


4.0 RESPONSIBILITIES

- [1] **Vice President, Operations Support (VPOS)** is responsible for the maintenance and interpretation of this procedure, and must approve any deviations from the provisions of this procedure.
- [2] **Each Site Senior Nuclear Executive (SNE)** is responsible for ensuring that necessary site documents are established and implemented to comply with regulatory requirements and the intent of this procedure.
- [3] **Radwaste Focus Group** is responsible for periodic reviews and revisions of this procedure.
- [4] Each Site's **Radwaste Group** (Radiation Protection) is responsible for implementing the site-specific requirements of this procedure.

5.0 DETAILS

5.1 PRECAUTIONS AND LIMITATIONS

None


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5.2 GENERAL REQUIREMENTS

NOTE

An equivalent form may be used in place of Attachment 9.1, “10CFR Part 61 Waste Stream Sample Screening and Evaluation” & Attachment 9.2 “Quarterly Trending Documentation”, however the form must contain as a minimum the information contained in the attachment

- [1] The following are examples of the various waste streams used in the determination of waste stream scaling factors. This list is not exhaustive and surrogate waste streams may be used.
- Resins
 - Radioactive Liquids
 - Dry Active Waste (DAW)
 - Mechanical Filters
- [2] Frequency for sampling of existing waste streams:
- (a) Noted exceptions to Class A, B & C waste sample frequencies
- Resin media – if there is not sufficient volume in the tank or there is no intended shipment to be made, then no sample is required. The resin media (tank containing the waste stream) will be sampled prior to the next shipment after a sufficient volume (tank level) is attained or shipment is scheduled. The results of the sample taken will be used to characterize all waste (in the tank) generated since the previously documented 10CFR61 results.
 - Filters – **IF** there is not sufficient volume in the container **OR** there is no intended shipment to be made, **THEN** no sample is required. Sampling of filters will occur within the periodicity noted unless it is discovered that the waste stream information does not match the plant conditions. **IF** this situation occurs, **THEN** additional methods for sampling will be employed (filter smears, clippings **OR** running flow of the waste stream through a Millipore filter of similar micron size as the filter in service) to obtain an official sample. The 10CFR61 waste stream analysis results will be used to characterize all filters generated since the previously documented waste stream results.
- (b) Class A Waste - at least biennially (within two years from the date the last official 10CFR61 sample was taken).

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5.2[2] continued

- (c) Class B & C Waste - at least annually (within one year from the date the last official 10CFR61 sample was taken).


NOTE

Specific examples of significant equipment or process changes include: changes in oxidation reduction methods such as zinc injection, hydrogen water chemistry, media specialization, media distribution ion/cation ratios, fuel leaks and other changes in reactor coolant chemistry, sustained, unexplained changes in the routinely monitored Beta/Alpha ratios as determined by Radiation Protection, extended Reactor shutdown (>90 days), changes to liquid waste processing such as bypassing filters, utilizing filters or a change in ion exchange media, or when there are changes to waste stream that could change biogas generation rate.

- (d) **IF** there is a reason to believe that an equipment or process change has significantly altered the previously determined scaling factors by a factor of 10, **THEN** samples should be taken in addition to the annual/biennial sampling frequency. The waste stream sample should be analyzed, re-evaluated **AND** if necessary, shipped to a vendor laboratory for additional analysis.

[3] Trending

- (a) Once per quarter, each site shall compare one of the following listed ratios to the previous four quarter average of that same ratio for the primary waste stream. The ratios are taken from the Chemistry reactor water sample for the station for one of the desired combinations.
- Cs-137 to Co-60
 - I-134 to Co-60
 - Dose equivalent Iodine (DEI) to Co-60
 - I-133 to I-131
 - Cs-134 to Cs-137
- (b) Calculate an average of the ratios for the last four quarters **AND** compare the average to the current quarter.
- (c) **IF** the comparison is less than a factor of ten, **THEN** no action is required.

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5.2[3] continued

- (d) **IF** the comparison is more than or equal to a factor of ten higher, **THEN** the primary waste stream is to be sampled, analyzed, evaluated for change (increase) in waste class prior to the next shipment.
- (e) **IF** the change is more than or equal to a factor of ten lower, **THEN** the primary waste stream should be evaluated for a change (reduction) in waste class prior to the next shipment. Once it has been determined that the primary waste stream needs to be resampled prior to the next shipment, no further quarterly trending is necessary until the new data is obtained and accepted for update of the waste stream.
- (f) Document quarterly trending on Attachment 9.2.

[4] For non-routine waste streams, generate scaling factors on a case by case basis

5.3 INDEPENDENT LABORATORY ANALYSIS


[1] Obtain a sample from the appropriate waste stream and perform an in-house gamma spectral analysis of the waste stream sample.

[2] Enter the in-house gamma spectral analysis results into the RADMAN Samples module.

(a) **IF** using RADMAN version 8.2, **THEN** reference RADMAN Operating Procedure, WMG-P-065.

(b) **IF** using the current version of RADMAN, **THEN** reference RADMAN Operating Procedure WMG-P-103

[3] Ship the waste stream sample to the independent laboratory for 10 CFR 61 sample analysis per the vendor's instructions and in accordance with, EN-RW-102, Radioactive Shipping Procedure.


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5.4 WASTE STREAM SAMPLE DATA SCREENING

- [1] Using Attachment 9.1, “10 CFR Part 61 Waste Stream Sample Screening and Evaluation”, perform the waste stream sample data screening.
 - (a) **IF** the waste stream sample data activities are reported in uCi/g, **THEN** they must be converted to uCi/cc and nCi/g to perform the lower limit of detection (LLD) comparison.
 - (b) **IF** the activities are reported in uCi/sample, **THEN** the LLD comparisons cannot be performed.
- [2] **WHEN** performing the nuclide elimination, **THEN** document the nuclides eliminated on Attachment 9.1 or on the independent laboratory waste stream sample analysis.
- [3] Upon completion of the waste stream sample screening process, enter the new waste stream data into the RADMAN Samples module
 - (a) **IF** using RADMAN version 8.2, **THEN** enter data according to RADMAN Operating Procedure, WMG-P-065.
 - (b) **IF** using the current version of RADMAN, **THEN** enter data according to RADMAN Operating Procedure, WMG-P-103.
- [4] Complete the “entered by” **AND** “verified by” on Attachment 9.1.

5.5 WASTE STREAM SAMPLE DATA EVALUATION USING RADMAN VERSION 8.2

- [1] Use Attachment 9.1 in conjunction with these instructions to perform the waste stream sample data evaluation.
- [2] Compare the independent laboratory results to the in-house gamma results for the same sample using the Validate program in the RADMAN Samples module per RADMAN Operating Procedure, WMG-P-065. The comparisons performed are specific activity (for samples results reported in uCi/g or uCi/cc) and fractional abundance.
- [3] **IF** the specific activity **OR** fractional abundance comparison exceeds the recommended variance, **THEN**:
 - (a) Investigate to determine the reason for the variance **OR** re-sample **AND** re-analyze the waste stream.
 - (b) Document the results of the investigation **OR** the reason for re-sampling and re-analyzing the waste stream on Attachment 9.1.

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5.5[3] continued

- (c) **IF** the new waste stream sample data is determined acceptable with variances greater than what is recommended, **THEN** document the explanation for the variance and disposition on Attachment 9.1.
- (d) **IF** the new waste stream sample data is determined to be unacceptable due to variances greater than what is recommended **OR** the waste stream is resampled and analyzed, **THEN** initiate a Condition Report.


NOTE

Exercising the Simulate Database Update function does not affect the existing waste stream 10 CFR Part 61 database. This program is a useful tool for determining the appropriate option (Retain old data and re-sample, Replace old data with new, or Combine old data with new) for updating the 10 CFR Part 61 database.

The NRC approved Topical Report for RADMAN contains flowcharts that can be used to help explain variances.

For new waste streams being developed there will not be a sample in the database to update. In this case the parts of Attachment 9.1 concerning comparison to the database may be marked as not applicable ("N/A").

- [4] Using the RADMAN Simulate Database Update function according to RADMAN Operating Procedure WMG-P-065, compare the specific activity, fractional abundance and scaling factors from the existing waste stream sample data to the new independent laboratory sample data set.
- [5] **IF** the specific activity, fractional abundance **OR** scaling factor comparison exceeds the recommended variance, **THEN**:
 - (a) Perform an investigation to determine a reason for the variance **OR** resample and reanalyze the waste stream.
 - (b) Document the results of the investigation **OR** the reason for resampling and reanalyzing the waste stream on Attachment 9.1.
 - (c) **IF** the new waste stream sample data is determined acceptable with variances greater than what is recommended, **THEN** document the explanation for the variance **AND** disposition on Attachment 9.1.

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5.5[5] continued

(d) **IF** existing sample data is to be retained **AND** not replaced **OR** combined due to unacceptable new waste stream sample data, **THEN** document the reason(s) on Attachment 9.1 **AND** initiate a Condition Report.

[6] **WHEN** the independent laboratory waste stream sample data (scaling factors) has been accepted, **THEN** replace the existing waste stream sample data with the new sample data **OR** combine the existing waste stream sample data with new sample data.

[7] Record the waste stream update verification on Attachment 9.1.

[8] Transmit a copy of the independent DAW Laboratory Analysis to the appropriate RP department personnel (e.g., Dosimetry, Instrumentation etc.)

[9] Transmit a copy of all new waste stream data to the Chemistry/Environmental personnel responsible for site effluent data.

5.6 WASTE STREAM SAMPLE DATA EVALUATION USING CURRENT VERSION OF RADMAN

[1] From the RADMAN home page, select the “Distribution” tab.

[2] Select “Nuclide Distribution Listing.”


[3] Select the distribution to be updated.

[4] From the Commands window, select “Update Distribution.”

[5] Select the sample to be used for the update.

[6] From the Commands window select “Replace Report,” **THEN** print the following reports:

- Scaling Factors
- Fractional (%) Abundance
- Data Values


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5.6 continued

NOTE

The Combine Report shows what the result will be if the Combine Existing Data action is executed. This shows what the effect of combining the old sample data with the new sample will be (in effect, a rolling average of past data).

- [7] From the Commands window select “Combine Report,” **THEN** print the following reports:
- Scaling Factors
 - Fractional (%) Abundance
 - Data Values
- [8] Compare the results of “Replace Report” to the results of “Combine Report.”
- [9] **IF** the specific activity, fractional abundance **OR** scaling factor comparison exceeds the recommended variance, **THEN**:
- (a) Perform an investigation to determine a reason for the variance **OR** resample and reanalyze the waste stream.
 - (b) Document the results of the investigation **OR** the reason for resampling and reanalyzing the waste stream on Attachment 9.1.
 - (c) **IF** the new waste stream sample data is determined acceptable with variances greater than what is recommended, **THEN** document the explanation for the variance **AND** disposition on Attachment 9.1.
 - (d) **IF** existing sample data will be retained and not replaced or combined due to unacceptable new waste stream sample data, **THEN** document the reason(s) on Attachment 9.1 **AND** initiate a Condition Report.
- [10] **WHEN** the independent laboratory waste stream sample data (scaling factors) has been accepted, **THEN** replace the existing waste stream sample data with the new sample data **OR** combine the existing waste stream sample data with new sample data.
- [11] Record the waste stream update verification on Attachment 9.1.

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5.6 continued

- [12] Transmit a copy of the independent DAW Laboratory Analysis to the appropriate RP department personnel (e.g., Dosimetry, Instrumentation etc.)
- [13] Transmit a copy of all new waste stream data to the Chemistry/Environmental personnel responsible for site effluent data.

6.0 INTERFACES

- [1] EN-RW-102, "Radioactive Shipping Procedure"
- [2] EN-AD-103, "Document Control and Records Management Programs"
- [3] RADMAN Operating Procedure WMG-P-065
- [4] RADMAN Operating Procedure WMG-P-103

7.0 RECORDS


- [1] Attachment 9.1, "10CFR Part 61 Waste Stream Sample Screening and Evaluation"
- [2] Attachment 9.2, "Quarterly Trending Documentation"
- [3] RADMAN software output
- [4] Independent laboratory waste stream sample analysis results

8.0 SITE SPECIFIC COMMITMENTS

None

9.0 ATTACHMENTS

- 9.1 10CFR Part 61 Waste Stream Sample Screening and Evaluation
- 9.2 Quarterly Trending Documentation

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Date: _____

In-House Sample Identification Number: _____

Independent Lab Sample Identification Number _____

Waste Stream Description: _____

Waste Stream Sample Data Screening


The screening process performs the following:

- Eliminate nuclides based on specific criteria,
- Record the status of 10 CFR 20 Appendix G radionuclides as LLD, Real or Not Present.
- Record the status of RADMAN base nuclides as LLD or Real.
- Determine that the values reported as an LLD for named 10 CFR Part 61 nuclides meet the limits established by the NRC.
- The nuclides selected from the screening process will be evaluated for the purpose of updating the applicable RADMAN waste stream sample database.

Nuclide Elimination

<i>Eliminate the following nuclides based on the criteria listed below:</i>	<i>List the nuclide(s) eliminated <u>and</u> comments if applicable.</i>
Nuclide is naturally occurring (i.e. Pb, Rn, K, Po, etc)	
Nuclide is a noble gas (i.e. Xe, Kr, etc.)	
Nuclide has a half life <8 days with exception of I-131 which has an extremely low RQ value	
Nuclide is lower than the detectable limit and is not a base nuclide or 10 CFR 20 Appendix G nuclide	

Comments: _____

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ATTACHMENT 9.1

10CFR PART 61 WASTE STREAM SAMPLE SCREENING AND EVALUATION

Sheet 2 of 5

10 CFR 20 Appendix G Nuclides Status


Nuclide	Value	Real	LLD	LLD Limit 1% of Table 1 Class C Limits for C-14, I-129, Tc-99 and 1% of Table 2 Class A Limits for H-3	Not Present
C-14				$\leq 8\text{E-}2$ uCi/cc	
H-3				$\leq 4\text{E-}1$ uCi/cc	
I-129				$\leq 8\text{E-}4$ uCi/cc	
Tc-99				$\leq 3\text{E-}2$ uCi/cc	

Comments: _____

RADMAN Base Nuclides Status

Nuclide	Value	Real	LLD	LLD Limit 1% of Table 2 Class A Limits	Not Present
Co-60				≤ 7 uci/cc	
Cs-137				$\leq 1\text{E-}2$ uCi/cc	
Ce-144				≤ 7 uci/cc	

Comments: _____

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ATTACHMENT 9.1

10CFR PART 61 WASTE STREAM SAMPLE SCREENING AND EVALUATION

Sheet 3 of 5

10 CFR 61.55 Listed Nuclides Status

Table 1 Nuclides


Nuclide	Value	Real	LLD	LLD Limit 1% of Table 1 Class C limits	Not Present
C-14				$\leq 8E-2$ uCi/cc	
C-14 in activated metal				$\leq 8E-1$ uCi/cc	
Ni-59 in activated metal				≤ 2.2 uCi/cc	
Nb-94 in activated metal				$\leq 2E-3$ uCi/cc	
Tc-99				$\leq 3E-2$ uCi/cc	
I-129				$\leq 8E-4$ uCi/cc	
Pu-241				≤ 35 nCi/gm	
Cm-242				≤ 200 nCi/gm	
TRUs > 5 year T $\frac{1}{2}$				< 1 nCi/gm	

Comments: _____

Table 2 Nuclides

Nuclide	Value	Real	LLD	LLD Limit 1% of Table 2 Class A limits	Not Present
H-3				$\leq 4E-1$ uCi/cc	
Co-60				≤ 7 uCi/cc	
Ni-63				$\leq 3.5E-2$ uCi/cc	
Ni-63 in activated metal				$\leq 3.5E-1$ uCi/cc	
Sr-90				$\leq 4E-4$ uCi/cc	
Cs-137				$\leq 1E-2$ uCi/cc	

Comments: _____

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ATTACHMENT 9.1

10CFR PART 61 WASTE STREAM SAMPLE SCREENING AND EVALUATION

Sheet 4 of 5

RADMAN Waste Stream Sample Data Set Entry

With the exception of the nuclides eliminated during the screening, enter the following nuclides into RADMAN as a sample data set and attach a hard copy of sample data entered.

- 10 CFR 20 Appendix G nuclides (indicate real, LLD, or not present)
- RADMAN Base nuclides (indicate real or LLD)
- 10 CFR 61.55 nuclides that have a real value

Sample data entered by: _____ Date _____

Sample data entry verified by: _____ Date _____


Sample Evaluation

Using RADMAN perform the Validate program in the Samples module and attach the hard copy. This program compares the independent laboratory results to the in-house gamma results for the same sample. Two comparisons are performed specific (for samples reported in uCi/cc or uCi/g) and total activity, and fractional abundance.

Document the variances identified by the Validate program and disposition.

Using RADMAN, compare existing waste stream data to a new independent laboratory sample data set attaching the software output hard copy. Comparisons are made for specific activity, fractional abundance and scaling factors. Based on the comparisons from the simulation, determine which option should be used to update the RADMAN waste stream Part 61 database:

- Retain old data and resample
- Replace old data with new sample
- Combine old data with new data

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Document the variances identified by the software **AND** the action taken to address each variance:

Specific Activity Variances:

Fractional Abundance Variances: (2 for base nuclides Co-60, Cs-137, and 5 for Ce-144)

Scaling Factor Variances:

Based on the above variances, the waste stream sample is dispositioned as:


- ☐ Retain old data and resample
☐ Replace old data with new sample
☐ Combine old data with new data

Reason for the above disposition:

Waste Stream Evaluation Performed by: _____ Date _____

Waste Stream Evaluation Reviewed by: _____ Date _____

Waste Stream Update Verified by: _____ Date _____

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ATTACHMENT 9.2

QUARTERLY TRENDING DOCUMENTATION

Sheet 1 of 1

Document the radionuclide ratio utilized per 5.2[3]: _____

Current quarter average: _____

Four quarter average: _____

A – Current quarter average value

B – Previous four quarters' average value (not including current quarter average, e.g. whole year prior to current quarter)

A & B – same selected nuclide ratios utilized

$B / A = \text{Variance (C)}$ as well as $1 / C$ if value of C is < 1.0

Variance (C) _____

Based on the above variance, the waste stream sample is dispositioned as:

- $<$ a factor of 10 – no action taken – current quarter
- \geq a factor of 10 – schedule re-sample of primary waste stream – prior to next shipment

Comments:

Performed by: _____ Date _____

Reviewed by: _____ Date _____