VALIDATION REPORT

Content uniformity and Dissolution Acceptance Limits is a set of SAS™ programs used to evaluate data against the current USP XXIII content uniformity and dissolution tests. Validation of these programs has been successfully completed. Details of the validation are given in this report.

PREPARED BY: James Bergum Date: 1/4/02

APPROVED BY:

Laura Foust: Laura B Foust Date: 01/08/02

MaryAnn Gorko Mary Ann Gorko Date: 1/15/02

Douglas Lee: D Lee Date: 1/16/02

Jerry Planchard: J Planchard Date: 1/22/02

Helen Strickland Helen A. Strickland Date: 02/04/2002

Merlin Utter: Merlin Utter Date: 02/11/2002

CONTENTS:

VALIDATION SUMMARY

There were three problem request forms (See request forms) and nine amendments (See Amendments) generated during the course of the validation resulting in several changes to the original protocol and minor changes to two of the SAS programs. The following two revisions were made to SAS programs: 1) A missing "&" was inserted in a line of code in the program DISP1.SAS (See Problem Request form from MaryAnn Gorko dated 5/18/01 and Amendment 7) so that an error screen would be generated when the input for the sample mean was less than Q. Also, two revisions to the DISP1.SAS code were made to make the program more efficient. 2) A "SE" in a line of code in the program DISP2.SAS was replaced by "SM" (See Amendment 8). This revision generates an error screen when the standard deviation for the between location standard deviation was less than zero. After making these two revisions, the test data ran correctly.

The other seven amendments involved a misprint in a formula (See Amendment 1 (Revised), release of a team member (See Amendment 2), replication of file (See Amendment 3), reversal of column headings in test data (See Amendment

4), misprint in amendment title (See Amendment 5), misprint in the description of the second stage of the capsule content uniformity test (See Amendment 6), and misprints in test values (See Amendment 8, Amendment 9).

The validation was performed in five steps (See original protocol): 1) Loading and running the program, 2) Testing for input errors in the primary windows, 3) Verifying the mathematical calculations for the lower bounds, 4) Verifying program strategy and SAS code, and 5) Independent calculations of test data using computer programs other than SAS. Each of these steps is listed below with comments on issues/problems that arose during the validation.

1) Loading and running of the program (See signed Form 1's)

Comments: All team members were able to load and run the program. All but one member ran the program using version 6.12 of SAS. The remaining member used version 8 and found that the enhanced editor must be turned off to run the program.

2) Testing for input errors in the primary windows (See signed Form 2, test data)

Comments: All input error window worked correctly after the following two changes: 1) Changed Line of SAS code in DISP2.SAS changing "SE" to "SM" (See Amendment 8), and 2) Corrected the test data set so that input values for Q and the sample mean correspond to dissolution instead of content uniformity (See Problem Request Form from Jerry Planchard dated 10/04/01). The program generates an error when input values are outside 85 to 115 for content uniformity or outside Q to 100 for dissolution. However, in the original protocol, the test data set for dissolution used values corresponding to the 85 to 115 range instead of Q to 100.

3) Verify mathematical calculations for lower bound (See signed Form 3)

Comments: There were no concerns/issues with the lower bound calculations

4) Verify program strategy and SAS code (See signed Form 4, Support Documentation)

Comments: There were no concerns/issues with the program strategy. The only comments on the SAS code are described in the Problem Request form from MaryAnn Gorko dated 5/18/01 and addressed in Amendment 7. The changes were 1) Put a missing "&" in DISP1.SAS and 2) Make several changes to DISP1.SAS (the changes had no effect on the program output but made the program more efficient). Note: Although Amendment 5 provided a revised Form 4 due to a misprint in the spelling of “PROGRAM”, the original Form 4 with the misprint was actually signed and included in this report.

5) Run Test Data Sets (See signed Form 5)

Part 1) Test the manager program (See completed test data form)

Comments: There were no issues/concerns with the manager program

Part 2) Compare acceptance limit table results with the expected results and an independent calculation. (See completed test data form and support documentation)

Comments: An independent calculation of the test data sets was performed using SPLUS. There were seven discrepancies found that are described in a problem request form from Merlin Utter dated 10/11/01 and addressed in Amendment 9. The results upon rerunning the CuDAL program agreed with the results found by Merlin Utter.

Part 3) Compare acceptance limit table evaluation results with the expected results and perform an independent calculation. (See completed test data form and Supporting Documentation)

Comments: An independent calculation of the test data sets was performed using MathCad. The results agreed to 4 places past the decimal point with one exception (Dissolution, Sampling plan 2, Q=40, Confidence level = 50, Lower Bound = 50, population mean = 75, between location standard deviation = 10, and within location standard deviation = 10). The SAS program result was 0.76350 whereas the MathCad result was 0.76500. Due to the extreme nature of this test data set and the number of integration lines (over 13000), the small difference of 0.0015 is considered acceptable.

Part 4) Compare lower bound results based on given sample input with the expected results and perform an independent calculation. (See completed test data form)

Comments: An independent calculation of the test data sets was performed using SPLUS. There were two discrepancies found that are described in a problem request form from Merlin Utter dated 10/11/01 and addressed in Amendment 9. The results upon rerunning the SAS program agreed with the results found by Merlin Utter

ORIGINAL PROTOCOL

Content **U**niformity and **D**issolution **A**cceptance **L**imit Program

VALIDATION PROTOCOL

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PROTOCOL

PURPOSE:

The validation of a program to generate content uniformity and dissolution acceptance limits (CuDAL) will be conducted to verify its functionality and reliability in generating acceptance limit tables based on user input.

OVERVIEW:

CuDAL is a set of programs written by James Bergum in SAS™ that can be used to evaluate content uniformity and dissolution data against the current USP XXIII tests. The program will generate an acceptance limit table for content uniformity and/or dissolution that can be applied when using two specific sampling plans. The first sampling plan assumes that one unit is tested for uniformity or dissolution from each of several locations throughout a batch. The second sampling plan assumes that an equal number of units (greater than one) are tested from several locations throughout a batch. For both sampling plans, the user can output the acceptance limit table, perform an evaluation of the table that determines the probability of passing the table given the population parameters, or generate a lower bound on the probability of passing the uniformity or dissolution test for a specific sample result. Meeting the acceptance limits given in the table assures that any future sample taken from the batch will pass the corresponding USP XXIII content uniformity or dissolution test at least P% of the time with a C% confidence level. The value of P and C are provided by the user.

DESCRIPTION OF SYSTEM SOFTWARE:

CuDAL was written using SAS™. The program consists of six files: FILES.SAS, MANAGER.SAS, CUSP1.SAS, CUSP2.SAS, DISP1.SAS, and DISP2.SAS written in SAS™. A hardcopy of these programs is given in Appendix A. During execution of the program, windows are displayed for user input (Primary Windows). If an input error is made by the user, an error window is displayed. These files and windows are listed Appendix B. Primary windows are also displayed in Appendix B. The software was designed to run on any IBM or compatible PC that has SAS™ 6.12 or later.

DESCRIPTION OF SYSTEM HARDWARE:

CuDAL was written in SAS™ Version 6.12 to run on any IBM or compatible PC that has SAS 6.12 or later on it. There are no additional hardware requirements. The PC's used in the validation of CuDAL will be documented in the validation report.

ASSUMPTIONS, EXCLUSIONS, AND OPERATIONAL LIMITATIONS:

The CuDAL program will operate using the appropriate PC hardware and software. There are no operational limits that have been identified at the time of this validation. Since SAS™ is an accepted vendor supplied software package, validation of the SAS™ program itself is not necessary.

The PC's used in the CuDAL validation are considered validated with respect to mice, keyboards, printers, monitors, and diskette drives.

VALIDATION PLAN:

The validation team to perform validation of CuDAL consists of the following members of the PhRMA Statistics Committee Working Group:

Laura Foust, Eli Lilly & Company
MaryAnn Gorko, Dupont Pharmaceuticals
Douglas Lee, Pfizer Inc.
Jerry Planchard, Hoechst Marion Roussel
Edith Senderak, Merck & Company, Inc.
Helen Strickland, Glaxo-Wellcome Inc.
Merlin Utter, Wyeth-Ayerst Pharmaceuticals

CV's from each member of the validation team will be included in the supporting documentation.

There are three validation subteams:

1) Macro strategy, SAS™ code, and Mathematical calculations:

Laura Foust
MaryAnn Gorko
Edith Senderak
Helen Strickland

2) Window Input Error Checking - Jerry Planchard

3) Test Data Evaluation and Independent Calculations-

Merlin Utter
Doug Lee
Jerry Planchard

The validation steps are described below:

VALIDATION STEPS

1) LOAD AND RUN PROGRAM

Each member of the validation team will:

- i) Copy the six program files (FILES.SAS, MANAGER.SAS, CUSP1.SAS, CUSP2.SAS, DISP1.SAS, AND DISP2.SAS) to their computer
- ii) Modify the file FILES.SAS to indicate location of the files on their PC
- iii) Submit the program FILES.SAS
- iv) Press enter to continue at the first window (STARTER) and input Y to all four entries on the second window (MAIN) to request running all four analysis macros (content uniformity and dissolution for both sampling plan 1 & 2).
- vi) Use the default values for all remaining windows (i.e. Press return for all requested input)
- vii) Compare the default output to the expected output found in Appendix C.
- viii) Fill out Form 1 to verify that the program was loaded properly and the appropriate output was generated.

2) TEST FOR INPUT ERRORS IN PRIMARY WINDOWS

The Error Checking Subteam will run the program to perform error checks. Test data are contained in Appendix D listing the main window name, input requested, test input, expected response, found response, and a column to record agreement between expected and found response. The Error Checking subteam will indicate a Y or N in this column after each test indicating whether or not an error window was displayed and the user was returned to the appropriate location on the input window. Once all error checks have been made, Form 2 will be filled out indicating whether or not all error checks passed.

3) VERIFY MATHEMATICAL CALCULATIONS FOR LOWER BOUND

Appendix E contains the mathematical calculations used to calculate the lower bound for each test. These calculations will be reviewed by the Macro strategy, SAS code, and Mathematical calculation subteam for appropriateness & accuracy. Form 3 will be filled out indicating that these calculations were reviewed and are considered correct.

4) VERIFY PROGRAM STRATEGY AND SAS CODE

The program will be reviewed by the Macro strategy, SAS™ code, and Mathematical calculation subteam to verify that the strategy is correct, the code implements the strategy correctly, and that the mathematical calculations are implemented correctly. A complete description of the SAS™ programs is given is Appendix F. Form 4 will be filled out to indicate that each macro has been reviewed for strategy, correct code, and mathematical lower bound implementation.

5) RUN TEST DATA SETS:

The test data sets are given in Appendix G. The test data is split into four parts as described below:

Part 1)

This part tests the manager program that receives input from the primary window MAIN. The program will be tested in two runs of the program. The test data provides the user input for calling the analysis macro CUSP1 (Content Uniformity using sampling plan 1), CUSP2 (Content Uniformity using sampling plan 2), DISP1 (Dissolution using sampling plan 1), and DISP2 (Dissolution using sampling plan 2) as well as the expected result. A column is provided to indicate whether or not the observed result agrees with the expected result. The validation team member performing this part of the validation will fill in this column with the appropriate response (Y or N).

Part 2)

In this part, the validation team member will compare two sets of acceptance limit table results with the expected results given in the test data set. The first set of results will be obtained by running the CuDAL program using the specified input values given in the test data set. The second set of results will be obtained by performing an independent calculation of the acceptance limit table result. This calculation will be performed using a software package other than SAS. The validation member performing these calculations will provide details as of the software and programs used to perform the calculations. The validation team member performing this part of the validation will fill in the final three columns in the test data table indicating the CuDAL program result, independent calculation result, and whether or not all three calculations agree with one another. Results should agree with the expected results after rounding to the number of digits given in the expected result column.

Part 3)

In this part, the validation team member will compare two sets of acceptance limit table evaluation results with the expected results given in the test data set. The first set of results will be obtained by running the CuDAL program with the specified input values given in the test data set. The second set of results will be obtained by performing an independent calculation of the acceptance limit table result. The validation team member will obtain the data sets used to perform the evaluations by saving the appropriate data set: ONE for content uniformity using sampling plan 1, TABC for content uniformity using sampling plan 2, DIONE for dissolution using sampling plan 1, and TABD for dissolution using sampling plan 2. These data sets are created by CuDAL and used to evaluate an acceptance limit table. The independent evaluation calculation will be performed running the appropriate saved data set on a software package other than SAS™. The validation member performing these calculations will provide details of the software and programs used to perform the calculations. The validation team member performing this part of the validation will fill in the final three columns in the test data table indicating the CuDAL program result, independent calculation result, and whether or not all three calculations agree with one another. Independent results should agree with the expected results to at least four digits past the decimal point in the expected result column.

Part 4)

In this part, the validation team member will compare two sets of lower bound results based on given sample input with the expected results given in the test data set. The first set of results will be obtained by running the CuDAL program with the specified input values given in the test data set. The second set of results will be obtained by performing an independent calculation of the acceptance limit table result. The independent evaluation calculation will be performed using a software package other than SAS™. The validation member performing these calculations will provide details of the software and programs used to perform the calculations. The validation team member performing this part of the validation will fill in the final three columns in the test data table indicating the CuDAL program result, independent calculation result, and whether or not all three calculations agree with one another. Results should agree with the expected results after rounding to the number of digits given in the expected result column.

CRITERIA FOR ACCEPTANCE:

Forms 1- 4 are all signed indicating that the program loaded and ran successfully, input errors made in the primary window return appropriate error windows, the mathematical calculations for the lower bound is correct, the strategy used is appropriate, the SAS™ code is correct, and the test data expected result agreed with both the CuDAL output from the validation members own run and the result from the independent calculation.

It will be the responsibility of the validation team to determine what impact any problems encountered, either singularly or in total, will have on this validation. The decision to continue or terminate this validation will be made by the validation team.

For ultimate acceptance, the program should perform as described without any failure that would compromise the user's confidence in the reliability of this program.

ERROR RESOLUTION:

Errors (discrepancies in results versus expected performance) detected during testing will be recorded on a Problem/Request Report form. A request for error resolution will be transmitted to the programmer (James Bergum). The validation team will evaluate and approve/accept all error resolutions received from the programmer.

DOCUMENTATION:

Once validation is done, the following documentation will be placed on a Recordable CD for distribution:

1) Programs
2) Validation protocol
3) Validation report

Any additional supporting documentation will be kept by James Bergum.

RESPONSIBILITIES AND AUTHORITY:

Validation protocol preparation: James Bergum

Approval of validation protocol: Validation Team

Execution of testing procedures: Validation Team

Evaluation of validation study results: Validation Team

Preparation of validation study report: James Bergum

Approval of validation study report: Validation Team

PROTOCOL CHANGES:

Any changes or revisions of the protocol, and reasons for them, will be documented, dated, and signed by the validation team and will be retained as amendments to the protocol.

PROTOCOL APPROVAL

Laura Foust:	Laura B Foust	Date: 05-June-2000
MaryAnn Gorko	Mary Ann Gorko	Date: 12-June-2000
Douglas Lee:	D M Lee	Date: 14 JUNE 2000
Jerry Planchard:	J Planchard	Date: 6/16/00
Edith Senderak:	Edith Senderak	Date: 6/21/2000
Helen Strickland	Helen N. Strickland	Date: 06/29/2000
Merlin Utter:	Merlin Utter	Date: 6/26/2000

APPENDIX A

PROGRAMS

FILES.SAS

```

**** DIRECTORY FOR MANAGER MACRO ********;

%LET MANAGER = 'A:\MANAGER.SAS';

****  DIRECTORIES FOR ANALYSIS MACROS  *********;

%LET CU1 = 'A:\CUSP1.SAS';
%LET CU2 = 'A:\CUSP2.SAS';
%LET DI1 = 'A:\DISP1.SAS';
%LET DI2 = 'A:\DISP2.SAS';

************************************************;

%INCLUDE "&MANAGER";
```

MANAGER.SAS

```
%macro start;
data _null_;
window STARTER color=GRAY
#5 @34 "CuDAL"  C=BLUE
#7 @10  "CONTENT UNIFORMITY AND DISSOLUTION ACCEPTANCE LIMITS" C=BLUE
#12 @24 "WRITTEN BY JAMES BERGUM" C=BLUE
#13 @25 "VERSION 1, REVISION 0" C=BLUE
#16 @24  "PRESS ENTER TO CONTINUE" C= WHITE;
DISPLAY STARTER bell;
dm starter '';
stop;
run;
%mend start;
%start
%macro win;
data _null_;
window MAIN color=GREY
#5 @5 "INDICATE TEST(S) AND SAMPLING PLAN(S) DESIRED (Y OR N)" C=BLUE
#8 @5  "CONTENT UNIFORMITY"  C=BLUE
#10 @10 "SAMPLING PLAN 1    (1/LOCATION) = " C= WHITE A_CUS1 $1.
#11 @10 "SAMPLING PLAN 2 (GT 1/LOCATION) = " C= WHITE A_CUS2 $1.
#14 @5  "DISSOLUTION"  C=BLUE
#16 @10 "SAMPLING PLAN 1    (1/LOCATION) = " C=WHITE A_DIS1 $1.
#17 @10 "SAMPLING PLAN 2 (GT 1/LOCATION) = " C=WHITE A_DIS2 $1.;
Window ANSWIN Color=RED
   COLUMNS=50 ICOLUMN=10 ROWS=10 IROW=5
#1 "REQUEST REQUIRES A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
A_CUS1 = 'Y';
A_CUS2 = 'N';
A_DIS1 = 'N';
A_DIS2 = 'N';
 MAIN:
DISPLAY MAIN bell;
IF A_CUS1 NE 'Y' AND A_CUS1 NE 'N' AND A_CUS1 NE 'y' AND A_CUS1 NE 'n'
THEN DO; DISPLAY ANSWIN BELL;
GOTO MAIN;
END;
IF A_CUS2 NE 'Y' AND A_CUS2 NE 'N' AND A_CUS2 NE 'y' AND A_CUS2 NE 'n'
THEN DO; DISPLAY ANSWIN BELL;
GOTO MAIN;
END;
IF A_DIS1 NE 'Y' AND A_DIS1 NE 'N' AND A_DIS1 NE 'y' AND A_DIS1 NE 'n'
THEN DO; DISPLAY ANSWIN BELL;
GOTO MAIN;
END;
IF A_DIS2 NE 'Y' AND A_DIS2 NE 'N' AND A_DIS2 NE 'y' AND A_DIS2 NE 'n'
THEN DO; DISPLAY ANSWIN BELL;
GOTO MAIN;
END;
CALL SYMPUT("A_CUS1",PUT(UPCASE(A_CUS1),$1.));
CALL SYMPUT("A_CUS2",PUT(UPCASE(A_CUS2),$1.));
CALL SYMPUT("A_DIS1",PUT(UPCASE(A_DIS1),$1.));
CALL SYMPUT("A_DIS2",PUT(UPCASE(A_DIS2),$1.));
STOP;
RUN;
%MEND WIN;
%MACRO AGAIN;
data _null_;
window GOBACK color=GRAY
#5 @24 "GO BACK TO MAIN MENU? (Y OR N) = "  C=BLUE  A_MAIN $1.
#16 @24  "PRESS ENTER TO CONTINUE" C=WHITE;
Window ANSBACK Color=RED
   COLUMNS=50 ICOLUMN=10 ROWS=10 IROW=5
```

```
#1 "REQUEST REQUIRES A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
A_MAIN = 'N';
 MAINBACK:
DISPLAY GOBACK bell;
IF A_MAIN NE 'Y' AND A_MAIN NE 'N' AND A_MAIN NE 'y' AND A_MAIN NE 'n'
THEN DO; DISPLAY ANSBACK BELL;
GOTO MAINBACK;
END;
CALL SYMPUT("A_MAIN",PUT(UPCASE(A_MAIN),$1.));
STOP;
RUN;
%MEND AGAIN;
%MACRO ANALYZE;
 %OVER:
   %WIN;
%IF %UPCASE(&A_CUS1)=Y %THEN %DO;
     %include &CU1;
    %END;
%IF %UPCASE(&A_CUS2)=Y %THEN %DO;
    %include &CU2;
    %END;
%IF %UPCASE(&A_DIS1)=Y %THEN %DO;
    %include &DI1;
    %END;
%IF %UPCASE(&A_DIS2)=Y %THEN %DO;
      %include &DI2;
    %END;
    %AGAIN
%IF %UPCASE(&A_MAIN)=Y %THEN %GOTO OVER;
%MEND ANALYZE;
%ANALYZE
run;
```

CUSP1.SAS

```
%MACRO CUSP1;
%LET D=0.1;
%macro winCUSP1;
DATA _NULL_;
WINDOW MCUSP1 COLOR=GRAY
#1 "CONTENT UNIFORMITY ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 1 (ONE SAMPLE PER LOCATION)" C=yellow
#4  "ENTER DOSAGE FORM (TABLET OR CAPSULE):  " C=BLUE FORM  $7.
     A=UNDERLINE
#5  "ENTER SAMPLE SIZE:  " C=BLUE NUMBER 4.0 A=UNDERLINE
#7  "ENTER BOUND ON FUTURE PERCENTAGE PASSING (50.0-99.0):  "
     C=BLUE LBOUND 4.1 A=UNDERLINE
#8  "ENTER CONFIDENCE LEVEL (50.0-99.0):  " C=BLUE CILEVEL 4.1
     A=UNDERLINE
#10 "DO YOU WANT TO PRINT THE ACCEPTANCE LIMIT TABLE?" C=BLUE
#11 "ENTER Y OR N ="  C=BLUE A1CUSP1 $1.
#13 "DO YOU WANT TO EVALUATE THE ACCEPTANCE LIMIT TABLE?" C=BLUE
#14 "ENTER Y OR N ="  C=BLUE A2CUSP1 $1.
#16 "DO YOU WANT THE LOWER BOUND FOR A SPECIFIC SAMPLE RESULT?"
    C=BLUE
#17 "ENTER Y OR N ="  C=BLUE A3CUSP1 $1.;
WINDOW DOSCUSP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "DOSAGE FORM MUST BE CAPSULE OR TABLET" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW SCUSP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "SAMPLE SIZE MUST BE AN INTEGER GREATER THAN 4" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW BCUSP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "THE LOWER BOUND ON THE PERCENTAGE OF ALL FUTURE BATCHES" C=YELLOW
#2 "PASSING THE USP TEST MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#3 "(TYPICAL VALUES ARE 50.0 AND 95.0)" C=YELLOW
#5 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW CICUSP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "CONFIDENCE INTERVAL VALUES MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#2 "(TYPICAL VALUES ARE 90.0, 95.0, OR 99.0)" C=YELLOW
#4 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ANSCUSP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "REQUESTS REQUIRE A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
FORM='CAPSULE';
NUMBER=30;
LBOUND = 95;
CILEVEL = 95;
A1CUSP1 = 'Y';
A2CUSP1 = 'N';
A3CUSP1 = 'N';
MAINCU1:
DISPLAY MCUSP1 BELL;
IF FORM NE 'CAPSULE' AND FORM NE 'TABLET' THEN DO;
DISPLAY DOSCUSP1 BELL;
```

```
GOTO MAINCU1;
END;
IF NUMBER  LE 4 OR NUMBER NE ROUND(NUMBER) THEN DO;
DISPLAY SCUSP1 BELL;
GOTO MAINCU1;
END;
IF LBOUND GT 99.0 OR LBOUND LT 50.0 THEN DO;
DISPLAY BCUSP1 BELL;
GOTO MAINCU1;
END;
IF CILEVEL GT 99.0 OR CILEVEL LT 50.0 THEN DO;
DISPLAY CICUSP1 BELL;
GOTO MAINCU1;
END;
IF A1CUSP1 NE 'Y' AND A1CUSP1 NE 'N' AND A1CUSP1 NE 'y' AND
   A1CUSP1 NE 'n' THEN DO;
DISPLAY ANSCUSP1 BELL;
GOTO MAINCU1;
END;
IF A2CUSP1 NE 'Y' AND A2CUSP1 NE 'N' AND A2CUSP1 NE 'y' AND
   A2CUSP1 NE 'n' THEN DO;
DISPLAY ANSCUSP1 BELL;
GOTO MAINCU1;
END;
IF A3CUSP1 NE 'Y' AND A3CUSP1 NE 'N' AND A3CUSP1 NE 'y' AND
   A3CUSP1 NE 'n' THEN DO;
DISPLAY ANSCUSP1 BELL;
GOTO MAINCU1;
END;

CALL SYMPUT("A1CUSP1",PUT(UPCASE(A1CUSP1),$1.));
CALL SYMPUT("A2CUSP1",PUT(UPCASE(A2CUSP1),$1.));
CALL SYMPUT("A3CUSP1",PUT(UPCASE(A3CUSP1),$1.));
CALL SYMPUT("NUMBER",PUT(NUMBER,4.0));
CALL SYMPUT("LBOUND",PUT(LBOUND,4.1));
CALL SYMPUT("FORM",PUT(UPCASE(FORM),$7.));
CALL SYMPUT("CILEVEL",PUT(CILEVEL,4.1)); STOP;
RUN;
%mend winCUSP1;
%macro c1calc;
   C2 = 0.078;
   K = 1 + 30 * LLU * LLU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 30 * LLU * LLU / (SIGMA * SIGMA));
   PCV2 = 1 - PROBF(30 / (K * C2 * C2), V, 29, 0.0);
   P1L = PROBNORM((100 - LLU) / SIGMA) - PROBNORM((85 - LLU) / SIGMA);
   P1U = PROBNORM((115 - LLU) / SIGMA) - PROBNORM((100 - LLU) / SIGMA);
   P1 = P1L + P1U;
   P2L = PROBNORM((85 - LLU) / SIGMA) - PROBNORM((75 - LLU) / SIGMA);
   P2U = PROBNORM((125 - LLU) / SIGMA) - PROBNORM((115 - LLU) / SIGMA);
   P2 = P2L + P2U;
     IF TYPE = 'T' THEN
   PCTTAB2 = P1 ** 30 + 30 * P1 ** 29 * P2;
     ELSE  IF TYPE = 'C' THEN
   PCTTAB2 = P1 ** 27 * (P1*P1*P1 + 30*P1*P1*P2 + 435*P1*P2*P2
             + 4060*P2*P2*P2);
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```
   LPROB2 = MAX(PCV2 + PCTTAB2 - 1, 0);
   C1 = 0.060;
   K = 1 + 10 * LLU * LLU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 10 * LLU * LLU / (SIGMA * SIGMA));
   PCV1 = 1 - PROBF(10 / (K * C1 * C1), V, 9, 0.0);
     IF TYPE = 'T' THEN
   PCTTAB1 = P1 ** 10;
     ELSE IF TYPE = 'C' THEN
   PCTTAB1 = P1 ** 9 * (P1 + 10*P2);
   LPROB1 = MAX(PCV1 + PCTTAB1 - 1,0);
   OVERLBD = MAX(LPROB1,LPROB2);
   C2 = 0.078;
   K = 1 + 30 * ULU * ULU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 30 * ULU * ULU / (SIGMA * SIGMA));
   PCV2 = 1 - PROBF(30 / (K * C2 * C2), V, 29, 0.0);
   P1L = PROBNORM((100 - ULU) / SIGMA) - PROBNORM((85 - ULU) / SIGMA);
   P1U = PROBNORM((115 - ULU) / SIGMA) - PROBNORM((100 - ULU) / SIGMA);
   P1 = P1L + P1U;
   P2L = PROBNORM((85 - ULU) / SIGMA) - PROBNORM((75 - ULU) / SIGMA);
   P2U = PROBNORM((125 - ULU) / SIGMA) - PROBNORM((115 - ULU) / SIGMA);
   P2 = P2L + P2U;
     IF TYPE = 'T' THEN
   PCTTAB2 = P1 ** 30 + 30 * P1 ** 29 * P2;
     ELSE  IF TYPE = 'C' THEN
   PCTTAB2 = P1 ** 27 * (P1*P1*P1 + 30*P1*P1*P2 + 435*P1*P2*P2
             + 4060*P2*P2*P2);
   LPROB2 = MAX(PCV2 + PCTTAB2 - 1, 0);
   C1 = 0.060;
   K = 1 + 10 * ULU * ULU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 10 * ULU * ULU / (SIGMA * SIGMA));
   PCV1 = 1 - PROBF(10 / (K * C1 * C1), V, 9, 0.0);
     IF TYPE = 'T' THEN
   PCTTAB1 = P1 ** 10;
     ELSE IF TYPE = 'C' THEN
   PCTTAB1 = P1 ** 9 * (P1 + 10*P2);
   LPROB1 = MAX(PCV1 + PCTTAB1 - 1,0);
   OVERUBD = MAX(LPROB1,LPROB2);
   OVERBD = MIN(OVERLBD, OVERUBD);
%mend c1calc;
%MACRO CALCUSP1;
DATA TAB;
LENGTH TYPE $1;
LABEL OVERBD = 'OVERALL LOWER BOUND'
       MEAN = 'SAMPLE MEAN(%CLAIM)';
   TYPE = "&FORM";
   D=&D;
   Z = PROBIT((1 + SQRT(&CILEVEL / 100)) / 2);
   N = &NUMBER;
   CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);
   SDOLD = 0;
   STARTSD = 0.01;
   DO MEAN = 85.1 TO 114.9 BY D;
      BEGIN = STARTSD;
    DO SAMPSD = BEGIN TO 7.8 BY 0.001;
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
```

```
    LLU = MEAN - Z *SIGMA / SQRT(N);
    ULU = MEAN + Z * SIGMA / SQRT(N);
%c1calc
   IF OVERBD < &LBOUND/100 AND SAMPSD <= 0.0101 THEN DO;
   CV = 0; OUTPUT; SAMPSD = 20.0; GOTO NEXTT; END;
   IF OVERBD < &LBOUND/100 THEN DO;
      SAMPSD = SAMPSD - 0.001;
      IF SAMPSD < SDOLD THEN DO;
         STARTM = MEAN;
         GOTO UPPER;
          END;
      SDOLD = SAMPSD;
      STARTSD = SAMPSD;
      CV = 100 * SAMPSD / MEAN;
       OUTPUT;
       SAMPSD = 20.0;
       END;
    NEXTT:
     END;
    END;
    GOTO FINISH;
    UPPER:
          STARTSD = 0.01;

   DO MEAN = 114.9 TO STARTM BY -D;
    DO SAMPSD = STARTSD TO 7.8 BY 0.001;
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
    LLU = MEAN - Z *SIGMA / SQRT(N);
    ULU = MEAN + Z * SIGMA / SQRT(N);
%c1calc
   IF OVERBD < &LBOUND/100 AND SAMPSD <= 0.0101 THEN DO;
   CV = 0; OUTPUT; SAMPSD = 20.0; GOTO NEXTB; END;
   IF OVERBD < &LBOUND/100 THEN DO;
      SAMPSD = SAMPSD - 0.001;
      STARTSD = SAMPSD;
      CV = 100 * SAMPSD / MEAN;
       OUTPUT;
       SAMPSD = 20.0;
       END;
    NEXTB:
     END;
    END;
  FINISH:
  KEEP CV MEAN;
PROC SORT DATA=TAB; BY MEAN;
DATA
     ONE(RENAME = (MEAN = X1 CV = CV1))
     TWO(RENAME = (MEAN = X2 CV = CV2))
     THREE(RENAME = (MEAN = X3 CV = CV3))
     FOUR(RENAME = (MEAN = X4 CV = CV4))
     FIVE(RENAME = (MEAN = X5 CV = CV5))
     SIX(RENAME = (MEAN = X6 CV = CV6));
 SET TAB;
 IF MEAN <= 90.05 THEN OUTPUT ONE;
 IF 90.05 < MEAN <=  95.05 THEN OUTPUT TWO;
```

```
 IF 95.05   < MEAN <= 100.05  THEN OUTPUT THREE;
 IF 100.05  < MEAN <= 105.05  THEN OUTPUT FOUR;
 IF 105.05  < MEAN <= 110.05  THEN OUTPUT FIVE;
 IF 110.05  < MEAN <= 115.0  THEN OUTPUT SIX;
DATA SEVEN;
   MERGE ONE TWO THREE FOUR FIVE SIX;
RUN;
%MEND CALCUSP1;

%MACRO PRTCUSP1;
OPTIONS MISSING = ' ' NODATE NONUMBER;
OPTIONS LS=132;
PROC PRINT DATA=SEVEN SPLIT = '*';
   FORMAT CV1 CV2 CV3 CV4 CV5 CV6 5.2;
   LABEL
         X1 = '  MEAN*(% CLAIM)'
         X2 = '  MEAN*(% CLAIM)'
         X3 = '  MEAN*(% CLAIM)'
         X4 = '  MEAN*(% CLAIM)'
         X5 = '  MEAN*(% CLAIM)'
         X6 = '  MEAN*(% CLAIM)'
         CV1 = 'CV*(%)'
         CV2 = 'CV*(%)'
         CV3 = 'CV*(%)'
         CV4 = 'CV*(%)'
         CV5 = 'CV*(%)'
         CV6 = 'CV*(%)';
      VAR CV1 X2 CV2 X3 CV3 X4 CV4 X5 CV5 X6 CV6;
      ID X1;
TITLE1 "ACCEPTANCE LIMITS FOR &FORM CONTENT UNIFORMITY(N=&NUMBER)";
TITLE2 "SAMPLING PLAN 1";
TITLE3 "(MEETING LIMITS GUARANTEES, WITH &CILEVEL.% ASSURANCE, THAT AT LEAST";
TITLE4 "&LBOUND.% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)";
%MEND PRTCUSP1;

%MACRO EVCUSP1;

DATA _NULL_; WINDOW SMAIN COLOR=GREY
#1 "CONTENT UNIFORMITY ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 1 (ONE SAMPLE PER LOCATION)" C=yellow
#4 "TO EVALUATE LIMITS, THE USER MUST SPECIFY THE RANGE OF" C=yellow
#5 "POSSIBLE POPULATION VALUES FOR THE MEAN AND CV" C=yellow
#6 "ENTER ALL VALUES AS POSITIVE INTEGERS" C=yellow
#8  "ENTER LOWER BOUND FOR MEAN: " C=BLUE ULOW 4.0 A=UNDERLINE
#9  "ENTER UPPER BOUND FOR MEAN: " C=BLUE UHIGH 4.0  A=UNDERLINE
#10 "ENTER INCREMENT FOR MEAN:   " C=BLUE UINCRE 4.0 A=UNDERLINE
#11 "ENTER DIVISOR FOR MEAN:     " C=BLUE UDIV 4.0  A=UNDERLINE
#13 "ENTER LOWER BOUND FOR CV:   " C=BLUE CVLOW 4.0 A=UNDERLINE
#14 "ENTER UPPER BOUND FOR CV:   " C=BLUE CVHIGH 4.0 A=UNDERLINE
#15 "ENTER INCREMENT FOR CV:     " C=BLUE CVINCRE 4.0 A=UNDERLINE
#16 "ENTER DIVISOR FOR CV:       " C=BLUE CVDIV 4.0 A=UNDERLINE;
WINDOW PINT COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
```

```
#1 "ALL VALUES MUST POSITIVE INTEGERS" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ORD  COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ERROR: UPPER BOUND IS LESS THAN LOWER BOUND" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
ULOW=950;
UHIGH=1000;
UINCRE=50;
UDIV=10;
CVLOW=10;
CVHIGH=40;
CVINCRE=30;
CVDIV=10;
SMAIN:
DISPLAY SMAIN BELL;
IF ULOW LT 1 OR ROUND(ULOW) NE ULOW
OR UHIGH LT 1 OR ROUND(UHIGH) NE UHIGH
OR UINCRE LT 1 OR ROUND(UINCRE) NE UINCRE
OR UDIV LT 1 OR ROUND(UDIV) NE UDIV
OR CVLOW LT 1 OR ROUND(CVLOW) NE CVLOW
OR CVHIGH LT 1 OR ROUND(CVHIGH) NE CVHIGH
OR CVINCRE LT 1 OR ROUND(CVINCRE) NE CVINCRE
OR CVDIV LT 1 OR ROUND(CVDIV) NE CVDIV
THEN DO;
DISPLAY PINT;
GOTO SMAIN;
END;
IF ULOW GT UHIGH
OR CVLOW GT CVHIGH
THEN DO;
DISPLAY ORD;
GOTO SMAIN;
END;
CALL SYMPUT("ULOW",PUT(ULOW,4.0));
CALL SYMPUT("UHIGH",PUT(UHIGH,4.0));
CALL SYMPUT("UINCRE",PUT(UINCRE,4.0));
CALL SYMPUT("UDIV",PUT(UDIV,4.0));
CALL SYMPUT("CVLOW",PUT(CVLOW,4.0));
CALL SYMPUT("CVHIGH",PUT(CVHIGH,4.0));
CALL SYMPUT("CVINCRE",PUT(CVINCRE,4.0));
CALL SYMPUT("CVDIV",PUT(CVDIV,4.0)); STOP;
RUN;

DATA TAB;
      SET SEVEN;

%MACRO DSCUSP1;
   %DO I = 1 %TO 6;
      DATA DATA&I;
         SET TAB;
         STD = X&I * CV&I / 100; RENAME X&I = X;
         KEEP X&I STD;
   %END;
```

```
%MEND DSCUSP1;

%DSCUSP1

DATA ONE;
   SET DATA1 DATA2 DATA3 DATA4 DATA5 DATA6;
   N = &NUMBER;

%MACRO SIGCUSP1;

   %DO CV = &CVLOW %TO &CVHIGH %BY &CVINCRE;
      %DO U = &ULOW %TO &UHIGH %BY &UINCRE;

         DATA SAVE;
            SET ONE END = LAST;
            U = &U / &UDIV;
            CV = &CV / &CVDIV;
            SIGMA = U * CV / 100;
            PMEAN = PROBNORM((x - U) * SQRT(N) / SIGMA)
                    - PROBNORM((LAG(X) - U) * SQRT(N) / SIGMA);
            AVEHT = (STD + LAG(STD)) / 2;
            PSTD = PROBCHI((N - 1) * AVEHT * AVEHT
                   / ( SIGMA * SIGMA), N - 1);
            PT = PMEAN * PSTD ;
            PTRAP + PT;
            IF LAST THEN OUTPUT;
         RUN;

PROC APPEND BASE = SAVEALL DATA = SAVE;

       %END;
    %END;

%MEND SIGCUSP1;

%SIGCUSP1

OPTIONS NODATE NONUMBER;
PROC PRINT DATA = SAVEALL split = '*';
   label ptrap = 'PROBABILITY*OF*PASSING';
   VAR CV PTRAP;
   ID U;
TITLE1 "ACCEPTANCE LIMIT TABLE FOR &FORM CONTENT
UNIFORMITY(N=&NUMBER)";
TITLE2 "SAMPLING PLAN 1";
TITLE3 'DETERMINE PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE';
TITLE4 "CONFIDENCE LEVEL = &CILEVEL AND LOWER BOUND = &LBOUND";
RUN;
%MEND EVCUSP1;

%MACRO SMPCUSP1;

DATA _NULL_; WINDOW TMAIN COLOR=GREY
#1 "CONTENT UNIFORMITY ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 1 (ONE SAMPLE PER LOCATION)" C=yellow
#4 "TO DETERMINE LOWER BOUND FOR FOUND SAMPLE RESULTS" C=yellow
```

```
#6  "ENTER SAMPLE MEAN (% CLAIM): " C=BLUE MEAN 6.3 A=UNDERLINE
#7  "ENTER SAMPLE CV (%):         " C=BLUE CV 6.3 A=UNDERLINE;
WINDOW LTZ COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "CV MUST BE NON NEGATIVE" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW RANGE COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "MEAN MUST BE BETWEEN 85.1 AND 114.9" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
MEAN= 100.00;
CV=4.00;
TMAIN:
DISPLAY TMAIN BELL;
IF CV LE 0 THEN DO;
DISPLAY LTZ;
GOTO TMAIN;
END;
IF MEAN LT 85.1 OR MEAN GT 114.9 THEN DO;
DISPLAY RANGE;
GOTO TMAIN;
END;
CALL SYMPUT("MEAN",PUT(MEAN,6.3));
CALL SYMPUT("CV",PUT(CV,6.3)); STOP;
RUN;

DATA TAB;
LENGTH TYPE $1;
LABEL OVERBD = 'OVERALL LOWER BOUND'
       MEAN = 'SAMPLE MEAN(%CLAIM)';
   CILEVEL = &CILEVEL;
   TYPE = "&FORM";
   Z = PROBIT((1 + SQRT(&CILEVEL / 100)) / 2);
   N = &NUMBER;
   CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);
      MEAN = &MEAN;
      CV = &CV;
      SAMPSD= &MEAN * CV/100;
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
    LLU = MEAN - Z *SIGMA / SQRT(N);
    ULU = MEAN + Z * SIGMA / SQRT(N);
%c1calc

OPTIONS NODATE NONUMBER;
PROC PRINT SPLIT = '*';
  LABEL SAMPSD = 'SAMPLE*STD DEV*(% CLAIM)'
        MEAN = 'SAMPLE* MEAN*(% CLAIM)'
        OVERBD = 'LOWER BOUND';

  ID MEAN;
  VAR SAMPSD CV OVERBD;
TITLE1 "ACCEPTANCE LIMIT TABLE FOR &FORM CONTENT UNIFORMITY(N=&NUMBER)";
TITLE2 "SAMPLING PLAN 1";
TITLE3 'DETERMINE PROBABILITY OF FUTURE SAMPLES PASSING THE USP TEST';
TITLE4 "WITH &CILEVEL ASSURANCE FOR GIVEN SAMPLE MEAN AND CV";
```

```
run;
%MEND SMPCUSP1;

%MACRO ANACUSP1;
    %wincusp1;
%IF %UPCASE(&A1CUSP1)=Y OR %UPCASE(&A2CUSP1)=Y %THEN %DO;
     %CALCUSP1;
    %END;
%IF %UPCASE(&A1CUSP1)=Y %THEN %DO;
      %PRTCUSP1;
    %END;
%IF %UPCASE(&A2CUSP1)=Y %THEN %DO;
      %EVCUSP1;
PROC DATASETS LIBRARY = WORK;
   DELETE SAVEALL;
    %END;
%IF %UPCASE(&A3CUSP1)=Y %THEN %DO;
      %SMPCUSP1;
    %END;
%MEND ANACUSP1;

%ANACUSP1

RUN;
%MEND CUSP1;
%CUSP1
```

CUSP2.SAS

```
%MACRO CUSP2;
%LET D1=0.10;

%MACRO WINCUSP2;

DATA _NULL_;
WINDOW MCUSP2 COLOR=grey
#1 "CONTENT UNIFORMITY ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 2 (GREATER THAN ONE SAMPLE PER LOCATION)" C=yellow
#4  "ENTER DOSAGE FORM(CAPSULE OR TABLET):  " C=blue FORM  $7.
    A=UNDERLINE
#5  "ENTER NUMBER OF LOCATIONS:  " C=blue LOC 4.0 A=UNDERLINE
#6  "ENTER NUMBER PER LOCATION:  " C=blue NUM 4.0 A=UNDERLINE
#8 "ENTER BOUND ON FUTURE PERCENTAGE PASSING (50.0-99.0):  " C=blue LBOUND 4.1
    A=UNDERLINE
#9 "ENTER CONFIDENCE LEVEL (50.0-99.0):  " C=blue CILEVEL 4.1 A=UNDERLINE
#11 "DO YOU WANT TO PRINT THE ACCEPTANCE LIMIT TABLE?" C=blue
#12 "ENTER Y OR N ="  C=blue A1CUSP2 $1.
#14 "DO YOU WANT TO EVALUATE THE ACCEPTANCE LIMIT TABLE?" C=blue
#15 "ENTER Y OR N ="  C=blue A2CUSP2 $1.
#17 "DO YOU WANT THE LOWER BOUND FOR A SPECIFIC SAMPLE RESULT?" C=blue
#18 "ENTER Y OR N ="  C=blue A3CUSP2 $1.;
WINDOW DOSCUSP2 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "DOSAGE FORM MUST BE CAPSULE OR TABLET" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW LOCAT COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS= 10 IROW=5
#1 "NUMBER OF LOCATIONS MUST BE AN INTEGER GREATER THAN 2" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW NUMB COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "SAMPLE SIZE MUST BE AN INTEGER GREATER THAN 1" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW BCUSP2 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "THE LOWER BOUND ON THE PERCENTAGE OF ALL FUTURE BATCHES" C=YELLOW
#2 "PASSING THE USP TEST MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#3 "(TYPICAL VALUES ARE 50.0 AND 95.0)" C=YELLOW
#5 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW CICUSP2 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "CONFIDENCE INTERVAL VALUES MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#2 "(TYPICAL VALUES ARE 90.0, 95.0, OR 99.0)" C=YELLOW
#4 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ANSCUSP2 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "REQUEST REQUIRES A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
FORM='CAPSULE';
LOC=10;
NUM=4;
LBOUND = 95;
CILEVEL = 95;
A1CUSP2 = 'Y';
A2CUSP2 = 'N';
A3CUSP2 = 'N';
MAINCU2:
DISPLAY MCUSP2 BELL;
IF FORM NE 'CAPSULE' AND FORM NE 'TABLET' THEN DO;
DISPLAY DOSCUSP2 BELL;
GOTO MAINCU2;
END;
IF LOC LE 2 OR LOC NE ROUND(LOC) THEN DO;
DISPLAY LOCAT BELL;
GOTO MAINCU2;
END;
IF NUM LE 1 OR NUM NE ROUND(NUM) THEN DO;
DISPLAY NUMB BELL;
```

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GOTO MAINCU2;
END;
IF LBOUND GT 99.0 OR LBOUND LT 50.0 THEN DO;
DISPLAY BCUSP2 BELL;
GOTO MAINCU2;
END;
IF CILEVEL GT 99.0 OR CILEVEL LT 50.0 THEN DO;
DISPLAY CICUSP2 BELL;
GOTO MAINCU2;
END;
IF A1CUSP2 NE 'Y' AND A1CUSP2 NE 'N' AND
   A1CUSP2 NE 'y' AND A1CUSP2 NE 'n' THEN DO;
DISPLAY ANSCUSP2 BELL;
GOTO MAINCU2;
END;
IF A2CUSP2 NE 'Y' AND A2CUSP2 NE 'N' AND
   A2CUSP2 NE 'y' AND A2CUSP2 NE 'n' THEN DO;
DISPLAY ANSCUSP2 BELL;
GOTO MAINCU2;
END;
IF A3CUSP2 NE 'Y' AND A3CUSP2 NE 'N' AND
   A3CUSP2 NE 'y' AND A3CUSP2 NE 'n' THEN DO;
DISPLAY ANSCUSP2 BELL;
GOTO MAINCU2;
END;
CALL SYMPUT("A1CUSP2",PUT(UPCASE(A1CUSP2),$1.));
CALL SYMPUT("A2CUSP2",PUT(UPCASE(A2CUSP2),$1.));
CALL SYMPUT("A3CUSP2",PUT(UPCASE(A3CUSP2),$1.));
CALL SYMPUT("LOC",PUT(LOC,4.0));
CALL SYMPUT("NUM",PUT(NUM,4.0));
CALL SYMPUT("LBOUND",PUT(LBOUND,4.1));
CALL SYMPUT("FORM",PUT(UPCASE(FORM),$7.));
CALL SYMPUT("CILEVEL",PUT(CILEVEL,4.1)); STOP;
RUN;
%MEND WINCUSP2;
OPTIONS NODATE NONUMBER;
%macro cullu;
   LLU = MEAN - Z * SQRT(MVAR / N);
   C2 = 0.078;
   K = 1 + 30 * LLU * LLU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 30 * LLU * LLU / (SIGMA * SIGMA));
   PCV2 = 1 - PROBF(30 / (K * C2 * C2), V, 29, 0.0);
   P1L = PROBNORM((100 - LLU) / SIGMA)
         - PROBNORM((85 - LLU) / SIGMA);
   P1U = PROBNORM((115 - LLU) / SIGMA)
         - PROBNORM((100 - LLU) / SIGMA);
   P1 = P1L + P1U;
   P2L = PROBNORM((85 - LLU) / SIGMA)
         - PROBNORM((75 - LLU) / SIGMA);
   P2U = PROBNORM((125 - LLU) / SIGMA)
         - PROBNORM((115 - LLU) / SIGMA);
   P2 = P2L + P2U;
  IF TYPE = 'T' THEN
   PCTTAB2 = P1 ** 30 + 30 * P1 **29 *P2;
  ELSE IF TYPE = 'C' THEN
   PCTTAB2 = P1 ** 27 * (P1*P1*P1 + 30*P1*P1*P2 + 435*P1*P2*P2
            + 4060*P2*P2*P2);
   TPROBL2 = MAX(PCV2 + PCTTAB2 - 1, 0);
  C1 = 0.060;
  K = 1 + 10 * LLU * LLU / (SIGMA * SIGMA);
  V = K * K / (1 + 2 * 10 * LLU * LLU / (SIGMA * SIGMA));
  PCV1 = 1 - PROBF(10 / (K * C1 * C1), V, 9, 0.0);
  IF TYPE = 'T' THEN
  PCTTAB1 = P1**10;
  ELSE IF TYPE = 'C' THEN
  PCTTAB1 = P1**9 * (P1 + 10*P2);
```

```
  LPROB1 = MAX(PCV1 + PCTTAB1 - 1, 0);
  OVERBDL = MAX(TPROBL2, LPROB1);
%mend cullu;
%macro cuulu;
   ULU = MEAN + Z * SQRT(MVAR / N);
   C2 = 0.078;
   K = 1 + 30 * ULU * ULU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 30 * ULU * ULU / (SIGMA * SIGMA));
   PCV2 = 1 - PROBF(30 / (K * C2 * C2), V, 29, 0.0);
   P1L = PROBNORM((100 - ULU) / SIGMA)
         - PROBNORM((85 - ULU) / SIGMA);
   P1U = PROBNORM((115 - ULU) / SIGMA)
         - PROBNORM((100 - ULU) / SIGMA);
   P1 = P1L + P1U;
   P2L = PROBNORM((85 - ULU) / SIGMA)
         - PROBNORM((75 - ULU) / SIGMA);
   P2U = PROBNORM((125 - ULU) / SIGMA)
         - PROBNORM((115 - ULU) / SIGMA);
   P2 = P2L + P2U;
  IF TYPE = 'T' THEN
   PCTTAB2 = P1 ** 30 + 30 * P1 **29 *P2;
  ELSE IF TYPE = 'C' THEN
   PCTTAB2 = P1 ** 27 * (P1*P1*P1 + 30*P1*P1*P2 + 435*P1*P2*P2
            + 4060*P2*P2*P2);
   TPROBL2 = MAX(PCV2 + PCTTAB2 - 1, 0);
  C1 = 0.060;
  K = 1 + 10 * ULU * ULU / (SIGMA * SIGMA);
  V = K * K / (1 + 2 * 10 * ULU * ULU / (SIGMA * SIGMA));
  PCV1 = 1 - PROBF(10 / (K * C1 * C1), V, 9, 0.0);
  IF TYPE = 'T' THEN
  PCTTAB1 = P1**10;
  ELSE IF TYPE = 'C' THEN
  PCTTAB1 = P1**9 * (P1 + 10*P2);
  LPROB1 = MAX(PCV1 + PCTTAB1 - 1, 0);
  OVERBDU = MAX(TPROBL2, LPROB1);
%mend cuulu;

%MACRO CALCUSP2;
DATA TABC;
 LENGTH TYPE $ 1;
   D=&D1;
   TYPE = "&FORM";
   Z = PROBIT((1 + SQRT(&CILEVEL/100))/2);
   NN = &NUM;
   L = &LOC;
   N = NN*L;
   CALL SYMPUT("TOT",PUT(N, 5.0));
   CHIERR = CINV(1 - SQRT(&CILEVEL / 100), L*(NN - 1));
   CHILOC = CINV(1 - SQRT(&CILEVEL / 100),L-1);
   SEBOUND = 9.2;
   SMLIM = 9.2;
   NEXTL = 84.9;
   NEXTU = 115.1;
  DO SE = D TO SEBOUND BY D;
   MEANL = NEXTL;
   MEANU = NEXTU;
   SMBOUND = SMLIM;
   SE2 = SE * SE;
   H2 = L * (NN - 1) / CHIERR - 1;
   SEC = ((1 - 1/NN)*H2*SE2)**2;
  DO SM = D TO SMBOUND BY D;
   IF MEANL = . THEN GOTO OVER;
   SL2 = SM * SM * NN;
   SL2UB = (L - 1) * SL2 / CHILOC;
   H1 = (L - 1) / CHILOC - 1;
   FIRST = ((1 / NN)*H1*SL2)**2;
      PTEST = (1 / NN) * SL2 + (1 - 1/NN) * SE2;
      VAR = PTEST + SQRT(FIRST + SEC);
      MVAR = SL2UB;
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    SIGMA = SQRT(VAR);
    DO MEAN = MEANL - D TO 115.5 BY D;
%cullu
    IF OVERBDL > &LBOUND/100 THEN DO;
       MEANL = MEAN;
       GOTO UPPER;
    END;
 END;
     MEANL = .;
     MEANU = .;
     IF SE=D THEN DO;
      SMLIM = SM - D;
      OUTPUT;
      SM=10;
      GOTO OVER;
                  END;
     IF SM=D THEN DO; SE = 10; GOTO OVER; END;
     GOTO SKIP;
 UPPER:

 DO MEAN = MEANU + D TO 84.9 BY -D;
%cuulu
    IF OVERBDU > &LBOUND/100 THEN DO;
       MEANU = MEAN;
       GOTO OUT;
    END;
 END;
 OUT:
 IF MEANU <= MEANL OR MEAN <= MEANL THEN DO;
     MEANL = .;
     MEANU = .;
     IF SE=D THEN DO;
      SMLIM = SM - D;
      OUTPUT;
      SM=10;
      GOTO OVER;
      END;
     IF SM=D THEN DO; SE = 10; GOTO OVER; END;
 END;

 SKIP: OUTPUT;
     IF SM = D THEN DO;
       NEXTL = MEANL;
       NEXTU = MEANU;
        END;
 OVER:
    END;
  END;
 KEEP N NN L D MEAN SE SM MEANL MEANU OVERBDL OVERBDU;
data tabc;
  set tabc;
  if SE = 10 or SM = 10 then delete;
PROC SORT DATA=TABC; BY SE SM;

%MEND CALCUSP2;

%MACRO PRTCUSP2;
options ls=132;
PROC TRANSPOSE DATA = TABC OUT = LDAT PREFIX = L;
   VAR MEANL;
   BY SE;

PROC TRANSPOSE DATA = TABC OUT = UDAT PREFIX = U;
   VAR MEANU;
   BY SE;

DATA together;
   MERGE LDAT UDAT;
   BY SE;
```

```
proc sort data=together; by se;
data miss;
  l1=.; u1=.;
  l2=.; u2=.;
  l3=.; u3=.;
  l4=.; u4=.;
  l5=.; u5=.;
  l6=.; u6=.;
  l7=.; u7=.;
  l8=.; u8=.;
  l9=.; u9=.;
  l10=.; u10=.;
  l11=.; u11=.;
  l12=.; u12=.;
  l13=.; u13=.;
  l14=.; u14=.;
  l15=.; u15=.;
  l16=.; u16=.;
  l17=.; u17=.;
  l18=.; u18=.;
  l19=.; u19=.;
  l20=.; u20=.;
  l21=.; u21=.;
  l22=.; u22=.;
  l23=.; u23=.;
  l24=.; u24=.;
  l25=.; u25=.;
  l26=.; u26=.;
  l27=.; u27=.;
  l28=.; u28=.;
  l29=.; u29=.;
  l30=.; u30=.;
  l31=.; u31=.;
  l32=.; u32=.;
  l33=.; u33=.;
  l34=.; u34=.;
  l35=.; u35=.;
  l36=.; u36=.;
  l37=.; u37=.;
  l38=.; u38=.;
  l39=.; u39=.;
  l40=.; u40=.;
  l41=.; u41=.;
  l42=.; u42=.;
  l43=.; u43=.;
  l44=.; u44=.;
  l45=.; u45=.;
  l46=.; u46=.;
  l47=.; u47=.;
  l48=.; u48=.;
  l49=.; u49=.;
  l50=.; u50=.;
  l51=.; u51=.;
  l52=.; u52=.;
  l53=.; u53=.;
  l54=.; u54=.;
  l55=.; u55=.;
  l56=.; u56=.;
  l57=.; u57=.;
  l58=.; u58=.;
  l59=.; u59=.;
  l60=.; u60=.;
  l61=.; u61=.;
  l62=.; u62=.;
  l63=.; u63=.;
  l64=.; u64=.;
  l65=.; u65=.;
  l66=.; u66=.;
  l67=.; u67=.;
```

```
  l68=.; u68=.;
  l69=.; u69=.;
  l70=.; u70=.;
  l71=.; u71=.;
  l72=.; u72=.;
data all;
   merge miss together;
DATA _NULL_;
   SET ALL;
   IF L1 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L1 U1 L2 U2 L3 U3 L4 U4 L5 U5 L6 U6 L7 U7 L8 U8 L9 U9)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '0.1' +10 '0.2' +10 '0.3' +10 '0.4' +10 '0.5' +10
              '0.6' +10 '0.7' +10 '0.8' +10 '0.9' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
TITLE1 "ACCEPTANCE LIMITS FOR &FORM CONTENT UNIFORMITY";
TITLE2 'SAMPLING PLAN 2';
TITLE3 "LOWER BOUND = &LBOUND, CONFIDENCE LEVEL = &CILEVEL";
TITLE4 'TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN';
TITLE5 "OF &TOT ASSAYS-&NUM ASSAYS AT EACH OF &LOC DIFFERENT LOCATIONS";
TITLE6 'SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION';
TITLE7 'STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM';
TITLE9 'STANDARD DEVIATION OF LOCATION MEANS';

DATA _NULL_;
   SET ALL;
   IF L10 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L10 U10 L11 U11 L12 U12 L13 U13 L14 U14
      L15 U15 L16 U16 L17 U17 L18 U18)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '1.0' +10 '1.1' +10 '1.2' +10 '1.3' +10 '1.4' +10
              '1.5' +10 '1.6' +10 '1.7' +10 '1.8' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L19 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L19 U19 L20 U20 L21 U21 L22 U22 L23 U23
      L24 U24 L25 U25 L26 U26 L27 U27)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '1.9' +10 '2.0' +10 '2.1' +10 '2.2' +10 '2.3' +10
              '2.4' +10 '2.5' +10 '2.6' +10 '2.7' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L28 = . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L28 U28 L29 U29 L30 U30 L31 U31 L32 U32
```

```
        L33 U33 L34 U34 L35 U35 L36 U36)
       (5.1 +1 5.1 +2);
     RETURN;
TOP: PUT / @9 '2.8' +10 '2.9' +10 '3.0' +10 '3.1' +10 '3.2' +10
              '3.3' +10 '3.4' +10 '3.5' +10 '3.6' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L37 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L37 U37 L38 U38 L39 U39 L40 U40 L41 U41
      L42 U42 L43 U43 L44 U44 L45 U45)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '3.7' +10 '3.8' +10 '3.9' +10 '4.0' +10 '4.1' +10
              '4.2' +10 '4.3' +10 '4.4' +10 '4.5' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L46 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L46 U46 L47 U47 L48 U48 L49 U49 L50 U50
      L51 U51 L52 U52 L53 U53 L54 U54)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '4.6' +10 '4.7' +10 '4.8' +10 '4.9' +10 '5.0' +10
              '5.1' +10 '5.2' +10 '5.3' +10 '5.4' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L55 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L55 U55 L56 U56 L57 U57 L58 U58 L59 U59
      L60 U60 L61 U61 L62 U62 L63 U63)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '5.5' +10 '5.6' +10 '5.7' +10 '5.8' +10 '5.9' +10
              '6.0' +10 '6.1' +10 '6.2' +10 '6.3' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L64 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L64 U64 L65 U65 L66 U66 L67 U67 L68 U68
      L69 U69 L70 U70 L71 U71 L72 U72)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '6.4' +10 '6.5' +10 '6.6' +10 '6.7' +10 '6.8' +10
              '6.9' +10 '7.0' +10 '7.1' +10 '7.2' //
```

```
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;

run;
%MEND PRTCUSP2;


%MACRO EVCUSP2;

DATA _NULL_; WINDOW SMAIN COLOR=GREY
#1 "TO EVALUATE LIMITS, THE USER MUST SPECIFY THE RANGE OF" C=yellow
#2 "POSSIBLE POPULATION VALUES FOR THE MEAN, WITHIN LOCATION" C=yellow
#3 "STD DEV AND BETWEEN LOCATION STD DEV" C=yellow
#5 "ENTER ALL VALUES AS POSITIVE INTEGERS" C=yellow
#7  "ENTER LOWER BOUND FOR MEAN:            " C=blue ULOW 4.0
    A=UNDERLINE
#8  "ENTER UPPER BOUND FOR MEAN:            " C=blue UHIGH 4.0
    A=UNDERLINE
#9  "ENTER INCREMENT FOR MEAN:              " C=blue UINCRE 4.0
    A=UNDERLINE
#10 "ENTER DIVISOR FOR MEAN:                " C=blue UDIV 4.0
    A=UNDERLINE
#12 "ENTER LOWER BOUND FOR WITHIN STD DEV:  " C=blue SELOW 4.0
    A=UNDERLINE
#13 "ENTER UPPER BOUND FOR WITHIN STD DEV:  " C=blue SEHIGH 4.0
    A=UNDERLINE
#14 "ENTER INCREMENT FOR WITHIN STD DEV:    " C=blue SEINCRE 4.0
    A=UNDERLINE
#15 "ENTER DIVISOR FOR WITHIN STD DEV:      " C=blue SEDIV 4.0
    A=UNDERLINE
#17 "ENTER LOWER BOUND FOR BETWEEN STD DEV: " C=blue SMLOW 4.0
    A=UNDERLINE
#18 "ENTER UPPER BOUND FOR BETWEEN STD DEV: " C=blue SMHIGH 4.0
    A=UNDERLINE
#19 "ENTER INCREMENT FOR BETWEEN STD DEV:   " C=blue SMINCRE 4.0
    A=UNDERLINE
#20 "ENTER DIVISOR FOR BETWEEN STD DEV:     " C=blue SMDIV 4.0
    A=UNDERLINE;
WINDOW PINT COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST BE POSITIVE INTEGERS" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ORD  COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ERROR: UPPER BOUND IS LESS THAN LOWER BOUND" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
ULOW=950;
UHIGH=1000;
UINCRE=50;
UDIV=10;
SELOW=22;
SEHIGH=22;
SEINCRE=10;
SEDIV=10;
SMLOW=22;
SMHIGH=22;
SMINCRE=10;
SMDIV=10;
SMAIN:
DISPLAY SMAIN BELL;
IF ULOW LT 1 OR ROUND(ULOW) NE ULOW
OR UHIGH LT 1 OR ROUND(UHIGH) NE UHIGH
OR UINCRE LT 1 OR ROUND(UINCRE) NE UINCRE
OR UDIV LT 1 OR ROUND(UDIV) NE UDIV
OR SELOW LT 1 OR ROUND(SELOW) NE SELOW
OR SEHIGH LT 1 OR ROUND(SEHIGH) NE SEHIGH
```

```
OR SEINCRE LT 1 OR ROUND(SEINCRE) NE SEINCRE
OR SEDIV LT 1 OR ROUND(SEDIV) NE SEDIV
OR SMLOW LT 1 OR ROUND(SMLOW) NE SMLOW
OR SMHIGH LT 1 OR ROUND(SMHIGH) NE SMHIGH
OR SMINCRE LT 1 OR ROUND(SMINCRE) NE SMINCRE
OR SMDIV LT 1 OR ROUND(SMDIV) NE SMDIV
THEN DO;
DISPLAY PINT;
GOTO SMAIN;
END;
IF ULOW GT UHIGH
OR SELOW GT SEHIGH
OR SMLOW GT SMHIGH
THEN DO;
DISPLAY ORD;
GOTO SMAIN;
END;
CALL SYMPUT("ULOW",PUT(ULOW,4.0));
CALL SYMPUT("UHIGH",PUT(UHIGH,4.0));
CALL SYMPUT("UINCRE",PUT(UINCRE,4.0));
CALL SYMPUT("UDIV",PUT(UDIV,4.0));
CALL SYMPUT("SELOW",PUT(SELOW,4.0));
CALL SYMPUT("SEHIGH",PUT(SEHIGH,4.0));
CALL SYMPUT("SEINCRE",PUT(SEINCRE,4.0));
CALL SYMPUT("SEDIV",PUT(SEDIV,4.0));
CALL SYMPUT("SMLOW",PUT(SMLOW,4.0));
CALL SYMPUT("SMHIGH",PUT(SMHIGH,4.0));
CALL SYMPUT("SMINCRE",PUT(SMINCRE,4.0));
CALL SYMPUT("SMDIV",PUT(SMDIV,4.0)); STOP;
RUN;


%MACRO SIGCUSP2;
%calcusp2
   %DO U = &ULOW %TO &UHIGH %BY &UINCRE;
      %DO SIGSE = &SELOW %TO &SEHIGH %BY &SEINCRE;
         %DO SIGSM = &SMLOW %TO &SMHIGH %BY &SMINCRE;

  DATA SAVE2;
    SET TABC END = LAST;
   U = &U / &UDIV;
   D = &D1;
   SIGSE = &SIGSE / &SEDIV;
   SIGSM = &SIGSM / &SMDIV;
   SIGSM2 = SIGSM * SIGSM;
   EXPSE2 = SIGSE * SIGSE;
   EXPSM2 = EXPSE2 + NN * SIGSM * SIGSM;
   PMEAN = PROBNORM((MEANU - U) * SQRT((N) / EXPSM2))
             - PROBNORM((MEANL - U) * SQRT((N) / EXPSM2));
   PSE = PROBCHI(L * (NN - 1) * SE * SE / EXPSE2, L * (NN -1))
           - PROBCHI(L * (NN - 1) * (SE - D) * (SE - D) /
         EXPSE2, L * (NN - 1));
   PSM = PROBCHI((L - 1) * NN * SM * SM / EXPSM2, L - 1)
           - PROBCHI((L - 1) * NN * (SM - D) * (SM - D) /
         EXPSM2, L - 1);
   P = PMEAN * PSE * PSM;
   PSUM + P;
   IF LAST THEN OUTPUT;
   RUN;
   PROC APPEND BASE = SAVES2E DATA = SAVE2;
   RUN;

       %END;
      %END;
     %END;

%MEND SIGCUSP2;

%SIGCUSP2
```

```
PROC PRINT DATA = SAVES2E split = '*';
  label U = 'MEAN'
       SIGSE = 'WITHIN LOCATION*STD DEV'
       SIGSM = 'BETWEEN LOCATION* STD DEV'
       PSUM = 'PROBABILITY*OF*PASSING';
   VAR U SIGSE SIGSM PSUM;
TITLE1 "ACCEPTANCE LIMITS FOR &FORM CONTENT UNIFORMITY";
TITLE2 'SAMPLING PLAN 2';
TITLE3 "PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE";
TITLE4 "WITH &NUM ASSAYS AT EACH OF &LOC LOCATIONS";
TITLE5 "CONFIDENCE LEVEL = &CILEVEL & LOWER BOUND = &LBOUND";
RUN;
%MEND EVCUSP2;

%MACRO SMPCUSP2;

DATA _NULL_; WINDOW TMAIN COLOR=GREY
#3 "TO DETERMINE LOWER BOUND FOR FOUND SAMPLE RESULTS" C=yellow
#7  "ENTER SAMPLE MEAN (% CLAIM):            " C=blue MEAN 6.3 A=UNDERLINE
#9  "ENTER SAMPLE WITHIN STD DEV (% CLAIM):  " C=blue SE 6.3 A=UNDERLINE
#11 "ENTER SAMPLE BETWEEN STD DEV (% CLAIM): " C=blue SM 6.3 A=UNDERLINE
#12 "(I.E. STANDARD DEVIATION OF SAMPLE LOCATION MEANS)" C=blue;
WINDOW LTZ COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST BE NON NEGATIVE" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW RANGE COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "MEAN MUST BE BETWEEN 85.1 AND 114.9" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
MEAN=100.00;
SE=2.20;
SM=2.46;
TMAIN:
DISPLAY TMAIN BELL;
IF SE LE 0 OR SM LE 0
THEN DO;
DISPLAY LTZ;
GOTO TMAIN;
END;
IF MEAN LT 85.1 OR MEAN GT 114.9
THEN DO;
DISPLAY RANGE;
GOTO TMAIN;
END;
CALL SYMPUT("MEAN",PUT(MEAN,6.3));
CALL SYMPUT("SE",PUT(SE,6.3));
CALL SYMPUT("SM",PUT(SM,6.3)); STOP;
RUN;

DATA TAB;
 LENGTH TYPE $ 1;
   TYPE = "&FORM";
   Z = PROBIT((1 + SQRT(&CILEVEL/100))/2);
   NN = &NUM;
   L = &LOC;
   N = NN*L;
   SE = &SE;
   SM = &SM;
   MEAN = &MEAN;
   CILEVEL = &CILEVEL;
   CHIERR = CINV(1 - SQRT(&CILEVEL / 100), L*(NN - 1));
   CHILOC = CINV(1 - SQRT(&CILEVEL / 100),L-1);
   SE2 = SE * SE;
   H2 = L * (NN - 1) / CHIERR - 1;
   SEC = ((1 - 1/NN)*H2*SE2)**2;
   SL2 = SM * SM * NN;
   SL2UB = (L - 1) * SL2 / CHILOC;
```

```
   H1 = (L - 1) / CHILOC - 1;
   FIRST = ((1 / NN)*H1*SL2)**2;
      PTEST = (1 / NN) * SL2 + (1 - 1/NN) * SE2;
      VAR = PTEST + SQRT(FIRST + SEC);
      MVAR = SL2UB;
   SIGMA = SQRT(VAR);
%cullu
%cuulu
  OVERBD = MIN(OVERBDU, OVERBDL);
 KEEP SE MEAN SM OVERBD;
PROC PRINT SPLIT='*';
 LABEL   SE = 'SAMPLE*WITHIN LOCATION*STD DEV'
         MEAN = 'SAMPLE*MEAN'
         SM = 'SAMPLE*BETWEEN LOCATION*STD DEV'
         OVERBD = 'LOWER BOUND';
  ID MEAN;
  VAR SE SM OVERBD;
TITLE1 "ACCEPTANCE LIMITS FOR &FORM CONTENT UNIFORMITY";
TITLE2 "SAMPLING PLAN 2 (&LOC LOCATIONS, &NUM PER LOCATION)";
TITLE3 "PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST";
TITLE4 "WITH &CILEVEL.% ASSURANCE";
TITLE5 'FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV';
RUN;
%MEND SMPCUSP2;

%MACRO ANACUSP2;
    %WINcusp2;
%IF %UPCASE(&A1CUSP2)=Y %THEN %DO;
     %CALCUSP2;
     %PRTCUSP2;
    %END;
%IF %UPCASE(&A2CUSP2)=Y %THEN %DO;
      %EVCUSP2;
PROC DATASETS LIBRARY=WORK;
   DELETE SAVES2E;
    %END;
%IF %UPCASE(&A3CUSP2)=Y %THEN %DO;
     %SMPCUSP2;
    %END;
%MEND ANACUSP2;

%ANACUSP2

RUN;
%MEND CUSP2;
%CUSP2
```

DISP1.SAS

```
%MACRO DISP1;
%macro winDISP1;
DATA _NULL_;
WINDOW MDISP1 COLOR=grey
#1 "DISSOLUTION ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 1 (ONE SAMPLE PER LOCATION)" C=yellow
#4 "ENTER Q VALUE: " C=blue  Q 4.1 A=UNDERLINE
#5  "ENTER SAMPLE SIZE:  " C=blue NUMBER 4.0 A=UNDERLINE
#7  "ENTER BOUND ON FUTURE PERCENTAGE PASSING (50.0-99.0):  "
     C=blue LBOUND 4.1 A=UNDERLINE
#8  "ENTER CONFIDENCE LEVEL (50.0-99.0):  " C=blue CILEVEL 4.1 A=UNDERLINE
#10 "DO YOU WANT TO PRINT THE ACCEPTANCE LIMIT TABLE?" C=blue
#11 "ENTER Y OR N ="  C=blue A1DISP1 $1.
#13 "DO YOU WANT TO EVALUATE THE ACCEPTANCE LIMIT TABLE?" C=blue
#14 "ENTER Y OR N ="  C=blue A2DISP1 $1.
#16 "DO YOU WANT THE LOWER BOUND FOR A SPECIFIC SAMPLE RESULT?"
    C=blue
#17 "ENTER Y OR N ="  C=blue A3DISP1 $1.;
WINDOW SDISP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "SAMPLE SIZE MUST BE AN INTEGER GREATER THAN 2" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW BDISP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "THE LOWER BOUND ON THE PERCENTAGE OF ALL FUTURE BATCHES" C=YELLOW
#2 "PASSING THE USP TEST MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#3 "(TYPICAL VALUES ARE 50.0 AND 95.0)" C=YELLOW
#5 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW QDISP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "VALUES FOR Q MUST BE BETWEEN 40 AND 95" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW CIDISP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "CONFIDENCE INTERVAL VALUES MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#2 "(TYPICAL VALUES ARE 90.0, 95.0, OR 99.0)" C=YELLOW
#4 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ANSDISP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "REQUESTS REQUIRE A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
Q=80.0;
NUMBER=6;
LBOUND = 95;
CILEVEL = 95;
A1DISP1 = 'Y';
A2DISP1 = 'N';
A3DISP1 = 'N';
MAINDI1:
DISPLAY MDISP1 BELL;
IF NUMBER  LE 2 OR NUMBER NE ROUND(NUMBER) THEN DO;
DISPLAY SDISP1 BELL;
GOTO MAINDI1;
END;
IF Q GT 95.0 OR Q LT 40.0 THEN DO;
DISPLAY QDISP1 BELL;
GOTO MAINDI1;
END;

IF LBOUND GT 99.0 OR LBOUND LT 50.0 THEN DO;
```

```
DISPLAY BDISP1 BELL;
GOTO MAINDI1;
END;
IF CILEVEL GT 99.0 OR CILEVEL LT 50.0 THEN DO;
DISPLAY CIDISP1 BELL;
GOTO MAINDI1;
END;
IF A1DISP1 NE 'Y' AND A1DISP1 NE 'N' AND A1DISP1 NE 'y' AND
   A1DISP1 NE 'n' THEN DO;
DISPLAY ANSDISP1 BELL;
GOTO MAINDI1;
END;
IF A2DISP1 NE 'Y' AND A2DISP1 NE 'N' AND A2DISP1 NE 'y' AND
   A2DISP1 NE 'n' THEN DO;
DISPLAY ANSDISP1 BELL;
GOTO MAINDI1;
END;
IF A3DISP1 NE 'Y' AND A3DISP1 NE 'N' AND A3DISP1 NE 'y' AND
   A3DISP1 NE 'n' THEN DO;
DISPLAY ANSDISP1 BELL;
GOTO MAINDI1;
END;

CALL SYMPUT("Q",PUT(Q,4.1));
CALL SYMPUT("A1DISP1",PUT(UPCASE(A1DISP1),$1.));
CALL SYMPUT("A2DISP1",PUT(UPCASE(A2DISP1),$1.));
CALL SYMPUT("A3DISP1",PUT(UPCASE(A3DISP1),$1.));
CALL SYMPUT("NUMBER",PUT(NUMBER,4.0));
CALL SYMPUT("LBOUND",PUT(LBOUND,4.1));
CALL SYMPUT("CILEVEL",PUT(CILEVEL,4.1)); STOP;
RUN;
%mend winDISP1;

%MACRO COMPUTE;
   F1 = (1 - PROBNORM((5 - LLU)/SIGMA)) ** 6;
   SN2 = SQRT(12);
   PM2 = PROBNORM (SN2 * -LLU / SIGMA);
   PB2 = 1 - PROBNORM ((-15 - LLU) / SIGMA);
   F2 = PB2 ** 12 - PM2;
   SN3 = SQRT(24);
   PM3 = PROBNORM (SN3 * -LLU / SIGMA);
   P2 = PROBNORM ((-15 - LLU) / SIGMA) - PROBNORM ((-25 - LLU) / SIGMA);
   P3 = 1 - PROBNORM ((-15 - LLU) / SIGMA);
   F3 = P3**24 + 24*P2*P3**23 + 276*P2*P2*P3**22 - PM3;
   OVERBD = MAX(F1, F2, F3);
%mend compute;


%MACRO CALDISP1;
DATA D1ONE;
   Q = &Q;
   LIM = 100 - Q;
   N = &NUMBER;
   D=0.2;
   Z = PROBIT(SQRT(&CILEVEL / 100));
   CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);
   STARTSD = 0.002;
   DO MEANADJ = D TO LIM BY D;
      BEGIN = STARTSD;
    DO SAMPSD = BEGIN TO 60.0 BY 0.001;
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
```

```
      LLU = MEANADJ - Z *SIGMA / SQRT(N);
%COMPUTE
   IF OVERBD < &LBOUND/100 AND SAMPSD <= 0.00201 then do;
   CV = 0; OUTPUT; SAMPLSD = 65.0; GOTO NEXT; END;
   IF OVERBD < &LBOUND/100 THEN DO;
      SAMPSD = SAMPSD - 0.001;
      STARTSD = SAMPSD;
      MEAN = MEANADJ + Q;
      CV = 100 * SAMPSD / MEAN;
       OUTPUT;
       SAMPSD = 65.0;
       END;
    NEXT:
     END;
    END;
  KEEP CV MEAN ;
PROC SORT DATA=D1ONE; BY MEAN;
DATA
     ONE(RENAME = (MEAN = X1 CV = CV1))
     TWO(RENAME = (MEAN = X2 CV = CV2))
     THREE(RENAME = (MEAN = X3 CV = CV3))
     FOUR(RENAME = (MEAN = X4 CV = CV4))
     FIVE(RENAME = (MEAN = X5 CV = CV5));
 SET D1ONE;
    Q = &Q;
    LIM = 100 - Q;
 IF Q         < MEAN <= Q+ LIM/5  THEN OUTPUT ONE;
 IF Q+LIM/5   < MEAN <= Q+ 2*LIM/5  THEN OUTPUT TWO;
 IF Q+2*LIM/5 < MEAN <= Q+ 3*lIM/5  THEN OUTPUT THREE;
 IF Q+3*LIM/5 < MEAN <= Q+ 4*LIM/5 THEN OUTPUT FOUR;
 IF Q+4*LIM/5 < MEAN <= Q+ LIM + 0.0001 THEN OUTPUT FIVE;
DATA D1ALL;
   MERGE ONE TWO THREE FOUR FIVE;
RUN;

%MEND CALDISP1;

%MACRO PRTDISP1;
OPTIONS MISSING = ' ' NODATE NONUMBER;
OPTIONS LS=132;
PROC PRINT DATA=D1ALL SPLIT = '*';
   FORMAT CV1 CV2 CV3 CV4 CV5 5.2;
   LABEL
         X1 = '  MEAN*(% CLAIM)'
         X2 = '  MEAN*(% CLAIM)'
         X3 = '  MEAN*(% CLAIM)'
         X4 = '  MEAN*(% CLAIM)'
         X5 = '  MEAN*(% CLAIM)'
         CV1 = 'CV*(%)'
         CV2 = 'CV*(%)'
         CV3 = 'CV*(%)'
         CV4 = 'CV*(%)'
         CV5 = 'CV*(%)';
      VAR CV1 X2 CV2 X3 CV3 X4 CV4 X5 CV5;
      ID X1;
TITLE "ACCEPTANCE LIMITS FOR DISSOLUTION (N = &NUMBER, Q = &Q)";
TITLE2 'SAMPLING PLAN 1';
TITLE3 "(MEETING LIMITS GUARANTEES WITH &CILEVEL % ASSURANCE,";
TITLE4 "THAT AT LEAST &LBOUND% OF ALL FUTURE SAMPLES TESTED";
TITLE5 'FOR DISSOLUTION WILL PASS THE USP TEST)';
TITLE6 "TABLE ENTRY IS UPPER LIMIT ON CV OF &NUMBER DISSOLUTION ASSAYS";
```

```
%MEND PRTDISP1;


%MACRO EVDISP1;

DATA _NULL_; WINDOW SMAIN COLOR=GREY
#1  "TO EVALUATE LIMITS, THE USER MUST SPECIFY THE RANGE OF" C=yellow
#2  "POSSIBLE POPULATION VALUES FOR THE MEAN AND CV" C=yellow
#3  "ENTER ALL VALUES AS POSITIVE INTEGERS" C=yellow
#5  "ENTER LOWER BOUND FOR MEAN: " C=blue ULOW 4.0 A=UNDERLINE
#6  "ENTER UPPER BOUND FOR MEAN: " C=blue UHIGH 4.0 A=UNDERLINE
#7  "ENTER INCREMENT FOR MEAN:   " C=blue UINCRE 4.0 A=UNDERLINE
#8  "ENTER DIVISOR FOR MEAN:     " C=blue UDIV 4.0 A=UNDERLINE
#10 "ENTER LOWER BOUND FOR CV:   " C=blue CVLOW 4.0 A=UNDERLINE
#11 "ENTER UPPER BOUND FOR CV:   " C=blue CVHIGH 4.0 A=UNDERLINE
#12 "ENTER INCREMENT FOR CV:     " C=blue CVINCRE 4.0 A=UNDERLINE
#13 "ENTER DIVISOR FOR CV:       " C=blue CVDIV 4.0 A=UNDERLINE;
WINDOW PINT COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST BE POSITIVE INTEGERS" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ORD  COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ERROR: UPPER BOUND IS LESS THAN LOWER BOUND" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
ULOW=950;
UHIGH=1000;
UINCRE=50;
UDIV=10;
CVLOW=10;
CVHIGH=40;
CVINCRE=30;
CVDIV=10;
SMAIN:
DISPLAY SMAIN BELL;
IF ULOW LT 1 OR ROUND(ULOW) NE ULOW
OR UHIGH LT 1 OR ROUND(UHIGH) NE UHIGH
OR UINCRE LT 1 OR ROUND(UINCRE) NE UINCRE
OR UDIV LT 1 OR ROUND(UDIV) NE UDIV
OR CVLOW LT 1 OR ROUND(CVLOW) NE CVLOW
OR CVHIGH LT 1 OR ROUND(CVHIGH) NE CVHIGH
OR CVINCRE LT 1 OR ROUND(CVINCRE) NE CVINCRE
OR CVDIV LT 1 OR ROUND(CVDIV) NE CVDIV
THEN DO;
DISPLAY PINT;
GOTO SMAIN;
END;
IF ULOW GT UHIGH
OR CVLOW GT CVHIGH
THEN DO;
DISPLAY ORD;
GOTO SMAIN;
END;
CALL SYMPUT("ULOW",PUT(ULOW,4.0));
CALL SYMPUT("UHIGH",PUT(UHIGH,4.0));
CALL SYMPUT("UINCRE",PUT(UINCRE,4.0));
CALL SYMPUT("UDIV",PUT(UDIV,4.0));
CALL SYMPUT("CVLOW",PUT(CVLOW,4.0));
CALL SYMPUT("CVHIGH",PUT(CVHIGH,4.0));
CALL SYMPUT("CVINCRE",PUT(CVINCRE,4.0));
CALL SYMPUT("CVDIV",PUT(CVDIV,4.0)); STOP;
```

```
RUN;
DATA DI1SET;
      SET D1ALL;
%MACRO DSDISP1;
   %DO I = 1 %TO 5;
      DATA DATA&I;
         SET DI1SET;
         STD = X&I * CV&I / 100; RENAME X&I = X;
         KEEP X&I STD;
   %END;
%MEND DSDISP1;
%DSDISP1
DATA DIONE;
   SET DATA1 DATA2 DATA3 DATA4 DATA5;
   N = &NUMBER;
%MACRO SIGDISP1;
   %DO CV = &CVLOW %TO &CVHIGH %BY &CVINCRE;
      %DO U = &ULOW %TO &UHIGH %BY &UINCRE;
         DATA D1SAVE;
            SET DIONE END = LAST;
            U = &U / &UDIV;
            CV = &CV / &CVDIV;
            SIGMA = U * CV / 100;
            PMEAN = PROBNORM((x - U) * SQRT(N) / SIGMA)
                    - PROBNORM((LAG(X) - U) * SQRT(N) / SIGMA);
            AVEHT = (STD + LAG(STD)) / 2;
            PSTD = PROBCHI((N - 1) * AVEHT * AVEHT
                   / ( SIGMA * SIGMA), N - 1);
            PT = PMEAN * PSTD ;
            PTRAP + PT;
            IF X > 99.9 THEN DO;
               PMEAN = 1 - PROBNORM((X - U) * SQRT (N) / SIGMA);
               PSTD = PROBCHI((N - 1) * STD * STD
                      / ( SIGMA * SIGMA), N - 1);
               PT = PMEAN * PSTD;
               PTRAP + PT;
            END;
            IF LAST THEN OUTPUT;
         RUN;
PROC APPEND BASE = D1SAVALL DATA = D1SAVE;
       %END;
    %END;
%MEND SIGDISP1;
%SIGDISP1
PROC PRINT DATA = D1SAVALL split = '*';
   label ptrap = 'PROBABILITY*OF*PASSING';
   VAR CV PTRAP;
   ID U;
```

```
TITLE  "ACCEPTANCE LIMITS FOR DISSOLUTION (N = &NUMBER, Q = &Q)";
TITLE2 'SAMPLING PLAN 1';
TITLE3 'PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE';
TITLE4 "CONFIDENCE LEVEL = &CILEVEL AND LOWER BOUND = &LBOUND";
RUN;
%MEND EVDISP1;

%MACRO SMPDISP1;

DATA _NULL_; WINDOW TMAIN COLOR=GREY
#3 "TO DETERMINE LOWER BOUND FOR FOUND SAMPLE RESULTS" C=yellow
#5  "ENTER SAMPLE MEAN (% CLAIM): " C=blue MEAN 6.3 A=UNDERLINE
#6  "ENTER SAMPLE CV (%):         " C=blue CV 6.3 A=UNDERLINE;
WINDOW LTZ COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "CV MUST BE NON NEGATIVE" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW RANGE COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "MEAN MUST BE GREATER THAN Q" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
MEAN= 100.00;
CV=4.00;
TMAIN:
DISPLAY TMAIN BELL;
IF CV LE 0 THEN DO;
DISPLAY LTZ;
GOTO TMAIN;
END;
IF MEAN LE Q THEN DO;
DISPLAY RANGE;
GOTO TMAIN;
END;
CALL SYMPUT("MEAN",PUT(MEAN,6.3));
CALL SYMPUT("CV",PUT(CV,6.3)); STOP;
RUN;

DATA DI1SMP;
LABEL OVERBD = 'OVERALL LOWER BOUND'
       MEAN = 'SAMPLE MEAN(%CLAIM)';
   Q = &Q;
   N = &NUMBER;
   CILEVEL = &CILEVEL;
   Z = PROBIT(SQRT(&CILEVEL / 100));
   N = &NUMBER;
   CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);
      MEAN = &MEAN;
      MEANADJ = MEAN - Q;
      CV = &CV;
      SAMPSD= &MEAN * CV/100;
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
    LLU = MEANADJ - Z *SIGMA / SQRT(N);
%COMPUTE
PROC PRINT SPLIT = '*';
  LABEL SAMPSD = 'SAMPLE*STD DEV*(% CLAIM)'
        MEAN = 'SAMPLE* MEAN*(% CLAIM)'
        OVERBD = 'LOWER BOUND';

  ID MEAN;
  VAR SAMPSD CV OVERBD;
TITLE  "ACCEPTANCE LIMITS FOR DISSOLUTION (N = &NUMBER, Q = &Q)";
```

```
TITLE2 'SAMPLING PLAN 1';
TITLE3 "PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST";
TITLE4 "FOR A GIVEN SAMPLE MEAN AND CV WITH &CILEVEL.% ASSURANCE";
run;
%MEND SMPDISP1;

%MACRO ANADISP1;
    %winDIsp1;
%IF %UPCASE(&A1DISP1)=Y OR %UPCASE(&A2DISP1)=Y %THEN %DO;
     %CALDISP1;
    %END;
%IF %UPCASE(&A1DISP1)=Y %THEN %DO;
      %PRTDISP1;
    %END;
%IF %UPCASE(&A2DISP1)=Y %THEN %DO;
      %EVDISP1;
PROC DATASETS LIBRARY = WORK;
   DELETE D1SAVALL;
    %END;
%IF %UPCASE(&A3DISP1)=Y %THEN %DO;
      %SMPDISP1;
    %END;
%MEND ANADISP1;

%ANADISP1
RUN;
%MEND DISP1;
%DISP1
```

DISP2.SAS

```
%MACRO DISP2;
%MACRO WINDISP2;
DATA _NULL_;
WINDOW MDISP2 COLOR=grey
#1 "DISSOLUTION ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 2 (GREATER THAN ONE SAMPLE PER LOCATION)" C=yellow
#4  "ENTER Q:  " C=blue Q 4.1 A=UNDERLINE
#5  "ENTER NUMBER OF LOCATIONS:  " C=blue LOC 4.0 A=UNDERLINE
#6  "ENTER NUMBER PER LOCATION:  " C=blue NUM 4.0 A=UNDERLINE
#9 "ENTER BOUND ON FUTURE PERCENTAGE PASSING (50.0-99.0):  " C=blue
    LBOUND 4.1 A=UNDERLINE
#10 "ENTER CONFIDENCE LEVEL (50.0-99.0):  " C=blue CILEVEL 4.1 A=UNDERLINE
#12 "ENTER INCREMENT FOR SE:  " C=blue DSE  4.2 A=UNDERLINE
#13 "ENTER INCREMENT FOR BETWEEN LOCATION STD DEV:  " C=blue DSM 4.2
     A=UNDERLINE
#15 "DO YOU WANT TO PRINT THE ACCEPTANCE LIMIT TABLE?" C=BLUE
#16 "ENTER Y OR N ="  C=BLUE A1DISP2 $1.
#18 "DO YOU WANT TO EVALUATE THE ACCEPTANCE LIMIT TABLE?" C=BLUE
#19 "ENTER Y OR N ="  C=BLUE A2DISP2 $1.
#21 "DO YOU WANT THE LOWER BOUND FOR A SPECIFIC SAMPLE RESULT?" C=BLUE
#22 "ENTER Y OR N ="  C=BLUE A3DISP2 $1.;
WINDOW DSESM COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "THE INCREMENT FOR SE AND BETWEEN LOCATION STD DEV" C=YELLOW
#2 "MUST BE GREATER THAN ZERO" C=YELLOW
#3 "(TYPICAL VALUES ARE 0.1, 0.2, 0.25, OR 0.50)" C=YELLOW
#5 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW DILOCAT COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS= 10 IROW=5
#1 "NUMBER OF LOCATIONS MUST BE AN INTEGER GREATER THAN 2" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW DINUMB COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS= 10 IROW=5
#1 "NUMBER PER LOCATION MUST BE AN INTEGER GREATER THAN 1" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW BDISP2 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "THE LOWER BOUND ON THE PERCENTAGE OF ALL FUTURE BATCHES" C=YELLOW
#2 "PASSING THE USP TEST MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#3 "(TYPICAL VALUES ARE 50.0 AND 95.0)" C=YELLOW
#5 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW QDISP2 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "VALUES FOR Q MUST BE BETWEEN 40 AND 95" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW CIDISP2 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "CONFIDENCE INTERVAL VALUES MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#2 "(TYPICAL VALUES ARE 90.0, 95.0, OR 99.0)" C=YELLOW
#4 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ANSDISP2 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "REQUEST REQUIRES A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
LOC=10;
NUM=6;
Q=80;
DSE = 0.25;
DSM = 0.25;
LBOUND = 95;
CILEVEL = 95;
A1DISP2 = 'Y';
A2DISP2 = 'N';
A3DISP2 = 'N';
MAINDI2:
DISPLAY MDISP2 BELL;
IF LOC LE 2 OR LOC NE ROUND(LOC) THEN DO;
DISPLAY DILOCAT BELL;
GOTO MAINDI2;
```

```
END;
IF NUM LE 1 OR NUM NE ROUND(NUM) THEN DO;
DISPLAY DINUMB BELL;
GOTO MAINDI2;
END;
IF Q GT 95.0 OR Q LT 40.0 THEN DO;
DISPLAY QDISP2 BELL;
GOTO MAINDI2;
END;
IF DSE LE 0 OR DSM LE 0 THEN DO;
DISPLAY DSESM BELL;
GOTO MAINDI2;
END;
IF LBOUND GT 99.0 OR LBOUND LT 50.0 THEN DO;
DISPLAY BDISP2 BELL;
GOTO MAINDI2;
END;
IF CILEVEL GT 99.0 OR CILEVEL LT 50.0 THEN DO;
DISPLAY CIDISP2 BELL;
GOTO MAINDI2;
END;
IF A1DISP2 NE 'Y' AND A1DISP2 NE 'N' AND
   A1DISP2 NE 'y' AND A1DISP2 NE 'n' THEN DO;
DISPLAY ANSDISP2 BELL;
GOTO MAINDI2;
END;
IF A2DISP2 NE 'Y' AND A2DISP2 NE 'N' AND
   A2DISP2 NE 'y' AND A2DISP2 NE 'n' THEN DO;
DISPLAY ANSDISP2 BELL;
GOTO MAINDI2;
END;
IF A3DISP2 NE 'Y' AND A3DISP2 NE 'N' AND
   A3DISP2 NE 'y' AND A3DISP2 NE 'n' THEN DO;
DISPLAY ANSDISP2 BELL;
GOTO MAINDI2;
END;
CALL SYMPUT("Q",PUT(Q,4.1));
CALL SYMPUT("DSE",PUT(DSE,4.2));
CALL SYMPUT("DSM",PUT(DSM,4.2));
CALL SYMPUT("A1DISP2",PUT(UPCASE(A1DISP2),$1.));
CALL SYMPUT("A2DISP2",PUT(UPCASE(A2DISP2),$1.));
CALL SYMPUT("A3DISP2",PUT(UPCASE(A3DISP2),$1.));
CALL SYMPUT("LOC",PUT(LOC,4.0));
CALL SYMPUT("NUM",PUT(NUM,4.0));
CALL SYMPUT("LBOUND",PUT(LBOUND,4.1));
CALL SYMPUT("CILEVEL",PUT(CILEVEL,4.1)); STOP;
RUN;

%MEND WINDISP2;

OPTIONS NODATE NONUMBER;
%MACRO COMPUTE;
   F1 = (1 - PROBNORM((5 - LLU)/SIGMA)) ** 6;
   SN2 = SQRT(12);
   PM2 = PROBNORM (SN2 * -LLU / SIGMA);
   PB2 = 1 - PROBNORM ((-LLU - 15) / SIGMA);
   F2 = PB2 ** 12 - PM2;
   SN3 = SQRT(24);
   PM3 = PROBNORM (SN3 * -LLU / SIGMA);
   P2 = PROBNORM ((-LLU - 15) / SIGMA) - PROBNORM ((-LLU - 25) / SIGMA);
   P3 = 1 - PROBNORM ((-LLU - 15) / SIGMA);
   F3 = P3**24 + 24*P2*P3**23 + 276*P2*P2*P3**22 - PM3;
   OVERBD = MAX(F1, F2, F3);
%mend compute;



%MACRO CALDISP2;
DATA TABD;
```

```
    DM =0.10;
    DSE = &DSE;
    DSM = &DSM;
    Q = &Q;
    LIM = 100 - Q;
    NN = &NUM;
    L = &LOC;
    N = NN*L;
    CALL SYMPUT("TOT",PUT(N, 5.0));
    Z = PROBIT(SQRT(&CILEVEL / 100));
    CHIERR = CINV(1 - SQRT(&CILEVEL / 100), L*(NN - 1));
    CHILOC = CINV(1 - SQRT(&CILEVEL / 100),L-1);
    SEBOUND = 60;
    SMLIM = 60;
    NEXTM = 0.2;
   DO SE = DSE TO SEBOUND BY DSE;
    MEANL = NEXTM;
    SMBOUND = SMLIM;
    SE2 = SE * SE;
    H2 = L * (NN - 1) / CHIERR - 1;
    SEC = ((1 - 1/NN)*H2*SE2)**2;
   DO SM = DSM TO SMBOUND BY DSM;
    IF MEANL =. THEN GOTO OVER;
    SL2 = SM * SM * NN;
    SL2UB = (L - 1) * SL2 / CHILOC;
    H1 = (L - 1) / CHILOC - 1;
    FIRST = ((1 / NN)*H1*SL2)**2;
       PTEST = (1 / NN) * SL2 + (1 - 1/NN) * SE2;
       VAR = PTEST + SQRT(FIRST + SEC);
       MVAR = SL2UB;
    SIGMA = SQRT(VAR);
    DO MEANADJ = MEANL TO LIM BY DM;
    LLU = MEANADJ - Z *SQRT(MVAR / N);
 %COMPUTE
    IF OVERBD > &LBOUND/100 THEN DO;
      MEANL = MEANADJ;
      GOTO SKIP;
                                END;
    END;
     MEANL =.;
  IF SE=DSE THEN DO;
    SMLIM = SM - DSM;
    MEAN = MEANL + Q;
    OUTPUT;
    SM = 90;
    GOTO OVER;
                END;
  IF SM=DSM THEN DO; SE = 90; GOTO OVER; END;
 SKIP:
    MEAN = MEANL + Q;
    OUTPUT;
 IF SM = DSM THEN NEXTM = MEANL;
 OVER:
   END;
  END;
 KEEP N NN L MEAN SE SM OVERBD;
 PROC SORT DATA=TABD; BY SE SM;


 %MEND CALDISP2;

 %MACRO PRTDISP2;
 options ls=132;

 PROC TABULATE DATA=TABD FORMAT=6.2 FORMCHAR='           ';
   CLASS SE SM;
   FORMAT SE 6.2 SM 6.2;
   VAR MEAN;
   TABLE SE, SUM*MEAN = ' ' * (SM = ' ')/rts=8;
```

```
  KEYLABEL SUM = 'STANDARD DEVIATION OF LOCATION MEANS';
TITLE "ACCEPTANCE LIMITS FOR DISSOLUTION (Q = &Q) ";
TITLE2 'SAMPLING PLAN 2';
TITLE3 "LOWER BOUND = &LBOUND, CONFIDENCE LEVEL = &CILEVEL";
TITLE4 'TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN';
TITLE5 "OF &TOT ASSAYS-&NUM ASSAYS AT EACH OF &LOC DIFFERENT LOCATIONS";
TITLE6 'SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION';
TITLE7 'STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM';
run;
%MEND PRTDISP2;
%MACRO EVDISP2;
DATA _NULL_; WINDOW SMAIN COLOR=GREY
#1 "TO EVALUATE LIMITS, THE USER MUST SPECIFY THE RANGE OF" C=yellow
#2 "POSSIBLE POPULATION VALUES FOR THE MEAN, WITHIN LOCATION" C=yellow
#3 "STD DEV AND BETWEEN LOCATION STD DEV" C=yellow
#5 "ENTER ALL VALUES AS POSITIVE INTEGERS" C=yellow
#7  "ENTER LOWER BOUND FOR MEAN:            " C=blue ULOW 4.0
    A=UNDERLINE
#8  "ENTER UPPER BOUND FOR MEAN:            " C=blue UHIGH 4.0
    A=UNDERLINE
#9  "ENTER INCREMENT FOR MEAN:              " C=blue UINCRE 4.0
    A=UNDERLINE
#10 "ENTER DIVISOR FOR MEAN:                " C=blue UDIV 4.0
    A=UNDERLINE
#12 "ENTER LOWER BOUND FOR WITHIN STD DEV:  " C=blue SELOW 4.0
    A=UNDERLINE
#13 "ENTER UPPER BOUND FOR WITHIN STD DEV:  " C=blue SEHIGH 4.0
    A=UNDERLINE
#14 "ENTER INCREMENT FOR WITHIN STD DEV:    " C=blue SEINCRE 4.0
    A=UNDERLINE
#15 "ENTER DIVISOR FOR WITHIN STD DEV:      " C=blue SEDIV 4.0
    A=UNDERLINE
#17 "ENTER LOWER BOUND FOR BETWEEN STD DEV: " C=blue SMLOW 4.0
    A=UNDERLINE
#18 "ENTER UPPER BOUND FOR BETWEEN STD DEV: " C=blue SMHIGH 4.0
    A=UNDERLINE
#19 "ENTER INCREMENT FOR BETWEEN STD DEV:   " C=blue SMINCRE 4.0
    A=UNDERLINE
#20 "ENTER DIVISOR FOR BETWEEN STD DEV:     " C=blue SMDIV 4.0
    A=UNDERLINE;
WINDOW DI2PINT COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST BE POSITIVE INTEGERS" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW DI2ORD  COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ERROR: UPPER BOUND IS LESS THAN LOWER BOUND" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
ULOW=950;
UHIGH=1000;
UINCRE=50;
UDIV=10;
SELOW=22;
SEHIGH=22;
SEINCRE=10;
SEDIV=10;
SMLOW=22;
SMHIGH=22;
SMINCRE=10;
SMDIV=10;
MAINDI2:
DISPLAY SMAIN BELL;
IF ULOW LT 1 OR ROUND(ULOW) NE ULOW
OR UHIGH LT 1 OR ROUND(UHIGH) NE UHIGH
OR UINCRE LT 1 OR ROUND(UINCRE) NE UINCRE
```

```
OR UDIV LT 1 OR ROUND(UDIV) NE UDIV
OR SELOW LT 1 OR ROUND(SELOW) NE SELOW
OR SEHIGH LT 1 OR ROUND(SEHIGH) NE SEHIGH
OR SEINCRE LT 1 OR ROUND(SEINCRE) NE SEINCRE
OR SEDIV LT 1 OR ROUND(SEDIV) NE SEDIV
OR SMLOW LT 1 OR ROUND(SMLOW) NE SMLOW
OR SMHIGH LT 1 OR ROUND(SMHIGH) NE SMHIGH
OR SMINCRE LT 1 OR ROUND(SMINCRE) NE SMINCRE
OR SMDIV LT 1 OR ROUND(SMDIV) NE SMDIV
THEN DO;
DISPLAY DI2PINT;
GOTO MAINDI2;
END;
IF ULOW GT UHIGH
OR SELOW GT SEHIGH
OR SMLOW GT SMHIGH
THEN DO;
DISPLAY DI2ORD;
GOTO MAINDI2;
END;
CALL SYMPUT("ULOW",PUT(ULOW,4.0));
CALL SYMPUT("UHIGH",PUT(UHIGH,4.0));
CALL SYMPUT("UINCRE",PUT(UINCRE,4.0));
CALL SYMPUT("UDIV",PUT(UDIV,4.0));
CALL SYMPUT("SELOW",PUT(SELOW,4.0));
CALL SYMPUT("SEHIGH",PUT(SEHIGH,4.0));
CALL SYMPUT("SEINCRE",PUT(SEINCRE,4.0));
CALL SYMPUT("SEDIV",PUT(SEDIV,4.0));
CALL SYMPUT("SMLOW",PUT(SMLOW,4.0));
CALL SYMPUT("SMHIGH",PUT(SMHIGH,4.0));
CALL SYMPUT("SMINCRE",PUT(SMINCRE,4.0));
CALL SYMPUT("SMDIV",PUT(SMDIV,4.0)); STOP;
RUN;


%MACRO SIGDISP2;
%CALDISP2
   %DO U = &ULOW %TO &UHIGH %BY &UINCRE;
      %DO SIGSE = &SELOW %TO &SEHIGH %BY &SEINCRE;
         %DO SIGSM = &SMLOW %TO &SMHIGH %BY &SMINCRE;

  DATA SAVE2;
    SET TABD END = LAST;
   U = &U / &UDIV;
   DSE = &DSE;
   DSM = &DSM;
   SIGSE = &SIGSE / &SEDIV;
   SIGSM = &SIGSM / &SMDIV;
   SIGSM2 = SIGSM * SIGSM;
   EXPSE2 = SIGSE * SIGSE;
   EXPSM2 = EXPSE2 + NN * SIGSM * SIGSM;
   PMEAN = 1 - PROBNORM((MEAN - U) * SQRT((N) / EXPSM2));
   PSE = PROBCHI(L * (NN - 1) * SE * SE / EXPSE2, L * (NN -1))
         - PROBCHI(L * (NN - 1) * (SE - DSE) * (SE - DSE) /
         EXPSE2, L * (NN - 1));
   PSM = PROBCHI((L - 1) * NN * SM * SM / EXPSM2, L - 1)
         - PROBCHI((L - 1) * NN * (SM - DSM) * (SM - DSM) /
         EXPSM2, L - 1);
   P = PMEAN * PSE * PSM;
   PSUM + P;
   IF LAST THEN OUTPUT;
   RUN;
   PROC APPEND BASE = SAVES2E DATA = SAVE2;
   RUN;

       %END;
      %END;
     %END;

```

```
%MEND SIGDISP2;

%SIGDISP2

PROC PRINT DATA = SAVES2E split = '*';
  label U = 'MEAN'
       SIGSE = 'WITHIN LOCATION*STD DEV'
       SIGSM = 'BETWEEN LOCATION* STD DEV'
       PSUM = 'PROBABILITY*OF*PASSING';
   VAR U SIGSE SIGSM PSUM;
TITLE1 "ACCEPTANCE LIMITS FOR DISSOLUTION (Q = &Q) ";
TITLE2 'SAMPLING PLAN 2';
TITLE3 "PROBABILITY OF PASSING DISSOLUTION ACCEPTANCE LIMIT TABLE";
TITLE4 "WITH &NUM ASSAYS AT EACH OF &LOC LOCATIONS";
TITLE5 "CONFIDENCE LEVEL = &CILEVEL & LOWER BOUND = &LBOUND";
RUN;
%MEND EVDISP2;

%MACRO SMPDISP2;

DATA _NULL_; WINDOW TMAIN COLOR=GREY
#3 "TO DETERMINE LOWER BOUND FOR FOUND SAMPLE RESULTS" C=yellow
#7  "ENTER SAMPLE MEAN (% CLAIM):            " C=blue MEAN 6.3 A=UNDERLINE
#9  "ENTER SAMPLE WITHIN STD DEV (% CLAIM):  " C=blue SE 6.3 A=UNDERLINE
#11 "ENTER SAMPLE BETWEEN STD DEV (% CLAIM): " C=blue SM 6.3 A=UNDERLINE
#12 "(I.E. STANDARD DEVIATION OF SAMPLE LOCATION MEANS)" C=blue;
WINDOW LTZ COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST BE NON NEGATIVE" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW RANGE COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "MEAN MUST BE GREATER THAN Q" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
MEAN=100.00;
SE=2.20;
SM=2.46;
TMAIN:
DISPLAY TMAIN BELL;
IF SE LE 0 OR SE LT 0
THEN DO;
DISPLAY LTZ;
GOTO TMAIN;
END;
IF MEAN LE Q
THEN DO;
DISPLAY RANGE;
GOTO TMAIN;
END;
CALL SYMPUT("MEAN",PUT(MEAN,6.3));
CALL SYMPUT("SE",PUT(SE,6.3));
CALL SYMPUT("SM",PUT(SM,6.3)); STOP;
RUN;

DATA TAB;
   Z = PROBIT(SQRT(&CILEVEL/100));
   NN = &NUM;
   L = &LOC;
   N = NN*L;
   SE = &SE;
   SM = &SM;
   MEAN = &MEAN;
   Q = &Q;
   MEANADJ = MEAN - Q;
   CILEVEL = &CILEVEL;
   CHIERR = CINV(1 - SQRT(&CILEVEL / 100), L*(NN - 1));
   CHILOC = CINV(1 - SQRT(&CILEVEL / 100),L-1);
   SE2 = SE * SE;
   H2 = L * (NN - 1) / CHIERR - 1;
```

```
   SEC = ((1 - 1/NN)*H2*SE2)**2;
   SL2 = SM * SM * NN;
   SL2UB = (L - 1) * SL2 / CHILOC;
   H1 = (L - 1) / CHILOC - 1;
   FIRST = ((1 / NN)*H1*SL2)**2;
      PTEST = (1 / NN) * SL2 + (1 - 1/NN) * SE2;
      VAR = PTEST + SQRT(FIRST + SEC);
      MVAR = SL2UB;
   SIGMA = SQRT(VAR);
   LLU = MEANADJ - Z *SQRT(MVAR / N);
%COMPUTE
     KEEP SE MEAN SM OVERBD;
PROC PRINT SPLIT='*';
 LABEL   SE = 'SAMPLE*WITHIN LOCATION*STD DEV'
         MEAN = 'SAMPLE*MEAN'
         SM = 'SAMPLE*BETWEEN LOCATION*STD DEV'
         OVERBD = 'LOWER BOUND';
  ID MEAN;
  VAR SE SM OVERBD;
TITLE "ACCEPTANCE LIMITS FOR DISSOLUTION (Q = &Q) ";
TITLE2 "SAMPLING PLAN 2 (&LOC LOCATIONS, &NUM PER LOCATION)";
TITLE3 'PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST';
TITLE4 "WITH &CILEVEL.% ASSURANCE";
TITLE5 'GIVEN THE SAMPLE MEAN, WITHIN AND BETWEEN STD DEV';
RUN;
%MEND SMPDISP2;

%MACRO ANADISP2;
    %WINDISP2;
%IF %UPCASE(&A1DISP2)=Y %THEN %DO;
     %CALDISP2;
     %PRTDISP2;
    %END;
%IF %UPCASE(&A2DISP2)=Y %THEN %DO;
      %EVDISP2;
PROC DATASETS LIBRARY=WORK;
   DELETE SAVES2E;
    %END;
%IF %UPCASE(&A3DISP2)=Y %THEN %DO;
     %SMPDISP2;
    %END;
%MEND ANADISP2;

%ANADISP2

RUN;
%MEND DISP2;
%DISP2
```

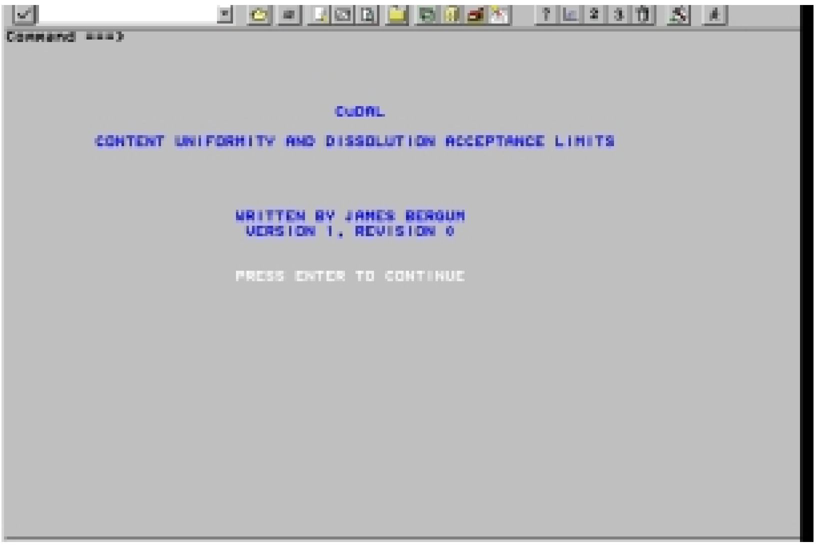
APPENDIX B
PRIMARY WINDOWS

PROGRAM	PRIMARY WINDOWS	ERROR WINDOWS
FILES.SAS		
MANAGER.SAS	STARTER	
	MAIN	ANSWIN
	GOBACK	ANSBACK
CUSP1.SAS	MCUSP1	DOSCUSP1
		SCUSP1
		BCUSP1
		CICUSP1
		ANSCUSP1
	SMAIN	PINT
		ORD
	TMAIN	LTZ
CUSP2.SAS	MCUSP2	DOSCUSP2
		LOCAT
		NUMB
		BCUSP2
		CICUSP2
		ANSCUSP2
	SMAIN	PINT
		ORD
	TMAIN	LTZ
DISP1.SAS	MDISP1	SDISP1
		BDISP1
		QDISP1
		CIDISP1
		ANSDISP1
	SMAIN	PINT
		ORD
	TMAIN	LTZ
DISP2.SAS	MDISP2	DSESUM
		DILOCAT
		DINUMB
		BDISP2
		QDISP2
		CIDISP2
		ANSDISP2
	SMAIN	DI2PINT
		DI2ORD
	TMAIN	LTZ

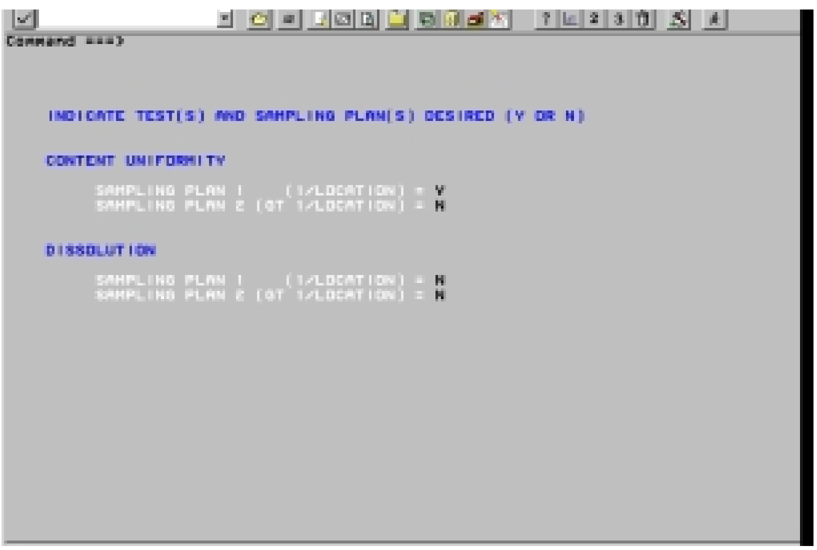
PRIMARY WINDOWS:

FILE: MANAGER.SAS

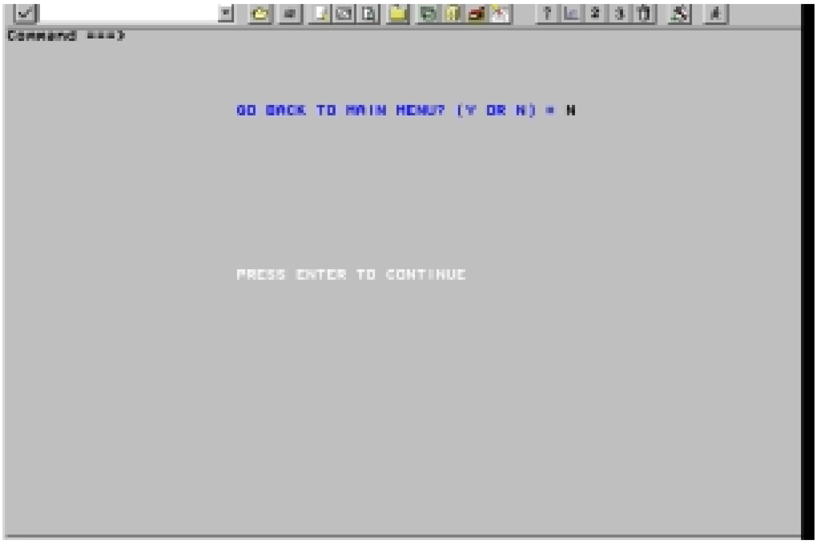
WINDOW: STARTER



WINDOW: MAIN

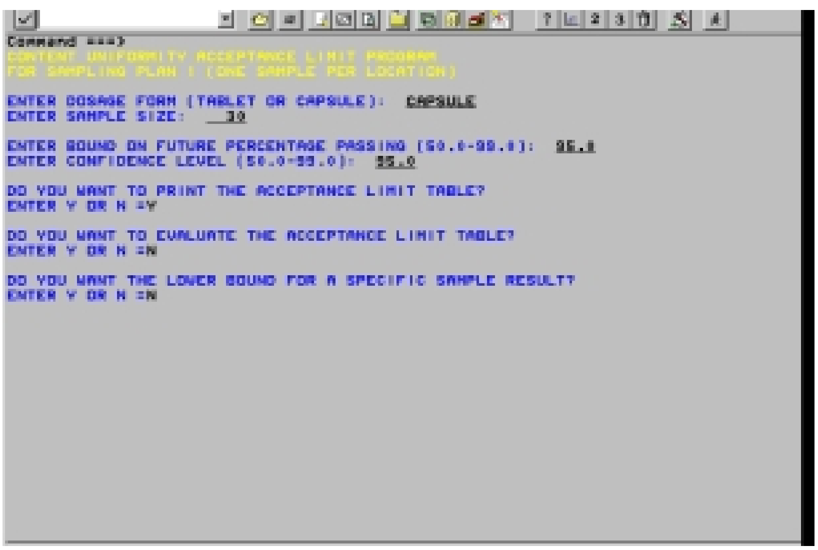


WINDOW: GOBACK

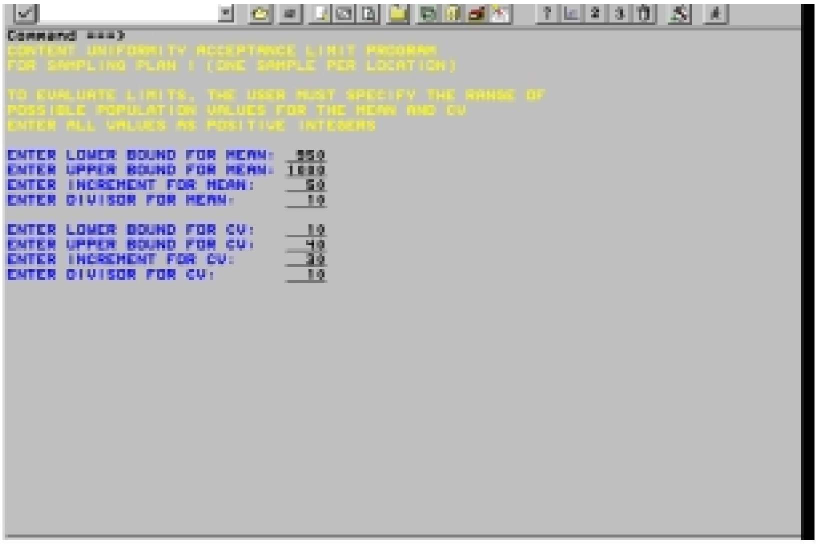


FILE: MACRO CUSP1

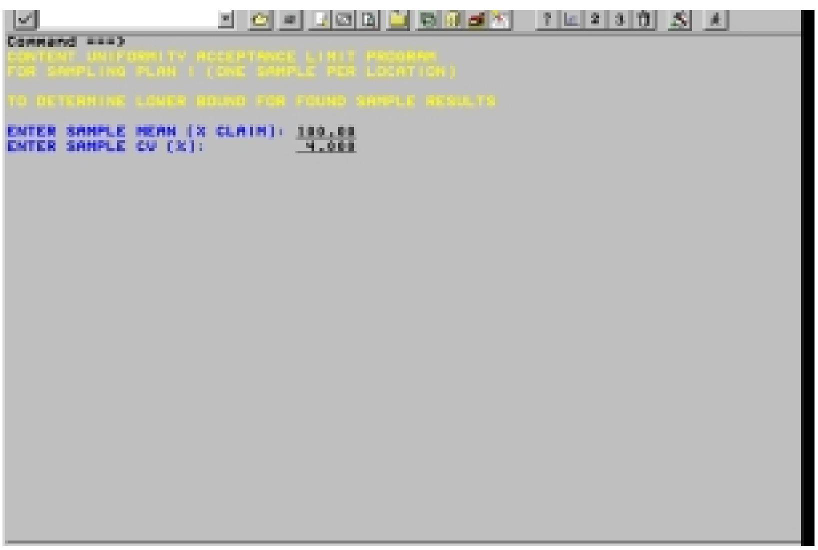
WINDOW: MCUSP1



WINDOW: SMAIN

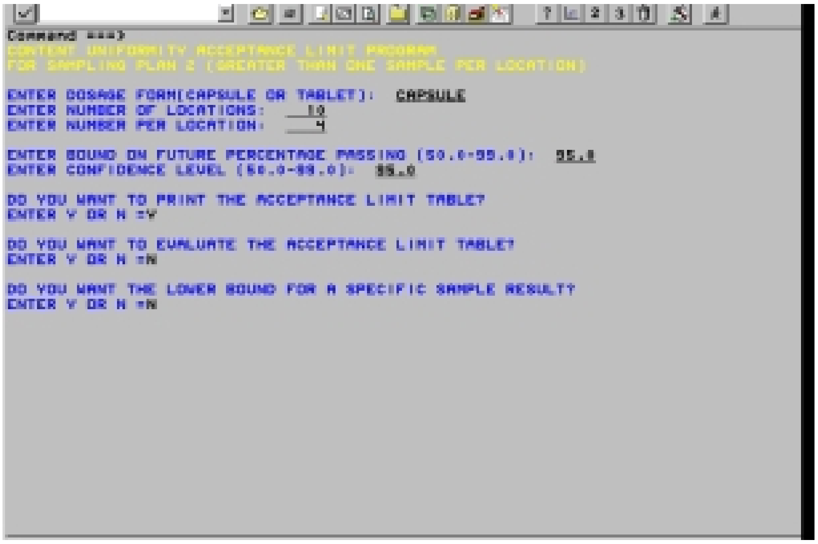


WINDOW: TMAIN

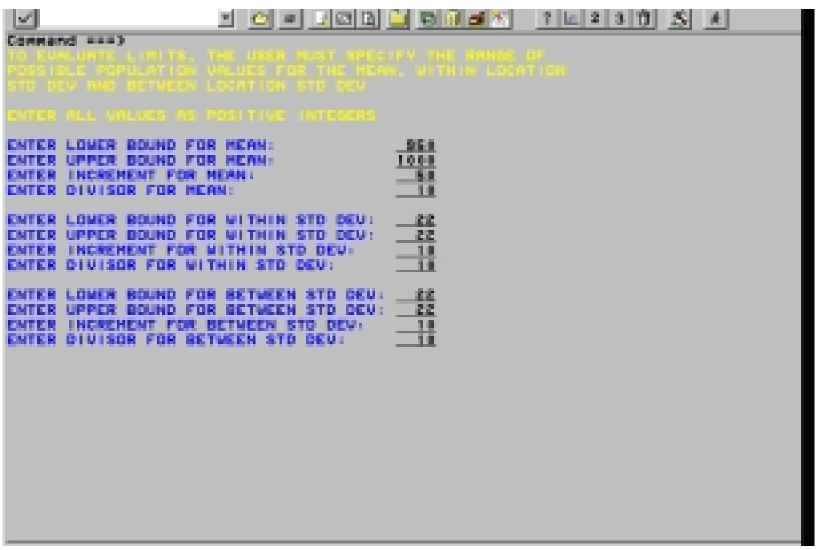


FILE: MACRO CUSP2

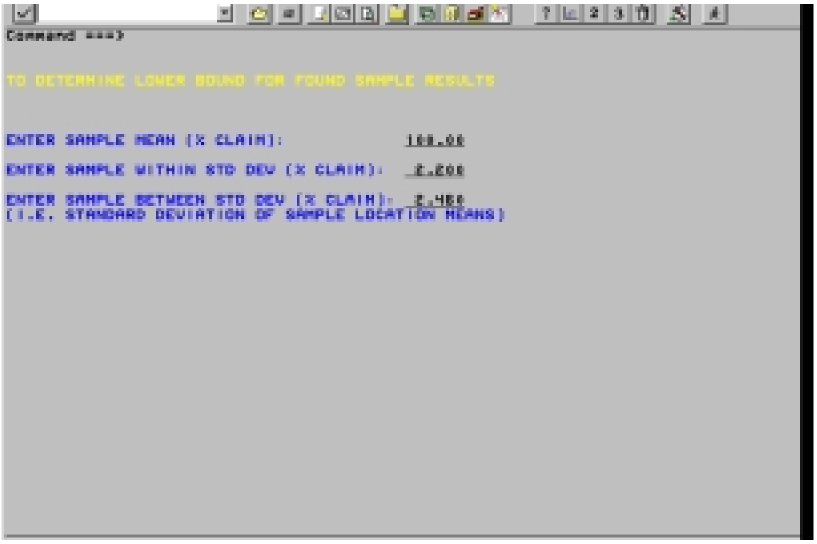
WINDOW: MCUSP2



WINDOW: SMAIN

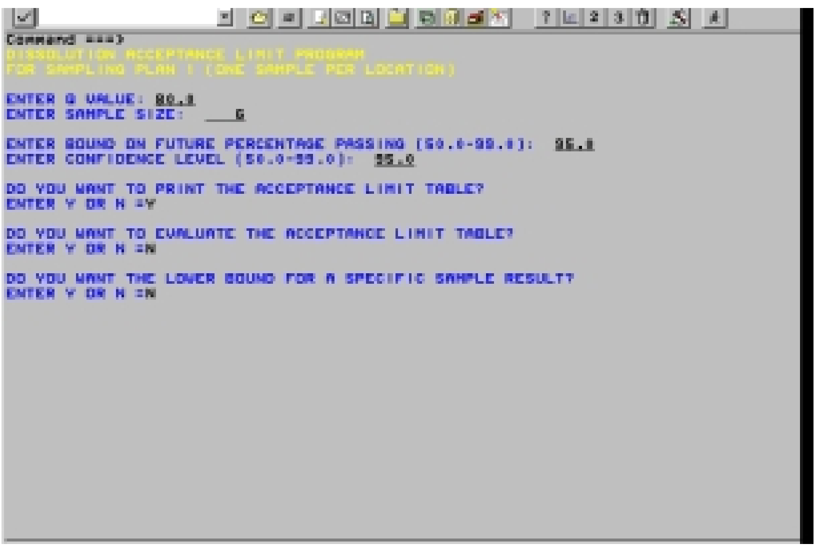


WINDOW: TMAIN

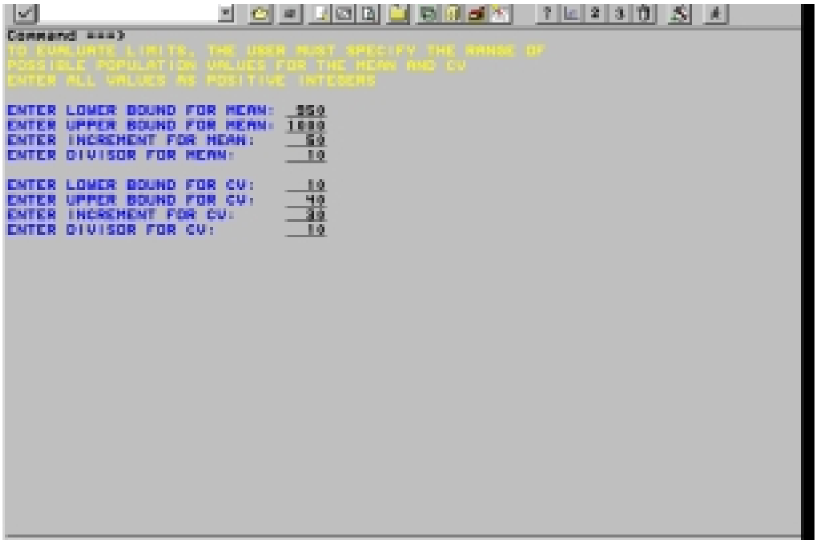


FILE: MACRO DISP1

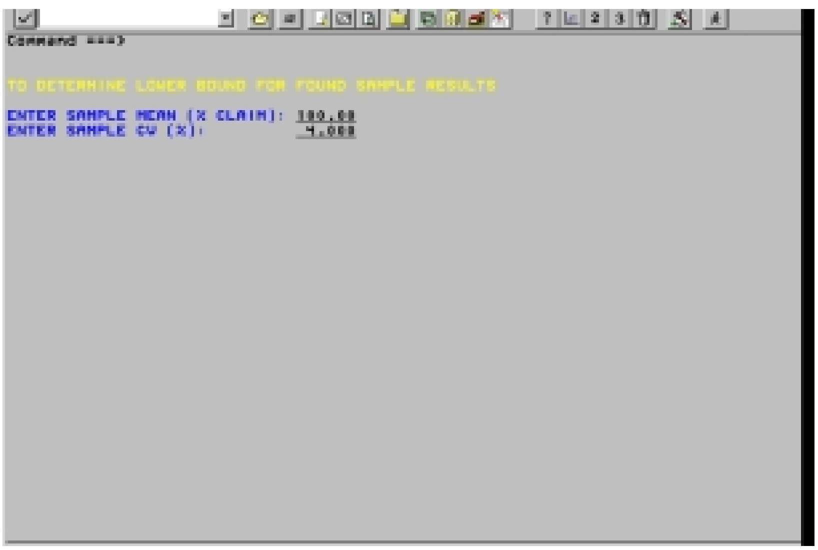
WINDOW: MDISP1



WINDOW: SMAIN

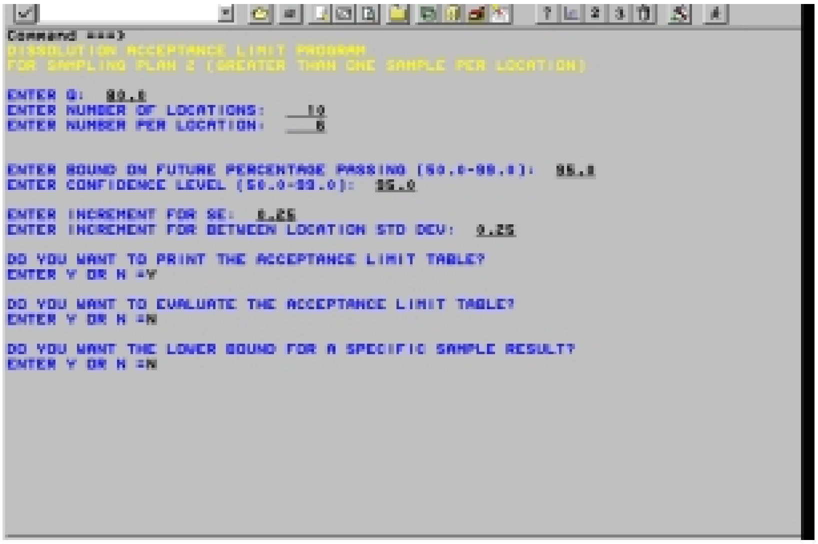


WINDOW: TMAIN

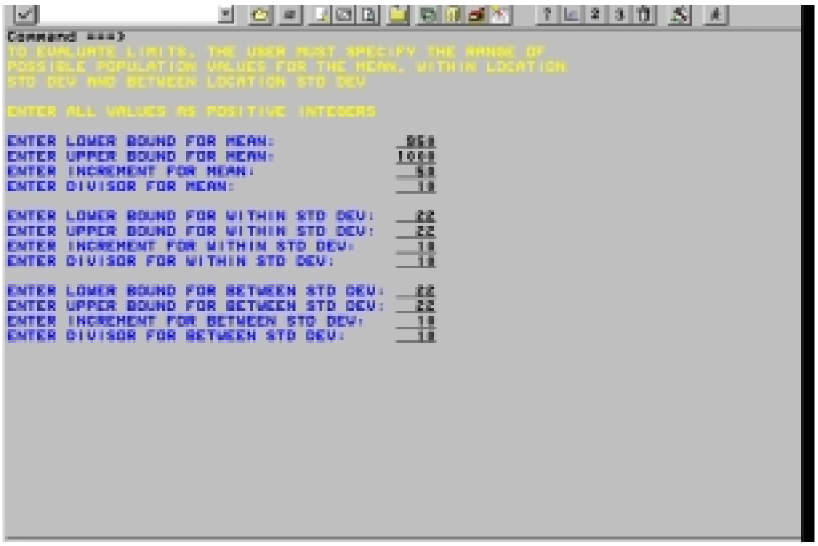


FILE: MACRO DISP2

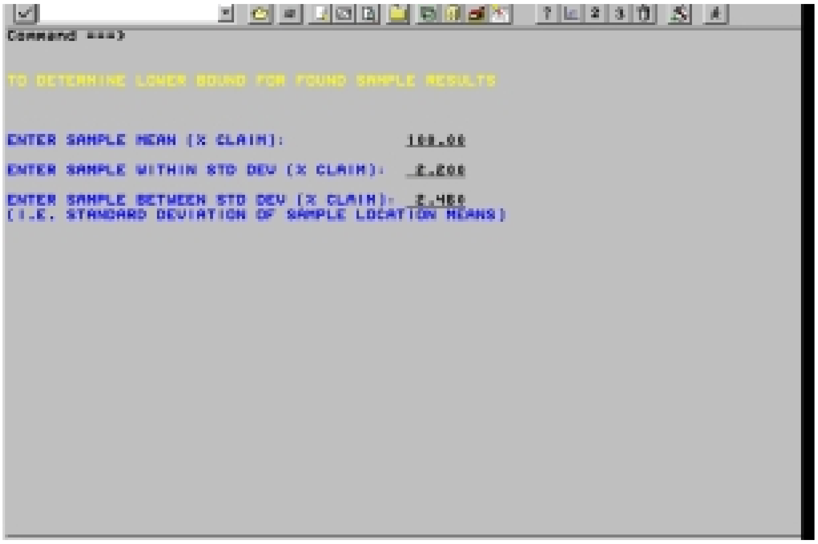
WINDOW: MDISP2



WINDOW: SMAIN



TMAIN



Command ===>
TO DETERMINE LOWER BOUND FOR FOUND SAMPLE RESULTS
ENTER SAMPLE MEAN (% CLAIM): 100.00
ENTER SAMPLE WITHIN STD DEV (% CLAIM): 2.200
ENTER SAMPLE BETWEEN STD DEV (% CLAIM): 2.400
(I.E. STANDARD DEVIATION OF SAMPLE LOCATION MEANS)

APPENDIX C
DEFAULT WINDOW OUTPUT

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 30)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 95.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)
85.1	0.04	90.1	2.02	95.1	3.78	100.1	4.61	105.1	3.35	110.1	1.59
85.2	0.08	90.2	2.06	95.2	3.81	100.2	4.62	105.2	3.32	110.2	1.56
85.3	0.13	90.3	2.10	95.3	3.84	100.3	4.62	105.3	3.28	110.3	1.52
85.4	0.17	90.4	2.13	95.4	3.87	100.4	4.62	105.4	3.25	110.4	1.49
85.5	0.21	90.5	2.17	95.5	3.91	100.5	4.62	105.5	3.21	110.5	1.45
85.6	0.25	90.6	2.21	95.6	3.94	100.6	4.63	105.6	3.17	110.6	1.42
85.7	0.29	90.7	2.24	95.7	3.97	100.7	4.63	105.7	3.14	110.7	1.39
85.8	0.33	90.8	2.28	95.8	4.00	100.8	4.63	105.8	3.10	110.8	1.35
85.9	0.37	90.9	2.32	95.9	4.03	100.9	4.63	105.9	3.06	110.9	1.32
86.0	0.42	91.0	2.35	96.0	4.06	101.0	4.63	106.0	3.03	111.0	1.29
86.1	0.46	91.1	2.39	96.1	4.08	101.1	4.63	106.1	2.99	111.1	1.25
86.2	0.50	91.2	2.43	96.2	4.11	101.2	4.62	106.2	2.96	111.2	1.22
86.3	0.54	91.3	2.46	96.3	4.14	101.3	4.60	106.3	2.92	111.3	1.19
86.4	0.58	91.4	2.50	96.4	4.16	101.4	4.57	106.4	2.88	111.4	1.15
86.5	0.62	91.5	2.54	96.5	4.19	101.5	4.55	106.5	2.85	111.5	1.12
86.6	0.66	91.6	2.57	96.6	4.22	101.6	4.53	106.6	2.81	111.6	1.09
86.7	0.70	91.7	2.61	96.7	4.24	101.7	4.50	106.7	2.78	111.7	1.05
86.8	0.74	91.8	2.64	96.8	4.26	101.8	4.48	106.8	2.74	111.8	1.02
86.9	0.78	91.9	2.68	96.9	4.28	101.9	4.45	106.9	2.70	111.9	0.99
87.0	0.82	92.0	2.72	97.0	4.31	102.0	4.42	107.0	2.67	112.0	0.96
87.1	0.86	92.1	2.75	97.1	4.33	102.1	4.40	107.1	2.63	112.1	0.92
87.2	0.90	92.2	2.79	97.2	4.35	102.2	4.37	107.2	2.60	112.2	0.89
87.3	0.94	92.3	2.82	97.3	4.36	102.3	4.34	107.3	2.56	112.3	0.86
87.4	0.98	92.4	2.86	97.4	4.38	102.4	4.31	107.4	2.53	112.4	0.83
87.5	1.02	92.5	2.90	97.5	4.40	102.5	4.27	107.5	2.49	112.5	0.79
87.6	1.06	92.6	2.93	97.6	4.41	102.6	4.24	107.6	2.46	112.6	0.76
87.7	1.10	92.7	2.97	97.7	4.43	102.7	4.21	107.7	2.42	112.7	0.73
87.8	1.14	92.8	3.00	97.8	4.44	102.8	4.18	107.8	2.38	112.8	0.70
87.9	1.18	92.9	3.04	97.9	4.46	102.9	4.14	107.9	2.35	112.9	0.66
88.0	1.22	93.0	3.07	98.0	4.47	103.0	4.11	108.0	2.31	113.0	0.63
88.1	1.26	93.1	3.11	98.1	4.48	103.1	4.07	108.1	2.28	113.1	0.60
88.2	1.29	93.2	3.14	98.2	4.49	103.2	4.04	108.2	2.24	113.2	0.57
88.3	1.33	93.3	3.17	98.3	4.50	103.3	4.00	108.3	2.21	113.3	0.54
88.4	1.37	93.4	3.21	98.4	4.51	103.4	3.97	108.4	2.17	113.4	0.50
88.5	1.41	93.5	3.24	98.5	4.52	103.5	3.93	108.5	2.14	113.5	0.47
88.6	1.45	93.6	3.28	98.6	4.53	103.6	3.90	108.6	2.10	113.6	0.44
88.7	1.49	93.7	3.31	98.7	4.54	103.7	3.86	108.7	2.07	113.7	0.41
88.8	1.53	93.8	3.35	98.8	4.55	103.8	3.82	108.8	2.03	113.8	0.38
88.9	1.57	93.9	3.38	98.9	4.56	103.9	3.79	108.9	2.00	113.9	0.34
89.0	1.60	94.0	3.41	99.0	4.56	104.0	3.75	109.0	1.97	114.0	0.31
89.1	1.64	94.1	3.45	99.1	4.57	104.1	3.72	109.1	1.93	114.1	0.28
89.2	1.68	94.2	3.48	99.2	4.58	104.2	3.68	109.2	1.90	114.2	0.25
89.3	1.72	94.3	3.52	99.3	4.58	104.3	3.64	109.3	1.86	114.3	0.22
89.4	1.76	94.4	3.55	99.4	4.59	104.4	3.61	109.4	1.83	114.4	0.19
89.5	1.80	94.5	3.58	99.5	4.59	104.5	3.57	109.5	1.79	114.5	0.16
89.6	1.83	94.6	3.62	99.6	4.60	104.6	3.54	109.6	1.76	114.6	0.12
89.7	1.87	94.7	3.65	99.7	4.60	104.7	3.50	109.7	1.73	114.7	0.09
89.8	1.91	94.8	3.68	99.8	4.60	104.8	3.46	109.8	1.69	114.8	0.06
89.9	1.95	94.9	3.71	99.9	4.61	104.9	3.43	109.9	1.66	114.9	0.03
90.0	1.98	95.0	3.75	100.0	4.61	105.0	3.39	110.0	1.62		

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 40 ASSAYS- 4 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8		0.9	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	85.5	114.5	85.9	114.1	86.4	113.6	86.8	113.2	87.2	112.8	87.7	112.3	88.1	111.9	88.5	111.5	89.0	111.0
0.2	85.6	114.4	86.0	114.0	86.4	113.6	86.8	113.2	87.2	112.8	87.7	112.3	88.1	111.9	88.5	111.5	89.0	111.0
0.3	85.8	114.2	86.1	113.9	86.5	113.5	86.9	113.1	87.3	112.7	87.7	112.3	88.1	111.9	88.6	111.4	89.0	111.0
0.4	86.0	114.0	86.2	113.8	86.5	113.5	86.9	113.1	87.3	112.7	87.7	112.3	88.2	111.8	88.6	111.4	89.0	111.0
0.5	86.2	113.8	86.4	113.6	86.7	113.3	87.0	113.0	87.4	112.6	87.8	112.2	88.2	111.8	88.6	111.4	89.1	110.9
0.6	86.4	113.6	86.5	113.5	86.8	113.2	87.1	112.9	87.5	112.5	87.9	112.1	88.3	111.7	88.7	111.3	89.1	110.9
0.7	86.5	113.5	86.7	113.3	86.9	113.1	87.2	112.8	87.6	112.4	88.0	112.0	88.3	111.7	88.7	111.3	89.2	110.8
0.8	86.7	113.3	86.9	113.1	87.1	112.9	87.4	112.6	87.7	112.3	88.0	112.0	88.4	111.6	88.8	111.2	89.2	110.8
0.9	86.9	113.1	87.1	112.9	87.3	112.7	87.5	112.5	87.8	112.2	88.2	111.8	88.5	111.5	88.9	111.1	89.3	110.7
1.0	87.1	112.9	87.3	112.7	87.5	112.5	87.7	112.3	88.0	112.0	88.3	111.7	88.6	111.4	89.0	111.0	89.4	110.6
1.1	87.3	112.7	87.5	112.5	87.6	112.4	87.9	112.1	88.1	111.9	88.4	111.6	88.7	111.3	89.1	110.9	89.4	110.6
1.2	87.5	112.5	87.7	112.3	87.8	112.2	88.0	112.0	88.3	111.7	88.5	111.5	88.8	111.2	89.2	110.8	89.5	110.5
1.3	87.7	112.3	87.9	112.1	88.0	112.0	88.2	111.8	88.4	111.6	88.7	111.3	89.0	111.0	89.3	110.7	89.6	110.4
1.4	87.9	112.1	88.0	112.0	88.2	111.8	88.4	111.6	88.6	111.4	88.8	111.2	89.1	110.9	89.4	110.6	89.8	110.2
1.5	88.1	111.9	88.2	111.8	88.4	111.6	88.6	111.4	88.8	111.2	89.0	111.0	89.3	110.7	89.6	110.4	89.9	110.1
1.6	88.3	111.7	88.4	111.6	88.6	111.4	88.8	111.2	89.0	111.0	89.2	110.8	89.4	110.6	89.7	110.3	90.0	110.0
1.7	88.5	111.5	88.6	111.4	88.8	111.2	88.9	111.1	89.1	110.9	89.3	110.7	89.6	110.4	89.9	110.1	90.1	109.9
1.8	88.7	111.3	88.8	111.2	89.0	111.0	89.1	110.9	89.3	110.7	89.5	110.5	89.8	110.2	90.0	110.0	90.3	109.7
1.9	88.9	111.1	89.0	111.0	89.2	110.8	89.3	110.7	89.5	110.5	89.7	110.3	89.9	110.1	90.2	109.8	90.4	109.6
2.0	89.1	110.9	89.2	110.8	89.3	110.7	89.5	110.5	89.7	110.3	89.9	110.1	90.1	109.9	90.3	109.7	90.6	109.4
2.1	89.3	110.7	89.4	110.6	89.5	110.5	89.7	110.3	89.9	110.1	90.1	109.9	90.3	109.7	90.5	109.5	90.7	109.3
2.2	89.4	110.6	89.6	110.4	89.7	110.3	89.9	110.1	90.1	109.9	90.2	109.8	90.4	109.6	90.7	109.3	90.9	109.1
2.3	89.6	110.4	89.8	110.2	89.9	110.1	90.1	109.9	90.2	109.8	90.4	109.6	90.6	109.4	90.8	109.2	91.1	108.9
2.4	89.8	110.2	90.0	110.0	90.1	109.9	90.3	109.7	90.4	109.6	90.6	109.4	90.8	109.2	91.0	109.0	91.2	108.8
2.5	90.0	110.0	90.2	109.8	90.3	109.7	90.5	109.5	90.6	109.4	90.8	109.2	91.0	109.0	91.2	108.8	91.4	108.6
2.6	90.2	109.8	90.4	109.6	90.5	109.5	90.7	109.3	90.8	109.2	91.0	109.0	91.2	108.8	91.4	108.6	91.6	108.4
2.7	90.4	109.6	90.6	109.4	90.7	109.3	90.8	109.2	91.0	109.0	91.2	108.8	91.4	108.6	91.5	108.5	91.8	108.2
2.8	90.6	109.4	90.7	109.3	90.9	109.1	91.0	109.0	91.2	108.8	91.4	108.6	91.5	108.5	91.7	108.3	91.9	108.1
2.9	90.8	109.2	90.9	109.1	91.1	108.9	91.2	108.8	91.4	108.6	91.6	108.4	91.7	108.3	91.9	108.1	92.1	107.9
3.0	91.0	109.0	91.1	108.9	91.3	108.7	91.4	108.6	91.6	108.4	91.7	108.3	91.9	108.1	92.1	107.9	92.3	107.7
3.1	91.2	108.8	91.3	108.7	91.5	108.5	91.6	108.4	91.8	108.2	91.9	108.1	92.1	107.9	92.3	107.7	92.5	107.5
3.2	91.4	108.6	91.5	108.5	91.7	108.3	91.8	108.2	92.0	108.0	92.1	107.9	92.3	107.7	92.5	107.5	92.7	107.3
3.3	91.6	108.4	91.7	108.3	91.9	108.1	92.0	108.0	92.2	107.8	92.3	107.7	92.5	107.5	92.7	107.3	92.8	107.2
3.4	91.8	108.2	91.9	108.1	92.1	107.9	92.2	107.8	92.3	107.7	92.5	107.5	92.7	107.3	92.8	107.2	93.0	107.0
3.5	92.0	108.0	92.1	107.9	92.2	107.8	92.4	107.6	92.5	107.5	92.7	107.3	92.9	107.1	93.0	107.0	93.2	106.8
3.6	92.2	107.8	92.3	107.7	92.4	107.6	92.6	107.4	92.7	107.3	92.9	107.1	93.1	106.9	93.2	106.8	93.4	106.6
3.7	92.4	107.6	92.5	107.5	92.6	107.4	92.8	107.2	92.9	107.1	93.1	106.9	93.2	106.8	93.4	106.6	93.6	106.4
3.8	92.6	107.4	92.7	107.3	92.8	107.2	93.0	107.0	93.1	106.9	93.3	106.7	93.4	106.6	93.6	106.4	93.8	106.2
3.9	92.8	107.2	92.9	107.1	93.0	107.0	93.2	106.8	93.3	106.7	93.5	106.5	93.6	106.4	93.8	106.2	94.0	106.0
4.0	93.0	107.0	93.1	106.9	93.2	106.8	93.4	106.6	93.5	106.5	93.7	106.3	93.8	106.2	94.0	106.0	94.2	105.8
4.1	93.2	106.8	93.3	106.7	93.4	106.6	93.6	106.4	93.7	106.3	93.9	106.1	94.0	106.0	94.2	105.8	94.4	105.6
4.2	93.4	106.6	93.5	106.5	93.6	106.4	93.8	106.2	93.9	106.1	94.1	105.9	94.2	105.8	94.4	105.6	94.6	105.4
4.3	93.6	106.4	93.7	106.3	93.8	106.2	94.0	106.0	94.1	105.9	94.3	105.7	94.4	105.6	94.6	105.4	94.8	105.2

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 40 ASSAYS- 4 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8		0.9	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
4.4	93.8	106.2	93.9	106.1	94.1	106.0	94.2	105.8	94.3	105.7	94.5	105.5	94.6	105.4	94.8	105.2	95.0	105.0
4.5	94.0	106.0	94.1	105.9	94.3	105.8	94.4	105.6	94.6	105.5	94.7	105.3	94.9	105.2	95.0	105.0	95.2	104.8
4.6	94.2	105.8	94.4	105.7	94.5	105.5	94.6	105.4	94.8	105.3	94.9	105.1	95.1	105.0	95.3	104.8	95.4	104.6
4.7	94.5	105.6	94.6	105.5	94.7	105.3	94.9	105.2	95.0	105.0	95.2	104.9	95.4	104.7	95.5	104.6	95.7	104.4
4.8	94.7	105.4	94.9	105.3	95.0	105.1	95.2	105.0	95.3	104.8	95.5	104.7	95.6	104.5	95.8	104.4	96.0	104.2
4.9	95.0	105.2	95.2	105.0	95.3	104.9	95.5	104.8	95.6	104.6	95.8	104.5	96.0	104.3	96.1	104.1	96.3	104.0
5.0	95.4	104.9	95.5	104.8	95.7	104.7	95.8	104.5	96.0	104.4	96.2	104.2	96.3	104.1	96.5	103.9	96.7	103.7
5.1	95.8	104.7	96.0	104.6	96.1	104.4	96.3	104.3	96.4	104.1	96.6	104.0	96.8	103.8	97.0	103.7	97.2	103.5
5.2	96.4	104.4	96.5	104.3	96.7	104.1	96.8	104.0	97.0	103.9	97.2	103.7	97.4	103.5	97.6	103.4	97.9	103.2
5.3	97.1	104.1	97.3	104.0	97.4	103.8	97.6	103.7	97.8	103.5	98.0	103.4	98.2	103.2	98.5	103.0	98.8	102.8
5.4	98.2	103.7	98.3	103.6	98.5	103.4	98.7	103.3	98.9	103.1	99.2	102.9	99.4	102.8	99.7	102.6	100.1	102.3
5.5	99.7	103.1	99.8	103.0	100.0	102.8	100.2	102.6	100.5	102.4	100.8	102.2	101.1	102.0	101.5	101.7		

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
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SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	1.0		1.1		1.2		1.3		1.4		1.5		1.6		1.7		1.8	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	89.4	110.6	89.8	110.2	90.3	109.7	90.7	109.3	91.1	108.9	91.6	108.4	92.0	108.0	92.4	107.6	92.9	107.1
0.2	89.4	110.6	89.8	110.2	90.3	109.7	90.7	109.3	91.1	108.9	91.6	108.4	92.0	108.0	92.4	107.6	92.9	107.1
0.3	89.4	110.6	89.9	110.1	90.3	109.7	90.7	109.3	91.2	108.8	91.6	108.4	92.0	108.0	92.5	107.5	92.9	107.1
0.4	89.4	110.6	89.9	110.1	90.3	109.7	90.7	109.3	91.2	108.8	91.6	108.4	92.0	108.0	92.5	107.5	92.9	107.1
0.5	89.5	110.5	89.9	110.1	90.3	109.7	90.8	109.2	91.2	108.8	91.6	108.4	92.1	107.9	92.5	107.5	92.9	107.1
0.6	89.5	110.5	89.9	110.1	90.4	109.6	90.8	109.2	91.2	108.8	91.6	108.4	92.1	107.9	92.5	107.5	92.9	107.1
0.7	89.6	110.4	90.0	110.0	90.4	109.6	90.8	109.2	91.3	108.7	91.7	108.3	92.1	107.9	92.5	107.5	93.0	107.0
0.8	89.6	110.4	90.0	110.0	90.4	109.6	90.9	109.1	91.3	108.7	91.7	108.3	92.1	107.9	92.6	107.4	93.0	107.0
0.9	89.7	110.3	90.1	109.9	90.5	109.5	90.9	109.1	91.3	108.7	91.8	108.2	92.2	107.8	92.6	107.4	93.0	107.0
1.0	89.8	110.2	90.2	109.8	90.6	109.4	91.0	109.0	91.4	108.6	91.8	108.2	92.2	107.8	92.6	107.4	93.1	106.9
1.1	89.8	110.2	90.2	109.8	90.6	109.4	91.0	109.0	91.4	108.6	91.8	108.2	92.3	107.7	92.7	107.3	93.1	106.9
1.2	89.9	110.1	90.3	109.7	90.7	109.3	91.1	108.9	91.5	108.5	91.9	108.1	92.3	107.7	92.7	107.3	93.1	106.9
1.3	90.0	110.0	90.4	109.6	90.8	109.2	91.2	108.8	91.6	108.4	92.0	108.0	92.4	107.6	92.8	107.2	93.2	106.8
1.4	90.1	109.9	90.5	109.5	90.9	109.1	91.2	108.8	91.6	108.4	92.0	108.0	92.4	107.6	92.8	107.2	93.3	106.7
1.5	90.2	109.8	90.6	109.4	90.9	109.1	91.3	108.7	91.7	108.3	92.1	107.9	92.5	107.5	92.9	107.1	93.3	106.7
1.6	90.3	109.7	90.7	109.3	91.0	109.0	91.4	108.6	91.8	108.2	92.2	107.8	92.6	107.4	93.0	107.0	93.4	106.6
1.7	90.5	109.5	90.8	109.2	91.1	108.9	91.5	108.5	91.9	108.1	92.3	107.7	92.6	107.4	93.0	107.0	93.4	106.6
1.8	90.6	109.4	90.9	109.1	91.3	108.7	91.6	108.4	92.0	108.0	92.3	107.7	92.7	107.3	93.1	106.9	93.5	106.5
1.9	90.7	109.3	91.0	109.0	91.4	108.6	91.7	108.3	92.1	107.9	92.4	107.6	92.8	107.2	93.2	106.8	93.6	106.4
2.0	90.9	109.1	91.2	108.8	91.5	108.5	91.8	108.2	92.2	107.8	92.5	107.5	92.9	107.1	93.3	106.7	93.7	106.3
2.1	91.0	109.0	91.3	108.7	91.6	108.4	91.9	108.1	92.3	107.7	92.6	107.4	93.0	107.0	93.4	106.6	93.8	106.2
2.2	91.2	108.8	91.5	108.5	91.8	108.2	92.1	107.9	92.4	107.6	92.7	107.3	93.1	106.9	93.5	106.5	93.8	106.2
2.3	91.3	108.7	91.6	108.4	91.9	108.1	92.2	107.8	92.5	107.5	92.9	107.1	93.2	106.8	93.6	106.4	93.9	106.1
2.4	91.5	108.5	91.7	108.3	92.0	108.0	92.3	107.7	92.6	107.4	93.0	107.0	93.3	106.7	93.7	106.3	94.0	106.0
2.5	91.6	108.4	91.9	108.1	92.2	107.8	92.5	107.5	92.8	107.2	93.1	106.9	93.4	106.6	93.8	106.2	94.1	105.9
2.6	91.8	108.2	92.1	107.9	92.3	107.7	92.6	107.4	92.9	107.1	93.2	106.8	93.6	106.4	93.9	106.1	94.2	105.8
2.7	92.0	108.0	92.2	107.8	92.5	107.5	92.8	107.2	93.1	106.9	93.4	106.6	93.7	106.3	94.0	106.0	94.4	105.6
2.8	92.2	107.8	92.4	107.6	92.6	107.4	92.9	107.1	93.2	106.8	93.5	106.5	93.8	106.2	94.1	105.9	94.5	105.5
2.9	92.3	107.7	92.6	107.4	92.8	107.2	93.1	106.9	93.3	106.7	93.6	106.4	93.9	106.1	94.3	105.7	94.6	105.4
3.0	92.5	107.5	92.7	107.3	93.0	107.0	93.2	106.8	93.5	106.5	93.8	106.2	94.1	105.9	94.4	105.6	94.7	105.3
3.1	92.7	107.3	92.9	107.1	93.1	106.9	93.4	106.6	93.7	106.3	93.9	106.1	94.2	105.8	94.5	105.5	94.9	105.1
3.2	92.9	107.1	93.1	106.9	93.3	106.7	93.6	106.4	93.8	106.2	94.1	105.9	94.4	105.6	94.7	105.3	95.0	105.0
3.3	93.0	107.0	93.3	106.7	93.5	106.5	93.7	106.3	94.0	106.0	94.2	105.8	94.5	105.5	94.8	105.2	95.1	104.9
3.4	93.2	106.8	93.4	106.6	93.7	106.3	93.9	106.1	94.1	105.9	94.4	105.6	94.7	105.3	95.0	105.0	95.3	104.7
3.5	93.4	106.6	93.6	106.4	93.8	106.2	94.1	105.9	94.3	105.7	94.6	105.4	94.8	105.2	95.1	104.9	95.4	104.6
3.6	93.6	106.4	93.8	106.2	94.0	106.0	94.2	105.8	94.5	105.5	94.7	105.3	95.0	105.0	95.3	104.7	95.6	104.4
3.7	93.8	106.2	94.0	106.0	94.2	105.8	94.4	105.6	94.6	105.4	94.9	105.1	95.2	104.8	95.4	104.6	95.7	104.3
3.8	94.0	106.0	94.2	105.8	94.4	105.6	94.6	105.4	94.8	105.2	95.1	104.9	95.3	104.7	95.6	104.4	95.9	104.1
3.9	94.2	105.8	94.4	105.6	94.6	105.4	94.8	105.2	95.0	105.0	95.2	104.8	95.5	104.5	95.8	104.2	96.0	104.0
4.0	94.4	105.6	94.5	105.5	94.7	105.3	95.0	105.0	95.2	104.8	95.4	104.6	95.7	104.3	95.9	104.1	96.2	103.8
4.1	94.5	105.5	94.7	105.3	94.9	105.1	95.1	104.9	95.4	104.6	95.6	104.4	95.9	104.2	96.1	103.9	96.4	103.6
4.2	94.7	105.3	94.9	105.1	95.1	104.9	95.3	104.7	95.6	104.5	95.8	104.2	96.0	104.0	96.3	103.7	96.6	103.5
4.3	95.0	105.1	95.1	104.9	95.3	104.7	95.5	104.5	95.8	104.3	96.0	104.0	96.3	103.8	96.5	103.6	96.8	103.3

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STANDARD DEVIATION OF LOCATION MEANS

	1.0		1.1		1.2		1.3		1.4		1.5		1.6		1.7		1.8	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
4.4	95.2	104.9	95.3	104.7	95.5	104.5	95.8	104.3	96.0	104.1	96.2	103.8	96.5	103.6	96.8	103.4	97.1	103.1
4.5	95.4	104.7	95.6	104.5	95.8	104.3	96.0	104.1	96.2	103.9	96.5	103.7	96.7	103.4	97.0	103.2	97.3	102.9
4.6	95.6	104.5	95.8	104.3	96.0	104.1	96.2	103.9	96.5	103.7	96.7	103.5	97.0	103.2	97.3	103.0	97.7	102.7
4.7	95.9	104.2	96.1	104.1	96.3	103.9	96.5	103.7	96.8	103.5	97.0	103.2	97.3	103.0	97.7	102.8	98.0	102.5
4.8	96.2	104.0	96.4	103.8	96.6	103.7	96.8	103.5	97.1	103.3	97.4	103.0	97.7	102.8	98.1	102.5	98.5	102.3
4.9	96.5	103.8	96.7	103.6	97.0	103.4	97.2	103.2	97.5	103.0	97.8	102.8	98.2	102.5	98.6	102.3	99.1	102.0
5.0	96.9	103.6	97.2	103.4	97.4	103.2	97.7	103.0	98.0	102.8	98.4	102.5	98.8	102.3	99.3	102.0	99.9	101.7
5.1	97.5	103.3	97.7	103.1	98.0	102.9	98.3	102.7	98.7	102.5	99.1	102.2	99.7	101.9	100.3	101.6	101.1	101.2
5.2	98.1	103.0	98.4	102.8	98.8	102.6	99.2	102.4	99.6	102.1	100.2	101.8	100.9	101.5				
5.3	99.1	102.6	99.5	102.4	99.9	102.2	100.4	101.9	101.0	101.6								
5.4	100.5	102.1	100.9	101.8	101.4	101.5												

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 40 ASSAYS- 4 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	1.9		2.0		2.1		2.2		2.3		2.4		2.5		2.6		2.7	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	93.3	106.7	93.7	106.3	94.2	105.8	94.6	105.4	95.0	105.0	95.5	104.5	95.9	104.1	96.4	103.6	96.8	103.2
0.2	93.3	106.7	93.7	106.3	94.2	105.8	94.6	105.4	95.1	104.9	95.5	104.5	95.9	104.1	96.4	103.6	96.8	103.2
0.3	93.3	106.7	93.8	106.2	94.2	105.8	94.6	105.4	95.1	104.9	95.5	104.5	95.9	104.1	96.4	103.6	96.8	103.2
0.4	93.3	106.7	93.8	106.2	94.2	105.8	94.6	105.4	95.1	104.9	95.5	104.5	96.0	104.0	96.4	103.6	96.8	103.2
0.5	93.3	106.7	93.8	106.2	94.2	105.8	94.6	105.4	95.1	104.9	95.5	104.5	96.0	104.0	96.4	103.6	96.9	103.1
0.6	93.4	106.6	93.8	106.2	94.2	105.8	94.7	105.3	95.1	104.9	95.5	104.5	96.0	104.0	96.4	103.6	96.9	103.1
0.7	93.4	106.6	93.8	106.2	94.3	105.7	94.7	105.3	95.1	104.9	95.6	104.4	96.0	104.0	96.4	103.6	96.9	103.1
0.8	93.4	106.6	93.8	106.2	94.3	105.7	94.7	105.3	95.1	104.9	95.6	104.4	96.0	104.0	96.5	103.5	96.9	103.1
0.9	93.5	106.5	93.9	106.1	94.3	105.7	94.7	105.3	95.2	104.8	95.6	104.4	96.0	104.0	96.5	103.5	96.9	103.1
1.0	93.5	106.5	93.9	106.1	94.3	105.7	94.8	105.2	95.2	104.8	95.6	104.4	96.1	103.9	96.5	103.5	97.0	103.0
1.1	93.5	106.5	93.9	106.1	94.4	105.6	94.8	105.2	95.2	104.8	95.7	104.3	96.1	103.9	96.5	103.5	97.0	103.0
1.2	93.6	106.4	94.0	106.0	94.4	105.6	94.8	105.2	95.3	104.7	95.7	104.3	96.1	103.9	96.6	103.4	97.0	103.0
1.3	93.6	106.4	94.0	106.0	94.5	105.5	94.9	105.1	95.3	104.7	95.7	104.3	96.2	103.8	96.6	103.4	97.1	103.0
1.4	93.7	106.3	94.1	105.9	94.5	105.5	94.9	105.1	95.4	104.6	95.8	104.2	96.2	103.8	96.6	103.4	97.1	102.9
1.5	93.7	106.3	94.1	105.9	94.6	105.4	95.0	105.0	95.4	104.6	95.8	104.2	96.3	103.7	96.7	103.3	97.1	102.9
1.6	93.8	106.2	94.2	105.8	94.6	105.4	95.0	105.0	95.4	104.6	95.9	104.1	96.3	103.7	96.7	103.3	97.2	102.8
1.7	93.8	106.2	94.3	105.7	94.7	105.3	95.1	104.9	95.5	104.5	95.9	104.1	96.3	103.7	96.8	103.2	97.2	102.8
1.8	93.9	106.1	94.3	105.7	94.7	105.3	95.1	104.9	95.6	104.4	96.0	104.0	96.4	103.6	96.8	103.2	97.3	102.7
1.9	94.0	106.0	94.4	105.6	94.8	105.2	95.2	104.8	95.6	104.4	96.0	104.0	96.5	103.5	96.9	103.1	97.3	102.7
2.0	94.1	105.9	94.5	105.5	94.9	105.1	95.3	104.7	95.7	104.3	96.1	103.9	96.5	103.5	96.9	103.1	97.4	102.6
2.1	94.1	105.9	94.5	105.5	94.9	105.1	95.3	104.7	95.7	104.3	96.2	103.8	96.6	103.4	97.0	103.0	97.5	102.6
2.2	94.2	105.8	94.6	105.4	95.0	105.0	95.4	104.6	95.8	104.2	96.2	103.8	96.6	103.4	97.1	102.9	97.5	102.5
2.3	94.3	105.7	94.7	105.3	95.1	104.9	95.5	104.5	95.9	104.1	96.3	103.7	96.7	103.3	97.1	102.9	97.6	102.4
2.4	94.4	105.6	94.8	105.2	95.2	104.8	95.6	104.4	96.0	104.0	96.4	103.6	96.8	103.2	97.2	102.8	97.7	102.4
2.5	94.5	105.5	94.9	105.1	95.3	104.7	95.7	104.3	96.0	104.0	96.5	103.6	96.9	103.1	97.3	102.7	97.8	102.3
2.6	94.6	105.4	95.0	105.0	95.4	104.6	95.7	104.3	96.1	103.9	96.5	103.5	97.0	103.1	97.4	102.6	97.9	102.2
2.7	94.7	105.3	95.1	104.9	95.5	104.5	95.8	104.2	96.2	103.8	96.6	103.4	97.0	103.0	97.5	102.6	98.0	102.1
2.8	94.8	105.2	95.2	104.8	95.6	104.4	95.9	104.1	96.3	103.7	96.7	103.3	97.1	102.9	97.6	102.5	98.1	102.1
2.9	94.9	105.1	95.3	104.7	95.7	104.3	96.0	104.0	96.4	103.6	96.8	103.2	97.2	102.8	97.7	102.4	98.2	102.0
3.0	95.1	104.9	95.4	104.6	95.8	104.2	96.1	103.9	96.5	103.5	96.9	103.1	97.3	102.7	97.8	102.3	98.3	101.9
3.1	95.2	104.8	95.5	104.5	95.9	104.1	96.3	103.8	96.6	103.4	97.0	103.0	97.5	102.6	97.9	102.2	98.4	101.8
3.2	95.3	104.7	95.7	104.3	96.0	104.0	96.4	103.6	96.7	103.3	97.1	102.9	97.6	102.5	98.1	102.1	98.6	101.7
3.3	95.4	104.6	95.8	104.2	96.1	103.9	96.5	103.5	96.9	103.2	97.3	102.8	97.7	102.4	98.2	102.0	98.8	101.6
3.4	95.6	104.4	95.9	104.1	96.3	103.8	96.6	103.4	97.0	103.0	97.4	102.7	97.9	102.3	98.4	101.9	99.0	101.5
3.5	95.7	104.3	96.1	104.0	96.4	103.6	96.8	103.3	97.1	102.9	97.6	102.5	98.0	102.2	98.6	101.8	99.2	101.3
3.6	95.9	104.1	96.2	103.8	96.5	103.5	96.9	103.1	97.3	102.8	97.7	102.4	98.2	102.0	98.8	101.6	99.5	101.2
3.7	96.0	104.0	96.3	103.7	96.7	103.3	97.0	103.0	97.4	102.7	97.9	102.3	98.4	101.9	99.0	101.5	99.8	101.0
3.8	96.2	103.8	96.5	103.5	96.8	103.2	97.2	102.9	97.6	102.5	98.1	102.2	98.6	101.8	99.3	101.4	100.2	100.9
3.9	96.3	103.7	96.7	103.4	97.0	103.1	97.4	102.7	97.8	102.4	98.3	102.0	98.9	101.6	99.6	101.2	100.6	100.7
4.0	96.5	103.5	96.8	103.2	97.2	102.9	97.6	102.6	98.0	102.2	98.6	101.9	99.2	101.5	100.0	101.0		
4.1	96.7	103.4	97.0	103.1	97.4	102.7	97.8	102.4	98.3	102.1	98.9	101.7	99.6	101.3	100.6	100.8		
4.2	96.9	103.2	97.3	102.9	97.6	102.6	98.1	102.3	98.6	101.9	99.2	101.5	100.1	101.1				
4.3	97.1	103.0	97.5	102.7	97.9	102.4	98.4	102.1	99.0	101.7	99.7	101.3	100.7	100.8				

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 40 ASSAYS- 4 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	1.9		2.0		2.1		2.2		2.3		2.4		2.5		2.6		2.7	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
4.4	97.4	102.8	97.8	102.5	98.2	102.2	98.7	101.9	99.4	101.5	100.3	101.1						
4.5	97.7	102.6	98.1	102.3	98.6	102.0	99.2	101.7	100.0	101.3								
4.6	98.0	102.4	98.5	102.1	99.1	101.8	99.8	101.4	100.7	101.0								
4.7	98.5	102.2	99.0	101.9	99.7	101.5	100.5	101.1										
4.8	99.0	102.0	99.6	101.6	100.5	101.2												
4.9	99.7	101.7	100.5	101.3														
5.0	100.7	101.3																

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 40 ASSAYS- 4 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	2.8		2.9		3.0		3.1		3.2		3.3		3.4		3.5		3.6	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	97.3	102.7	97.8	102.3	98.3	101.8	98.9	101.3	99.6	100.8								
0.2	97.3	102.7	97.8	102.3	98.3	101.8	98.9	101.3	99.6	100.8								
0.3	97.3	102.7	97.8	102.3	98.3	101.8	98.9	101.3	99.6	100.8								
0.4	97.3	102.7	97.8	102.3	98.3	101.8	98.9	101.3	99.6	100.8								
0.5	97.3	102.7	97.8	102.2	98.3	101.8	98.9	101.3	99.6	100.8								
0.6	97.3	102.7	97.8	102.2	98.3	101.8	98.9	101.3	99.7	100.8								
0.7	97.3	102.7	97.8	102.2	98.4	101.8	99.0	101.3	99.7	100.8								
0.8	97.4	102.6	97.9	102.2	98.4	101.7	99.0	101.3	99.7	100.8								
0.9	97.4	102.6	97.9	102.2	98.4	101.7	99.0	101.2	99.8	100.7								
1.0	97.4	102.6	97.9	102.1	98.4	101.7	99.1	101.2	99.8	100.7								
1.1	97.4	102.6	97.9	102.1	98.5	101.7	99.1	101.2	99.9	100.7								
1.2	97.5	102.5	98.0	102.1	98.5	101.6	99.1	101.2	99.9	100.6								
1.3	97.5	102.5	98.0	102.1	98.6	101.6	99.2	101.1	100.0	100.6								
1.4	97.6	102.5	98.1	102.0	98.6	101.6	99.3	101.1	100.1	100.6								
1.5	97.6	102.4	98.1	102.0	98.7	101.5	99.3	101.0	100.2	100.5								
1.6	97.6	102.4	98.1	101.9	98.7	101.5	99.4	101.0	100.3	100.5								
1.7	97.7	102.3	98.2	101.9	98.8	101.4	99.5	100.9	100.4	100.4								
1.8	97.8	102.3	98.3	101.8	98.9	101.4	99.6	100.9										
1.9	97.8	102.2	98.3	101.8	98.9	101.3	99.7	100.8										
2.0	97.9	102.2	98.4	101.7	99.0	101.3	99.8	100.8										
2.1	97.9	102.1	98.5	101.7	99.1	101.2	99.9	100.7										
2.2	98.0	102.1	98.6	101.6	99.2	101.2	100.1	100.6										
2.3	98.1	102.0	98.7	101.6	99.3	101.1	100.2	100.6										
2.4	98.2	101.9	98.8	101.5	99.5	101.0	100.4	100.5										
2.5	98.3	101.9	98.9	101.4	99.6	100.9												
2.6	98.4	101.8	99.0	101.3	99.8	100.9												
2.7	98.5	101.7	99.1	101.3	100.0	100.8												
2.8	98.6	101.6	99.3	101.2	100.2	100.7												
2.9	98.8	101.5	99.5	101.1	100.4	100.6												
3.0	98.9	101.4	99.7	101.0														
3.1	99.1	101.3	99.9	100.9														
3.2	99.3	101.2	100.2	100.7														
3.3	99.5	101.1	100.5	100.6														
3.4	99.8	101.0																
3.5	100.1	100.9																
3.6	100.4	100.7																

ACCEPTANCE LIMITS FOR DISSOLUTION (N = 6, Q = 80.0)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES WITH 95.0 % ASSURANCE,
THAT AT LEAST 95.0% OF ALL FUTURE SAMPLES TESTED
FOR DISSOLUTION WILL PASS THE USP TEST)
TABLE ENTRY IS UPPER LIMIT ON CV OF 6 DISSOLUTION ASSAYS

MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)
80.2	0.09	84.2	1.80	88.2	3.34	92.2	4.28	96.2	4.69
80.4	0.18	84.4	1.88	88.4	3.41	92.4	4.31	96.4	4.70
80.6	0.27	84.6	1.96	88.6	3.47	92.6	4.33	96.6	4.72
80.8	0.36	84.8	2.04	88.8	3.54	92.8	4.36	96.8	4.73
81.0	0.44	85.0	2.12	89.0	3.60	93.0	4.38	97.0	4.75
81.2	0.53	85.2	2.20	89.2	3.66	93.2	4.41	97.2	4.77
81.4	0.62	85.4	2.28	89.4	3.71	93.4	4.43	97.4	4.78
81.6	0.71	85.6	2.36	89.6	3.77	93.6	4.45	97.6	4.80
81.8	0.79	85.8	2.44	89.8	3.82	93.8	4.47	97.8	4.81
82.0	0.88	86.0	2.52	90.0	3.87	94.0	4.49	98.0	4.82
82.2	0.96	86.2	2.59	90.2	3.92	94.2	4.51	98.2	4.84
82.4	1.05	86.4	2.67	90.4	3.96	94.4	4.53	98.4	4.85
82.6	1.13	86.6	2.75	90.6	4.00	94.6	4.55	98.6	4.87
82.8	1.22	86.8	2.82	90.8	4.04	94.8	4.57	98.8	4.88
83.0	1.30	87.0	2.90	91.0	4.08	95.0	4.59	99.0	4.90
83.2	1.39	87.2	2.98	91.2	4.12	95.2	4.60	99.2	4.91
83.4	1.47	87.4	3.05	91.4	4.15	95.4	4.62	99.4	4.92
83.6	1.55	87.6	3.12	91.6	4.19	95.6	4.64	99.6	4.94
83.8	1.63	87.8	3.20	91.8	4.22	95.8	4.65	99.8	4.95
84.0	1.72	88.0	3.27	92.0	4.25	96.0	4.67	100.0	4.97

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 60 ASSAYS- 6 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25
0.25	80.50	80.90	81.40	81.80	82.20	82.70	83.10	83.50	84.00	84.40	84.80	85.30	85.70	86.10	86.60	87.00	87.50
0.50	80.60	81.00	81.40	81.80	82.20	82.70	83.10	83.50	84.00	84.40	84.80	85.30	85.70	86.10	86.60	87.10	87.50
0.75	80.60	81.00	81.40	81.80	82.30	82.70	83.10	83.50	84.00	84.40	84.80	85.30	85.70	86.20	86.60	87.10	87.60
1.00	80.70	81.10	81.50	81.90	82.30	82.70	83.10	83.60	84.00	84.40	84.90	85.30	85.70	86.20	86.60	87.10	87.60
1.25	80.80	81.10	81.50	81.90	82.30	82.70	83.20	83.60	84.00	84.40	84.90	85.30	85.70	86.20	86.60	87.10	87.60
1.50	80.90	81.20	81.60	82.00	82.40	82.80	83.20	83.60	84.00	84.50	84.90	85.30	85.80	86.20	86.60	87.10	87.60
1.75	81.00	81.30	81.60	82.00	82.40	82.80	83.20	83.60	84.10	84.50	84.90	85.30	85.80	86.20	86.70	87.10	87.60
2.00	81.10	81.40	81.70	82.10	82.50	82.90	83.30	83.70	84.10	84.50	84.90	85.40	85.80	86.20	86.70	87.10	87.70
2.25	81.20	81.50	81.80	82.20	82.50	82.90	83.30	83.70	84.10	84.50	85.00	85.40	85.80	86.30	86.70	87.20	87.70
2.50	81.30	81.60	81.90	82.20	82.60	83.00	83.40	83.80	84.20	84.60	85.00	85.40	85.80	86.30	86.70	87.20	87.70
2.75	81.40	81.70	82.00	82.30	82.70	83.00	83.40	83.80	84.20	84.60	85.00	85.50	85.90	86.30	86.80	87.20	87.80
3.00	81.50	81.80	82.10	82.40	82.70	83.10	83.50	83.90	84.30	84.70	85.10	85.50	85.90	86.30	86.80	87.30	87.80
3.25	81.60	81.90	82.20	82.50	82.80	83.20	83.50	83.90	84.30	84.70	85.10	85.50	86.00	86.40	86.80	87.30	87.90
3.50	81.70	82.00	82.30	82.60	82.90	83.20	83.60	84.00	84.40	84.80	85.20	85.60	86.00	86.40	86.90	87.40	87.90
3.75	81.80	82.10	82.30	82.70	83.00	83.30	83.70	84.00	84.40	84.80	85.20	85.60	86.00	86.50	86.90	87.50	88.00
4.00	81.90	82.10	82.40	82.70	83.10	83.40	83.80	84.10	84.50	84.90	85.30	85.70	86.10	86.50	87.00	87.50	88.10
4.25	82.00	82.20	82.50	82.80	83.20	83.50	83.80	84.20	84.60	84.90	85.30	85.70	86.20	86.60	87.10	87.60	88.20
4.50	82.00	82.30	82.60	82.90	83.20	83.60	83.90	84.30	84.60	85.00	85.40	85.80	86.20	86.70	87.20	87.70	88.30
4.75	82.10	82.40	82.70	83.00	83.30	83.70	84.00	84.30	84.70	85.10	85.50	85.90	86.30	86.70	87.20	87.80	88.40
5.00	82.20	82.50	82.80	83.10	83.40	83.70	84.10	84.40	84.80	85.10	85.50	85.90	86.40	86.80	87.30	87.90	88.60

(CONTINUED)

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 60 ASSAYS- 6 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25
5.25	82.30	82.60	82.90	83.20	83.50	83.80	84.20	84.50	84.90	85.20	85.60	86.00	86.40	86.90	87.40	88.00	88.70
5.50	82.40	82.70	83.00	83.30	83.60	83.90	84.20	84.60	84.90	85.30	85.70	86.10	86.60	87.00	87.60	88.20	88.90
5.75	82.50	82.80	83.10	83.40	83.70	84.00	84.30	84.70	85.00	85.40	85.80	86.20	86.70	87.20	87.70	88.40	89.10
6.00	82.60	82.90	83.20	83.50	83.80	84.10	84.40	84.80	85.10	85.50	85.90	86.30	86.80	87.30	87.90	88.60	89.30
6.25	82.70	83.00	83.30	83.60	83.90	84.20	84.60	84.90	85.30	85.60	86.00	86.50	87.00	87.50	88.10	88.80	89.60
6.50	82.90	83.10	83.40	83.70	84.00	84.40	84.70	85.00	85.40	85.80	86.20	86.60	87.10	87.70	88.30	89.00	89.90
6.75	83.00	83.30	83.60	83.90	84.20	84.50	84.80	85.20	85.50	85.90	86.40	86.80	87.30	87.90	88.60	89.30	90.20
7.00	83.10	83.40	83.70	84.00	84.30	84.70	85.00	85.30	85.70	86.10	86.60	87.00	87.60	88.20	88.90	89.70	90.60
7.25	83.30	83.60	83.90	84.20	84.50	84.80	85.20	85.50	85.90	86.30	86.80	87.30	87.90	88.50	89.20	90.00	91.00
7.50	83.50	83.80	84.10	84.40	84.70	85.10	85.40	85.80	86.20	86.60	87.10	87.60	88.20	88.80	89.60	90.40	91.40
7.75	83.80	84.10	84.40	84.70	85.00	85.30	85.70	86.10	86.50	86.90	87.40	87.90	88.60	89.30	90.00	90.90	91.80
8.00	84.10	84.40	84.70	85.00	85.30	85.60	86.00	86.40	86.80	87.30	87.80	88.40	89.00	89.70	90.50	91.40	92.30
8.25	84.40	84.70	85.00	85.30	85.70	86.00	86.40	86.80	87.20	87.70	88.20	88.80	89.50	90.20	91.00	91.90	92.80
8.50	84.80	85.10	85.40	85.80	86.10	86.40	86.80	87.20	87.70	88.20	88.70	89.30	90.00	90.70	91.50	92.40	93.40
8.75	85.30	85.60	85.90	86.20	86.60	86.90	87.30	87.80	88.20	88.70	89.30	89.90	90.60	91.30	92.10	93.00	93.90
9.00	85.80	86.10	86.50	86.80	87.10	87.50	87.90	88.30	88.80	89.30	89.90	90.50	91.20	91.90	92.70	93.50	94.50
9.25	86.50	86.80	87.10	87.40	87.80	88.10	88.50	89.00	89.40	90.00	90.50	91.10	91.80	92.50	93.30	94.10	95.00
9.50	87.10	87.40	87.70	88.10	88.40	88.80	89.20	89.60	90.10	90.60	91.20	91.80	92.40	93.20	93.90	94.70	95.60
9.75	87.80	88.10	88.40	88.80	89.10	89.50	89.90	90.30	90.80	91.30	91.90	92.50	93.10	93.80	94.60	95.40	96.20
10.00	88.50	88.80	89.20	89.50	89.80	90.20	90.60	91.10	91.50	92.00	92.60	93.10	93.80	94.50	95.20	96.00	96.80

(CONTINUED)

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 60 ASSAYS- 6 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25
10.25	89.30	89.60	89.90	90.20	90.60	91.00	91.40	91.80	92.20	92.70	93.30	93.80	94.50	95.10	95.90	96.60	97.40
10.50	90.00	90.30	90.60	91.00	91.30	91.70	92.10	92.50	93.00	93.50	94.00	94.50	95.20	95.80	96.50	97.30	98.10
10.75	90.80	91.10	91.40	91.70	92.10	92.40	92.80	93.30	93.70	94.20	94.70	95.30	95.90	96.50	97.20	97.90	98.70
11.00	91.50	91.80	92.10	92.50	92.80	93.20	93.60	94.00	94.40	94.90	95.40	96.00	96.60	97.20	97.90	98.60	99.40
11.25	92.30	92.60	92.90	93.20	93.60	94.00	94.30	94.80	95.20	95.70	96.20	96.70	97.30	97.90	98.60	99.30	100.00
11.50	93.10	93.40	93.70	94.00	94.30	94.70	95.10	95.50	95.90	96.40	96.90	97.40	98.00	98.60	99.30	100.00	
11.75	93.80	94.10	94.40	94.80	95.10	95.50	95.90	96.30	96.70	97.20	97.60	98.20	98.70	99.30	100.00		
12.00	94.60	94.90	95.20	95.50	95.90	96.30	96.60	97.00	97.50	97.90	98.40	98.90	99.50				
12.25	95.40	95.70	96.00	96.30	96.70	97.00	97.40	97.80	98.20	98.70	99.20	99.70					
12.50	96.20	96.50	96.80	97.10	97.40	97.80	98.20	98.60	99.00	99.40	99.90						
12.75	96.90	97.20	97.60	97.90	98.20	98.60	99.00	99.40	99.80								
13.00	97.70	98.00	98.30	98.70	99.00	99.40	99.70										
13.25	98.50	98.80	99.10	99.50	99.80												
13.50	99.30	99.60	99.90														

(CONTINUED)

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
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STANDARD DEVIATION OF LOCATION MEANS

SE	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25
0.25	88.10	88.70	89.50	90.30	91.40	92.60	94.00	95.40	96.90	98.40	99.90	
0.50	88.10	88.70	89.50	90.40	91.40	92.60	94.00	95.40	96.90	98.40	99.90	
0.75	88.10	88.70	89.50	90.40	91.40	92.70	94.00	95.50	96.90	98.40	99.90	
1.00	88.10	88.80	89.50	90.40	91.50	92.70	94.10	95.50	97.00	98.50	100.00	
1.25	88.10	88.80	89.50	90.40	91.50	92.80	94.10	95.60	97.00	98.50	100.00	
1.50	88.20	88.80	89.60	90.50	91.60	92.80	94.20	95.60	97.10	98.60		
1.75	88.20	88.90	89.60	90.50	91.60	92.90	94.30	95.70	97.20	98.60		
2.00	88.20	88.90	89.70	90.60	91.70	93.00	94.40	95.80	97.20	98.70		
2.25	88.30	88.90	89.70	90.70	91.80	93.10	94.50	95.90	97.30	98.80		
2.50	88.30	89.00	89.80	90.80	91.90	93.20	94.60	96.00	97.50	98.90		
2.75	88.40	89.10	89.90	90.90	92.00	93.30	94.70	96.10	97.60	99.10		
3.00	88.40	89.10	90.00	91.00	92.20	93.50	94.80	96.30	97.70	99.20		
3.25	88.50	89.20	90.10	91.10	92.30	93.60	95.00	96.40	97.90	99.30		
3.50	88.60	89.30	90.20	91.30	92.50	93.80	95.20	96.60	98.00	99.50		
3.75	88.70	89.40	90.30	91.40	92.60	93.90	95.30	96.70	98.20	99.60		
4.00	88.80	89.60	90.50	91.60	92.80	94.10	95.50	96.90	98.40	99.80		
4.25	88.90	89.70	90.70	91.80	93.00	94.30	95.70	97.10	98.60	100.00		
4.50	89.00	89.90	90.80	92.00	93.20	94.60	95.90	97.30	98.80			
4.75	89.20	90.00	91.00	92.20	93.50	94.80	96.20	97.60	99.00			
5.00	89.30	90.20	91.30	92.40	93.70	95.00	96.40	97.80	99.20			

(CONTINUED)

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 60 ASSAYS- 6 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25
5.25	89.50	90.40	91.50	92.70	94.00	95.30	96.70	98.00	99.50			
5.50	89.70	90.70	91.80	93.00	94.30	95.60	96.90	98.30	99.70			
5.75	90.00	90.90	92.10	93.30	94.50	95.90	97.20	98.60	100.00			
6.00	90.20	91.20	92.40	93.60	94.90	96.20	97.50	98.90				
6.25	90.50	91.60	92.70	93.90	95.20	96.50	97.80	99.20				
6.50	90.80	91.90	93.00	94.30	95.50	96.80	98.10	99.50				
6.75	91.20	92.30	93.40	94.60	95.90	97.20	98.50	99.80				
7.00	91.60	92.60	93.80	95.00	96.20	97.50	98.80					
7.25	92.00	93.10	94.20	95.40	96.60	97.90	99.20					
7.50	92.40	93.50	94.60	95.80	97.00	98.30	99.50					
7.75	92.90	93.90	95.10	96.20	97.40	98.70	99.90					
8.00	93.30	94.40	95.50	96.70	97.80	99.10						
8.25	93.80	94.90	96.00	97.10	98.30	99.50						
8.50	94.30	95.40	96.50	97.60	98.70	99.90						
8.75	94.90	95.90	96.90	98.10	99.20							
9.00	95.40	96.40	97.50	98.50	99.70							
9.25	96.00	96.90	98.00	99.00								
9.50	96.50	97.50	98.50	99.60								
9.75	97.10	98.10	99.10									
10.00	97.70	98.60	99.60									

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(CONTINUED)

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 60 ASSAYS- 6 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25
10.25	98.30	99.20										
10.50	98.90	99.80										
10.75	99.60											
11.00												
11.25												
11.50												
11.75												
12.00												
12.25												
12.50												
12.75												
13.00												
13.25												
13.50												

APPENDIX D
WINDOW INPUT ERROR CHECKING
TEST DATA

MANAGER WINDOWS

PRIMARY	INPUT	INPUT	EXPECTED	FOUND	AGREE?
WINDOW	REQUESTED		RESPONSE	RESPONSE	(Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MAIN	CU PLAN 1	Y	N		
		y	N		
		N	N		
		n	N		
		G	ES		
		7	ES		
	CU PLAN 2	Y	N		
		y	N		
		N	N		
		n	N		
		h	ES		
		8	ES		
	DISS PLAN 1	Y	N		
		y	N		
		N	N		
		n	N		
		T	ES		
		.	ES		
	DISS PLAN 2	Y	N		
		y	N		
		N	N		
		n	N		
		G	ES		
		0	ES		
GOBACK	MAIN MENU	Y	N		
		y	N		
		N	N		
		n	N		
		k	ES		
		6	ES		

CONTENT UNIFORMITY
SAMPLING PLAN 1
WINDOWS

PRIMARY	INPUT	INPUT	EXPECTED	FOUND	AGREE?
WINDOW	REQUESTED		RESPONSE	RESPONSE	(Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MCUSP1	DOSAGE FORM	CAPSULE	N		
		caPSULE	ES		
		567	ES		
		TABLET	N		
		Tablet	ES		
		&	ES		
	SAMPLE SIZE	5	N		
		4	ES		
		A	ES		
		2000	N		
	BOUND	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		75	N		
		A	ES		
	CONFIDENCE LEVEL	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		65	N		
		B	ES		
	ACCEPTANCE TABLE	Y	N		
		N	N		
		y	N		
		n	N		
		k	ES		
		6	ES		
	EVALUATE	Y	N		
		y	N		
		N	N		
		n	N		
		L	ES		
		4	ES		
	LOWER BOUND	Y	N		
		y	N		
		N	N		
		n	N		
		m	ES		
		9	ES		
SMAIN	LOWER BOUND MEAN	1	N		

		200	N		
		0	ES		
		H	ES		
		4.1	ES		
	UPPER BOUND MEAN	1	N		
		200	N		
		0	ES		
		P	ES		
		4.1	ES		
	INCREMENT MEAN	1	N		
		200	N		
		0	ES		
		Q	ES		
		5.6	ES		
	LOWER BOUND CV	1	N		
		200	N		
		0	ES		
		R	ES		
		6.2	ES		
	UPPER BOUND CV	1	N		
		200	N		
		0	ES		
		S	ES		
		0.2	ES		
	INCREMENT CV	1	N		
		200	N		
		0	ES		
		T	ES		
		6.7	ES		
TMAIN	SAMPLE MEAN	85.1	N		
		114.9	N		
		85.0	ES		
		115.0	ES		
		100.123	N		
		S	ES		
	SAMPLE CV	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		

CONTENT UNIFORMITY
SAMPLING PLAN 2
WINDOWS

PRIMARY	INPUT	INPUT	EXPECTED	FOUND	AGREE?
WINDOW	REQUESTED		RESPONSE	RESPONSE	(Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MCUSP2	DOSAGE FORM	CAPSULE	N		
		caPSULE	ES		
		567	ES		
		TABLET	N		
		Tablet	ES		
		&	ES		
	NUMBER LOCATIONS	3	N		
		2	ES		
		A	ES		
		2000	N		
	NUMBER PER LOCATION	2	N		
		1	ES		
		B	ES		
		2000	N		
	BOUND	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		80	N		
		B	ES		
	CONFIDENCE LEVEL	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		70	N		
		C	ES		
	ACCEPTANCE TABLE	Y	N		
		N	N		
		y	N		
		n	N		
		k	ES		
		6	ES		
	EVALUATE	Y	N		
		y	N		
		N	N		
		n	N		
		d	ES		
		7	ES		
	LOWER BOUND	Y	N		
		y	N		
		N	N		
		n	N		

		f	ES		
		8	ES		
SMAIN	LOWER BOUND MEAN	1	N		
		200	N		
		0	ES		
		G	ES		
		4.1	ES		
	UPPER BOUND MEAN	1	N		
		200	N		
		0	ES		
		H	ES		
		0.4	ES		
	INCREMENT MEAN	1	N		
		200	N		
		0	ES		
		H	ES		
		6.2	ES		
	LOWER BOUND WITHIN SD	1	N		
		200	N		
		0	ES		
		J	ES		
		1.4	ES		
	UPPER BOUND WITHIN SD	1	N		
		200	N		
		0	ES		
		H	ES		
		5.1	ES		
	INCREMENT WITHIN SD	1	N		
		200	N		
		0	ES		
		K	ES		
		9.2	ES		
	LOWER BOUND BETWEEN SD	1	N		
		200	N		
		0	ES		
		L	ES		
		1.6	ES		
	UPPER BOUND BETWEEN SD	1	N		
		200	N		
		0	ES		
		M	ES		
		2.1	ES		
	INCREMENT BETWEEN SD	1	N		
		200	N		
		0	ES		
		N	ES		
		4.1	ES		
TMAIN	SAMPLE MEAN	85.1	N		
		114.9	N		

		85.0	ES		
		115.0	ES		
		100.123	N		
		S	ES		
	SAMPLE WITHIN SD	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		
	SAMPLE BETWEEN SD	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		

DISSOLUTION
SAMPLING PLAN 1
WINDOWS

PRIMARY WINDOW	INPUT REQUESTED	INPUT	EXPECTED RESPONSE	FOUND RESPONSE	AGREE? (Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MDISP1	Q	40.0	N		
		85.0	N		
		39.9	ES		
		85.1	ES		
		P	ES		
	SAMPLE SIZE	3	N		
		2	ES		
		A	ES		
		2000	N		
	BOUND	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		75	N		
		B	ES		
	CONFIDENCE LEVEL	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		80	N		
		C	ES		
	ACCEPTANCE TABLE	Y	N		
		N	N		
		y	N		
		n	N		
		K	ES		
		7	ES		
	EVALUATE	Y	N		
		y	N		
		N	N		
		n	N		
		k	ES		
		6	ES		
	LOWER BOUND	Y	N		
		y	N		
		N	N		
		n	N		
		C	ES		
		2	ES		
SMAIN	LOWER BOUND MEAN	1	N		
		200	N		

		0	ES		
		D	ES		
		4.9	ES		
	UPPER BOUND MEAN	1	N		
		200	N		
		0	ES		
		E	ES		
		9.7	ES		
	INCREMENT MEAN	1	N		
		200	N		
		0	ES		
		F	ES		
		1.4	ES		
	LOWER BOUND CV	1	N		
		200	N		
		0	ES		
		G	ES		
		2.2	ES		
	UPPER BOUND CV	1	N		
		200	N		
		0	ES		
		H	ES		
		1.1	ES		
	INCREMENT CV	1	N		
		200	N		
		0	ES		
		J	ES		
		5.1	ES		
TMAIN	SAMPLE MEAN	85.1	N		
		114.9	N		
		85.0	ES		
		115.0	ES		
		100.123	N		
		S	ES		
	SAMPLE CV	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		

	DISSOLUTION				
	SAMPLING PLAN 2				
	WINDOWS				
PRIMARY	INPUT	INPUT	EXPECTED	FOUND	AGREE?
WINDOW	REQUESTED		RESPONSE	RESPONSE	(Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MDISP2	Q	40.0	N		
		85.0	N		
		39.9	ES		
		85.1	ES		
		P	ES		
	NUMBER LOCATIONS	3	N		
		2	ES		
		A	ES		
		2000	N		
	NUMBER PER LOCATION	2	N		
		1	ES		
		F	ES		
		2000	N		
	BOUND	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		65	N		
		A	ES		
	CONFIDENCE LEVEL	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		80	N		
		D	ES		
	ACCEPTANCE TABLE	Y	N		
		N	N		
		y	N		
		n	N		
		k	ES		
		6	ES		
	EVALUATE	Y	N		
		y	N		
		N	N		
		n	N		
		D	ES		
		7	ES		
	LOWER BOUND	Y	N		
		y	N		
		N	N		
		n	N		
		b	ES		

		2	ES		
SMAIN	LOWER BOUND MEAN	1	N		
		200	N		
		0	ES		
		C	ES		
		7.1	ES		
	UPPER BOUND MEAN	1	N		
		200	N		
		0	ES		
		D	ES		
		3.1	ES		
	INCREMENT MEAN	1	N		
		200	N		
		0	ES		
		E	ES		
		4.2	ES		
	LOWER BOUND WITHIN SD	1	N		
		200	N		
		0	ES		
		F	ES		
		5.3	ES		
	UPPER BOUND WITHIN SD	1	N		
		200	N		
		0	ES		
		G	ES		
		6.4	ES		
	INCREMENT WITHIN SD	1	N		
		200	N		
		0	ES		
		H	ES		
		7.5	ES		
	LOWER BOUND BETWEEN SD	1	N		
		200	N		
		0	ES		
		L	ES		
		6.3	ES		
	UPPER BOUND BETWEEN SD	1	N		
		200	N		
		0	ES		
		J	ES		
		9.7	ES		
	INCREMENT BETWEEN SD	1	N		
		200	N		
		0	ES		
		K	ES		
		7.9	ES		
TMAIN	SAMPLE MEAN	85.1	N		
		114.9	N		
		85.0	ES		

		115.0	ES		
		100.123	N		
		S	ES		
	SAMPLE WITHIN SD	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		
	SAMPLE BETWEEN SD	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		

APPENDIX E
LOWER BOUND CALCULATIONS

From the Bergum paper, the lower bound on passing a multiple stage test such as the USP content uniformity and dissolution test can be determined by using the following set of inequalities:

P(passing Content Uniformity 2 stage test) ≥ Max {P(meeting stage 1), P(meeting stage 2)} ≥ Max {P(passing 1st criteria of stage 1) + P(passing 2nd criteria of stage 1) - 1, P(passing 1st criteria of stage 2) + P(passing 2nd criteria of stage 2) - 1}

P(passing Dissolution stage test) ≥ Max {P(meeting stage 1), P(meeting stage 2), P(meeting stage 3)} ≥ Max {P(meeting criteria of stage 1), P(passing 1st criteria of stage 2) + P(passing 2nd criteria of stage 2) - 1, P(passing 1st criteria of stage 3) + P(passing 2nd criteria of stage 3) - 1}

The inequalities hold because these types of tests have the following property: If criteria at a given stage of the test result in failure of the overall test, it is impossible to pass the overall test at later stages.

The calculations used for Content Uniformity are described below:

i) CV:

The probability calculation for the CV is done by noting that $\sqrt{n}/cv$ has a noncentral T distribution with noncentrality parameter $\sqrt{n}\mu / \sigma$ where n is the sample size, μ is the population mean, and σ is the population standard deviation. To compute the noncentral T probability, the program uses a central F distribution critical value to approximate a non-central F distribution (Note: The T distribution squared is an F) with noncentrality parameter $n\mu^2 / \sigma^2$ where n is the sample size, μ is the population mean, and σ is the population standard deviation. This approximation can be found in Johnson & Kotz, "Distributions in Statistics: Continuous Univariate Distributions-2", published by John Wiley and Sons, 1970, p. 194. The noncentral F with numerator degrees of freedom, v_1, denominator degrees of freedom v_2, and noncentrality parameter ϕ can be approximated by $(1 + \phi/v_1)$ times a central F with v numerator degrees of freedom and v_2 denominator degrees of freedom where $v = (v_1 + \phi)^2/(v_1 + 2\phi)$. So, in SAS,

$$PROBF(x, v_1, v_2, \phi) = PROBF(x/(1 + \phi/v_1), v, v_2, 0).$$

ii) INDIVIDUAL VALUES:

Assuming a normal distribution for individual results, say x

Let P1 = Prob(85 < x < 115)

and P2 = Prob(75 < x < 85) + Prob(115 < x < 125)

For Tablets, the USP test and the calculation is as follows:

Stage 1) Test 10 units.

Pass if following criteria are met:

1) CV $\leq$ 6.0%

2) No value is outside 85% to 115% of Claim

Calculation:

P(passing 1st criteria of stage 1)

Use Johnson Kotz approximation with

$x = 10/0.06^2$
$v_1 = 1$
$v_2 = 9$
$\phi = 10(\mu/\sigma)^2$

P(passing 2nd criteria of stage 1)

$= P1^{10}$

Stage 2) Test 20 additional units.

Pass if for all 30 units the following criteria are met:

1) CV $\leq$ 7.8%

2) No more than one value is outside 85% to 115% of claim and no value is outside 75% to 125% of claim.

Calculation:

P(passing 1st criteria of stage 2)

Use Johnson Kotz approximation with

$x = 30/0.078^2$
$v_1 = 1$
$v_2 = 29$
$\phi = 30(\mu/\sigma)^2$

P(passing 2nd criteria of stage 2)

$= P1^{30} + 30P1^{29} * P2$

For capsules, the test and calculations are:

Stage 1) Test 10 units.

Pass if the following criteria are met:

1) CV ≤ 6.0%

2) No more than one value outside 85% to 115% of Claim with no value outside 75% to 125% of claim

Calculation:

P(passing 1st criteria of stage 1)

Use Johnson Kotz approximation with

$x = 10/0.06^2$
$v_1 = 1$
$v_2 = 9$
$\phi = 10(\mu/\sigma)^2$

P(passing 2nd criteria of stage 1)

$= P1^{10} + 10\ P1^{9}P2$

Stage 2) Test 20 additional units.

Pass if for all 30 units the following criteria are met:

1) CV ≤ 7.8%

2) No more than two values are outside 85% to 115% of claim and no value is outside 75% to 125% of claim.

Calculation:

P(passing 1st criteria of stage 2)

Use Johnson Kotz approximation with

$x = 30/0.078^2$
$v_1 = 1$
$v_2 = 29$
$\phi = 30(\mu/\sigma)^2$

P(passing 2nd criteria of stage 2)

$= P1^{30} + 30P1^{29}P2 + 435P1^{28}P2^2 + 4060\ P1^{27}P2^3$

The USP dissolution test and calculations are as follows:

Stage 1) Test 6 units (Result = % released at specified dissolution time point)

Pass if the following criteria are met:

1) All 6 results ≥ Q + 5

Calculation:

P(meeting criteria of stage 1)

$= [P(x \geq Q + 5)]^6$

Stage 2) Test 6 additional units

Pass if for all 12 units the following criteria are met:

1) Mean result $\geq Q$

2) No result $\leq Q - 15$

Calculation:

P(passing 1st criteria of stage 2)

$= P(\text{Mean} \geq Q)$

P(passing 2nd criteria of stage 2)

$= [P(x \geq Q - 15)]^{12}$

Stage 3) Test 12 additional units

Pass if for all 24 units the following criteria are met:

1) Mean result $\geq Q$

2) No more than two results $\leq Q – 15$
with no results $\leq Q - 25$

Calculation:

P(passing 1st criteria of stage 3)

$= P(\text{Mean result} \geq Q)$

P(passing 2nd criteria of stage 3)

$$= [P(x \geq Q - 15)]^{24} + 24\,[P(Q - 25 \leq x \leq Q - 15)]\,[P(x \geq Q - 15)]^{23} + 276[P(Q - 25 \leq x \leq Q - 15)]^2\,[P(x \geq Q - 15)]^{22}$$

APPENDIX F
PROGRAM DESCRIPTION

Each of the six program included in CuDAL are described below. Macros are italicized. To aid in locating the macro's and windows in the SAS™ programs, brackets enclose the associated program line numbers.

PROGRAM: FILES.SAS - Used to define file locations

The file FILES.SAS shown below provides the location of the manager macro (MANAGER.SAS) and the four analysis macro's (CUSP1.SAS, CUSP2.SAS, DISP1.SAS, and DISP2.SAS). In each of these lines of code, the user replaces A:\ with the appropriate directory locations. This is the only file that requires editing.

```
**** DIRECTORY FOR MANAGER MACRO ********;
%LET MANAGER = 'N:/SAS612/JIMB/LIMITS/MANAGER.SAS';

****  DIRECTORIES FOR ANALYSIS MACROS  *********;

%LET CU1 = 'N:/SAS612/JIMB/LIMITS/CUSP1.SAS';
%LET CU2 = 'N:/SAS612/JIMB/LIMITS/CUSP2.SAS';
%LET DI1 = 'N:/SAS612/JIMB/LIMITS/DISP1.SAS';
%LET DI2 = 'N:/SAS612/JIMB/LIMITS/DISP2.SAS';

************************************************;

%INCLUDE "&MANAGER";
**** DIRECTORY FOR MANAGER MACRO ********;

%LET MANAGER = 'A:\MANAGER.SAS';

****  DIRECTORIES FOR ANALYSIS MACROS  *********;

%LET CU1 = 'A:\CUSP1.SAS';
%LET CU2 = 'A:\CUSP2.SAS';
%LET DI1 = 'A:\DISP1.SAS';
%LET DI2 = 'A:\DISP2.SAS';

**********************************************;

%INCLUDE "&MANAGER";
```

PROGRAM: MANAGER.SAS - Used to selects analysis macros

The macros contained in MANAGER.SAS are defined below:

start [2-14]

Defines first window (STARTER [4-9]) that appears when executing the program

win [16-60]-

Defines the second window (MAIN [18-25]) that allows the user to select the desired analysis macros. The user selects analysis macros by entering Y or N.

Defines an error window (ANSWIN [27-30]) for incorrect input.

again [62-82]-

Defines a window (GOBACK [64-66]) that allows the user to go back to the main menu (MAIN). The user enters Y or N response.

Defines an error window (ANSBACK [68-71]) for incorrect input.

analyze [83-100]-

Reads the input from the macro *win* and calls the selected analysis macros (indicated in *win* by Y)

calls the macro *again* after selected analyses are performed.

PROGRAM: CUSP1.SAS - Used to generate Content Uniformity acceptance limits using Sampling Plan 1

The macros contained in CUSP1.SAS are described below:

WinCUSP1 [3-94]-

Defines window (MCUSP1 [5-21]) requesting input for dosage form (FORM), sample size (NUMBER), lower bound (LBOUND) and confidence level (CILEVEL). The user can select whether or not to have the acceptance limit table printed, the acceptance limit table evaluated against various values of population parameters, or the lower bound calculated for a specific sample result.

Several windows are defined to respond to errors in user input [22-44]. Windows are created for misspelling of the dosage form (DOSCUSP1), sample size integer greater than one (SCUSP1), lower probability bound (BCUSP1) and confidence interval (CICUSP1) between 50.0 and 99.9, and Y/N input (ANSCUSP1).

c1calc [95-149]-

This macro is used to calculate the lower bound on passing the USP content uniformity test given a pair of specific values for μ and σ. The macro *calcusp1* passes two points in the confidence region for μ and σ to evaluate. Both of these points have the largest value of σ (SIGMA) in the confidence region. One point has the smallest value of μ (LLU) and the other the largest value for μ (ULU). The pair LLU, SIGMA is evaluated first, then the pair ULU, SIGMA. PROBNORM is used to calculate the probability of meeting the CV criteria and to calculate the normal probability of an individual value falling within a given interval. Since the criteria for tablets and capsules is different, the probability calculation depends on dosage form. Since the probability of passing the USP test is greater than or equal to the probability of passing any individual stage, the maximum probability of passing is selected from stage 1 (LPROB1) and stage 2 (LPROB2) for each point. Finally, the lowest probability of passing the USP test occurs with the pair with the lowest probability of passing so the minimum probability (OVERBD) is selected from the two evaluated points.

calcusp1[150-228]-

This macro determines the largest value for the sample CV such that for all points in the confidence region for μ and σ, the probability of passing the USP test for content uniformity is greater than the user specified lower bound (LBOUND). The confidence interval is a triangle. The only two points to evaluate on the triangle are the two points with the maximum value of sigma. So, for a given value of the sample mean, the strategy is to start with a very small value for the sample standard deviation and then construct the corresponding confidence region

for μ and σ. Then evaluate the two points corresponding to the largest value of σ and the smallest and largest values for μ . If both of the points result in probabilities greater than LBOUND, this means that all of the points in the entire confidence region would give a probability of passing the USP content uniformity test greater than LBOUND. Therefore, given the same sample mean, a larger value of the standard deviation can be evaluated. The value of the sample standard deviation is increased until one of the two points evaluated in the confidence region is less than LBOUND. The last value of the standard deviation is kept for the acceptance limit table. At a value of the sample mean around 100, the sample standard deviation will reach its maximum acceptance limit table value. The next sample mean evaluated after this maximum has been reached will have a lower value of the sample standard deviation. The program checks to determine when this occurs. At this point, the program starts generating the rest of the acceptance limit table by setting the sample mean to 114.9, resetting the sample standard deviation to a small value and works its way down from 114.9 to the value of the sample mean with the largest sample standard deviation.

The strategy describe above is performed by using a DO loop that starts with a sample mean of 85.1 and increases to 114.9 in increments of 0.1 (set by macro variable D). The standard deviation starts at 0.01 (STARTSD) and increments by 0.001. For each value of the standard deviation (SAMPSD), the upper bound for sigma (SIGMA) is calculated using the usual χ^2 based confidence bound formula. The two points in the confidence interval that will be evaluated are determined (LLU and ULU). LLU and ULU are the lower and upper ends of the confidence region associated with SIGMA. Since the sample mean and sample variance are independent, the overall α level (1- confidence level) is the product of the two individual α levels for μ and σ. So the two individual confidence levels are the square root of the overall α. Then the portion of the overall α used to estimate μ is divided equally to construct a 2-tailed test. Since the confidence interval for σ is one-sided, the portion of the overall α for σ is all put into one tail. The macro *c1calc* is called to calculate the lower bound on the probability of passing the USP test for LLU and ULU. The minimum of the two probabilities (OVERBD) is returned from *c1calc*. If the minimum is greater than the lower bound selected by the user (LBOUND), the standard deviation (SAMPSD) is incremented by 0.001 and a new LLU and ULU are computed and the minimum probability is found again. Once the minimum in less than the lower bound, 0.001 is subtracted from the standard deviation, and the CV is computed. A special case is when the starting value (STARTSD) of 0.01 gives a minimum less than the lower bound. In this case the CV is set to 0. The value of the standard deviation is used as a starting point for the next sample mean since the standard deviation must increase as the sample mean increases from 85.1 to around 100. At some value of the sample mean greater than 100, the standard deviation will start decreasing. In the macro, when a new sample mean is evaluated with the starting value of the previous standard deviation and the resulting OVERBD is less than the user pre-specified lower bound (LBOUND), this means that the maximum tabled sample standard deviation has been reached. Therefore, the macro saves the value of this mean (STARTM), goes to the label UPPER, sets the starting standard deviation back to 0.01, and starts a DO loop that starts with a sample mean (MEAN) at 114.9 and decreases by 0.1 to STARTM. The same procedure is used as described above to find the sample standard deviation for each sample mean.

Once the entire set of sample mean, CV combinations are determined, the data is sorted by MEAN and a data set is prepared for use in printing the table. This is done by creating six data sets. Each of these data sets contains the data for two columns of the printed acceptance table (one for the sample mean and one for the CV). Data set ONE contains the mean and CV for values of the sample mean between 85.1 and 90.0, data set TWO from 90.1 to 95.0, etc. All six of these data sets are then merged together to form data set SEVEN.

PRTCUSP1 [230-254]-

This macro prints the acceptance limit table by printing out data set SEVEN prepared by the macro *calcusp1*.

EVCUSP1[256-376]-

This macro starts by defining a window (SMAIN [258-271]) for the user to specify the range of possible population values for the mean and CV. For the population mean, the user specifies the lower bound for the mean (ULOW), the upper bound for the mean (UHIGH), the increment (UINCRE), and the divisor (UDIV). Each of these values must be a positive integer. So if the user wants to evaluate population means from 98.0 to 102.0 by 0.5, the following values would be specified: ULOW = 980, UHIGH = 1020, UINCRE = 5, and UDIV = 10. The upper and lower values for the CV as well as the increment and divisor are input in the same manner as those are for the mean. Two windows are also defined for error checking (PINT and ORD [272-279]). PINT checks for integer values and ORD checks for the upper bound being greater than lower bound. Default values are given for all of the input variables which is followed by the code to check for input errors. Finally, data set SEVEN is read into data set TAB. The macro DSCUSP1 [321-329] reads TAB and creates 6 data sets containing the sample means and standard deviations from TAB. The 6 data sets are appended to one another and stored in data set ONE.

The macro *SIGCUSP1* [337-362] performs the calculations for each population mean and CV combination. The strategy is as follows: The acceptance limit table consists of pairs of sample means with an upper bound on the sample CV. Data set ONE contains the sample mean and sample standard deviation pairs that make up the entire acceptance limit table. The table begins with a sample mean of 85.1 and ends with a sample mean of 114.9. To calculate the probability of passing the acceptance limit table for specified values for the population mean and population CV, the probability is calculated of a sample mean falling between adjacent means in the table and the sample standard deviation falling below the average standard deviation at the two endpoints. So, suppose the standard deviation at a sample mean of 85.1 was 0.2 and the sample standard deviation bound at a sample mean of 85.2 was 0.5. If the evaluation was at a population mean of 100 with standard deviation of 3, then the first calculation would be to find the probability of getting a sample mean between 85.1 and 85.2 and a sample standard deviation less than (0.2 + 0.5)/2 or 0.35. This is done using the SAS functions - PROBNORM and PROBCHI. The second calculation would calculate the probability of getting a sample means between 85.2 to 85.3 with a sample standard deviation less than the average of the corresponding standard deviations for 85.2 and 85.3. These probabilities are summed across all the intervals from 85.1 to 114.9. The sum of these probabilities (PTRAP) is the probability of passing the table for specific population values for the mean and standard deviation. To perform the calculation, the lag function in SAS is used to obtain the previous value for the sample mean and sample standard deviation. The last value of PTRAP is output. PROC APPEND is used to save the PTRAP value for each combination of CV and U in the DO loop. These values are stored in the data set SAVEALL. Finally, the data set SAVEALL is printed.

SMPCUSP1 [378-440]

This macro is used to calculate the lower bound of passing the USP content uniformity test given the sample mean and sample standard deviation. The macro displays the window TMAIN [380-385]for the user to input the sample mean and sample standard deviation. Error checks (LTZ & RANGE [386-393]) are made to make sure that a positive integer has been entered and is within the range of 85.1 to 114.9. The data set TAB determines the endpoints of the confidence interval based on the user input values for the sample mean and standard deviation and prior information such as dosage form type, confidence level, and sample size. The overall α is divided into two portions as described above in the macro *calcusp1*. The macro *c1calc* is called to determine the lower bound. Finally, the lower bound is printed.

ANACUSP1 [442-458]

This macro is used to respond to the user input from *WinCUSP1*. If the user requests printing of the acceptance limit table or evaluation of a table, then the macro *calcusp1* is called. If the user requests a printout of the acceptance limit table, the macro *PRTCUSP1* is called. If an evaluation is requested, the macro *EVCUSP1* is called. After the evaluation macro is finished the dataset SAVEALL is deleted. Finally, if the user requests a lower bound for a sample mean and standard deviation, the macro *SMPCUSP1* is called.

PROGRAM: CUSP2.SAS - Content Uniformity using Sampling Plan 2

The macros contained in CUSP2.SAS are defined below:

WinCUSP2 [4-105]

Defines window (MCUSP2 [7-22]) requesting input for dosage form (FORM), number of locations (LOC), number of samples per location (NUM), lower bound (LBOUND) and confidence level (CILEVEL). User can select whether or not to have the acceptance limit table printed, the acceptance limit table evaluated against various values of population parameters, or the lower bound calculated for a specific sample result.

Several windows are defined to respond to errors in user input [23-49]. Windows are created for misspelling of the dosage form (DOSCUSP2), number of locations being an integer greater than one (LOCAT), sample size per location integer greater than one (NUMB), lower probability bound (BCUSP2) and confidence interval between 50.0 and 99.9 (CICUSP2), and Y/N input (ANSCUSP2).

Cullu [109-141]

This macro performs the lower probability bound calculation for the point in the confidence region with the smallest value of μ (LLU) and largest value of σ (SIGMA). The calculation is performed as in *c1calc* using the SAS function PROBNORM. The probability calculation depends on the dosage form (Tablet or Capsule). Since the probability of passing the USP test is greater than or equal to the probability of passing any individual stage, the maximum probability of passing is selected from stage 1 (LPROB1) and stage 2 (TPROBL2).

Cuulu [142-174]

This macro performs the lower probability bound calculation for the point in the confidence region with the largest value of μ (ULU) and largest value of σ (SIGMA). The calculation is performed as in *c1calc* using the SAS function PROBNORM. The probability calculation depends on the dosage form (Tablet or Capsule). Since the probability of passing the USP test is greater than or equal to the probability of passing any individual stage, the maximum probability of passing is selected from stage 1 (LPROB1) and stage 2 (TPROBL2).

calcusp2 [176-262]

This macro finds the acceptance limit on the CV for a given mean. The confidence interval is a triangle. The only two points to evaluate on the triangle are the two points with the maximum value of sigma. However, the value of sigma is a function of both the between and within variance components. A method to construct a confidence interval for the sum of the within and between variance components is given in Graybill, F.A. & Wang, C., "Confidence Intervals on Nonnegative Linear Combinations of Variances", Journal of the American Statistical Association, December 1980, Volume 75, Number 372, p. 869 - 873.

Let

MS_L = Mean Square Between Locations from One-Way Anova
MS_E = Mean Square Within Locations from One-Way Anova
L = Number of Locations
n = Number observations at each location

Then the upper confidence limit for the sum of the between location and within location variance components (i.e. σ) is

$$[1/n\ MS_L + (1 - 1/n)\ MS_E] + \{[(1/n\ ((L - 1)/ \chi^2_{L-1} - 1)\ MS_L]^2$$

$$+ [((1 - 1/n)\ L\ (n - 1)/\chi^2_{L(n-1)} - 1)\ MS_E)]^2\}^{1/2}$$

The strategy is as follows: Given the sample within location standard deviation (SE) and the sample between location standard deviation (SM), a confidence interval for σ (SIGMA) was computed using the Graybill Wang method. Since the sample mean and mean squares for the between location and within location are independent, the overall α level (1- confidence level) is the product of the two individual α levels for μ and σ. So the two individual confidence levels are the square root of the overall α. Then the portion of the overall α used to estimate μ is divided equally to construct a 2-tailed test. Since the confidence interval for σ is one-sided, the portion of the overall α for σ is all put into one tail. [Note that SM is not the between location variance component. It's the standard deviation of the location means.] Then, for increasing values of the sample mean starting at 84.9, the lower bound is calculated by calling the macro *cullu*. Once the lower bound (OVERBDL) is greater than the specified lower bound (LBOUND), the lower limit for the sample mean has been identified (MEANL) and program goes to the label UPPER to find the upper limit for the sample mean. This time the sample mean starts at 115.1, calls the macro *cuulu*, and decreases until the overall bound (OVERBU) is greater than LBOUND. The upper bound for the mean (MEANU) has been identified. So for the given values for SE and SM, the lower and upper limits for the sample mean have been found.

The SAS code is written to handle two special situations. The first is when the value of SM equals D (D is the starting value for both SM and SE in the DO loops). If SM equals D, this means that for the first value of SM, the upper bound was greater than the specified lower bound. Therefore, there is no sample mean that results in an evaluated lower bound less than the specified bound. The symbol '.' is output indicating that there is no sample mean that meets the requirements for the lower bound and confidence level specified. The second situation is if SE equals D. This means that the largest value of SM that needs to be evaluated anywhere in the table has been found. So, the code resets the largest value of SM that needs to be evaluated.

The set of means and standard deviations is stored in the data set TABC.

PRTCUSP2 [264-491]

This macro prints the acceptance limit table by reading the data set TABC, transposing it, and printing out data.

EVCUSP2 [494-635]

This macro starts by defining a window (SMAIN [496-524]) for the user to specify the range of possible population values for the mean, within location standard deviation, and between location standard deviation. [Note that the between location standard deviation is the between location variance component and not the standard deviation of the location means.] For the population mean, the user specifies the lower bound for the mean (ULOW), the upper bound for the mean (UHIGH), the increment (UINCRE), and the divisor (UDIV). Each of these values must be a positive integer. So if the user wants to evaluate population means from 98.0 to 102.0 by 0.5, the following values would be specified: ULOW = 980, UHIGH = 1020, UINCRE = 5, and UDIV = 10. The upper and lower values for the within location standard deviation and between location standard deviation as well as the increment and divisor are input in the same manner as those for the mean. Two windows are also defined for error checking (PINT and ORD [525-532]). PINT checks for integer values and ORD checks for upper bound being greater than lower bound. Default values are given for all of the input variables followed by the code to determine input errors.

The macro *SIGCUSP2* [585-619] performs the calculations for each population mean (U), within location standard deviation (SIGSE), between location standard deviation (SIGSM) combination. The strategy is as follows: The acceptance limit table consists of a pair of sample means for each combination of within location standard deviation (SE) and standard deviation of location means (SM). Data set TABC contains the lower limit for the sample mean (MEANL), the upper limit for the sample mean (MEANU), the value of the within location standard deviation (SE), and the standard deviation of the between location means (SM).

To calculate the probability of passing the acceptance limit tables for specified values for the population mean, within location standard deviation, and between location standard deviation, the probability is calculated of a sample mean falling between the upper and lower mean limits. So, suppose one line from TABC is se = 0.4, sm = 0.2, meanl = 98.0, and meanu = 101.5. Then the program would calculate the probability that the sample mean would lie within 98.0 and 101.5, se would lie between 0.3 and 0.4, and sm would lie between 0.1 and 0.2. This is done using the SAS functions - PROBNORM and PROBCHI. The same calculation would be performed for each observation in the data set TABC. These probabilities are summed for all observation in the data set. The sum of these probabilities (PSUM) is the probability of passing the table for specific population values for the mean, within and between location standard deviations. The last value of PSUM is output. PROC APPEND is used to save the PSUM value for each combination of U, SIGSE, and SIGSM in the DO loop. These values are stored in the data set SAVES2E. Finally, the data set SAVES2E is printed.

SMPCUSP2 [637-714]

This macro is used to calculate the lower bound of passing the USP content uniformity test given the sample mean, sample within location standard deviation, and the standard deviation of location means. The macro displays the window TMAIN [639-644] for the user to input the sample mean, sample within location standard deviation, and standard deviation of location means. Error checks (LTZ & RANGE [645-652]) are made to make sure that a positive integer has been entered and is within the range of 85.1 to 114.9. The data set TAB determines the endpoints of the confidence interval based on the user input values for the sample mean, sample within location standard deviation, and standard deviation of location means and prior information such as dosage form type, confidence level, number of locations and number of samples at each location. The overall α is divided into two portions as described in the macro *calcusp2*. The macro's *cullu* and *cuulu* are called to determine the lower bound. Finally, the lower bound is printed.

ANACUSP2 [716-730]

This macro is used to respond to the user input from *WinCUSP2*. If the user requests printing of the acceptance limit table or evaluation of a table, then the macro *calcusp2* is called. If the user requests a printout of the acceptance limit table, the macro *PRTCUSP2* is called. If an evaluation is requested, the macro *EVCUSP2* is called. After the evaluation macro is finished the dataset SAVES2E is deleted. Finally, if the user requests a lower bound for a sample mean and standard deviation, the macro *SMPCUSP2* is called.

PROGRAM: DISP1.SAS - Used to generate Dissolution acceptance limits using Sampling Plan 1

The macros contained in DISP1.SAS are defined below:

WinDISP1 [3-93]-

Defines window (MDISP1 [5-19]) requesting input for Q (Q), sample size (NUMBER), lower bound (LBOUND) and confidence level (CILEVEL). The user can select whether or not to have the acceptance limit table printed, the acceptance limit table evaluated against various values of population parameters, or the lower bound calculated for a specific sample result.

Several windows are defined to respond to errors in user input [20-42]. Windows are created for sample size integer greater than one (SDISP1), lower probability bound (BDISP1) and confidence interval (CIDISP1) between 50.0 and 99.9, Q between 40 and 95 (QDISP1) and Y/N input (ANSDISP1).

COMPUTE [95-107]-

For specific values of the population mean and standard deviation, this macro performs the lower probability bound calculation.

Each time this macro is called there is one value for μ (LLU) and one value for σ (SIGMA). The pair LLU, SIGMA is evaluated. PROBNORM is used to calculate the normal probability of an individual value falling within a given interval. Since the probability of passing the USP test is greater than or equal to the probability of passing any individual stage, the maximum probability of passing is selected from stage 1 (F1), stage 2 (F2), and stage 3 (F3).

caldisp1 [110-158]-

This macro finds the acceptance limit on the CV for a given sample mean. The confidence interval is a triangle. For dissolution, only one point needs to be evaluated. This is the point with the smallest value of the population mean and the maximum value of sigma. So, for a given value of the sample mean, one can just keep increasing the sample value of the standard deviation until the evaluation of the point on the triangle has a lower bound probability less than pre-specified lower bound. Also note that the probability of passing the dissolution test only depends on the distance from Q and not the actual value of Q. So, the lower bound on passing the dissolution test with a Q of 80 and sample mean of 85 would be the same as passing the dissolution test with a Q of 85 and a sample mean of 90 since they both are 5 units away from Q. Therefore, this macro generates the acceptance limits on the interval from 0 to (100 -Q). Once the table has been generated, the value of Q is added to each value of the sample mean. The table is generated by using a DO loop that starts with a sample mean of 0.2

and goes to (100 - Q) in increments of 0.2 (set by macro variable D). The standard deviation starts at 0.002 (STARTSD) and increments by 0.001. For each value of the standard deviation (SAMPSD), the upper bound for sigma (SIGMA) is calculated using the usual confidence bound formula. The point in the confidence interval that will be evaluated is determined (LLU). LLU is the lower end of the confidence region associated with SIGMA. Since the sample mean and sample variance are independent, the overall α level (1- confidence level) is the product of the two individual α levels for μ and σ. So each of the two individual confidence levels are the square root of the overall α. The macro *COMPUTE* is called to find the lower bound on the probability of passing the USP test for LLU. If the minimum is greater than the lower bound selected by the user (LBOUND), the standard deviation (SAMPSD) is incremented by 0.001 and a new LLU is computed and the minimum probability is found again. Once the minimum is less than the lower bound, 0.001 is subtracted from the standard deviation, and the CV is computed. A special case is when the starting value (STARTSD) of 0.002 gives a minimum less than the lower bound. In this case the CV is set to 0. The value of the standard deviation is used as a starting point for the next sample mean since we know that the standard deviation must increase as the sample mean increases.

Once the entire set of sample mean, CV combinations are determined, the data is sorted by MEAN and a data set is prepared for use in printing the table. This is done by creating five data sets. Each of these data sets contains the data for two columns of the printed acceptance table. Data set ONE contains the mean and CV for the first fifth of the values of the sample mean, data set TWO the second fifth, etc. All five of these data sets are then merged together to form data set D1ALL.

PRTDISP1 [160-184]-

This macro prints the acceptance limit table by printing out data set D1ALL prepared by the macro *caldisp1*.

EVDISP1 [187-311]-

This macro starts by defining a window (SMAIN [189-200]) for the user to specify the range of possible population values for the mean and CV. For the population mean, the user specifies the lower bound for the mean (ULOW), the upper bound for the mean (UHIGH), the increment (UINCRE), and the divisor (UDIV). Each of these values must be a positive integer. So if the user wants to evaluate population means from 90.0 to 92.0 by 0.5, the following values would be specified: ULOW = 900, UHIGH = 920, UINCRE = 5, and UDIV = 10. The upper and lower values for the CV as well as the increment and divisor are input in the same manner as those are for the mean. Two windows are also defined for error checking (PINT and ORD [201-208]). PINT checks for integer values and ORD checks for upper bound being greater than lower bound. Default values are given for all of the input variables followed by the code to determine input errors. Finally, data set D1ALL is read into data set DI1SET. The macro DSCUSP1

[250-258] reads DI1SET and creates five data sets containing the sample means and standard deviations from DI1SET. The five data sets are appended to one another and stored in data set DIONE.

The macro *SIGDISP1* [266-298] performs the calculations for each population mean and CV combination. The strategy is as follows: The acceptance limit table consists of pairs of sample means with an upper bound on the sample CV. Data set DIONE contains the sample mean and sample standard deviation pairs that make up the entire acceptance limit table beginning with a sample mean of Q + 0.2 and ending with a sample mean of 100.0. To calculate the probability of passing the acceptance limit table for specified values for the population mean and population CV, the probability is calculated of a sample mean falling between adjacent means in the table and the sample standard deviation falling below the average standard deviation at the two endpoints. The product of these two probabilities is computed since the sample mean and sample variance are independent of one another. So, suppose the standard deviation at a sample mean of 75.2 was 0.2 and the sample standard deviation bound at a sample mean of 75.4 was 0.5. If the evaluation was at a population mean of 100 with standard deviation of 3, then the first calculation would be to find the probability of getting a sample mean between 75.2 and 75.4 and a sample standard deviation less than (0.2 + 0.5)/2 or 0.35. This is done using the SAS functions - PROBNORM and PROBCHI. The second calculation would calculate the probability of getting a sample means between 75.4 to 75.6 with a sample standard deviation less than the average of the corresponding standard deviations for 75.4 and 75.6. These probabilities are summed across all the intervals from Q + 0.2 to 100.0. The sum of these probabilities (PTRAP) is the probability of passing the table for specific population values for the mean and standard deviation. To perform the calculation, the lag function in SAS is used to obtain the previous value for the sample mean and sample standard deviation. The last value of PTRAP is output. PROC APPEND is used to save the PTRAP value for each combination of CV and U in the DO loop. These values are stored in the data set D1SAVALL. Finally, the data set D1SAVALL is printed.

SMPDISP1 [313-371]

This macro is used to calculate the lower bound of passing the USP dissolution test given the sample mean and sample standard deviation. The macro displays the window TMAIN [315-318] for the user to input the sample mean and sample standard deviation. Error checks (LTZ & RANGE [319-326]) are made to make sure that a positive integer has been entered and that the mean is greater than Q. The data set DI1SMP determines the endpoints of the confidence interval based on the user input values for the sample mean and standard deviation and prior information such as confidence level and sample size. The macro *COMPUTE* is called to determine the lower bound. Finally, the lower bound is printed.

ANADISP1 [373-389]

This macro is used to respond to the user input from *WinDISP1*. If the user requests printing of the acceptance limit table or evaluation of a table, then the macro *caldisp1* is called. If the user requests a printout of the acceptance limit table, the macro *PRTDISP1* is called. If an evaluation is requested, the macro *EVDISP1* is called. After the evaluation macro is finished the dataset D1SAVALL is deleted. Finally, if the user requests a lower bound for a sample mean and standard deviation, the macro *SMPDISP1* is called.

PROGRAM: DISP2.SAS - Used to generate Dissolution acceptance limits using Sampling Plan 2

The macros contained in DISP2.SAS are defined below:

WinDISP2 [2-118]

Defines window (MDISP2 [4-21]) requesting input for Q (Q), number of locations (LOC), number of samples per location (NUM), lower bound (LBOUND), confidence level (CILEVEL), increment for the within location standard deviation (DSE), and increment for the standard deviation of between location means (DSM). User can select whether or not to have the acceptance limit table printed, the acceptance limit table evaluated against various values of population parameters, or the lower bound calculated for a specific sample result.

Several windows are defined to respond to errors in user input [22-54]. Windows are created for checking that the increments for DSE and DSM are positive, the number of locations is an integer greater than one (DILOCAT), the sample size per location is an integer greater than one (DINUMB), lower probability bound (BDISP2), the value of Q is between 40 and 95 (QDISP2), and confidence interval between 50.0 and 99.9 (CIDISP2), and Y/N input (ANSCISP2).

COMPUTE [121-133]

For specific values of the population mean and standard deviation, this macro performs the lower probability bound calculation.

Each time this macro is called there is one value for μ (LLU) and one value for σ (SIGMA). The pair LLU, SIGMA is evaluated. PROBNORM is used to calculate the normal probability of an individual value falling within a given interval. Since the probability of passing the USP test is greater than or equal to the probability of passing any individual stage, the maximum probability of passing is selected from stage 1 (F1), stage 2 (F2), and stage 3 (F3).

caldisp2 [137-198]

This macro finds the acceptance limit on the CV for a given mean. The confidence interval is a triangle. The only point to evaluate on the triangle is the point with the smallest value of the population mean and the maximum value of sigma. However, the value of sigma is a function of both the between and within variance components. The confidence interval for the sum of the within and between variance components uses the Graybill, F.A. & Wang, C. method described above in the macro *calcusp2* of the content uniformity section for sampling plan 2. Since the sample mean and mean squares for the between location and within location are independent, the overall α level (1- confidence level) is the product of the two individual α levels for μ and σ. So the two individual confidence levels are the square root of the overall α.

The strategy was as follows: Given the sample within location standard deviation (SE) and the sample between location standard deviation (SM), a confidence interval for σ (SIGMA)was computed using the Graybill Wang method. Then, for increasing values of the sample mean starting at 0.2, the lower bound was calculated by calling the macro *COMPUTE*. Once the lower bound (OVERBD) is greater than the specified lower bound (LBOUND), the lower limit for the sample mean has been found (MEANL) for the given values of SE and SM.

As described in *calcusp2*,the SAS code is written to handle two special situations when either the value of SM or SE equals D.

These values are stored in the data set TABD.

PRTDISP2 [200-218]

This macro prints the acceptance limit table using the SAS procedure PROC TABULATE by reading the data set TABD and printing the output.

EVDISP2 [221-362]

This macro starts by defining a window (SMAIN [223-251]) for the user to specify the range of possible population values for the mean, within location standard deviation, and between location standard deviation. For the population mean, the user specifies the lower bound for the mean (ULOW), the upper bound for the mean (UHIGH), the increment (UINCRE), and the divisor (UDIV). Each of these values must be a positive integer. So if the user wants to evaluate population means from 90.0 to 92.0 by 0.5, the following values would be specified: ULOW = 900, UHIGH = 920, UINCRE = 5, and UDIV = 10. The upper and lower values for the within location standard deviation and between location standard deviation as well as the increment and divisor are input in the same manner as those for the mean. Two windows are also defined for error checking (DI2PINT and DI2ORD [252-259]). DI2PINT checks for integer values and DI2ORD checks for upper bound being greater than lower bound. Default values are given for all of the input variables followed by the code to determine input errors.

The macro *SIGDISP2* [312-346] performs the calculations for each population mean (U), within location (SIGSE), between location (SIGSM) combination. The strategy is as follows: The acceptance limit table consists of a sample mean for each combination of within location standard deviation (SE) and standard deviation of location means (SM). Data set TABD contains the lower limit for the sample mean (MEANL), the value of the within location standard deviation

(SE), and the standard deviation of the between location means (SM). To calculate the probability of passing the acceptance limit tables for specified values for the population mean, within location standard deviation, and between location standard deviation, the probability is calculated of a sample mean falling above lower mean limit. So, suppose one line from TABD is se = 0.4, sm = 0.2 and meanl = 98.0. Then the program would calculate the probability that the sample mean would be greater than 98.0, se would lie between 0.3 and 0.4, and sm would lie between 0.1 and 0.2. This is done using the SAS functions - PROBNORM and PROBCHI. The same calculation would be performed for each observation in the data set TABD. These probabilities are summed for all observation in the data set. The sum of these probabilities (PSUM) is the probability of passing the table for specific population values for the mean, within and between location standard deviations. The last value of PSUM is output. PROC APPEND is used to save the PSUM value for each combination of U, SIGSE, and SIGSM in the DO loop. These values are stored in the data set SAVES2E. Finally, the data set SAVES2E is printed.

SMPDISP2 [364-440]

This macro is used to calculate the lower bound of passing the USP dissolution test given the sample mean, sample within location standard deviation, and the standard deviation of location means. The macro displays the window TMAIN [366-371] for the user to input the sample mean (MEAN), sample within location standard deviation (SE), and standard deviation of location means (SM). Error checks (LTZ & RANGE [372-379]) are made to make sure that a positive integer has been entered and the mean is greater than Q. The data set TAB determines the endpoints of the confidence interval based on the user input values for the sample mean, sample within location standard deviation, and standard deviation of location means and prior information such as confidence level, number of locations and number of samples at each location. The macro *COMPUTE* is called to determine the lower bound. Finally, the lower bound is printed.

ANADISP2 [442-456]

This macro is used to respond to the user input from *WinDISP2*. If the user requests printing of the acceptance limit table or evaluation of a table, then the macro *caldisp2* is called. If the user requests a printout of the acceptance limit table, the macro *PRTDISP2* is called. If an evaluation is requested, the macro *EVDISP2* is called. After the evaluation macro is finished, the dataset SAVES2E is deleted. Finally, if the user requests a lower bound for a sample mean and standard deviation, the macro *SMPDISP2* is called.

APPENDIX G
TEST DATA

PART 1
MANAGER.SAS
Test Data & Results

		USER INPUT					Observed Matches
RUN	**CUSP1**	**CUSP2**	**DISP1**	**DISP2**	**CONTINUE**	EXPECTED RESULT	Expected Result (Y or N)
1	N	N	N	N	Y	No output	
						Return to Main Screen	
	Y	Y	Y	Y	N	Default Output (Appendix C)	
						Exits from Program	
2	Y	N	Y	N	Y	CUSP1 Output	
						No CUSP2 Output	
						DISP1 Output	
						No DISP2 Output	
						Return to Main Screen	
	N	Y	N	Y	N	No CUSP1 Output	
						CUSP2 Output	
						No DISP1 Output	
						DISP2 Output	
						Exits from Program	

PART 2
Content Uniformity
Sampling Plan 1
Test Data Set & Results

						Program	Independent	All
Dosage	CI	Lower	Sample	Sample	Expected	Result	Result	Agree?
Form	Level	Bound	Size	Mean	CV	CV	CV	(Y or N)
Tablet	50.0	50.0	5	85.1	0.04			
				100.0	4.90			
				114.9	0.03			
			2000	85.1	0.08			
				100.0	7.05			
				114.9	0.06			
	99.0	50.0	5	85.1	0.00			
				100.0	1.20			
				114.9	0.00			
			2000	85.1	0.07			
				100.0	6.81			
				114.9	0.05			
	99.0	99.0	5	85.1	0.00			
				100.0	0.89			
				114.9	0.00			
			2000	85.1	0.04			
				100.0	5.11			
				114.9	0.03			
Capsule	50.0	50.0	5	85.1	0.06			
				100.0	5.33			
				114.9	0.04			
			2000	85.1	0.12			
				100.0	7.58			
				114.9	0.09			
	50.0	99.0	5	85.1	0.04			
				100.0	4.20			
				114.9	0.03			
			2000	85.1	0.06			
				100.0	5.87			
				114.9	0.04			
	99.0	99.0	5	85.1	0.00			
				100.0	1.08			
				114.9	0.00			
			2000	85.1	0.06			
				100.0	5.67			
				114.9	0.04			

PART 2 (CON'T)
Content Uniformity
Sampling Plan 2
Test Data Set & Results

Dosage Form	CI Level	Lower Bound	# Loc	#/Location	SE	SM	Expected Result Mean (Lower)	Program Result Mean (Lower)	Indepenent Result Mean (Lower)	Expected Result Mean (Upper)	Program Result Mean (Upper)	Indepedent Result Mean (Upper)	All Agree? (Y or N)
Tablet	50.0	50.0	3	2	0.1	0.1	85.4			114.6			
					0.1	3	96.3			103.7			
					3	0.1	89.8			110.2			
					3	3	97.1			102.9			
				300	0.1	0.1	85.4			114.6			
					0.1	3	89.7			110.3			
					3	0.1	96.3			103.7			
					3	3	97.8			102.4			
			300	2	0.1	0.1	85.2			114.8			
					0.1	3	89.8			110.2			
					3	0.1	88.3			111.7			
					3	3	91.0			109.2			
				300	0.1	0.1	85.3			114.7			
					0.1	3	89.8			110.2			
					3	0.1	89.6			110.4			
					3	3	92.1			108.2			
	50.0	99.0	3	2	0.1	0.1	85.6			114.4			
					0.1	3	.			.			
					3	0.1	93.2			106.8			
					3	3	.			.			
				300	0.1	0.1	85.7			114.3			
					0.1	3	.			.			
					3	0.1	93.0			107.0			
					3	3	.			.			
			300	2	0.1	0.1	85.4			114.6			
					0.1	3	93.1			106.9			
					3	0.1	90.7			109.3			
					3	3	94.9			105.1			

				300	0.1	0.1	85.4			114.6			
					0.1	3	93.1			106.9			
					3	0.1	92.8			107.2			
					3	3	96.3			103.7			
	99.0	99.0	3	2	0.1	0.1	91.0			109.0			
					0.1	3	.			.			
					3	0.1	.			.			
					3	3	.			.			
				300	0.1	0.1	91.0			109.0			
					0.1	3	.			.			
					3	0.1	.			.			
					3	3	.			.			
			300	2	0.1	0.1	85.4			114.6			
					0.1	3	94.2			105.8			
					3	0.1	91.2			108.8			
					3	3	95.9			104.1			
				300	0.1	0.1	85.5			114.5			
					0.1	3	94.2			105.8			
					3	0.1	92.8			107.2			
					3	3	97.2			102.8			
Capsule	50.0	50.0	3	2	0.1	0.1	85.3			114.7			
					0.1	3	94.1			106.3			
					3	0.1	88.2			111.8			
					3	3	94.8			105.3			
				300	0.1	0.1	85.3			114.7			
					0.1	3	94.1			106.3			
					3	0.1	88.1			111.9			
					3	3	95.4			104.9			
			300	2	0.1	0.1	85.2			114.8			
					0.1	3	88.3			111.7			
					3	0.1	87.2			112.8			
					3	3	89.1			111.1			
				300	0.1	0.1	85.2			114.8			
					0.1	3	88.3			111.7			
					3	0.1	88.0			112.0			
					3	3	90.1			110.5			
	99.0	50.0	3	2	0.1	0.1	88.7			111.3			

					0.1	3	.			.			
					3	0.1	.			.			
					3	3	.			.			
				300	0.1	0.1	88.7			111.3			
					0.1	3	.			.			
					3	0.1	90.7			109.4			
					3	3	.			.			
			300	2	0.1	0.1	85.2			114.8			
					0.1	3	88.9			111.1			
					3	0.1	87.4			112.6			
					3	3	89.8			110.5			
				300	0.1	0.1	85.2			114.8			
					0.1	3	88.9			111.1			
					3	0.1	88.0			112.0			
					3	3	90.9			109.9			
	99.0	99.0	3	2	0.1	0.1	90.0			110.0			
					0.1	3	.			.			
					3	0.1	.			.			
					3	3	.			.			
				300	0.1	0.1	90.0			110.0			
					0.1	3	.			.			
					3	0.1	93.7			106.3			
					3	3	.			.			
			300	2	0.1	0.1	85.3			114.7			
					0.1	3	92.0			108.0			
					3	0.1	89.6			110.4			
					3	3	93.2			106.8			
				300	0.1	0.1	85.4			114.6			
					0.1	3	92.0			108.0			
					3	0.1	90.8			109.2			
					3	3	94.2			105.8			

PART 2 (CON'T)
Dissolution
Sampling Plan 1
Test Data Set & Results

CI Level	Lower Bound	Q	Sample Size	Sample Mean	Expected Result	Program Result	Independent Result	All Agree? (Y or N)
50.0	50.0	40	3	40.2	0.93			
				100.0	23.20			
			1000	40.2	18.07			
				100.0	46.13			
		85	3	85.2	0.44			
				100.0	10.10			
			1000	85.2	8.53			
				100.0	19.83			
	99.0	40	3	40.2	0.37			
				100.0	13.69			
			1000	40.2	1.00			
				100.0	25.00			
		85	3	85.2	0.17			
				100.0	6.41			
			1000	85.2	0.47			
				100.0	11.73			
99.0	50.0	40	3	40.2	0.02			
				100.0	1.76			
			1000	40.2	5.76			
				100.0	42.34			
		85	3	85.2	0.01			
				100.0	0.68			
			1000	85.2	2.72			
				100.0	18.27			
	99.0	40	3	40.2	0.02			
				100.0	1.25			
			1000	40.2	0.84			
				100.0	23.42			
		85	3	85.2	0.01			
				100.0	0.54			
			1000	85.2	0.40			
				100.0	10.98			

PART 2 (CON'T)
Dissolution
Sampling Plan 2
Test Data Set & Results

CI Level	Lower Bound	Q	# Loc	#/Location	SE Increment	SM Increment	SE	SM	Expected Result	Program Result	Independent Result	All Agree? (Y or N)
50.0	50.0	40	3	2	0.10	5.00	0.10	5.00	43.10			
					0.10	5.00	0.10	20.00	89.70			
					0.10	5.00	5.00	5.00	43.20			
					0.10	5.00	5.00	20.00	90.00			
				300	5.00	0.10	5.00	0.10	40.20			
					5.00	0.10	5.00	5.00	43.70			
					5.00	0.10	20.00	0.10	55.00			
					5.00	0.10	20.00	5.00	60.30			
			300	2	5.00	5.00	5.00	5.00	40.20			
					5.00	5.00	5.00	20.00	56.60			
					5.00	5.00	20.00	5.00	46.90			
					5.00	5.00	20.00	20.00	64.10			
				300	5.00	5.00	5.00	5.00	40.30			
					5.00	5.00	5.00	20.00	57.10			
					5.00	5.00	20.00	5.00	55.80			
					5.00	5.00	20.00	20.00	70.80			
		85	3	2	0.10	0.10	0.10	0.10	85.20			
					0.10	0.10	0.10	5.00	88.10			
					0.10	0.10	5.00	0.10	85.20			
					0.10	0.10	5.00	5.00	88.40			
			300	300	5.00	0.10	5.00	0.10	85.20			
					5.00	0.10	5.00	5.00	85.30			
					5.00	0.10	10.00	0.10	86.10			
					5.00	0.10	10.00	5.00	87.20			
50.0	99.0	40	3	2	5.00	5.00	5.00	5.00	49.40			
					5.00	5.00	5.00	20.00	.			
					5.00	5.00	20.00	5.00	89.40			
					5.00	5.00	20.00	20.00	.			
			300	300	5.00	5.00	5.00	5.00	43.70			

					5.00	5.00	5.00	20.00	86.10				
					5.00	5.00	20.00	5.00	84.10				
					5.00	5.00	20.00	20.00	.				
		85	3	2	0.25	0.25	0.25	0.25	85.40				
					0.25	0.25	0.25	5.00	92.50				
					0.25	0.25	5.00	0.25	87.70				
					0.25	0.25	5.00	5.00	94.40				
99.0	50.0	40	3	2	0.25	0.25	0.25	0.25	45.30				
					0.25	0.25	0.25	5.00	.				
					0.25	0.25	5.00	0.25	64.90				
					0.25	0.25	5.00	5.00	.				
			300	300	5.00	5.00	5.00	5.00	41.00				
					5.00	5.00	5.00	20.00	63.00				
					5.00	5.00	20.00	5.00	56.80				
					5.00	5.00	20.00	20.00	76.00				
		85	3	2	0.25	0.25	0.25	0.25	90.30				
					0.25	0.25	0.25	5.00	.				
					0.25	0.25	5.00	0.25	.				
					0.25	0.25	5.00	5.00	.				
99.0	99.0	40	3	2	0.25	0.25	0.25	0.25	47.00				
					0.25	0.25	0.25	5.00	.				
					0.25	0.25	5.00	0.25	96.60				
					0.25	0.25	5.00	5.00	.				
				300	5.00	0.10	5.00	0.10	44.70				
					5.00	0.10	5.00	5.00	.				
					5.00	0.10	20.00	0.10	88.10				
					5.00	0.10	20.00	5.00	.				
			300	2	5.00	5.00	5.00	5.00	44.10				
					5.00	5.00	5.00	20.00	93.90				
					5.00	5.00	20.00	5.00	71.30				
					5.00	5.00	20.00	20.00	.				
				300	5.00	5.00	5.00	5.00	44.60				
					5.00	5.00	5.00	20.00	94.80				
					5.00	5.00	20.00	5.00	85.30				
					5.00	5.00	20.00	20.00	.				
		85	3	2	0.25	0.25	0.25	0.25	92.00				
					0.25	0.25	0.25	5.00	.				

					0.25	0.25	5.00	0.25	.				
					0.25	0.25	5.00	5.00	.				
			300	300	0.10	5.00	0.10	5.00	88.50				
					0.10	5.00	0.10	10.00	99.20				
					0.10	5.00	5.00	5.00	89.60				
					0.10	5.00	5.00	10.00	.				

PART 3
Evaluation

Content Uniformity
Sampling Plan 1

Dosage Form	CI Level	Lower Bound	Sample Size	Population Mean	Population CV	Expected Result	Program Result	Independent Result	All Agree? (Y or N)
Tablet	99.0	99.0	5	98.5	1.0	0.38250			
				100.0	0.5	0.98529			
Capsule	50.0	50.0	2000	93.0	6.8	0.08688			
				95.0	7.0	0.93923			

Content Uniformity
Sampling Plan 2

Dosage Form	CI Level	Lower Bound	# Loc	#/Location	Population Mean	Population Between Location	Population Within Location	Expected Result	Program Result	Independent Result	All Agree? (Y or N)
Tablet	50.0	50.0	3	2	100.0	1.0	1.0	0.99986			
						3.0	3.0	0.52631			
Capsule	99.0	99.0	300	300	97.5	3.5	3.5	0.99200			
						3.5	4.0	0.24251			

Dissolution
Sampling Plan 1

									All
Q	CI	Lower	Sample	Population	Population	Expected	Program	Independent	Agree?
	Level	Bound	Size	Mean	CV	Result	Result	Result	(Y or N)
40	99.0	99.0	3	98.0	1.0	0.78665			
				100.0	3.0	0.15652			
85	50.0	50.0	2000	85.3	4.0	0.90502			

Dissolution
Sampling Plan 2

												All
							Population	Population	Expected	Program	Independent	Agree?
Q	CI	Lower				Population	Between	Within	Result	Result	Result	(Y or N)
	Level	Bound	# Loc	#/Location	Increment	Mean	Location	Location				
40	50.0	50.0	3	2	0.25	75.0	6.0	6.0	0.98481			
					0.25		10.0	10.0	0.76350			
85	99	99	300	300	0.25	87.0	2.0	2.0	0.76594			
					0.25		3.0	2.0	0.01274			

PART 4
Content Uniformity
Sampling Plan 1

						Expected	Program	Independent	All
				Sample	Sample	Lower	Lower	Lower	Agree?
Case	Dosage Form	CI Level	Sample Size	Mean	CV	Bound	Bound	Bound	(Y or N)
1	Capsule	50	2000	110.00	2.650	0.95017			
2	Tablet	99	5	86.00	0.100	0.42512			
3	Capsule	83.2	48	94.42	4.919	0.84227			
4	Tablet	57.4	15	110.83	1.714	0.54160			

Content Uniformity
Sampling Plan 2

								Expected	Program	Independent	All
					Sample	Sample	Sample	Lower	Lower	Lower	Agree?
Case	Dosage Form	CI Level	# Locations	# / Location	SE	SM	Mean	Bound	Bound	Bound	(Y or N)
1	Capsule	50	300	300	4.000	4.800	103.10	0.95164			
2	Tablet	99	3	2	0.100	0.100	90.50	0.95271			
3	Capsule	55.3	15	4	4.216	3.461	92.52	0.45013			
4	Tablet	88.8	30	2	1.842	1.016	111.21	0.62909			

Dissolution
Sampling Plan 1

						Expected	Program	Independent	All
				Sample	Sample	Lower	Lower	Lower	Agree?
Case	Q	CI Level	Sample Size	Mean	CV	Bound	Bound	Bound	(Y or N)
1	40.0	99	1000	41.00	5.510	0.95004			
2	85.0	50	3	100.00	7.320	0.95018			
3	75.4	58.4	12	77.63	6.432	0.78157			

Dissolution
Sampling Plan 2

								Expected	Program	Independent	All
					Sample	Sample	Sample	Lower	Lower	Lower	Agree?
Case	Q	CI Level	# Locations	# / Location	SE	SM	Mean	Bound	Bound	Bound	(Y or N)
1	40.0	50	3	300	1.000	1.000	41.20	0.99825			
2	85.0	99	300	2	10.750	9.250	99.20	0.96410			
3	55.7	67.4	15	3	6.251	5.752	59.11	0.77095			

FORMS

FORM 1
LOAD AND RUN PROGRAM

Name: ________________________________

Computer Description:

PC

Manufacturer: _________________________
Model: _________________________
CPU Speed: _________________________
Hard Drive Size: _________________________
RAM Memory: _________________________

SAS Version Number: _________________________

Sign below to indicate that the program, CuDAL, loaded and ran successfully on your PC.

Laura Foust: ___________________________ Date: _________________

MaryAnn Gorko ___________________________ Date: _________________

Douglas Lee: ___________________________ Date: _________________

Jerry Planchard: ___________________________ Date: _________________

Edith Senderak: ___________________________ Date: _________________

Helen Strickland ___________________________ Date: _________________

Merlin Utter: ___________________________ Date: _________________

FORM 2
PRIMARY WINDOW INPUT ERROR CHECKS

Sign below to indicate that all of the found responses agree with the expected results in Appendix D.

Jerry Planchard: ____________________ Date: _____________

FORM 3
MATHEMATICAL CALCULATION VERIFICATION

Signing below indicates that the calculations described in Appendix E to determine lower bounds for content uniformity and dissolution are correct.

Laura Foust: ____________________________ Date: __________________

MaryAnn Gorko ____________________________ Date: __________________

Edith Senderak: ____________________________ Date: __________________

FORM 4
PROGAM STRATEGY & SAS CODE VERIFICATION

Signing below indicates the following:

1) The calculations described in Appendix E to determine lower bounds for content uniformity and dissolution are implemented correctly in the macros.

2) The strategies described in Appendix F are appropriate.

3) The SAS code implements the strategies described in Appendix F correctly.

Laura Foust: ______________________________ Date: ____________________

MaryAnn Gorko ______________________________ Date: ____________________

Edith Senderak: ______________________________ Date: ____________________

Helen Strickland: ______________________________ Date: ____________________

FORM 5
TEST DATA SET AGREEMENT

Part 1: Test the manager program

Signing below indicates that the primary window MAIN used to select the analysis macros successfully completed the test data in Appendix G (Part 1). The observed results agreed with the expected results.

Jerry Planchard: ____________________________ Date: __________________

Part 2: Test Table generation

Signing below indicates that the test data in Appendix G (Part 2) used to generate the acceptance limit tables agreed with the following:

1) The results from running CuDAL.

2) The results from an independent calculation.

Merlin Utter: ____________________________ Date: __________________

Part 3: Test Table Evaluation

Signing below indicates that the test data in Appendix G (Part 3) used to generate the acceptance limit tables agreed with the following:

1) The results from running CuDAL.

2) The results from an independent calculation.

Douglas Lee: ____________________________ Date: __________________

Part 4: Test specific sample results

Signing below indicates that the test data in Appendix G (Part 4) used to generate the acceptance limit tables agreed with the following:

1) The results from running CuDAL.

2) The results from an independent calculation.

Merlin Utter: ____________________________ Date: __________________

FORM 6
PROBLEM/REQUEST REPORT

Name: ________________________________

Date: ________________________________

Describe the error or discrepancy in expected result verses found result or in expected performance of the program.

AMENDMENTS

Amendment 1

Name: ____James Bergum________________

Date: ____March 12, 2001________________

Description:

Two misprints were found in Appendix F of the protocol. An equation in the macro *calcusp2* description has a misplaced parenthesis as well as an extra parenthesis. The corrected page is attached. The misprints were made in the protocol only and not in the SAS code. Therefore, no change was made to the SAS program.

Before Change:

$$[1/n\ MS_L + (1 - 1/n)\ MS_E] + \{[(1/n\ ((L - 1)/ \chi^2_{L-1} - 1)\ MS_L]^2$$

$$+ [((1 - 1/n)\ L\ (n - 1)/\chi^2_{L(n-1)} - 1)\ MS_E)]^2\}^{1/2}$$

After Change:

$$[1/n\ MS_L + (1 - 1/n)\ MS_E] + \{[(1/n\ ((L - 1)/ \chi^2_{L-1} - 1)\ MS_L]^2$$

$$+ [(1 - 1/n)\ (L\ (n - 1)/\chi^2_{L(n-1)} - 1)\ MS_E]^2\}^{1/2}$$

Validation Team Approval:

Laura Foust: Laura B Foust 5/8/01

MaryAnn Gorko: Mary Ann Gorko 5/8/01

Douglas Lee: D Lee 5/9/01

Jerry Planchard: J Planchard 5/9/01

Edith Senderak: N/A (See Amendment 2) by DB 5/9/01

Helen Strickland Helen Strickland 05-08-2001

Merlin Utter: Merlin Utter 5/8/01

calcusp2 [176-262]

This macro finds the acceptance limit on the CV for a given mean. The confidence interval is a triangle. The only two points to evaluate on the triangle are the two points with the maximum value of sigma. However, the value of sigma is a function of both the between and within variance components. A method to construct a confidence interval for the sum of the within and between variance components is given in Graybill, F.A. & Wang, C., "Confidence Intervals on Nonnegative Linear Combinations of Variances", Journal of the American Statistical Association, December 1980, Volume 75, Number 372, p. 869 - 873.

Let

MS_L = Mean Square Between Locations from One-Way Anova
MS_E = Mean Square Within Locations from One-Way Anova
L = Number of Locations
n = Number observations at each location

Then the upper confidence limit for the sum of the between location and within location variance components (i.e. σ) is

$$[1/n\ MS_L + (1 - 1/n)\ MS_E] + \{[(1/n\ ((L - 1)/\chi^2_{L-1} - 1)\ MS_L]^2$$

$$+ [(1 - 1/n)\ (L\ (n - 1)/\chi^2_{L(n-1)} - 1)\ MS_E]^2\}^{1/2}$$

The strategy is as follows: Given the sample within location standard deviation (SE) and the sample between location standard deviation (SM), a confidence interval for σ (SIGMA) was computed using the Graybill Wang method. Since the sample mean and mean squares for the between location and within location are independent, the overall α level (1- confidence level) is the product of the two individual α levels for μ and σ. So the two individual confidence levels are the square root of the overall α. Then the portion of the overall α used to estimate μ is divided equally to construct a 2-tailed test. Since the confidence interval for σ is one-sided, the portion of the overall α for σ is all put into one tail. [Note that SM is not the between location variance component. It's the standard deviation of the location means.] Then, for increasing values of the sample mean starting at 84.9, the lower bound is calculated by calling the macro *cullu*. Once the lower bound (OVERBDL) is greater than the specified lower bound (LBOUND), the lower limit for the sample mean has been identified (MEANL) and program goes to the label UPPER to find the upper limit for the sample mean. This time the sample mean starts at 115.1, calls the macro *cuulu*, and decreases until the overall bound (OVERBU) is greater than LBOUND. The upper bound for the mean (MEANU) has been identified. So for the given values for SE and SM, the lower and upper limits for the sample mean have been found.

Amendment 1(Revised)

Name: ____James Bergum______________

Date: ____October 9, 2001______________

Description:

Misprints were found in an equation in the description of the macro *calcusp2* in Appendix F of the protocol. Three parentheses have been removed and one added in the appropriate places in the equation. The corrected page is attached. The misprint was made in the protocol and not in the SAS code. Therefore, no change is required in the SAS program.

Before Change:

$$[1/n\ MS_L + (1 - 1/n)\ MS_E] + \{[(1/n\ ((L - 1)/ \chi^2_{L-1} - 1)\ MS_L]^2$$

$$+ [((1 - 1/n)\ L\ (n - 1)/\chi^2_{L(n-1)} - 1)\ MS_E)]^2\}^{1/2}$$

After Change:

$$[1/n\ MS_L + (1 - 1/n)\ MS_E] + \{[1/n\ ((L - 1)/ \chi^2_{L-1} - 1)\ MS_L]^2$$

$$+ [(1 - 1/n)\ (L\ (n - 1)/\chi^2_{L(n-1)} - 1)\ MS_E]^2\}^{1/2}$$

Validation Team Approval:

Laura Foust: Laura B Foust 11/6/01

MaryAnn Gorko: Mary Ann Gorko 11/9/01

Douglas Lee: D Lee 10/17/01

Jerry Planchard: J Planchard 10/10/01

Helen Strickland Helen A. Strickland 11-15-2001

Merlin Utter: Merlin Utter 10/17/01

calcusp2 [176-262]

This macro finds the acceptance limit on the CV for a given mean. The confidence interval is a triangle. The only two points to evaluate on the triangle are the two points with the maximum value of sigma. However, the value of sigma is a function of both the between and within variance components. A method to construct a confidence interval for the sum of the within and between variance components is given in Graybill, F.A. & Wang, C., "Confidence Intervals on Nonnegative Linear Combinations of Variances", Journal of the American Statistical Association, December 1980, Volume 75, Number 372, p. 869 - 873.

Let

MS_L = Mean Square Between Locations from One-Way Anova
MS_E = Mean Square Within Locations from One-Way Anova
L = Number of Locations
n = Number observations at each location

Then the upper confidence limit for the sum of the between location and within location variance components (i.e. σ) is

$$[1/n\ MS_L + (1 - 1/n)\ MS_E] + \{[1/n\ ((L - 1)/ \chi^2_{L-1} - 1)\ MS_L]^2$$

$$+ [(1 - 1/n)\ (L\ (n - 1)/\chi^2_{L(n-1)} - 1)\ MS_E]^2\}^{1/2}$$

The strategy is as follows: Given the sample within location standard deviation (SE) and the sample between location standard deviation (SM), a confidence interval for σ (SIGMA) was computed using the Graybill Wang method. Since the sample mean and mean squares for the between location and within location are independent, the overall α level (1- confidence level) is the product of the two individual α levels for μ and σ. So the two individual confidence levels are the square root of the overall α. Then the portion of the overall α used to estimate μ is divided equally to construct a 2-tailed test. Since the confidence interval for σ is one-sided, the portion of the overall α for σ is all put into one tail. [Note that SM is not the between location variance component. It's the standard deviation of the location means.] Then, for increasing values of the sample mean starting at 84.9, the lower bound is calculated by calling the macro *cullu*. Once the lower bound (OVERBDL) is greater than the specified lower bound (LBOUND), the lower limit for the sample mean has been identified (MEANL) and program goes to the label UPPER to find the upper limit for the sample mean. This time the sample mean starts at 115.1, calls the macro *cuulu*, and decreases until the overall bound (OVERBU) is greater than LBOUND. The upper bound for the mean (MEANU) has been identified. So for the given values for SE and SM, the lower and upper limits for the sample mean have been found.

Amendment 2

Name: ____James Bergum_______________

Date: ____March 13, 2001_______________

Description:

Edith Senderak sent a letter to James Bergum dated March 1, 2001 stating that she is on maternity leave and will not be able to continue to participate on the validation team. All forms requiring Edith's signature will be replaced by James Bergum with "N/A (See Amendment 2)". Edith's letter will be included in the validation supporting documentation.

Validation Team Approval:

Laura Foust: Laura B Foust 5/8/01

MaryAnn Gorko: Mary Ann Gorko 5/8/01

Douglas Lee: D. A. Lee 5/9/01

Jerry Planchard: J Planchard 5/9/01

Helen Strickland Helen Strickland 05-08-2001

Merlin Utter: Merlin Utter 5/8/01

Amendment 3

Name: ___James Bergum_________

Date: ____ April 9, 2001_________

Description:

The first page of Appendix F contains two different versions of the file FILES.SAS. The first version should be deleted. Attached is the page with the correction.

Validation Team Approval:

Laura Foust: Laura B Foust 5/8/01

MaryAnn Gorko: Mary Ann Gorko 5/8/01

Douglas Lee: D A Lee 5/9/01

Jerry Planchard: J Planchard 5/9/01

Helen Strickland: Helen Strickland 05-08-2001

Merlin Utter: Merlin Utter 5/8/01

APPENDIX F
PROGRAM DESCRIPTION

Each of the six program included in CuDAL are described below. Macros are italicized. To aid in locating the macro's and windows in the SAS™ programs, brackets enclose the associated program line numbers.

PROGRAM: FILES.SAS - Used to define file locations

The file FILES.SAS shown below provides the location of the manager macro (MANAGER.SAS) and the four analysis macro's (CUSP1.SAS, CUSP2.SAS, DISP1.SAS, and DISP2.SAS). In each of these lines of code, the user replaces A:\ with the appropriate directory locations. This is the only file that requires editing.

```
**** DIRECTORY FOR MANAGER MACRO ********;

%LET MANAGER = 'A:\MANAGER.SAS';

****  DIRECTORIES FOR ANALYSIS MACROS  *********;

%LET CU1 = 'A:\CUSP1.SAS';
%LET CU2 = 'A:\CUSP2.SAS';
%LET DI1 = 'A:\DISP1.SAS';
%LET DI2 = 'A:\DISP2.SAS';

**********************************************;

%INCLUDE "&MANAGER";
```

Amendment 4

Name: ___James Bergum_________

Date: ____ April 16, 2001________

Description:

Appendix G, Part 3 (Evaluation) test data has table headings for content uniformity and dissolution using sampling plan 2 that are reversed. The Population Between Location & Population Within Location headings should be reversed so the test values are under the correct headings. Attached are the corrected tables.

Validation Team Approval:

Laura Foust: Laura B Foust 5-8-01

MaryAnn Gorko: Mary Ann Gorko 5/8/01

Douglas Lee: D Lee 5/9/01

Jerry Planchard: J Planchard 5/9/01

Helen Strickland: Helen A. Strickland 05-08-2001

Merlin Utter: Merlin Utter 5/8/01

PART 3
Evaluation

Content Uniformity
Sampling Plan 1

Dosage Form	CI Level	Lower Bound	Sample Size	Population Mean	Population CV	Expected Result	Program Result	Independent Result	All Agree? (Y or N)
Tablet	99.0	99.0	5	98.5	1.0	0.38250			
				100.0	0.5	0.98529			
Capsule	50.0	50.0	2000	93.0	6.8	0.08688			
				95.0	7.0	0.93923			

Content Uniformity
Sampling Plan 2

Dosage Form	CI Level	Lower Bound	# Loc	#/Location	Population Mean	Population Within Location	Population Between Location	Expected Result	Program Result	Independent Result	All Agree? (Y or N)
Tablet	50.0	50.0	3	2	100.0	1.0	1.0	0.99986			
						3.0	3.0	0.52631			
Capsule	99.0	99.0	300	300	97.5	3.5	3.5	0.99200			
						3.5	4.0	0.24251			

Dissolution
Sampling Plan 1

									All
Q	CI	Lower	Sample	Population	Population	Expected	Program	Independent	Agree?
	Level	Bound	Size	Mean	CV	Result	Result	Result	(Y or N)
40	99.0	99.0	3	98.0	1.0	0.78665			
				100.0	3.0	0.15652			
85	50.0	50.0	2000	85.3	4.0	0.90502			

Dissolution
Sampling Plan 2

												All
							Population	Population	Expected	Program	Independent	Agree?
Q	CI	Lower				Population	Within	Between	Result	Result	Result	(Y or N)
	Level	Bound	# Loc	#/Location	Increment	Mean	Location	Location				
40	50.0	50.0	3	2	0.25	75.0	6.0	6.0	0.98481			
					0.25		10.0	10.0	0.76350			
85	99	99	300	300	0.25	87.0	2.0	2.0	0.76594			
					0.25		3.0	2.0	0.01274			

Amendment 5

Name: ___James Bergum_________

Date: ____ May 3, 2001________

Description:

There is a misprint in the heading for Form 4. PROGAM will be replaced by PROGRAM. The corrected page is attached.

Validation Team Approval:

Laura Foust: Laura B Foust 5/8/01

MaryAnn Gorko: Mary Ann Gorko 5/8/01

Douglas Lee: D A Lee 5/9/01

Jerry Planchard: J Planchard 5/9/01

Helen Strickland: Helen Strickland 05-08-2001

Merlin Utter: Merlin Utter 5/8/01

FORM 4
PROGRAM STRATEGY & SAS CODE VERIFICATION

Signing below indicates the following:

1) The calculations described in Appendix E to determine lower bounds for content uniformity and dissolution are implemented correctly in the macros.

2) The strategies described in Appendix F are appropriate.

3) The SAS code implements the strategies described in Appendix F correctly.

Laura Foust: ______________________________ Date: ___________________

MaryAnn Gorko ______________________________ Date: ___________________

Edith Senderak: ______________________________ Date: ___________________

Helen Strickland: ______________________________ Date: ___________________

Amendment 6

Name: ___James Bergum_________

Date: ____ May 8, 2001________

Description:

In the description of the content uniformity test for capsules, there is a misprint in the number of values that can be outside 85% to 115% of claim in the second stage. Instead of "No more than two values are outside 85% to 115% of claim", it should read "No more than three values are outside 85% to 115% of claim". The calculation is correct, so there is no effect on the calculation or program.

Validation Team Approval:

Laura Foust: Laura B Foust 5-8-01

MaryAnn Gorko: Mary Ann Gorko 5/8/01

Douglas Lee: D M Lee 5/9/01

Jerry Planchard: J Planchard 5/9/01

Helen Strickland: Helen Strickland 05-09-2001

Merlin Utter: Merlin Utter 5/9/01

$= P1^{10} + 10\ P1^{9}P2$

Stage 2) Test 20 additional units.

Pass if for all 30 units the following criteria are met:

1) CV ≤ 7.8%

2) No more than three values are outside 85% to 115% of claim and no value is outside 75% to 125% of claim.

Calculation:

P(passing 1st criteria of stage 2)

Use Johnson Kotz approximation with

$x = 30/0.078^2$
$v_1 = 1$
$v_2 = 29$
$\phi = 30(\mu/\sigma)^2$

P(passing 2nd criteria of stage 2)

$= P1^{30} + 30P1^{29}P2 + 435P1^{28}P2^2 + 4060\ P1^{27}P2^3$

The USP dissolution test and calculations are as follows:

Stage 1) Test 6 units (Result = % released at specified dissolution time point)

Pass if the following criteria are met:

1) All 6 results ≥ Q + 5

Calculation:

P(meeting criteria of stage 1)

Amendment 7

Name: ___James Bergum_________

Date: ____ May 21, 2001_______

Description:

In the program DISP1.SAS, there is a "&" missing on line 335. Lines 335-338 are used to check that the sample mean is greater than Q. The missing "&" causes Q to be undefined since Q is a macro variable. The correction has been made. This error has no effect on the other parts of the validation.

Although DISP1.SAS is correct as is, there are several changes that were made to make the program more efficient and easier to read. The changes are described below:

1) In lines 149-153, the cutoff values for generating the data sets that make up the acceptance limit table have been offset by 0.0001 so that after dividing by 5, the result is not a possible printed mean value. This helps to evenly distribute the number of observations in each data set in situations where rounding is a problem.

2) To create the acceptance limit table, the data set D1ONE is divided into five data sets. These five data sets make up the columns in the acceptance limit table. To perform the evaluation, these five data sets are appended to one another. This is not necessary since this just recreates D1ONE. So lines 247-264 were deleted and data set DIONE [Note: I instead of 1 in data set name] was created by setting D1ONE and creating the variables X and STD from the variables MEAN and CV in D1ONE.

3) The description of DISP1.SAS was changed to reflect these changes.

Attached is the revised DISP1.SAS program and description.

Validation Team Approval:

Laura Foust: Laura B Foust 06/11/01

MaryAnn Gorko: Mary Ann Gorko 6/5/2001

Douglas Lee: D M Lee 6/13/2001

Jerry Planchard: J Planchard 6/25/2001

Helen Strickland: Helen Strickland 07-12-2001

Merlin Utter: Merlin Utter 07-23-2001

DISP1.SAS

```

%MACRO DISP1;
%macro winDISP1;
DATA _NULL_;
WINDOW MDISP1 COLOR=grey
#1 "DISSOLUTION ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 1 (ONE SAMPLE PER LOCATION)" C=yellow
#4 "ENTER Q VALUE: " C=blue  Q 4.1 A=UNDERLINE
#5  "ENTER SAMPLE SIZE:  " C=blue NUMBER 4.0 A=UNDERLINE
#7  "ENTER BOUND ON FUTURE PERCENTAGE PASSING (50.0-99.0):  "
     C=blue LBOUND 4.1 A=UNDERLINE
#8  "ENTER CONFIDENCE LEVEL (50.0-99.0):  " C=blue CILEVEL 4.1 A=UNDERLINE
#10 "DO YOU WANT TO PRINT THE ACCEPTANCE LIMIT TABLE?" C=blue
#11 "ENTER Y OR N ="  C=blue A1DISP1 $1.
#13 "DO YOU WANT TO EVALUATE THE ACCEPTANCE LIMIT TABLE?" C=blue
#14 "ENTER Y OR N ="  C=blue A2DISP1 $1.
#16 "DO YOU WANT THE LOWER BOUND FOR A SPECIFIC SAMPLE RESULT?"
    C=blue
#17 "ENTER Y OR N ="  C=blue A3DISP1 $1.;
WINDOW SDISP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "SAMPLE SIZE MUST BE AN INTEGER GREATER THAN 2" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW BDISP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "THE LOWER BOUND ON THE PERCENTAGE OF ALL FUTURE BATCHES" C=YELLOW
#2 "PASSING THE USP TEST MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#3 "(TYPICAL VALUES ARE 50.0 AND 95.0)" C=YELLOW
#5 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW QDISP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "VALUES FOR Q MUST BE BETWEEN 40 AND 95" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW CIDISP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "CONFIDENCE INTERVAL VALUES MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#2 "(TYPICAL VALUES ARE 90.0, 95.0, OR 99.0)" C=YELLOW
#4 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ANSDISP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "REQUESTS REQUIRE A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
Q=80.0;
NUMBER=6;
LBOUND = 95;
CILEVEL = 95;
A1DISP1 = 'Y';
A2DISP1 = 'N';
A3DISP1 = 'N';
MAINDI1:
DISPLAY MDISP1 BELL;
IF NUMBER  LE 2 OR NUMBER NE ROUND(NUMBER) THEN DO;
DISPLAY SDISP1 BELL;
GOTO MAINDI1;
END;
IF Q GT 95.0 OR Q LT 40.0 THEN DO;
DISPLAY QDISP1 BELL;
```

```
GOTO MAINDI1;
END;

IF LBOUND GT 99.0 OR LBOUND LT 50.0 THEN DO;
DISPLAY BDISP1 BELL;
GOTO MAINDI1;
END;
IF CILEVEL GT 99.0 OR CILEVEL LT 50.0 THEN DO;
DISPLAY CIDISP1 BELL;
GOTO MAINDI1;
END;
IF A1DISP1 NE 'Y' AND A1DISP1 NE 'N' AND A1DISP1 NE 'y' AND
   A1DISP1 NE 'n' THEN DO;
DISPLAY ANSDISP1 BELL;
GOTO MAINDI1;
END;
IF A2DISP1 NE 'Y' AND A2DISP1 NE 'N' AND A2DISP1 NE 'y' AND
   A2DISP1 NE 'n' THEN DO;
DISPLAY ANSDISP1 BELL;
GOTO MAINDI1;
END;
IF A3DISP1 NE 'Y' AND A3DISP1 NE 'N' AND A3DISP1 NE 'y' AND
   A3DISP1 NE 'n' THEN DO;
DISPLAY ANSDISP1 BELL;
GOTO MAINDI1;
END;

CALL SYMPUT("Q",PUT(Q,4.1));
CALL SYMPUT("A1DISP1",PUT(UPCASE(A1DISP1),$1.));
CALL SYMPUT("A2DISP1",PUT(UPCASE(A2DISP1),$1.));
CALL SYMPUT("A3DISP1",PUT(UPCASE(A3DISP1),$1.));
CALL SYMPUT("NUMBER",PUT(NUMBER,4.0));
CALL SYMPUT("LBOUND",PUT(LBOUND,4.1));
CALL SYMPUT("CILEVEL",PUT(CILEVEL,4.1)); STOP;
RUN;
%mend winDISP1;

%MACRO COMPUTE;
   F1 = (1 - PROBNORM((5 - LLU)/SIGMA)) ** 6;
   SN2 = SQRT(12);
   PM2 = PROBNORM (SN2 * -LLU / SIGMA);
   PB2 = 1 - PROBNORM ((-15 - LLU) / SIGMA);
   F2 = PB2 ** 12 - PM2;
   SN3 = SQRT(24);
   PM3 = PROBNORM (SN3 * -LLU / SIGMA);
   P2 = PROBNORM ((-15 - LLU) / SIGMA) - PROBNORM ((-25 - LLU) / SIGMA);
   P3 = 1 - PROBNORM ((-15 - LLU) / SIGMA);
   F3 = P3**24 + 24*P2*P3**23 + 276*P2*P2*P3**22 - PM3;
   OVERBD = MAX(F1, F2, F3);
%mend compute;


%MACRO CALDISP1;
DATA D1ONE;
   Q = &Q;
   LIM = 100 - Q;
   N = &NUMBER;
```

DISP1.SAS (CON’T)

```
    D=0.2;
    Z = PROBIT(SQRT(&CILEVEL / 100));
    CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);
    STARTSD = 0.002;
    DO MEANADJ = D TO LIM BY D;
       BEGIN = STARTSD;
     DO SAMPSD = BEGIN TO 60.0 BY 0.001;
     SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
     LLU = MEANADJ - Z *SIGMA / SQRT(N);
%COMPUTE
    IF OVERBD < &LBOUND/100 AND SAMPSD <= 0.00201 then do;
    CV = 0; OUTPUT; SAMPLSD = 65.0; GOTO NEXT; END;
    IF OVERBD < &LBOUND/100 THEN DO;
       SAMPSD = SAMPSD - 0.001;
       STARTSD = SAMPSD;
       MEAN = MEANADJ + Q;
       CV = 100 * SAMPSD / MEAN;
        OUTPUT;
        SAMPSD = 65.0;
        END;
     NEXT:
      END;
     END;
  KEEP CV MEAN ;
PROC SORT DATA=D1ONE; BY MEAN;
DATA
      ONE(RENAME = (MEAN = X1 CV = CV1))
      TWO(RENAME = (MEAN = X2 CV = CV2))
      THREE(RENAME = (MEAN = X3 CV = CV3))
      FOUR(RENAME = (MEAN = X4 CV = CV4))
      FIVE(RENAME = (MEAN = X5 CV = CV5));
 SET D1ONE;
     Q = &Q;
     LIM = 100 - Q;
 IF Q                  < MEAN <= Q+ LIM/5   + 0.0001 THEN OUTPUT ONE;
 IF Q+LIM/5   + 0.0001 < MEAN <= Q+ 2*LIM/5 + 0.0001 THEN OUTPUT TWO;
 IF Q+2*LIM/5 + 0.0001 < MEAN <= Q+ 3*lIM/5 + 0.0001 THEN OUTPUT THREE;
 IF Q+3*LIM/5 + 0.0001 < MEAN <= Q+ 4*LIM/5 + 0.0001 THEN OUTPUT FOUR;
 IF Q+4*LIM/5 + 0.0001 < MEAN <= Q+ LIM     + 0.0001 THEN OUTPUT FIVE;
DATA D1ALL;
    MERGE ONE TWO THREE FOUR FIVE;
RUN;

%MEND CALDISP1;

%MACRO PRTDISP1;
OPTIONS MISSING = ' ' NODATE NONUMBER;
OPTIONS LS=132;
PROC PRINT DATA=D1ALL SPLIT = '*';
    FORMAT CV1 CV2 CV3 CV4 CV5 5.2;
    LABEL
          X1 = '  MEAN*(% CLAIM)'
          X2 = '  MEAN*(% CLAIM)'
          X3 = '  MEAN*(% CLAIM)'
          X4 = '  MEAN*(% CLAIM)'
          X5 = '  MEAN*(% CLAIM)'
          CV1 = 'CV*(%)'
```

```
          CV2 = 'CV*(%)'
          CV3 = 'CV*(%)'
          CV4 = 'CV*(%)'
          CV5 = 'CV*(%)';
      VAR CV1 X2 CV2 X3 CV3 X4 CV4 X5 CV5;
      ID X1;
TITLE "ACCEPTANCE LIMITS FOR DISSOLUTION (N = &NUMBER, Q = &Q)";
TITLE2 'SAMPLING PLAN 1';
TITLE3 "(MEETING LIMITS GUARANTEES WITH &CILEVEL % ASSURANCE,";
TITLE4 "THAT AT LEAST &LBOUND% OF ALL FUTURE SAMPLES TESTED";
TITLE5 'FOR DISSOLUTION WILL PASS THE USP TEST)';
TITLE6 "TABLE ENTRY IS UPPER LIMIT ON CV OF &NUMBER DISSOLUTION ASSAYS";
%MEND PRTDISP1;


%MACRO EVDISP1;

DATA _NULL_; WINDOW SMAIN COLOR=GREY
#1  "TO EVALUATE LIMITS, THE USER MUST SPECIFY THE RANGE OF" C=yellow
#2  "POSSIBLE POPULATION VALUES FOR THE MEAN AND CV" C=yellow
#3  "ENTER ALL VALUES AS POSITIVE INTEGERS" C=yellow
#5  "ENTER LOWER BOUND FOR MEAN: " C=blue ULOW 4.0 A=UNDERLINE
#6  "ENTER UPPER BOUND FOR MEAN: " C=blue UHIGH 4.0 A=UNDERLINE
#7  "ENTER INCREMENT FOR MEAN:   " C=blue UINCRE 4.0 A=UNDERLINE
#8  "ENTER DIVISOR FOR MEAN:     " C=blue UDIV 4.0 A=UNDERLINE
#10 "ENTER LOWER BOUND FOR CV:   " C=blue CVLOW 4.0 A=UNDERLINE
#11 "ENTER UPPER BOUND FOR CV:   " C=blue CVHIGH 4.0 A=UNDERLINE
#12 "ENTER INCREMENT FOR CV:     " C=blue CVINCRE 4.0 A=UNDERLINE
#13 "ENTER DIVISOR FOR CV:       " C=blue CVDIV 4.0 A=UNDERLINE;
WINDOW PINT COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST BE POSITIVE INTEGERS" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ORD  COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ERROR: UPPER BOUND IS LESS THAN LOWER BOUND" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
ULOW=950;
UHIGH=1000;
UINCRE=50;
UDIV=10;
CVLOW=10;
CVHIGH=40;
CVINCRE=30;
CVDIV=10;
SMAIN:
DISPLAY SMAIN BELL;
IF ULOW LT 1 OR ROUND(ULOW) NE ULOW
OR UHIGH LT 1 OR ROUND(UHIGH) NE UHIGH
OR UINCRE LT 1 OR ROUND(UINCRE) NE UINCRE
OR UDIV LT 1 OR ROUND(UDIV) NE UDIV
OR CVLOW LT 1 OR ROUND(CVLOW) NE CVLOW
OR CVHIGH LT 1 OR ROUND(CVHIGH) NE CVHIGH
OR CVINCRE LT 1 OR ROUND(CVINCRE) NE CVINCRE
OR CVDIV LT 1 OR ROUND(CVDIV) NE CVDIV
THEN DO;
DISPLAY PINT;
```

DISP1.SAS (CON’T)

```
GOTO SMAIN;
END;
IF ULOW GT UHIGH
OR CVLOW GT CVHIGH
THEN DO;
DISPLAY ORD;
GOTO SMAIN;
END;
CALL SYMPUT("ULOW",PUT(ULOW,4.0));
CALL SYMPUT("UHIGH",PUT(UHIGH,4.0));
CALL SYMPUT("UINCRE",PUT(UINCRE,4.0));
CALL SYMPUT("UDIV",PUT(UDIV,4.0));
CALL SYMPUT("CVLOW",PUT(CVLOW,4.0));
CALL SYMPUT("CVHIGH",PUT(CVHIGH,4.0));
CALL SYMPUT("CVINCRE",PUT(CVINCRE,4.0));
CALL SYMPUT("CVDIV",PUT(CVDIV,4.0)); STOP;
RUN;

DATA DIONE;
   SET d1one;
   x = mean;
   std = x*cv/100;
   N = &NUMBER;

%MACRO SIGDISP1;

   %DO CV = &CVLOW %TO &CVHIGH %BY &CVINCRE;
      %DO U = &ULOW %TO &UHIGH %BY &UINCRE;

         DATA D1SAVE;
            SET DIONE END = LAST;
            U = &U / &UDIV;
            CV = &CV / &CVDIV;
            SIGMA = U * CV / 100;
            PMEAN = PROBNORM((x - U) * SQRT(N) / SIGMA)
                    - PROBNORM((LAG(X) - U) * SQRT(N) / SIGMA);
            AVEHT = (STD + LAG(STD)) / 2;
            PSTD = PROBCHI((N - 1) * AVEHT * AVEHT
                   / ( SIGMA * SIGMA), N - 1);
            PT = PMEAN * PSTD ;
            PTRAP + PT;
            IF X > 99.9 THEN DO;
               PMEAN = 1 - PROBNORM((X - U) * SQRT (N) / SIGMA);
               PSTD = PROBCHI((N - 1) * STD * STD
                      / ( SIGMA * SIGMA), N - 1);
               PT = PMEAN * PSTD;
               PTRAP + PT;
            END;
            IF LAST THEN OUTPUT;
         RUN;

PROC APPEND BASE = D1SAVALL DATA = D1SAVE;

       %END;
    %END;

%MEND SIGDISP1;
```

```

%SIGDISP1

PROC PRINT DATA = D1SAVALL split = '*';
   label ptrap = 'PROBABILITY*OF*PASSING';
   VAR CV PTRAP;
   ID U;
TITLE  "ACCEPTANCE LIMITS FOR DISSOLUTION (N = &NUMBER, Q = &Q)";
TITLE2 'SAMPLING PLAN 1';
TITLE3 'PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE';
TITLE4 "CONFIDENCE LEVEL = &CILEVEL AND LOWER BOUND = &LBOUND";
RUN;
%MEND EVDISP1;

%MACRO SMPDISP1;

DATA _NULL_; WINDOW TMAIN COLOR=GREY
#3 "TO DETERMINE LOWER BOUND FOR FOUND SAMPLE RESULTS" C=yellow
#5  "ENTER SAMPLE MEAN (% CLAIM): " C=blue MEAN 6.3 A=UNDERLINE
#6  "ENTER SAMPLE CV (%):         " C=blue CV 6.3 A=UNDERLINE;
WINDOW LTZ COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "CV MUST BE NON NEGATIVE" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW RANGE COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "MEAN MUST BE GREATER THAN Q" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
MEAN= 100.00;
CV=4.00;
TMAIN:
DISPLAY TMAIN BELL;
IF CV LE 0 THEN DO;
DISPLAY LTZ;
GOTO TMAIN;
END;
IF MEAN LE &Q THEN DO;
DISPLAY RANGE;
GOTO TMAIN;
END;
CALL SYMPUT("MEAN",PUT(MEAN,6.3));
CALL SYMPUT("CV",PUT(CV,6.3)); STOP;
RUN;

DATA DI1SMP;
LABEL OVERBD = 'OVERALL LOWER BOUND'
       MEAN = 'SAMPLE MEAN(%CLAIM)';
   Q = &Q;
   N = &NUMBER;
   CILEVEL = &CILEVEL;
   Z = PROBIT(SQRT(&CILEVEL / 100));
   N = &NUMBER;
   CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);
      MEAN = &MEAN;
      MEANADJ = MEAN - Q;
      CV = &CV;
      SAMPSD= &MEAN * CV/100;
```

```
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
    LLU = MEANADJ - Z *SIGMA / SQRT(N);
%COMPUTE
PROC PRINT SPLIT = '*';
  LABEL SAMPSD = 'SAMPLE*STD DEV*(% CLAIM)'
        MEAN = 'SAMPLE* MEAN*(% CLAIM)'
        OVERBD = 'LOWER BOUND';

  ID MEAN;
  VAR SAMPSD CV OVERBD;
TITLE  "ACCEPTANCE LIMITS FOR DISSOLUTION (N = &NUMBER, Q = &Q)";
TITLE2 'SAMPLING PLAN 1';
TITLE3 "PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST";
TITLE4 "FOR A GIVEN SAMPLE MEAN AND CV WITH &CILEVEL.% ASSURANCE";
run;
%MEND SMPDISP1;

%MACRO ANADISP1;
    %winDIsp1;
%IF %UPCASE(&A1DISP1)=Y OR %UPCASE(&A2DISP1)=Y %THEN %DO;
     %CALDISP1;
    %END;
%IF %UPCASE(&A1DISP1)=Y %THEN %DO;
      %PRTDISP1;
    %END;
%IF %UPCASE(&A2DISP1)=Y %THEN %DO;
      %EVDISP1;
PROC DATASETS LIBRARY = WORK;
   DELETE D1SAVALL;
    %END;
%IF %UPCASE(&A3DISP1)=Y %THEN %DO;
      %SMPDISP1;
    %END;
%MEND ANADISP1;

%ANADISP1
RUN;
%MEND DISP1;
%DISP1
```

PROGRAM: DISP1.SAS - Used to generate Dissolution acceptance limits using Sampling Plan 1

The macros contained in DISP1.SAS are defined below:

WinDISP1 [3-93]-

Defines window (MDISP1 [5-19]) requesting input for Q (Q), sample size (NUMBER), lower bound (LBOUND) and confidence level (CILEVEL). The user can select whether or not to have the acceptance limit table printed, the acceptance limit table evaluated against various values of population parameters, or the lower bound calculated for a specific sample result.

Several windows are defined to respond to errors in user input [20-42]. Windows are created for sample size integer greater than one (SDISP1), lower probability bound (BDISP1) and confidence interval (CIDISP1) between 50.0 and 99.9, Q between 40 and 95 (QDISP1) and Y/N input (ANSDISP1).

COMPUTE [95-107]-

For specific values of the population mean and standard deviation, this macro performs the lower probability bound calculation.

Each time this macro is called there is one value for μ (LLU) and one value for σ (SIGMA). The pair LLU, SIGMA is evaluated. PROBNORM is used to calculate the normal probability of an individual value falling within a given interval. Since the probability of passing the USP test is greater than or equal to the probability of passing any individual stage, the maximum probability of passing is selected from stage 1 (F1), stage 2 (F2), and stage 3 (F3).

caldisp1 [110-158]-

This macro finds the acceptance limit on the CV for a given sample mean. The confidence interval is a triangle. For dissolution, only one point needs to be evaluated. This is the point with the smallest value of the population mean and the maximum value of sigma. So, for a given value of the sample mean, one can just keep increasing the sample value of the standard deviation until the evaluation of the point on the triangle has a lower bound probability less than pre-specified lower bound. Also note that the probability of passing the dissolution test only depends on the distance from Q and not the actual value of Q. So, the lower bound on passing the dissolution test with a Q of 80 and sample mean of 85 would be the same as passing the dissolution test with a Q of 85 and a sample mean of 90 since they both are 5 units away from Q. Therefore, this macro generates the acceptance limits on the interval from 0 to (100 -Q). Once the table has been generated, the value of Q is added to each value of the sample mean. The table is generated by using a DO loop that starts with a sample mean of 0.2

and goes to (100 - Q) in increments of 0.2 (set by macro variable D). The standard deviation starts at 0.002 (STARTSD) and increments by 0.001. For each value of the standard deviation (SAMPSD), the upper bound for sigma (SIGMA) is calculated using the usual confidence bound formula. The point in the confidence interval that will be evaluated is determined (LLU). LLU is the lower end of the confidence region associated with SIGMA. Since the sample mean and sample variance are independent, the overall α level (1- confidence level) is the product of the two individual α levels for μ and σ. So each of the two individual confidence levels are the square root of the overall α. The macro *COMPUTE* is called to find the lower bound on the probability of passing the USP test for LLU. If the minimum is greater than the lower bound selected by the user (LBOUND), the standard deviation (SAMPSD) is incremented by 0.001 and a new LLU is computed and the minimum probability is found again. Once the minimum is less than the lower bound, 0.001 is subtracted from the standard deviation, and the CV is computed. A special case is when the starting value (STARTSD) of 0.002 gives a minimum less than the lower bound. In this case the CV is set to 0. The value of the standard deviation is used as a starting point for the next sample mean since we know that the standard deviation must increase as the sample mean increases.

Once the entire set of sample mean, CV combinations are determined, the data is sorted by MEAN and a data set is prepared for use in printing the table. This is done by creating five data sets. Each of these data sets contains the data for two columns of the printed acceptance table. Data set ONE contains the mean and CV for the first fifth of the values of the sample mean, data set TWO the second fifth, etc. All five of these data sets are then merged together to form data set D1ALL.

PRTDISP1 [160-184]-

This macro prints the acceptance limit table by printing out data set D1ALL prepared by the macro *caldisp1*.

EVDISP1 [187- 298]-

This macro starts by defining a window (SMAIN [189-200]) for the user to specify the range of possible population values for the mean and CV. For the population mean, the user specifies the lower bound for the mean (ULOW), the upper bound for the mean (UHIGH), the increment (UINCRE), and the divisor (UDIV). Each of these values must be a positive integer. So if the user wants to evaluate population means from 90.0 to 92.0 by 0.5, the following values would be specified: ULOW = 900, UHIGH = 920, UINCRE = 5, and UDIV = 10. The upper and lower values for the CV as well as the increment and divisor are input in the same manner as those are for the mean. Two windows are also defined for error checking (PINT and ORD [201-208]). PINT checks for integer values and ORD checks for upper bound being greater than lower bound. Default values are given for all of the input variables followed by the code to determine input errors.

DIONE is created from D1ONE and contains the sample mean and sample standard deviation pairs that make up the entire acceptance limit table.

The macro *SIGDISP1* [253-285] performs the calculations for each population mean and CV combination. The strategy is as follows: The acceptance limit table consists of pairs of sample means with an upper bound on the sample CV. Data set DIONE contains the sample mean and sample standard deviation pairs that make up the entire acceptance limit table beginning with a sample mean of Q + 0.2 and ending with a sample mean of 100.0. To calculate the probability of passing the acceptance limit table for specified values for the population mean and population CV, the probability is calculated of a sample mean falling between adjacent means in the table and the sample standard deviation falling below the average standard deviation at the two endpoints. The product of these two probabilities is computed since the sample mean and sample variance are independent of one another. So, suppose the standard deviation at a sample mean of 75.2 was 0.2 and the sample standard deviation bound at a sample mean of 75.4 was 0.5. If the evaluation was at a population mean of 100 with standard deviation of 3, then the first calculation would be to find the probability of getting a sample mean between 75.2 and 75.4 and a sample standard deviation less than (0.2 + 0.5)/2 or 0.35. This is done using the SAS functions - PROBNORM and PROBCHI. The second calculation would calculate the probability of getting a sample means between 75.4 to 75.6 with a sample standard deviation less than the average of the corresponding standard deviations for 75.4 and 75.6. These probabilities are summed across all the intervals from Q + 0.2 to 100.0. The sum of these probabilities (PTRAP) is the probability of passing the table for specific population values for the mean and standard deviation. To perform the calculation, the lag function in SAS is used to obtain the previous value for the sample mean and sample standard deviation. The last value of PTRAP is output. PROC APPEND is used to save the PTRAP value for each combination of CV and U in the DO loop. These values are stored in the data set D1SAVALL. Finally, the data set D1SAVALL is printed.

SMPDISP1 [300-358]

This macro is used to calculate the lower bound of passing the USP dissolution test given the sample mean and sample standard deviation. The macro displays the window TMAIN [302-305] for the user to input the sample mean and sample standard deviation. Error checks (LTZ & RANGE [306-313]) are made to make sure that a positive integer has been entered and that the mean is greater than Q. The data set DI1SMP determines the endpoints of the confidence interval based on the user input values for the sample mean and standard deviation and prior information such as confidence level and sample size. The macro *COMPUTE* is called to determine the lower bound. Finally, the lower bound is printed.

ANADISP1 [360-376]

This macro is used to respond to the user input from *WinDISP1*. If the user requests printing of the acceptance limit table or evaluation of a table, then the macro *caldisp1* is called. If the user requests a printout of the acceptance limit table, the macro *PRTDISP1* is called. If an evaluation is requested, the macro *EVDISP1* is called. After the evaluation macro is finished the dataset D1SAVALL is deleted. Finally, if the user requests a lower bound for a sample mean and standard deviation, the macro *SMPDISP1* is called.

Amendment 8

Name: ___James Bergum_________

Date: ____ October 11, 2001______

Description:

This amendment addresses the following four concerns identified in the problem request form written by Jerry Planchard on October 4, 2001.

1) The error screens do not appear in the Dissolution, Sampling Plan 2, TMAIN window, for the SAMPLE BETWEEN SD parameter. Values of 0, A, and -3 were inputted and errors are not indicated.

The reason for the error is a misprint in the program DISP2.SAS, line 385. The first SE in the line should be replaced by SM. The following change was made:

```
IF SE LE 0 OR SE LT 0
```

Replaced by

```
IF SM LE 0 OR SE LT 0
```

No other changes were made to the program. This change only affects the condition used to output an error window.

2) In Appendix D of the protocol, several misprints were found in the dissolution test data. The test input values used for content uniformity were inadvertently used for dissolution input values in the following locations:

> The value of Q in the MDISP1 and MDISP2 primary windows in sampling plans 1 and 2 respectively
>
> The values for the sample mean in the TMAIN primary window for both sampling plans 1 and 2.

The revised test pages are attached.

3) In Appendix F the macro calcusp1 states that the overall α level (1-confidence level) is the product of the two individual α levels for μ and σ. So the two individual confidence levels are the square root of the overall α. Actually this should read the two individual confidence levels are the square root of the overall confidence level. This statement is repeated in describing the macro caldisp1. The revised pages are attached. These changes require no changes to the SAS programs.

4) The correction to the formula given in Appendix 1 had misplaced parentheses. The formula was revised and a new Appendix 1 titled Appendix 1 (Revised) was issued.

Validation Team Approval:

Laura Foust: Laura B Foust 11/6/01

MaryAnn Gorko: Mary Ann Gorko 11/9/01

Douglas Lee: D. Lee 10/16/01

Jerry Planchard: J Planchard 10/12/01

Helen Strickland: Helen A. Strickland 11-15-2001

Merlin Utter: Merlin Utter 10/16/01

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APPENDIX D

DISSOLUTION

WINDOW ERROR CHECKING

TEST PAGES

(CONCERN 2)

DISSOLUTION
SAMPLING PLAN 1
WINDOWS

PRIMARY	INPUT	INPUT	EXPECTED	FOUND	AGREE?
WINDOW	REQUESTED		RESPONSE	RESPONSE	(Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MDISP1	Q	40.0	N		
		95.0	N		
		39.9	ES		
		95.1	ES		
		P	ES		
	SAMPLE SIZE	3	N		
		2	ES		
		A	ES		
		2000	N		
	BOUND	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		75	N		
		B	ES		
	CONFIDENCE LEVEL	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		80	N		
		C	ES		
	ACCEPTANCE TABLE	Y	N		
		N	N		
		y	N		
		n	N		
		K	ES		
		7	ES		
	EVALUATE	Y	N		
		y	N		
		N	N		
		n	N		
		k	ES		
		6	ES		
	LOWER BOUND	Y	N		
		y	N		
		N	N		
		n	N		
		C	ES		

		2	ES		
SMAIN	LOWER BOUND MEAN	1	N		
		200	N		
		0	ES		
		D	ES		
		4.9	ES		
	UPPER BOUND MEAN	1	N		
		200	N		
		0	ES		
		E	ES		
		9.7	ES		
	INCREMENT MEAN	1	N		
		200	N		
		0	ES		
		F	ES		
		1.4	ES		
	LOWER BOUND CV	1	N		
		200	N		
		0	ES		
		G	ES		
		2.2	ES		
	UPPER BOUND CV	1	N		
		200	N		
		0	ES		
		H	ES		
		1.1	ES		
	INCREMENT CV	1	N		
		200	N		
		0	ES		
		J	ES		
		5.1	ES		
TMAIN	SAMPLE MEAN	75.1	N		
	(Q = 75)	100.0	N		
		85.5	N		
		75.0	ES		
		S	ES		
	SAMPLE CV	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		

DISSOLUTION
SAMPLING PLAN 2
WINDOWS

PRIMARY	INPUT	INPUT	EXPECTED	FOUND	AGREE?
WINDOW	REQUESTED		RESPONSE	RESPONSE	(Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MDISP2	Q	40.0	N		
		95.0	N		
		39.9	ES		
		95.1	ES		
		P	ES		
	NUMBER LOCATIONS	3	N		
		2	ES		
		A	ES		
		2000	N		
	NUMBER PER LOCATION	2	N		
		1	ES		
		F	ES		
		2000	N		
	BOUND	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		65	N		
		A	ES		
	CONFIDENCE LEVEL	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		80	N		
		D	ES		
	ACCEPTANCE TABLE	Y	N		
		N	N		
		y	N		
		n	N		
		k	ES		
		6	ES		
	EVALUATE	Y	N		
		y	N		
		N	N		
		n	N		
		D	ES		
		7	ES		
	LOWER BOUND	Y	N		
		y	N		

		N	N		
		n	N		
		b	ES		
		2	ES		
SMAIN	LOWER BOUND MEAN	1	N		
		200	N		
		0	ES		
		C	ES		
		7.1	ES		
	UPPER BOUND MEAN	1	N		
		200	N		
		0	ES		
		D	ES		
		3.1	ES		
	INCREMENT MEAN	1	N		
		200	N		
		0	ES		
		E	ES		
		4.2	ES		
	LOWER BOUND WITHIN SD	1	N		
		200	N		
		0	ES		
		F	ES		
		5.3	ES		
	UPPER BOUND WITHIN SD	1	N		
		200	N		
		0	ES		
		G	ES		
		6.4	ES		
	INCREMENT WITHIN SD	1	N		
		200	N		
		0	ES		
		H	ES		
		7.5	ES		
	LOWER BOUND BETWEEN SD	1	N		
		200	N		
		0	ES		
		L	ES		
		6.3	ES		
	UPPER BOUND BETWEEN SD	1	N		
		200	N		
		0	ES		
		J	ES		
		9.7	ES		
	INCREMENT BETWEEN SD	1	N		
		200	N		
		0	ES		

		K	ES		
		7.9	ES		
TMAIN	SAMPLE MEAN	60.1	N		
	(Q = 60)	100.0	N		
		80.6	N		
		60.0	ES		
		S	ES		
	SAMPLE WITHIN SD	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		
	SAMPLE BETWEEN SD	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		

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APPENDIX F

PAGES

(CONCERN 3)

for μ and σ. Then evaluate the two points corresponding to the largest value of σ and the smallest and largest values for μ . If both of the points result in probabilities greater than LBOUND, this means that all of the points in the entire confidence region would give a probability of passing the USP content uniformity test greater than LBOUND. Therefore, given the same sample mean, a larger value of the standard deviation can be evaluated. The value of the sample standard deviation is increased until one of the two points evaluated in the confidence region is less than LBOUND. The last value of the standard deviation is kept for the acceptance limit table. At a value of the sample mean around 100, the sample standard deviation will reach its maximum acceptance limit table value. The next sample mean evaluated after this maximum has been reached will have a lower value of the sample standard deviation. The program checks to determine when this occurs. At this point, the program starts generating the rest of the acceptance limit table by setting the sample mean to 114.9, resetting the sample standard deviation to a small value and works its way down from 114.9 to the value of the sample mean with the largest sample standard deviation.

The strategy describe above is performed by using a DO loop that starts with a sample mean of 85.1 and increases to 114.9 in increments of 0.1 (set by macro variable D). The standard deviation starts at 0.01 (STARTSD) and increments by 0.001. For each value of the standard deviation (SAMPSD), the upper bound for sigma (SIGMA) is calculated using the usual χ^2 based confidence bound formula. The two points in the confidence interval that will be evaluated are determined (LLU and ULU). LLU and ULU are the lower and upper ends of the confidence region associated with SIGMA. Since the sample mean and sample variance are independent, the overall confidence level is the product of the two individual confidence levels for μ and σ. So the two individual confidence levels are the square root of the overall confidence level. Then the portion of the overall α (1 - confidence level) used to estimate μ is divided equally to construct a 2-tailed test. Since the confidence interval for σ is one-sided, the portion of the overall α for σ is all put into one tail. The macro *c1calc* is called to calculate the lower bound on the probability of passing the USP test for LLU and ULU. The minimum of the two probabilities (OVERBD) is returned from *c1calc*. If the minimum is greater than the lower bound selected by the user (LBOUND), the standard deviation (SAMPSD) is incremented by 0.001 and a new LLU and ULU are computed and the minimum probability is found again. Once the minimum in less than the lower bound, 0.001 is subtracted from the standard deviation, and the CV is computed. A special case is when the starting value (STARTSD) of 0.01 gives a minimum less than the lower bound. In this case the CV is set to 0. The value of the standard deviation is used as a starting point for the next sample mean since the standard deviation must increase as the sample mean increases from 85.1 to around 100. At some value of the sample mean greater than 100, the standard deviation will start decreasing. In the macro, when a new sample mean is evaluated with the starting value of the previous standard deviation and the resulting OVERBD is less than the user pre-specified lower bound (LBOUND), this means that the maximum tabled sample standard deviation has been reached.

Therefore, the macro saves the value of this mean (STARTM), goes to the label UPPER, sets the starting standard deviation back to 0.01, and starts a DO loop that starts with a sample mean (MEAN) at 114.9 and decreases by 0.1 to STARTM. The same procedure is used as described above to find the sample standard deviation for each sample mean.

Once the entire set of sample mean, CV combinations are determined, the data is sorted by MEAN and a data set is prepared for use in printing the table. This is done by creating six data sets. Each of these data sets contains the data for two columns of the printed acceptance table (one for the sample mean and one for the CV). Data set ONE contains the mean and CV for values of the sample mean between 85.1 and 90.0, data set TWO from 90.1 to 95.0, etc. All six of these data sets are then merged together to form data set SEVEN.

PRTCUSP1 [230-254]-

This macro prints the acceptance limit table by printing out data set SEVEN prepared by the macro *calcusp1*.

EVCUSP1[256-376]-

This macro starts by defining a window (SMAIN [258-271]) for the user to specify the range of possible population values for the mean and CV. For the population mean, the user specifies the lower bound for the mean (ULOW), the upper bound for the mean (UHIGH), the increment (UINCRE), and the divisor (UDIV). Each of these values must be a positive integer. So if the user wants to evaluate population means from 98.0 to 102.0 by 0.5, the following values would be specified: ULOW = 980, UHIGH = 1020, UINCRE = 5, and UDIV = 10. The upper and lower values for the CV as well as the increment and divisor are input in the same manner as those are for the mean. Two windows are also defined for error checking (PINT and ORD [272-279]). PINT checks for integer values and ORD checks for the upper bound being greater than lower bound. Default values are given for all of the input variables which is followed by the code to check for input errors. Finally, data set SEVEN is read into data set TAB. The macro DSCUSP1 [321-329] reads TAB and creates 6 data sets containing the sample means and standard deviations from TAB. The 6 data sets are appended to one another and stored in data set ONE.

The macro *SIGCUSP1* [337-362] performs the calculations for each population mean and CV combination. The strategy is as follows: The acceptance limit table consists of pairs of sample means with an upper bound on the sample CV. Data set ONE contains the sample mean and sample standard deviation pairs that make up the entire acceptance limit table. The table begins with a sample mean of 85.1 and ends with a sample mean of 114.9. To calculate the probability of passing the acceptance limit table for specified values for the population mean and population CV, the probability is calculated of a sample mean falling between adjacent means in the table and the sample standard deviation falling below the average standard deviation at the two endpoints. So, suppose the standard deviation at a sample mean of 85.1 was 0.2 and the sample standard deviation bound at a sample mean of 85.2 was 0.5. If the evaluation was at a population mean of 100 with standard deviation of 3, then the first calculation would be to find the probability of getting a sample mean between 85.1 and 85.2 and a sample standard deviation less than (0.2 + 0.5)/2 or 0.35. This is done using the SAS functions - PROBNORM and PROBCHI. The second calculation would calculate the probability of getting a sample means between 85.2 to 85.3 with a sample standard deviation less than the average of the corresponding standard deviations for 85.2 and 85.3. These probabilities are summed across all the intervals from 85.1 to 114.9. The sum of these probabilities (PTRAP) is the probability of passing the table for specific population values for the mean and standard deviation. To perform the calculation, the lag function in SAS is used to obtain the previous value for the sample mean and sample standard deviation. The last value of PTRAP is output. PROC APPEND is used to save the PTRAP value for each combination of CV and U in the DO loop. These values are stored in the data set SAVEALL. Finally, the data set SAVEALL is printed.

SMPCUSP1 [378-440]

This macro is used to calculate the lower bound of passing the USP content uniformity test given the sample mean and sample standard deviation. The macro displays the window TMAIN [380-385]for the user to input the sample mean and sample standard deviation. Error checks (LTZ & RANGE [386-393]) are made to make sure that a positive integer has been entered and is within the range of 85.1 to 114.9. The data set TAB determines the endpoints of the confidence interval based on the user input values for the sample mean and standard deviation and prior information such as dosage form type, confidence level, and sample size. The overall α is divided into two portions as described above in the macro *calcusp1*. The macro *c1calc* is called to determine the lower bound. Finally, the lower bound is printed.

ANACUSP1 [442-458]

This macro is used to respond to the user input from *WinCUSP1*. If the user requests printing of the acceptance limit table or evaluation of a table, then the macro *calcusp1* is called. If the user requests a printout of the acceptance limit table, the macro *PRTCUSP1* is called. If an evaluation is requested, the macro *EVCUSP1* is called. After the evaluation macro is finished the dataset SAVEALL is deleted. Finally, if the user requests a lower bound for a sample mean and standard deviation, the macro *SMPCUSP1* is called.

and goes to (100 - Q) in increments of 0.2 (set by macro variable D). The standard deviation starts at 0.002 (STARTSD) and increments by 0.001. For each value of the standard deviation (SAMPSD), the upper bound for sigma (SIGMA) is calculated using the usual confidence bound formula. The point in the confidence interval that will be evaluated is determined (LLU). LLU is the lower end of the confidence region associated with SIGMA. Since the sample mean and sample variance are independent, the overall confidence level is the product of the two individual confidence levels for μ and σ. So each of the two individual confidence levels is the square root of the overall confidence level. The macro *COMPUTE* is called to find the lower bound on the probability of passing the USP test for LLU. If the minimum is greater than the lower bound selected by the user (LBOUND), the standard deviation (SAMPSD) is incremented by 0.001 and a new LLU is computed and the minimum probability is found again. Once the minimum is less than the lower bound, 0.001 is subtracted from the standard deviation, and the CV is computed. A special case is when the starting value (STARTSD) of 0.002 gives a minimum less than the lower bound. In this case the CV is set to 0. The value of the standard deviation is used as a starting point for the next sample mean since we know that the standard deviation must increase as the sample mean increases.

Once the entire set of sample mean, CV combinations are determined, the data is sorted by MEAN and a data set is prepared for use in printing the table. This is done by creating five data sets. Each of these data sets contains the data for two columns of the printed acceptance table. Data set ONE contains the mean and CV for the first fifth of the values of the sample mean, data set TWO the second fifth, etc. All five of these data sets are then merged together to form data set D1ALL.

PRTDISP1 [160-184]-

This macro prints the acceptance limit table by printing out data set D1ALL prepared by the macro *caldisp1*.

EVDISP1 [187-311]-

This macro starts by defining a window (SMAIN [189-200]) for the user to specify the range of possible population values for the mean and CV. For the population mean, the user specifies the lower bound for the mean (ULOW), the upper bound for the mean (UHIGH), the increment (UINCRE), and the divisor (UDIV). Each of these values must be a positive integer. So if the user wants to evaluate population means from 90.0 to 92.0 by 0.5, the following values would be specified: ULOW = 900, UHIGH = 920, UINCRE = 5, and UDIV = 10. The upper and lower values for the CV as well as the increment and divisor are input in the same manner as those are for the mean. Two windows are also defined for error checking (PINT and ORD [201-208]). PINT checks for integer values and ORD checks for upper bound being greater than lower bound. Default values are given for all of the input variables followed by the code to determine input errors.

Amendment 9

Name: ___James Bergum_________

Date: ____ October 11, 2001______

Description:

Nine discrepancies were discovered (See Problem Request Form from Merlin Utter dated 10/11/01) in the validation test data given in Appendix G of the protocol. These misprints are described below:

Part 2
Content Uniformity
Sampling Plan 2

Misprint: The Lower and Upper Expected Results shown below are incorrect.
The following corrections were made:

The 89.7 was replaced by 96.3
The 110.3 was replaced by 103.7
The 96.3 was replaced by 89.7
The 103.7 was replaced by 110.3.
The expected lower mean result . was replaced by 96.0
The expected upper mean result . was replaced by 104.0

Dosage Form	CI Level	Lower Bound	# Locations	#/ Location	SE	SM	Expected Result Mean (Lower)	Expected Result Mean (Upper)
Tablet	50.0	50.0	3	300	0.1	3.0	89.7	110.3
Tablet	50.0	50.0	3	300	3.0	0.1	96.3	103.7
Tablet	99.0	99.0	3	300	3.0	0.1	.	.

Dissolution
Sampling Plan 2

Misprint: The Expected result shown below is incorrect.
The 43.20 was replaced by 43.40

CI Level	Lower Bound	Q	# Locations	#/ Location	SE Increment	SM Increment	SE	SM	Expected Result Mean
50.0	50.0	40.0	3	2	0.1	5.00	5.00	5.00	43.20

Part 4
Evaluation
Dissolution
Sampling Plan 2

Misprint: The Expected Lower Bounds shown below are incorrect.
The following corrections were made:

The 0.99825 was replaced by 0.95102.
The 0.96410 was replaced by 0.95105

Q	CI Level	# Locations	#/ Locations	Sample SE	Sample SM	Sample Mean	Expected Lower Bound
40.0	50	3	300	1.000	1.000	41.20	0.99825
85.0	99	300	2	10.750	9.250	99.20	0.96410

The test data pages have been corrected and are attached. Output from the SAS program is also included to show these revised results. No changes were made to the SAS programs. The misprints were made while writing the protocol.

Validation Team Approval:

Laura Foust: Laura B Foust 11/06/01

MaryAnn Gorko: Mary Ann Gorko 11/9/01

Douglas Lee: D A Lee 10/17/01

Jerry Planchard: J Planchard 11/14/01

Helen Strickland: Helen A. Strickland 11-15-2001

Merlin Utter: Merlin Utter 10/17/01

PART 2 (CON'T)
Content Uniformity
Sampling Plan 2
Test Data Set & Results

Dosage Form	CI Level	Lower Bound	# Loc	#/Location	SE	SM	Expected Result Mean (Lower)	Program Result Mean (Lower)	Indepenent Result Mean (Lower)	Expected Result Mean (Upper)	Program Result Mean (Upper)	Indepedent Result Mean (Upper)	All Agree? (Y or N)
Tablet	50.0	50.0	3	2	0.1	0.1	85.4			114.6			
					0.1	3	96.3			103.7			
					3	0.1	89.8			110.2			
					3	3	97.1			102.9			
				300	0.1	0.1	85.4			114.6			
					0.1	3	96.3			103.7			
					3	0.1	89.7			110.3			
					3	3	97.8			102.4			
			300	2	0.1	0.1	85.2			114.8			
					0.1	3	89.8			110.2			
					3	0.1	88.3			111.7			
					3	3	91.0			109.2			
				300	0.1	0.1	85.3			114.7			
					0.1	3	89.8			110.2			
					3	0.1	89.6			110.4			
					3	3	92.1			108.2			
	50.0	99.0	3	2	0.1	0.1	85.6			114.4			
					0.1	3	.			.			
					3	0.1	93.2			106.8			
					3	3	.			.			
				300	0.1	0.1	85.7			114.3			
					0.1	3	.			.			
					3	0.1	93.0			107.0			
					3	3	.			.			
			300	2	0.1	0.1	85.4			114.6			
					0.1	3	93.1			106.9			
					3	0.1	90.7			109.3			
					3	3	94.9			105.1			

				300	0.1	0.1	85.4			114.6			
					0.1	3	93.1			106.9			
					3	0.1	92.8			107.2			
					3	3	96.3			103.7			
	99.0	99.0	3	2	0.1	0.1	91.0			109.0			
					0.1	3	.			.			
					3	0.1	.			.			
					3	3	.			.			
				300	0.1	0.1	91.0			109.0			
					0.1	3	.			.			
					3	0.1	.			.			
					3	3	.			.			
			300	2	0.1	0.1	85.4			114.6			
					0.1	3	94.2			105.8			
					3	0.1	91.2			108.8			
					3	3	95.9			104.1			
				300	0.1	0.1	85.5			114.5			
					0.1	3	94.2			105.8			
					3	0.1	92.8			107.2			
					3	3	97.2			102.8			
Capsule	50.0	50.0	3	2	0.1	0.1	85.3			114.7			
					0.1	3	94.1			106.3			
					3	0.1	88.2			111.8			
					3	3	94.8			105.3			
				300	0.1	0.1	85.3			114.7			
					0.1	3	94.1			106.3			
					3	0.1	88.1			111.9			
					3	3	95.4			104.9			
			300	2	0.1	0.1	85.2			114.8			
					0.1	3	88.3			111.7			
					3	0.1	87.2			112.8			
					3	3	89.1			111.1			
				300	0.1	0.1	85.2			114.8			
					0.1	3	88.3			111.7			
					3	0.1	88.0			112.0			
					3	3	90.1			110.5			
	99.0	50.0	3	2	0.1	0.1	88.7			111.3			

PART 2 (CON'T)
Dissolution
Sampling Plan 2
Test Data Set & Results

												All
CI Level	Lower Bound	Q	# Loc	#/Location	SE Increment	SM Increment	SE	SM	Expected Result	Program Result	Independent Result	Agree? (Y or N)
50.0	50.0	40	3	2	0.10	5.00	0.10	5.00	43.10			
					0.10	5.00	0.10	20.00	89.70			
					0.10	5.00	5.00	5.00	43.40			
					0.10	5.00	5.00	20.00	90.00			
				300	5.00	0.10	5.00	0.10	40.20			
					5.00	0.10	5.00	5.00	43.70			
					5.00	0.10	20.00	0.10	55.00			
					5.00	0.10	20.00	5.00	60.30			
			300	2	5.00	5.00	5.00	5.00	40.20			
					5.00	5.00	5.00	20.00	56.60			
					5.00	5.00	20.00	5.00	46.90			
					5.00	5.00	20.00	20.00	64.10			
				300	5.00	5.00	5.00	5.00	40.30			
					5.00	5.00	5.00	20.00	57.10			
					5.00	5.00	20.00	5.00	55.80			
					5.00	5.00	20.00	20.00	70.80			
		85	3	2	0.10	0.10	0.10	0.10	85.20			
					0.10	0.10	0.10	5.00	88.10			
					0.10	0.10	5.00	0.10	85.20			
					0.10	0.10	5.00	5.00	88.40			
			300	300	5.00	0.10	5.00	0.10	85.20			
					5.00	0.10	5.00	5.00	85.30			
					5.00	0.10	10.00	0.10	86.10			
					5.00	0.10	10.00	5.00	87.20			
50.0	99.0	40	3	2	5.00	5.00	5.00	5.00	49.40			
					5.00	5.00	5.00	20.00	.			
					5.00	5.00	20.00	5.00	89.40			
					5.00	5.00	20.00	20.00	.			
			300	300	5.00	5.00	5.00	5.00	43.70			

Dissolution
Sampling Plan 1

						Expected	Program	Independent	All
				Sample	Sample	Lower	Lower	Lower	Agree?
Case	Q	CI Level	Sample Size	Mean	CV	Bound	Bound	Bound	(Y or N)
1	40.0	99	1000	41.00	5.510	0.95004			
2	85.0	50	3	100.00	7.320	0.95018			
3	75.4	58.4	12	77.63	6.432	0.78157			

Dissolution
Sampling Plan 2

								Expected	Program	Independent	All
					Sample	Sample	Sample	Lower	Lower	Lower	Agree?
Case	Q	CI Level	# Locations	# / Location	SE	SM	Mean	Bound	Bound	Bound	(Y or N)
1	40.0	50	3	300	1.000	1.000	41.20	0.95102			
2	85.0	99	300	2	10.750	9.250	99.20	0.95105			
3	55.7	67.4	15	3	6.251	5.752	59.11	0.77095			

ACCEPTANCE LIMITS FOR TABLET CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 50.0, CONFIDENCE LEVEL = 50.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 900 ASSAYS- 300 ASSAYS AT EACH OF 3 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

0*QB 8/23/01

	2.8		2.9		3.0		3.1		3.2		3.3		3.4		3.5		3.6	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	95.5	104.5	95.9	104.1	* 96.3	103.7 *	96.7	103.3	97.1	103.0	97.5	102.6	97.9	102.2	98.4	101.8	98.9	101.4
0.2	95.5	104.5	95.9	104.1	96.3	103.7	96.7	103.3	97.1	103.0	97.5	102.6	97.9	102.2	98.4	101.8	98.9	101.4
0.3	95.5	104.5	95.9	104.1	96.3	103.7	96.7	103.3	97.1	103.0	97.5	102.6	97.9	102.2	98.4	101.8	98.9	101.4
0.4	95.6	104.5	95.9	104.1	96.3	103.7	96.7	103.3	97.1	102.9	97.5	102.6	97.9	102.2	98.4	101.8	98.9	101.4
0.5	95.6	104.5	95.9	104.1	96.3	103.7	96.7	103.3	97.1	102.9	97.5	102.6	97.9	102.2	98.4	101.8	98.9	101.4
0.6	95.6	104.4	96.0	104.0	96.3	103.7	96.7	103.3	97.1	102.9	97.5	102.5	98.0	102.2	98.4	101.8	98.9	101.3
0.7	95.6	104.4	96.0	104.0	96.4	103.6	96.7	103.3	97.1	102.9	97.5	102.5	98.0	102.1	98.4	101.7	99.0	101.3
0.8	95.6	104.4	96.0	104.0	96.4	103.6	96.8	103.2	97.2	102.9	97.6	102.5	98.0	102.1	98.5	101.7	99.0	101.3
0.9	95.7	104.3	96.0	104.0	96.4	103.6	96.8	103.2	97.2	102.8	97.6	102.5	98.0	102.1	98.5	101.7	99.0	101.3
1.0	95.7	104.3	96.1	103.9	96.4	103.6	96.8	103.2	97.2	102.8	97.6	102.4	98.1	102.1	98.5	101.7	99.1	101.3
1.1	95.7	104.3	96.1	103.9	96.5	103.5	96.9	103.2	97.3	102.8	97.7	102.4	98.1	102.0	98.6	101.6	99.1	101.2
1.2	95.8	104.2	96.1	103.9	96.5	103.5	96.9	103.1	97.3	102.8	97.7	102.4	98.1	102.0	98.6	101.6	99.2	101.2
1.3	95.8	104.2	96.2	103.8	96.6	103.5	96.9	103.1	97.3	102.7	97.7	102.3	98.2	102.0	98.7	101.6	99.2	101.1
1.4	95.9	104.1	96.2	103.8	96.6	103.4	97.0	103.0	97.4	102.7	97.8	102.3	98.2	101.9	98.7	101.5	99.3	101.1
1.5	95.9	104.1	96.3	103.7	96.6	103.4	97.0	103.0	97.4	102.6	97.8	102.3	98.3	101.9	98.8	101.5	99.3	101.1
1.6	95.9	104.1	96.3	103.7	96.7	103.3	97.1	103.0	97.5	102.6	97.9	102.2	98.4	101.8	98.9	101.4	99.4	101.0
1.7	96.0	104.0	96.4	103.6	96.7	103.3	97.1	102.9	97.5	102.5	98.0	102.2	98.4	101.8	98.9	101.4	99.5	100.9
1.8	96.1	103.9	96.4	103.6	96.8	103.2	97.2	102.9	97.6	102.5	98.0	102.1	98.5	101.7	99.0	101.3	99.6	100.9
1.9	96.1	103.9	96.5	103.5	96.9	103.2	97.2	102.8	97.7	102.4	98.1	102.1	98.6	101.7	99.1	101.3	99.7	100.8
2.0	96.2	103.8	96.5	103.5	96.9	103.1	97.3	102.8	97.7	102.4	98.2	102.0	98.6	101.6	99.2	101.2	99.7	100.7
2.1	96.2	103.8	96.6	103.4	97.0	103.1	97.4	102.7	97.8	102.3	98.2	101.9	98.7	101.6	99.3	101.1	99.9	100.7
2.2	96.3	103.7	96.7	103.3	97.1	103.0	97.4	102.6	97.9	102.3	98.3	101.9	98.8	101.5	99.4	101.1	100.0	100.6
2.3	96.4	103.6	96.7	103.3	97.1	102.9	97.5	102.6	97.9	102.2	98.4	101.8	98.9	101.4	99.5	101.0	100.1	100.5
2.4	96.5	103.6	96.8	103.2	97.2	102.9	97.6	102.5	98.0	102.1	98.5	101.7	99.0	101.3	99.6	100.9	100.2	100.4
2.5	96.5	103.5	96.9	103.1	97.3	102.8	97.7	102.4	98.1	102.1	98.6	101.7	99.1	101.3	99.7	100.8	100.3	100.3
2.6	96.6	103.4	97.0	103.1	97.4	102.7	97.8	102.4	98.2	102.0	98.7	101.6	99.2	101.2	99.8	100.7	.	.
2.7	96.7	103.3	97.1	103.0	97.5	102.6	97.9	102.3	98.3	101.9	98.8	101.5	99.4	101.1	100.0	100.6	.	.
2.8	96.8	103.2	97.2	102.9	97.6	102.6	98.0	102.2	98.4	101.8	98.9	101.4	99.5	101.0	100.1	100.5	.	.
2.9	96.9	103.2	97.3	102.8	97.7	102.5	98.1	102.1	98.6	101.7	99.1	101.3	99.6	100.9	100.3	100.4	.	.
3.0	97.0	103.1	97.4	102.7	97.8	102.4	98.2	102.0	98.7	101.6	99.2	101.2	99.8	100.8	.	.	.	.
3.1	97.1	103.0	97.5	102.6	97.9	102.3	98.3	101.9	98.8	101.5	99.3	101.1	99.9	100.7	.	.	.	.
3.2	97.2	102.9	97.6	102.6	98.0	102.2	98.4	101.8	98.9	101.4	99.5	101.0	100.1	100.5	.	.	.	.
3.3	97.3	102.8	97.7	102.5	98.1	102.1	98.6	101.7	99.1	101.3	99.7	100.9	100.3	100.4	.	.	.	.
3.4	97.4	102.7	97.8	102.4	98.3	102.0	98.7	101.6	99.3	101.2	99.8	100.8	.	.	.	.	.	.
3.5	97.5	102.6	97.9	102.3	98.4	101.9	98.9	101.5	99.4	101.1	100.0	100.6	.	.	.	.	.	.
3.6	97.7	102.5	98.1	102.2	98.5	101.8	99.1	101.4	99.6	101.0	100.2	100.5	.	.	.	.	.	.
3.7	97.8	102.4	98.2	102.0	98.7	101.7	99.2	101.3	99.8	100.8	.	.	.	.	.	.	.	.
3.8	98.0	102.3	98.4	101.9	98.9	101.5	99.4	101.1	100.0	100.6	.	.	.	.	.	.	.	.
3.9	98.1	102.2	98.6	101.8	99.1	101.4	99.6	101.0	100.3	100.5	.	.	.	.	.	.	.	.
4.0	98.3	102.0	98.7	101.7	99.3	101.3	99.8	100.8	.	.	.	.	.	.	.	.	.	.
4.1	98.5	101.9	98.9	101.5	99.5	101.1	100.1	100.6	.	.	.	.	.	.	.	.	.	.
4.2	98.6	101.8	99.1	101.4	99.7	100.9	100.3	100.4	.	.	.	.	.	.	.	.	.	.
4.3	98.8	101.6	99.4	101.2	100.0	100.7	.	.	.	.	.	.	.	.	.	.	.	.
4.4	99.1	101.5	99.6	101.0	100.2	100.5	.	.	.	.	.	.	.	.	.	.	.	.
4.5	99.3	101.3	99.9	100.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.

ACCEPTANCE LIMITS FOR TABLET CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 50.0, CONFIDENCE LEVEL = 50.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 900 ASSAYS- 300 ASSAYS AT EACH OF 3 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8		0.9	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	85.4	114.6	85.8	114.2	86.1	113.9	86.5	113.5	86.8	113.2	87.2	112.8	87.6	112.4	87.9	112.1	88.3	111.7
0.2	85.5	114.5	85.8	114.2	86.2	113.8	86.5	113.5	86.9	113.1	87.2	112.8	87.6	112.4	87.9	112.1	88.3	111.7
0.3	85.7	114.3	85.9	114.1	86.2	113.8	86.6	113.4	86.9	113.1	87.3	112.7	87.6	112.4	88.0	112.0	88.3	111.7
0.4	85.8	114.2	86.0	114.0	86.3	113.7	86.6	113.4	87.0	113.0	87.3	112.7	87.7	112.3	88.0	112.0	88.3	111.7
0.5	85.9	114.1	86.2	113.8	86.4	113.6	86.7	113.3	87.0	113.0	87.4	112.6	87.7	112.3	88.0	112.0	88.4	111.6
0.6	86.1	113.9	86.3	113.7	86.5	113.5	86.8	113.2	87.1	112.9	87.4	112.6	87.8	112.2	88.1	111.9	88.4	111.6
0.7	86.2	113.8	86.4	113.6	86.7	113.3	86.9	113.1	87.2	112.8	87.5	112.5	87.8	112.2	88.2	111.8	88.5	111.5
0.8	86.4	113.6	86.6	113.4	86.8	113.2	87.0	113.0	87.3	112.7	87.6	112.4	87.9	112.1	88.2	111.8	88.6	111.4
0.9	86.5	113.5	86.7	113.3	86.9	113.1	87.2	112.8	87.4	112.6	87.7	112.3	88.0	112.0	88.3	111.7	88.6	111.4
1.0	86.7	113.3	86.8	113.2	87.0	113.0	87.3	112.7	87.5	112.5	87.8	112.2	88.1	111.9	88.4	111.6	88.7	111.3
1.1	86.8	113.2	87.0	113.0	87.2	112.8	87.4	112.6	87.6	112.4	87.9	112.1	88.2	111.8	88.5	111.5	88.8	111.2
1.2	87.0	113.0	87.1	112.9	87.3	112.7	87.5	112.5	87.8	112.2	88.0	112.0	88.3	111.7	88.6	111.4	88.9	111.1
1.3	87.1	112.9	87.3	112.7	87.5	112.5	87.7	112.3	87.9	112.1	88.1	111.9	88.4	111.6	88.7	111.3	89.0	111.0
1.4	87.3	112.7	87.4	112.6	87.6	112.4	87.8	112.2	88.0	112.0	88.3	111.7	88.5	111.5	88.8	111.2	89.1	110.9
1.5	87.4	112.6	87.6	112.4	87.7	112.3	87.9	112.1	88.1	111.9	88.4	111.6	88.6	111.4	88.9	111.1	89.2	110.8
1.6	87.6	112.4	87.7	112.3	87.9	112.1	88.1	111.9	88.3	111.7	88.5	111.5	88.8	111.2	89.0	111.0	89.3	110.7
1.7	87.7	112.3	87.9	112.1	88.0	112.0	88.2	111.8	88.4	111.6	88.6	111.4	88.9	111.1	89.1	110.9	89.4	110.6
1.8	87.9	112.1	88.0	112.0	88.2	111.8	88.3	111.7	88.5	111.5	88.8	111.2	89.0	111.0	89.3	110.7	89.5	110.5
1.9	88.0	112.0	88.2	111.8	88.3	111.7	88.5	111.5	88.7	111.3	88.9	111.1	89.1	110.9	89.4	110.6	89.6	110.4
2.0	88.2	111.8	88.3	111.7	88.5	111.5	88.6	111.4	88.8	111.2	89.0	111.0	89.3	110.7	89.5	110.5	89.7	110.3
2.1	88.3	111.7	88.5	111.5	88.6	111.4	88.8	111.2	89.0	111.0	89.2	110.8	89.4	110.6	89.6	110.4	89.9	110.1
2.2	88.5	111.5	88.6	111.4	88.8	111.2	88.9	111.1	89.1	110.9	89.3	110.7	89.5	110.5	89.7	110.3	90.0	110.0
2.3	88.6	111.4	88.8	111.2	88.9	111.1	89.1	110.9	89.2	110.8	89.4	110.6	89.7	110.3	89.9	110.1	90.1	109.9
2.4	88.8	111.2	88.9	111.1	89.0	111.0	89.2	110.8	89.4	110.6	89.6	110.4	89.8	110.2	90.0	110.0	90.2	109.8
2.5	88.9	111.1	89.1	110.9	89.2	110.8	89.4	110.6	89.5	110.5	89.7	110.3	89.9	110.1	90.1	109.9	90.4	109.6
2.6	89.1	110.9	89.2	110.8	89.3	110.7	89.5	110.5	89.7	110.3	89.9	110.1	90.1	109.9	90.3	109.7	90.5	109.5
2.7	89.3	110.7	89.4	110.6	89.5	110.5	89.6	110.4	89.8	110.2	90.0	110.0	90.2	109.8	90.4	109.6	90.6	109.4
2.8	89.4	110.6	89.5	110.5	89.6	110.4	89.8	110.2	90.0	110.0	90.1	109.9	90.3	109.7	90.5	109.5	90.8	109.2
2.9	89.6	110.4	89.7	110.3	89.8	110.2	89.9	110.1	90.1	109.9	90.3	109.7	90.5	109.5	90.7	109.3	90.9	109.1
3.0	89.7	110.3	89.8	110.2	89.9	110.1	90.1	109.9	90.3	109.8	90.4	109.6	90.6	109.4	90.8	109.2	91.1	109.0
3.1	89.9	110.1	90.0	110.0	90.1	109.9	90.2	109.8	90.4	109.6	90.6	109.4	90.8	109.3	91.0	109.1	91.2	108.8
3.2	90.0	110.0	90.1	109.9	90.3	109.8	90.4	109.6	90.6	109.5	90.7	109.3	90.9	109.1	91.1	108.9	91.4	108.7
3.3	90.2	109.8	90.3	109.7	90.4	109.6	90.6	109.5	90.7	109.3	90.9	109.1	91.1	109.0	91.3	108.8	91.5	108.6
3.4	90.4	109.7	90.5	109.6	90.6	109.5	90.7	109.3	90.9	109.2	91.1	109.0	91.3	108.8	91.5	108.6	91.7	108.4
3.5	90.5	109.5	90.6	109.4	90.8	109.3	90.9	109.2	91.1	109.0	91.2	108.9	91.4	108.7	91.6	108.5	91.9	108.3
3.6	90.7	109.4	90.8	109.3	90.9	109.2	91.1	109.0	91.2	108.9	91.4	108.7	91.6	108.5	91.8	108.3	92.1	108.1
3.7	90.9	109.2	91.0	109.1	91.1	109.0	91.3	108.9	91.4	108.7	91.6	108.6	91.8	108.4	92.0	108.2	92.3	108.0
3.8	91.1	109.1	91.2	109.0	91.3	108.8	91.5	108.7	91.6	108.6	91.8	108.4	92.0	108.2	92.3	108.0	92.5	107.8
3.9	91.3	108.9	91.4	108.8	91.6	108.7	91.7	108.6	91.9	108.4	92.1	108.2	92.3	108.1	92.5	107.9	92.7	107.7
4.0	91.6	108.7	91.7	108.6	91.8	108.5	91.9	108.4	92.1	108.2	92.3	108.1	92.4	107.9	92.6	107.7	92.8	107.5
4.1	91.8	108.6	91.9	108.5	92.0	108.3	92.1	108.2	92.3	108.1	92.4	107.9	92.6	107.7	92.8	107.5	93.0	107.3
4.2	91.9	108.4	92.0	108.3	92.2	108.2	92.3	108.0	92.4	107.9	92.6	107.7	92.7	107.6	92.9	107.4	93.1	107.2
4.3	92.1	108.2	92.2	108.1	92.3	108.0	92.4	107.9	92.6	107.7	92.7	107.5	92.9	107.4	93.1	107.2	93.3	107.0
4.4	92.3	108.0	92.4	107.9	92.5	107.8	92.6	107.7	92.7	107.5	92.9	107.3	93.1	107.2	93.2	107.0	93.4	106.7
4.5	92.4	107.8	92.5	107.7	92.6	107.6	92.8	107.4	92.9	107.3	93.1	107.1	93.2	106.9	93.4	106.7	93.6	106.5

QB 8/23/01

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 40.0)
SAMPLING PLAN 2
LOWER BOUND = 50.0, CONFIDENCE LEVEL = 50.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 6 ASSAYS- 2 ASSAYS AT EACH OF 3 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	5.00	10.00	15.00	20.00	25.00
3.10	43.20	54.90	72.60	89.80	.
3.20	43.20	55.00	72.60	89.80	.
3.30	43.20	55.00	72.70	89.80	.
3.40	43.20	55.00	72.70	89.80	.
3.50	43.20	55.00	72.70	89.80	.
3.60	43.20	55.00	72.70	89.80	.
3.70	43.20	55.00	72.70	89.90	.
3.80	43.30	55.10	72.70	89.90	.
3.90	43.30	55.10	72.70	89.90	.
4.00	43.30	55.10	72.80	89.90	.
4.10	43.30	55.10	72.80	89.90	.
4.20	43.30	55.10	72.80	89.90	.
4.30	43.30	55.20	72.80	89.90	.
4.40	43.30	55.20	72.80	89.90	.
4.50	43.30	55.20	72.80	89.90	.
4.60	43.40	55.20	72.80	89.90	.
4.70	43.40	55.30	72.90	90.00	.
4.80	43.40	55.30	72.90	90.00	.
4.90	43.40	55.30	72.90	90.00	.
5.00	* 43.40 *	55.30	72.90	90.00	.
5.10	43.40	55.40	72.90	90.00	.
5.20	43.50	55.40	73.00	90.00	.

OK
913
8/23/01

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 85.0)
SAMPLING PLAN 2 (300 LOCATIONS, 2 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 99.0% ASSURANCE
GIVEN THE SAMPLE MEAN, WITHIN AND BETWEEN STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
99.2	10.75	9.25	* 0.95105 *

OK
QB
8/23/01

ACCEPTANCE LIMITS FOR TABLET CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 99.0, CONFIDENCE LEVEL = 99.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 900 ASSAYS- 300 ASSAYS AT EACH OF 3 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8		0.9	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	91.0	109.0	96.9	103.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.2	91.0	109.0	96.9	103.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.3	91.0	109.0	96.9	103.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.4	91.1	108.9	97.0	103.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.5	91.2	108.8	97.0	103.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.6	91.3	108.7	97.0	103.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.7	91.4	108.6	97.1	102.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.8	91.5	108.5	97.2	102.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.9	91.6	108.4	97.2	102.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.0	91.8	108.2	97.3	102.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.1	91.9	108.1	97.4	102.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.2	92.1	107.9	97.5	102.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.3	92.3	107.7	97.6	102.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.4	92.5	107.5	97.7	102.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.5	92.6	107.4	97.8	102.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.6	92.8	107.2	98.0	102.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.7	93.0	107.0	98.1	101.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.8	93.2	106.8	98.2	101.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.9	93.5	106.5	98.4	101.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.0	93.7	106.3	98.5	101.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.1	93.9	106.1	98.7	101.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.2	94.1	105.9	98.8	101.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.3	94.3	105.7	99.0	101.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.4	94.6	105.4	99.2	100.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.5	94.8	105.2	99.3	100.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.6	95.0	105.0	99.5	100.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.7	95.3	104.7	99.7	100.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.8	95.5	104.5	99.9	100.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.9	95.7	104.3			.	.	.	.	.	.	.	.	.	.	.	.	.	.
* 3.0	96.0	104.0	OK QB 10/11/01		.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.1	96.2	103.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.2	96.5	103.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.3	96.7	103.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.4	97.0	103.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.5	97.2	102.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.6	97.5	102.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.7	97.7	102.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.8	98.0	102.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3.9	98.3	101.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.0	98.5	101.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.1	98.8	101.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.2	99.0	101.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.3	99.3	100.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.4	99.6	100.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.5	99.9	100.1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

AMENDEND PROTOCOL

WITH SIGNED FORMS

Content **U**niformity and **D**issolution **A**cceptance **L**imit Program

VALIDATION PROTOCOL

TABLE OF CONTENTS

PROTOCOL

PURPOSE:

The validation of a program to generate content uniformity and dissolution acceptance limits (CuDAL) will be conducted to verify its functionality and reliability in generating acceptance limit tables based on user input.

OVERVIEW:

CuDAL is a set of programs written by James Bergum in SAS™ that can be used to evaluate content uniformity and dissolution data against the current USP XXIII tests. The program will generate an acceptance limit table for content uniformity and/or dissolution that can be applied when using two specific sampling plans. The first sampling plan assumes that one unit is tested for uniformity or dissolution from each of several locations throughout a batch. The second sampling plan assumes that an equal number of units (greater than one) are tested from several locations throughout a batch. For both sampling plans, the user can output the acceptance limit table, perform an evaluation of the table that determines the probability of passing the table given the population parameters, or generate a lower bound on the probability of passing the uniformity or dissolution test for a specific sample result. Meeting the acceptance limits given in the table assures that any future sample taken from the batch will pass the corresponding USP XXIII content uniformity or dissolution test at least P% of the time with a C% confidence level. The value of P and C are provided by the user.

DESCRIPTION OF SYSTEM SOFTWARE:

CuDAL was written using SAS™. The program consists of six files: FILES.SAS, MANAGER.SAS, CUSP1.SAS, CUSP2.SAS, DISP1.SAS, and DISP2.SAS written in SAS™. A hardcopy of these programs is given in Appendix A. During execution of the program, windows are displayed for user input (Primary Windows). If an input error is made by the user, an error window is displayed. These files and windows are listed Appendix B. Primary windows are also displayed in Appendix B. The software was designed to run on any IBM or compatible PC that has SAS™ 6.12 or later.

DESCRIPTION OF SYSTEM HARDWARE:

CuDAL was written in SAS™ Version 6.12 to run on any IBM or compatible PC that has SAS 6.12 or later on it. There are no additional hardware requirements. The PC's used in the validation of CuDAL will be documented in the validation report.

ASSUMPTIONS, EXCLUSIONS, AND OPERATIONAL LIMITATIONS:

The CuDAL program will operate using the appropriate PC hardware and software. There are no operational limits that have been identified at the time of this validation. Since SAS™ is an accepted vendor supplied software package, validation of the SAS™ program itself is not necessary.

The PC's used in the CuDAL validation are considered validated with respect to mice, keyboards, printers, monitors, and diskette drives.

VALIDATION PLAN:

The validation team to perform validation of CuDAL consists of the following members of the PhRMA Statistics Committee Working Group:

Laura Foust, Eli Lilly & Company
MaryAnn Gorko, Dupont Pharmaceuticals
Douglas Lee, Pfizer Inc.
Jerry Planchard, Hoechst Marion Roussel
Edith Senderak, Merck & Company, Inc.
Helen Strickland, Glaxo-Wellcome Inc.
Merlin Utter, Wyeth-Ayerst Pharmaceuticals

CV's from each member of the validation team will be included in the supporting documentation.

There are three validation subteams:

1) Macro strategy, SAS™ code, and Mathematical calculations:

Laura Foust
MaryAnn Gorko
Edith Senderak
Helen Strickland

2) Window Input Error Checking - Jerry Planchard

3) Test Data Evaluation and Independent Calculations-

Merlin Utter
Doug Lee
Jerry Planchard

The validation steps are described below:

VALIDATION STEPS

1) LOAD AND RUN PROGRAM

Each member of the validation team will:

i) Copy the six program files (FILES.SAS, MANAGER.SAS, CUSP1.SAS, CUSP2.SAS, DISP1.SAS, AND DISP2.SAS) to their computer
ii) Modify the file FILES.SAS to indicate location of the files on their PC
iii) Submit the program FILES.SAS
iv) Press enter to continue at the first window (STARTER) and input Y to all four entries on the second window (MAIN) to request running all four analysis macros (content uniformity and dissolution for both sampling plan 1 & 2).
vi) Use the default values for all remaining windows (i.e. Press return for all requested input)
vii) Compare the default output to the expected output found in Appendix C.
viii) Fill out Form 1 to verify that the program was loaded properly and the appropriate output was generated.

2) TEST FOR INPUT ERRORS IN PRIMARY WINDOWS

The Error Checking Subteam will run the program to perform error checks. Test data are contained in Appendix D listing the main window name, input requested, test input, expected response, found response, and a column to record agreement between expected and found response. The Error Checking subteam will indicate a Y or N in this column after each test indicating whether or not an error window was displayed and the user was returned to the appropriate location on the input window. Once all error checks have been made, Form 2 will be filled out indicating whether or not all error checks passed.

3) VERIFY MATHEMATICAL CALCULATIONS FOR LOWER BOUND

Appendix E contains the mathematical calculations used to calculate the lower bound for each test. These calculations will be reviewed by the Macro strategy, SAS code, and Mathematical calculation subteam for appropriateness & accuracy. Form 3 will be filled out indicating that these calculations were reviewed and are considered correct.

4) VERIFY PROGRAM STRATEGY AND SAS CODE

The program will be reviewed by the Macro strategy, SAS™ code, and Mathematical calculation subteam to verify that the strategy is correct, the code implements the strategy correctly, and that the mathematical calculations are implemented correctly. A complete description of the SAS™ programs is given is Appendix F. Form 4 will be filled out to indicate that each macro has been reviewed for strategy, correct code, and mathematical lower bound implementation.

5) RUN TEST DATA SETS:

The test data sets are given in Appendix G. The test data is split into four parts as described below:

Part 1)

This part tests the manager program that receives input from the primary window MAIN. The program will be tested in two runs of the program. The test data provides the user input for calling the analysis macro CUSP1 (Content Uniformity using sampling plan 1), CUSP2 (Content Uniformity using sampling plan 2), DISP1 (Dissolution using sampling plan 1), and DISP2 (Dissolution using sampling plan 2) as well as the expected result. A column is provided to indicate whether or not the observed result agrees with the expected result. The validation team member performing this part of the validation will fill in this column with the appropriate response (Y or N).

Part 2)

In this part, the validation team member will compare two sets of acceptance limit table results with the expected results given in the test data set. The first set of results will be obtained by running the CuDAL program using the specified input values given in the test data set. The second set of results will be obtained by performing an independent calculation of the acceptance limit table result. This calculation will be performed using a software package other than SAS. The validation member performing these calculations will provide details as of the software and programs used to perform the calculations. The validation team member performing this part of the validation will fill in the final three columns in the test data table indicating the CuDAL program result, independent calculation result, and whether or not all three calculations agree with one another. Results should agree with the expected results after rounding to the number of digits given in the expected result column.

Part 3)

In this part, the validation team member will compare two sets of acceptance limit table evaluation results with the expected results given in the test data set. The first set of results will be obtained by running the CuDAL program with the specified input values given in the test data set. The second set of results will be obtained by performing an independent calculation of the acceptance limit table result. The validation team member will obtain the data sets used to perform the evaluations by saving the appropriate data set: ONE for content uniformity using sampling plan 1, TABC for content uniformity using sampling plan 2, DIONE for dissolution using sampling plan 1, and TABD for dissolution using sampling plan 2. These data sets are created by CuDAL and used to evaluate an acceptance limit table. The independent evaluation calculation will be performed running the appropriate saved data set on a software package other than SAS™. The validation member performing these calculations will provide details of the software and programs used to perform the calculations. The validation team member performing this part of the validation will fill in the final three columns in the test data table indicating the CuDAL program result, independent calculation result, and whether or not all three calculations agree with one another. Independent results should agree with the expected results to at least four digits past the decimal point in the expected result column.

Part 4)

In this part, the validation team member will compare two sets of lower bound results based on given sample input with the expected results given in the test data set. The first set of results will be obtained by running the CuDAL program with the specified input values given in the test data set. The second set of results will be obtained by performing an independent calculation of the acceptance limit table result. The independent evaluation calculation will be performed using a software package other than SAS™. The validation member performing these calculations will provide details of the software and programs used to perform the calculations. The validation team member performing this part of the validation will fill in the final three columns in the test data table indicating the CuDAL program result, independent calculation result, and whether or not all three calculations agree with one another. Results should agree with the expected results after rounding to the number of digits given in the expected result column.

CRITERIA FOR ACCEPTANCE:

Forms 1- 4 are all signed indicating that the program loaded and ran successfully, input errors made in the primary window return appropriate error windows, the mathematical calculations for the lower bound is correct, the strategy used is appropriate, the SAS™ code is correct, and the test data expected result agreed with both the CuDAL output from the validation members own run and the result from the independent calculation.

It will be the responsibility of the validation team to determine what impact any problems encountered, either singularly or in total, will have on this validation. The decision to continue or terminate this validation will be made by the validation team.

For ultimate acceptance, the program should perform as described without any failure that would compromise the user's confidence in the reliability of this program.

ERROR RESOLUTION:

Errors (discrepancies in results versus expected performance) detected during testing will be recorded on a Problem/Request Report form. A request for error resolution will be transmitted to the programmer (James Bergum). The validation team will evaluate and approve/accept all error resolutions received from the programmer.

DOCUMENTATION:

Once validation is done, the following documentation will be placed on a Recordable CD for distribution:

1) Programs
2) Validation protocol
3) Validation report

Any additional supporting documentation will be kept by James Bergum.

RESPONSIBILITIES AND AUTHORITY:

Validation protocol preparation: James Bergum

Approval of validation protocol: Validation Team

Execution of testing procedures: Validation Team

Evaluation of validation study results: Validation Team

Preparation of validation study report: James Bergum

Approval of validation study report: Validation Team

PROTOCOL CHANGES:

Any changes or revisions of the protocol, and reasons for them, will be documented, dated, and signed by the validation team and will be retained as amendments to the protocol.

PROTOCOL APPROVAL

Laura Foust:	Laura B Foust	Date: 05-June-2000
MaryAnn Gorko	Mary Ann Gorko	Date: 12-June-2000
Douglas Lee:	D M Lee	Date: 14 JUNE 2000
Jerry Planchard:	J Planchard	Date: 6/16/00
Edith Senderak:	Edith Senderak	Date: 6/21/2000
Helen Strickland	Helen N. Strickland	Date: 06/29/2000
Merlin Utter:	Merlin Utter	Date: 6/26/2000

APPENDIX A

PROGRAMS

FILES.SAS

```

**** DIRECTORY FOR MANAGER MACRO ********;

%LET MANAGER = 'A:\MANAGER.SAS';

****  DIRECTORIES FOR ANALYSIS MACROS  *********;

%LET CU1 = 'A:\CUSP1.SAS';
%LET CU2 = 'A:\CUSP2.SAS';
%LET DI1 = 'A:\DISP1.SAS';
%LET DI2 = 'A:\DISP2.SAS';

************************************************;

%INCLUDE "&MANAGER";
```

MANAGER.SAS

```
%macro start;
data _null_;
window STARTER color=GRAY
#5 @34 "CuDAL"  C=BLUE
#7 @10  "CONTENT UNIFORMITY AND DISSOLUTION ACCEPTANCE LIMITS" C=BLUE
#12 @24 "WRITTEN BY JAMES BERGUM" C=BLUE
#13 @25 "VERSION 1, REVISION 0" C=BLUE
#16 @24  "PRESS ENTER TO CONTINUE" C= WHITE;
DISPLAY STARTER bell;
dm starter '';
stop;
run;
%mend start;
%start
%macro win;
data _null_;
window MAIN color=GREY
#5 @5 "INDICATE TEST(S) AND SAMPLING PLAN(S) DESIRED (Y OR N)" C=BLUE
#8 @5  "CONTENT UNIFORMITY"  C=BLUE
#10 @10 "SAMPLING PLAN 1    (1/LOCATION) = " C= WHITE A_CUS1 $1.
#11 @10 "SAMPLING PLAN 2 (GT 1/LOCATION) = " C= WHITE A_CUS2 $1.
#14 @5  "DISSOLUTION"  C=BLUE
#16 @10 "SAMPLING PLAN 1    (1/LOCATION) = " C=WHITE A_DIS1 $1.
#17 @10 "SAMPLING PLAN 2 (GT 1/LOCATION) = " C=WHITE A_DIS2 $1.;

Window ANSWIN Color=RED
   COLUMNS=50 ICOLUMN=10 ROWS=10 IROW=5
#1 "REQUEST REQUIRES A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;

A_CUS1 = 'Y';
A_CUS2 = 'N';
A_DIS1 = 'N';
A_DIS2 = 'N';
 MAIN:
DISPLAY MAIN bell;
IF A_CUS1 NE 'Y' AND A_CUS1 NE 'N' AND A_CUS1 NE 'y' AND A_CUS1 NE 'n'
THEN DO; DISPLAY ANSWIN BELL;
GOTO MAIN;
END;
IF A_CUS2 NE 'Y' AND A_CUS2 NE 'N' AND A_CUS2 NE 'y' AND A_CUS2 NE 'n'
THEN DO; DISPLAY ANSWIN BELL;
GOTO MAIN;
END;
IF A_DIS1 NE 'Y' AND A_DIS1 NE 'N' AND A_DIS1 NE 'y' AND A_DIS1 NE 'n'
THEN DO; DISPLAY ANSWIN BELL;
GOTO MAIN;
END;
IF A_DIS2 NE 'Y' AND A_DIS2 NE 'N' AND A_DIS2 NE 'y' AND A_DIS2 NE 'n'
THEN DO; DISPLAY ANSWIN BELL;
GOTO MAIN;
END;
CALL SYMPUT("A_CUS1",PUT(UPCASE(A_CUS1),$1.));
CALL SYMPUT("A_CUS2",PUT(UPCASE(A_CUS2),$1.));
CALL SYMPUT("A_DIS1",PUT(UPCASE(A_DIS1),$1.));
CALL SYMPUT("A_DIS2",PUT(UPCASE(A_DIS2),$1.));
STOP;
RUN;
%MEND WIN;

%MACRO AGAIN;
data _null_;
window GOBACK color=GRAY
#5 @24 "GO BACK TO MAIN MENU? (Y OR N) = "  C=BLUE  A_MAIN $1.
#16 @24  "PRESS ENTER TO CONTINUE" C=WHITE;

Window ANSBACK Color=RED
   COLUMNS=50 ICOLUMN=10 ROWS=10 IROW=5
```

```
#1 "REQUEST REQUIRES A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
A_MAIN = 'N';
 MAINBACK:
DISPLAY GOBACK bell;
IF A_MAIN NE 'Y' AND A_MAIN NE 'N' AND A_MAIN NE 'y' AND A_MAIN NE 'n'
THEN DO; DISPLAY ANSBACK BELL;
GOTO MAINBACK;
END;
CALL SYMPUT("A_MAIN",PUT(UPCASE(A_MAIN),$1.));
STOP;
RUN;
%MEND AGAIN;
%MACRO ANALYZE;
 %OVER:
   %WIN;
%IF %UPCASE(&A_CUS1)=Y %THEN %DO;
     %include &CU1;
    %END;
%IF %UPCASE(&A_CUS2)=Y %THEN %DO;
    %include &CU2;
    %END;
%IF %UPCASE(&A_DIS1)=Y %THEN %DO;
    %include &DI1;
    %END;
%IF %UPCASE(&A_DIS2)=Y %THEN %DO;
      %include &DI2;
    %END;
    %AGAIN
%IF %UPCASE(&A_MAIN)=Y %THEN %GOTO OVER;
%MEND ANALYZE;
%ANALYZE
run;
```

CUSP1.SAS

```
%MACRO CUSP1;
%LET D=0.1;
%macro winCUSP1;
DATA _NULL_;
WINDOW MCUSP1 COLOR=GRAY
#1 "CONTENT UNIFORMITY ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 1 (ONE SAMPLE PER LOCATION)" C=yellow
#4  "ENTER DOSAGE FORM (TABLET OR CAPSULE):  " C=BLUE FORM  $7.
     A=UNDERLINE
#5  "ENTER SAMPLE SIZE:  " C=BLUE NUMBER 4.0 A=UNDERLINE
#7  "ENTER BOUND ON FUTURE PERCENTAGE PASSING (50.0-99.0):  "
     C=BLUE LBOUND 4.1 A=UNDERLINE
#8  "ENTER CONFIDENCE LEVEL (50.0-99.0):  " C=BLUE CILEVEL 4.1
     A=UNDERLINE
#10 "DO YOU WANT TO PRINT THE ACCEPTANCE LIMIT TABLE?" C=BLUE
#11 "ENTER Y OR N ="  C=BLUE A1CUSP1 $1.
#13 "DO YOU WANT TO EVALUATE THE ACCEPTANCE LIMIT TABLE?" C=BLUE
#14 "ENTER Y OR N ="  C=BLUE A2CUSP1 $1.
#16 "DO YOU WANT THE LOWER BOUND FOR A SPECIFIC SAMPLE RESULT?"
    C=BLUE
#17 "ENTER Y OR N ="  C=BLUE A3CUSP1 $1.;
WINDOW DOSCUSP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "DOSAGE FORM MUST BE CAPSULE OR TABLET" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW SCUSP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "SAMPLE SIZE MUST BE AN INTEGER GREATER THAN 4" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW BCUSP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "THE LOWER BOUND ON THE PERCENTAGE OF ALL FUTURE BATCHES" C=YELLOW
#2 "PASSING THE USP TEST MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#3 "(TYPICAL VALUES ARE 50.0 AND 95.0)" C=YELLOW
#5 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW CICUSP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "CONFIDENCE INTERVAL VALUES MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#2 "(TYPICAL VALUES ARE 90.0, 95.0, OR 99.0)" C=YELLOW
#4 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ANSCUSP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "REQUESTS REQUIRE A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
FORM='CAPSULE';
NUMBER=30;
LBOUND = 95;
CILEVEL = 95;
A1CUSP1 = 'Y';
A2CUSP1 = 'N';
A3CUSP1 = 'N';
MAINCU1:
DISPLAY MCUSP1 BELL;
IF FORM NE 'CAPSULE' AND FORM NE 'TABLET' THEN DO;
DISPLAY DOSCUSP1 BELL;
```

CUSP1.SAS (CON'T)

```
GOTO MAINCU1;
END;
IF NUMBER  LE 4 OR NUMBER NE ROUND(NUMBER) THEN DO;
DISPLAY SCUSP1 BELL;
GOTO MAINCU1;
END;
IF LBOUND GT 99.0 OR LBOUND LT 50.0 THEN DO;
DISPLAY BCUSP1 BELL;
GOTO MAINCU1;
END;
IF CILEVEL GT 99.0 OR CILEVEL LT 50.0 THEN DO;
DISPLAY CICUSP1 BELL;
GOTO MAINCU1;
END;
IF A1CUSP1 NE 'Y' AND A1CUSP1 NE 'N' AND A1CUSP1 NE 'y' AND
   A1CUSP1 NE 'n' THEN DO;
DISPLAY ANSCUSP1 BELL;
GOTO MAINCU1;
END;
IF A2CUSP1 NE 'Y' AND A2CUSP1 NE 'N' AND A2CUSP1 NE 'y' AND
   A2CUSP1 NE 'n' THEN DO;
DISPLAY ANSCUSP1 BELL;
GOTO MAINCU1;
END;
IF A3CUSP1 NE 'Y' AND A3CUSP1 NE 'N' AND A3CUSP1 NE 'y' AND
   A3CUSP1 NE 'n' THEN DO;
DISPLAY ANSCUSP1 BELL;
GOTO MAINCU1;
END;

CALL SYMPUT("A1CUSP1",PUT(UPCASE(A1CUSP1),$1.));
CALL SYMPUT("A2CUSP1",PUT(UPCASE(A2CUSP1),$1.));
CALL SYMPUT("A3CUSP1",PUT(UPCASE(A3CUSP1),$1.));
CALL SYMPUT("NUMBER",PUT(NUMBER,4.0));
CALL SYMPUT("LBOUND",PUT(LBOUND,4.1));
CALL SYMPUT("FORM",PUT(UPCASE(FORM),$7.));
CALL SYMPUT("CILEVEL",PUT(CILEVEL,4.1)); STOP;
RUN;
%mend winCUSP1;
%macro c1calc;
   C2 = 0.078;
   K = 1 + 30 * LLU * LLU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 30 * LLU * LLU / (SIGMA * SIGMA));
   PCV2 = 1 - PROBF(30 / (K * C2 * C2), V, 29, 0.0);
   P1L = PROBNORM((100 - LLU) / SIGMA) - PROBNORM((85 - LLU) / SIGMA);
   P1U = PROBNORM((115 - LLU) / SIGMA) - PROBNORM((100 - LLU) / SIGMA);
   P1 = P1L + P1U;
   P2L = PROBNORM((85 - LLU) / SIGMA) - PROBNORM((75 - LLU) / SIGMA);
   P2U = PROBNORM((125 - LLU) / SIGMA) - PROBNORM((115 - LLU) / SIGMA);
   P2 = P2L + P2U;
     IF TYPE = 'T' THEN
   PCTTAB2 = P1 ** 30 + 30 * P1 ** 29 * P2;
     ELSE  IF TYPE = 'C' THEN
   PCTTAB2 = P1 ** 27 * (P1*P1*P1 + 30*P1*P1*P2 + 435*P1*P2*P2
             + 4060*P2*P2*P2);
```

```
   LPROB2 = MAX(PCV2 + PCTTAB2 - 1, 0);
   C1 = 0.060;
   K = 1 + 10 * LLU * LLU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 10 * LLU * LLU / (SIGMA * SIGMA));
   PCV1 = 1 - PROBF(10 / (K * C1 * C1), V, 9, 0.0);
     IF TYPE = 'T' THEN
   PCTTAB1 = P1 ** 10;
     ELSE IF TYPE = 'C' THEN
   PCTTAB1 = P1 ** 9 * (P1 + 10*P2);
   LPROB1 = MAX(PCV1 + PCTTAB1 - 1,0);
   OVERLBD = MAX(LPROB1,LPROB2);
   C2 = 0.078;
   K = 1 + 30 * ULU * ULU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 30 * ULU * ULU / (SIGMA * SIGMA));
   PCV2 = 1 - PROBF(30 / (K * C2 * C2), V, 29, 0.0);
   P1L = PROBNORM((100 - ULU) / SIGMA) - PROBNORM((85 - ULU) / SIGMA);
   P1U = PROBNORM((115 - ULU) / SIGMA) - PROBNORM((100 - ULU) / SIGMA);
   P1 = P1L + P1U;
   P2L = PROBNORM((85 - ULU) / SIGMA) - PROBNORM((75 - ULU) / SIGMA);
   P2U = PROBNORM((125 - ULU) / SIGMA) - PROBNORM((115 - ULU) / SIGMA);
   P2 = P2L + P2U;
     IF TYPE = 'T' THEN
   PCTTAB2 = P1 ** 30 + 30 * P1 ** 29 * P2;
     ELSE  IF TYPE = 'C' THEN
   PCTTAB2 = P1 ** 27 * (P1*P1*P1 + 30*P1*P1*P2 + 435*P1*P2*P2
             + 4060*P2*P2*P2);
   LPROB2 = MAX(PCV2 + PCTTAB2 - 1, 0);
   C1 = 0.060;
   K = 1 + 10 * ULU * ULU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 10 * ULU * ULU / (SIGMA * SIGMA));
   PCV1 = 1 - PROBF(10 / (K * C1 * C1), V, 9, 0.0);
     IF TYPE = 'T' THEN
   PCTTAB1 = P1 ** 10;
     ELSE IF TYPE = 'C' THEN
   PCTTAB1 = P1 ** 9 * (P1 + 10*P2);
   LPROB1 = MAX(PCV1 + PCTTAB1 - 1,0);
   OVERUBD = MAX(LPROB1,LPROB2);
   OVERBD = MIN(OVERLBD, OVERUBD);
%mend c1calc;
%MACRO CALCUSP1;
DATA TAB;
LENGTH TYPE $1;
LABEL OVERBD = 'OVERALL LOWER BOUND'
       MEAN = 'SAMPLE MEAN(%CLAIM)';
   TYPE = "&FORM";
   D=&D;
   Z = PROBIT((1 + SQRT(&CILEVEL / 100)) / 2);
   N = &NUMBER;
   CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);
   SDOLD = 0;
   STARTSD = 0.01;
   DO MEAN = 85.1 TO 114.9 BY D;
      BEGIN = STARTSD;
    DO SAMPSD = BEGIN TO 7.8 BY 0.001;
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
```

```
    LLU = MEAN - Z *SIGMA / SQRT(N);
    ULU = MEAN + Z * SIGMA / SQRT(N);
%c1calc
   IF OVERBD < &LBOUND/100 AND SAMPSD <= 0.0101 THEN DO;
   CV = 0; OUTPUT; SAMPSD = 20.0; GOTO NEXTT; END;
   IF OVERBD < &LBOUND/100 THEN DO;
      SAMPSD = SAMPSD - 0.001;
      IF SAMPSD < SDOLD THEN DO;
         STARTM = MEAN;
         GOTO UPPER;
          END;
      SDOLD = SAMPSD;
      STARTSD = SAMPSD;
      CV = 100 * SAMPSD / MEAN;
       OUTPUT;
       SAMPSD = 20.0;
       END;
    NEXTT:
     END;
    END;
    GOTO FINISH;
    UPPER:
          STARTSD = 0.01;

   DO MEAN = 114.9 TO STARTM BY -D;
    DO SAMPSD = STARTSD TO 7.8 BY 0.001;
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
    LLU = MEAN - Z *SIGMA / SQRT(N);
    ULU = MEAN + Z * SIGMA / SQRT(N);
%c1calc
   IF OVERBD < &LBOUND/100 AND SAMPSD <= 0.0101 THEN DO;
   CV = 0; OUTPUT; SAMPSD = 20.0; GOTO NEXTB; END;
   IF OVERBD < &LBOUND/100 THEN DO;
      SAMPSD = SAMPSD - 0.001;
      STARTSD = SAMPSD;
      CV = 100 * SAMPSD / MEAN;
       OUTPUT;
       SAMPSD = 20.0;
       END;
    NEXTB:
     END;
    END;
  FINISH:
  KEEP CV MEAN;
PROC SORT DATA=TAB; BY MEAN;
DATA
     ONE(RENAME = (MEAN = X1 CV = CV1))
     TWO(RENAME = (MEAN = X2 CV = CV2))
     THREE(RENAME = (MEAN = X3 CV = CV3))
     FOUR(RENAME = (MEAN = X4 CV = CV4))
     FIVE(RENAME = (MEAN = X5 CV = CV5))
     SIX(RENAME = (MEAN = X6 CV = CV6));
 SET TAB;
 IF MEAN <= 90.05 THEN OUTPUT ONE;
 IF 90.05 < MEAN <=  95.05 THEN OUTPUT TWO;
```

```
 IF 95.05   < MEAN <= 100.05  THEN OUTPUT THREE;
 IF 100.05  < MEAN <= 105.05  THEN OUTPUT FOUR;
 IF 105.05  < MEAN <= 110.05  THEN OUTPUT FIVE;
 IF 110.05  < MEAN <= 115.0  THEN OUTPUT SIX;
DATA SEVEN;
   MERGE ONE TWO THREE FOUR FIVE SIX;
RUN;
%MEND CALCUSP1;

%MACRO PRTCUSP1;
OPTIONS MISSING = ' ' NODATE NONUMBER;
OPTIONS LS=132;
PROC PRINT DATA=SEVEN SPLIT = '*';
   FORMAT CV1 CV2 CV3 CV4 CV5 CV6 5.2;
   LABEL
         X1 = '  MEAN*(% CLAIM)'
         X2 = '  MEAN*(% CLAIM)'
         X3 = '  MEAN*(% CLAIM)'
         X4 = '  MEAN*(% CLAIM)'
         X5 = '  MEAN*(% CLAIM)'
         X6 = '  MEAN*(% CLAIM)'
         CV1 = 'CV*(%)'
         CV2 = 'CV*(%)'
         CV3 = 'CV*(%)'
         CV4 = 'CV*(%)'
         CV5 = 'CV*(%)'
         CV6 = 'CV*(%)';
      VAR CV1 X2 CV2 X3 CV3 X4 CV4 X5 CV5 X6 CV6;
      ID X1;
TITLE1 "ACCEPTANCE LIMITS FOR &FORM CONTENT UNIFORMITY(N=&NUMBER)";
TITLE2 "SAMPLING PLAN 1";
TITLE3 "(MEETING LIMITS GUARANTEES, WITH &CILEVEL.% ASSURANCE, THAT AT LEAST";
TITLE4 "&LBOUND.% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)";
%MEND PRTCUSP1;

%MACRO EVCUSP1;

DATA _NULL_; WINDOW SMAIN COLOR=GREY
#1 "CONTENT UNIFORMITY ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 1 (ONE SAMPLE PER LOCATION)" C=yellow
#4 "TO EVALUATE LIMITS, THE USER MUST SPECIFY THE RANGE OF" C=yellow
#5 "POSSIBLE POPULATION VALUES FOR THE MEAN AND CV" C=yellow
#6 "ENTER ALL VALUES AS POSITIVE INTEGERS" C=yellow
#8  "ENTER LOWER BOUND FOR MEAN: " C=BLUE ULOW 4.0 A=UNDERLINE
#9  "ENTER UPPER BOUND FOR MEAN: " C=BLUE UHIGH 4.0  A=UNDERLINE
#10 "ENTER INCREMENT FOR MEAN:   " C=BLUE UINCRE 4.0 A=UNDERLINE
#11 "ENTER DIVISOR FOR MEAN:     " C=BLUE UDIV 4.0  A=UNDERLINE
#13 "ENTER LOWER BOUND FOR CV:   " C=BLUE CVLOW 4.0 A=UNDERLINE
#14 "ENTER UPPER BOUND FOR CV:   " C=BLUE CVHIGH 4.0 A=UNDERLINE
#15 "ENTER INCREMENT FOR CV:     " C=BLUE CVINCRE 4.0 A=UNDERLINE
#16 "ENTER DIVISOR FOR CV:       " C=BLUE CVDIV 4.0 A=UNDERLINE;
WINDOW PINT COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
```

```
#1 "ALL VALUES MUST POSITIVE INTEGERS" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ORD  COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ERROR: UPPER BOUND IS LESS THAN LOWER BOUND" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
ULOW=950;
UHIGH=1000;
UINCRE=50;
UDIV=10;
CVLOW=10;
CVHIGH=40;
CVINCRE=30;
CVDIV=10;
SMAIN:
DISPLAY SMAIN BELL;
IF ULOW LT 1 OR ROUND(ULOW) NE ULOW
OR UHIGH LT 1 OR ROUND(UHIGH) NE UHIGH
OR UINCRE LT 1 OR ROUND(UINCRE) NE UINCRE
OR UDIV LT 1 OR ROUND(UDIV) NE UDIV
OR CVLOW LT 1 OR ROUND(CVLOW) NE CVLOW
OR CVHIGH LT 1 OR ROUND(CVHIGH) NE CVHIGH
OR CVINCRE LT 1 OR ROUND(CVINCRE) NE CVINCRE
OR CVDIV LT 1 OR ROUND(CVDIV) NE CVDIV
THEN DO;
DISPLAY PINT;
GOTO SMAIN;
END;
IF ULOW GT UHIGH
OR CVLOW GT CVHIGH
THEN DO;
DISPLAY ORD;
GOTO SMAIN;
END;
CALL SYMPUT("ULOW",PUT(ULOW,4.0));
CALL SYMPUT("UHIGH",PUT(UHIGH,4.0));
CALL SYMPUT("UINCRE",PUT(UINCRE,4.0));
CALL SYMPUT("UDIV",PUT(UDIV,4.0));
CALL SYMPUT("CVLOW",PUT(CVLOW,4.0));
CALL SYMPUT("CVHIGH",PUT(CVHIGH,4.0));
CALL SYMPUT("CVINCRE",PUT(CVINCRE,4.0));
CALL SYMPUT("CVDIV",PUT(CVDIV,4.0)); STOP;
RUN;

DATA TAB;
      SET SEVEN;

%MACRO DSCUSP1;
   %DO I = 1 %TO 6;
      DATA DATA&I;
         SET TAB;
         STD = X&I * CV&I / 100; RENAME X&I = X;
         KEEP X&I STD;
   %END;

```

```
%MEND DSCUSP1;

%DSCUSP1

DATA ONE;
   SET DATA1 DATA2 DATA3 DATA4 DATA5 DATA6;
   N = &NUMBER;

%MACRO SIGCUSP1;

   %DO CV = &CVLOW %TO &CVHIGH %BY &CVINCRE;
      %DO U = &ULOW %TO &UHIGH %BY &UINCRE;

         DATA SAVE;
            SET ONE END = LAST;
            U = &U / &UDIV;
            CV = &CV / &CVDIV;
            SIGMA = U * CV / 100;
            PMEAN = PROBNORM((x - U) * SQRT(N) / SIGMA)
                    - PROBNORM((LAG(X) - U) * SQRT(N) / SIGMA);
            AVEHT = (STD + LAG(STD)) / 2;
            PSTD = PROBCHI((N - 1) * AVEHT * AVEHT
                   / ( SIGMA * SIGMA), N - 1);
            PT = PMEAN * PSTD ;
            PTRAP + PT;
            IF LAST THEN OUTPUT;
         RUN;

PROC APPEND BASE = SAVEALL DATA = SAVE;

       %END;
    %END;

%MEND SIGCUSP1;

%SIGCUSP1

OPTIONS NODATE NONUMBER;
PROC PRINT DATA = SAVEALL split = '*';
   label ptrap = 'PROBABILITY*OF*PASSING';
   VAR CV PTRAP;
   ID U;
TITLE1 "ACCEPTANCE LIMIT TABLE FOR &FORM CONTENT
UNIFORMITY(N=&NUMBER)";
TITLE2 "SAMPLING PLAN 1";
TITLE3 'DETERMINE PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE';
TITLE4 "CONFIDENCE LEVEL = &CILEVEL AND LOWER BOUND = &LBOUND";
RUN;
%MEND EVCUSP1;

%MACRO SMPCUSP1;

DATA _NULL_; WINDOW TMAIN COLOR=GREY
#1 "CONTENT UNIFORMITY ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 1 (ONE SAMPLE PER LOCATION)" C=yellow
#4 "TO DETERMINE LOWER BOUND FOR FOUND SAMPLE RESULTS" C=yellow
```

```
#6  "ENTER SAMPLE MEAN (% CLAIM): " C=BLUE MEAN 6.3 A=UNDERLINE
#7  "ENTER SAMPLE CV (%):         " C=BLUE CV 6.3 A=UNDERLINE;
WINDOW LTZ COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "CV MUST BE NON NEGATIVE" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW RANGE COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "MEAN MUST BE BETWEEN 85.1 AND 114.9" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
MEAN= 100.00;
CV=4.00;
TMAIN:
DISPLAY TMAIN BELL;
IF CV LE 0 THEN DO;
DISPLAY LTZ;
GOTO TMAIN;
END;
IF MEAN LT 85.1 OR MEAN GT 114.9 THEN DO;
DISPLAY RANGE;
GOTO TMAIN;
END;
CALL SYMPUT("MEAN",PUT(MEAN,6.3));
CALL SYMPUT("CV",PUT(CV,6.3)); STOP;
RUN;

DATA TAB;
LENGTH TYPE $1;
LABEL OVERBD = 'OVERALL LOWER BOUND'
       MEAN = 'SAMPLE MEAN(%CLAIM)';
   CILEVEL = &CILEVEL;
   TYPE = "&FORM";
   Z = PROBIT((1 + SQRT(&CILEVEL / 100)) / 2);
   N = &NUMBER;
   CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);
      MEAN = &MEAN;
      CV = &CV;
      SAMPSD= &MEAN * CV/100;
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
    LLU = MEAN - Z *SIGMA / SQRT(N);
    ULU = MEAN + Z * SIGMA / SQRT(N);
%c1calc

OPTIONS NODATE NONUMBER;
PROC PRINT SPLIT = '*';
  LABEL SAMPSD = 'SAMPLE*STD DEV*(% CLAIM)'
        MEAN = 'SAMPLE* MEAN*(% CLAIM)'
        OVERBD = 'LOWER BOUND';

  ID MEAN;
  VAR SAMPSD CV OVERBD;
TITLE1 "ACCEPTANCE LIMIT TABLE FOR &FORM CONTENT UNIFORMITY(N=&NUMBER)";
TITLE2 "SAMPLING PLAN 1";
TITLE3 'DETERMINE PROBABILITY OF FUTURE SAMPLES PASSING THE USP TEST';
TITLE4 "WITH &CILEVEL ASSURANCE FOR GIVEN SAMPLE MEAN AND CV";
```

```
run;
%MEND SMPCUSP1;

%MACRO ANACUSP1;
    %wincusp1;
%IF %UPCASE(&A1CUSP1)=Y OR %UPCASE(&A2CUSP1)=Y %THEN %DO;
     %CALCUSP1;
    %END;
%IF %UPCASE(&A1CUSP1)=Y %THEN %DO;
      %PRTCUSP1;
    %END;
%IF %UPCASE(&A2CUSP1)=Y %THEN %DO;
      %EVCUSP1;
PROC DATASETS LIBRARY = WORK;
   DELETE SAVEALL;
    %END;
%IF %UPCASE(&A3CUSP1)=Y %THEN %DO;
      %SMPCUSP1;
    %END;
%MEND ANACUSP1;

%ANACUSP1

RUN;
%MEND CUSP1;
%CUSP1
```

CUSP2.SAS

```
%MACRO CUSP2;
%LET D1=0.10;

%MACRO WINCUSP2;

DATA _NULL_;
WINDOW MCUSP2 COLOR=grey
#1 "CONTENT UNIFORMITY ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 2 (GREATER THAN ONE SAMPLE PER LOCATION)" C=yellow
#4  "ENTER DOSAGE FORM(CAPSULE OR TABLET):  " C=blue FORM  $7.
    A=UNDERLINE
#5  "ENTER NUMBER OF LOCATIONS:  " C=blue LOC 4.0 A=UNDERLINE
#6  "ENTER NUMBER PER LOCATION:  " C=blue NUM 4.0 A=UNDERLINE
#8 "ENTER BOUND ON FUTURE PERCENTAGE PASSING (50.0-99.0):  " C=blue LBOUND 4.1
    A=UNDERLINE
#9 "ENTER CONFIDENCE LEVEL (50.0-99.0):  " C=blue CILEVEL 4.1 A=UNDERLINE
#11 "DO YOU WANT TO PRINT THE ACCEPTANCE LIMIT TABLE?" C=blue
#12 "ENTER Y OR N ="  C=blue A1CUSP2 $1.
#14 "DO YOU WANT TO EVALUATE THE ACCEPTANCE LIMIT TABLE?" C=blue
#15 "ENTER Y OR N ="  C=blue A2CUSP2 $1.
#17 "DO YOU WANT THE LOWER BOUND FOR A SPECIFIC SAMPLE RESULT?" C=blue
#18 "ENTER Y OR N ="  C=blue A3CUSP2 $1.;
WINDOW DOSCUSP2 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "DOSAGE FORM MUST BE CAPSULE OR TABLET" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW LOCAT COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS= 10 IROW=5
#1 "NUMBER OF LOCATIONS MUST BE AN INTEGER GREATER THAN 2" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW NUMB COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "SAMPLE SIZE MUST BE AN INTEGER GREATER THAN 1" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW BCUSP2 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "THE LOWER BOUND ON THE PERCENTAGE OF ALL FUTURE BATCHES" C=YELLOW
#2 "PASSING THE USP TEST MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#3 "(TYPICAL VALUES ARE 50.0 AND 95.0)" C=YELLOW
#5 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW CICUSP2 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "CONFIDENCE INTERVAL VALUES MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#2 "(TYPICAL VALUES ARE 90.0, 95.0, OR 99.0)" C=YELLOW
#4 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ANSCUSP2 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "REQUEST REQUIRES A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
FORM='CAPSULE';
LOC=10;
NUM=4;
LBOUND = 95;
CILEVEL = 95;
A1CUSP2 = 'Y';
A2CUSP2 = 'N';
A3CUSP2 = 'N';
MAINCU2:
DISPLAY MCUSP2 BELL;
IF FORM NE 'CAPSULE' AND FORM NE 'TABLET' THEN DO;
DISPLAY DOSCUSP2 BELL;
GOTO MAINCU2;
END;
IF LOC LE 2 OR LOC NE ROUND(LOC) THEN DO;
DISPLAY LOCAT BELL;
GOTO MAINCU2;
END;
IF NUM LE 1 OR NUM NE ROUND(NUM) THEN DO;
DISPLAY NUMB BELL;
```

```
GOTO MAINCU2;
END;
IF LBOUND GT 99.0 OR LBOUND LT 50.0 THEN DO;
DISPLAY BCUSP2 BELL;
GOTO MAINCU2;
END;
IF CILEVEL GT 99.0 OR CILEVEL LT 50.0 THEN DO;
DISPLAY CICUSP2 BELL;
GOTO MAINCU2;
END;
IF A1CUSP2 NE 'Y' AND A1CUSP2 NE 'N' AND
   A1CUSP2 NE 'y' AND A1CUSP2 NE 'n' THEN DO;
DISPLAY ANSCUSP2 BELL;
GOTO MAINCU2;
END;
IF A2CUSP2 NE 'Y' AND A2CUSP2 NE 'N' AND
   A2CUSP2 NE 'y' AND A2CUSP2 NE 'n' THEN DO;
DISPLAY ANSCUSP2 BELL;
GOTO MAINCU2;
END;
IF A3CUSP2 NE 'Y' AND A3CUSP2 NE 'N' AND
   A3CUSP2 NE 'y' AND A3CUSP2 NE 'n' THEN DO;
DISPLAY ANSCUSP2 BELL;
GOTO MAINCU2;
END;
CALL SYMPUT("A1CUSP2",PUT(UPCASE(A1CUSP2),$1.));
CALL SYMPUT("A2CUSP2",PUT(UPCASE(A2CUSP2),$1.));
CALL SYMPUT("A3CUSP2",PUT(UPCASE(A3CUSP2),$1.));
CALL SYMPUT("LOC",PUT(LOC,4.0));
CALL SYMPUT("NUM",PUT(NUM,4.0));
CALL SYMPUT("LBOUND",PUT(LBOUND,4.1));
CALL SYMPUT("FORM",PUT(UPCASE(FORM),$7.));
CALL SYMPUT("CILEVEL",PUT(CILEVEL,4.1)); STOP;
RUN;

%MEND WINCUSP2;

OPTIONS NODATE NONUMBER;

%macro cullu;
   LLU = MEAN - Z * SQRT(MVAR / N);
   C2 = 0.078;
   K = 1 + 30 * LLU * LLU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 30 * LLU * LLU / (SIGMA * SIGMA));
   PCV2 = 1 - PROBF(30 / (K * C2 * C2), V, 29, 0.0);
   P1L = PROBNORM((100 - LLU) / SIGMA)
         - PROBNORM((85 - LLU) / SIGMA);
   P1U = PROBNORM((115 - LLU) / SIGMA)
         - PROBNORM((100 - LLU) / SIGMA);
   P1 = P1L + P1U;
   P2L = PROBNORM((85 - LLU) / SIGMA)
         - PROBNORM((75 - LLU) / SIGMA);
   P2U = PROBNORM((125 - LLU) / SIGMA)
         - PROBNORM((115 - LLU) / SIGMA);
   P2 = P2L + P2U;
  IF TYPE = 'T' THEN
   PCTTAB2 = P1 ** 30 + 30 * P1 **29 *P2;
  ELSE IF TYPE = 'C' THEN
   PCTTAB2 = P1 ** 27 * (P1*P1*P1 + 30*P1*P1*P2 + 435*P1*P2*P2
            + 4060*P2*P2*P2);
   TPROBL2 = MAX(PCV2 + PCTTAB2 - 1, 0);
  C1 = 0.060;
  K = 1 + 10 * LLU * LLU / (SIGMA * SIGMA);
  V = K * K / (1 + 2 * 10 * LLU * LLU / (SIGMA * SIGMA));
  PCV1 = 1 - PROBF(10 / (K * C1 * C1), V, 9, 0.0);
  IF TYPE = 'T' THEN
  PCTTAB1 = P1**10;
  ELSE IF TYPE = 'C' THEN
  PCTTAB1 = P1**9 * (P1 + 10*P2);
```

```
  LPROB1 = MAX(PCV1 + PCTTAB1 - 1, 0);
  OVERBDL = MAX(TPROBL2, LPROB1);
%mend cullu;
%macro cuulu;
   ULU = MEAN + Z * SQRT(MVAR / N);
   C2 = 0.078;
   K = 1 + 30 * ULU * ULU / (SIGMA * SIGMA);
   V = K * K / (1 + 2 * 30 * ULU * ULU / (SIGMA * SIGMA));
   PCV2 = 1 - PROBF(30 / (K * C2 * C2), V, 29, 0.0);
   P1L = PROBNORM((100 - ULU) / SIGMA)
         - PROBNORM((85 - ULU) / SIGMA);
   P1U = PROBNORM((115 - ULU) / SIGMA)
         - PROBNORM((100 - ULU) / SIGMA);
   P1 = P1L + P1U;
   P2L = PROBNORM((85 - ULU) / SIGMA)
         - PROBNORM((75 - ULU) / SIGMA);
   P2U = PROBNORM((125 - ULU) / SIGMA)
         - PROBNORM((115 - ULU) / SIGMA);
   P2 = P2L + P2U;
  IF TYPE = 'T' THEN
   PCTTAB2 = P1 ** 30 + 30 * P1 **29 *P2;
  ELSE IF TYPE = 'C' THEN
   PCTTAB2 = P1 ** 27 * (P1*P1*P1 + 30*P1*P1*P2 + 435*P1*P2*P2
            + 4060*P2*P2*P2);
   TPROBL2 = MAX(PCV2 + PCTTAB2 - 1, 0);
  C1 = 0.060;
  K = 1 + 10 * ULU * ULU / (SIGMA * SIGMA);
  V = K * K / (1 + 2 * 10 * ULU * ULU / (SIGMA * SIGMA));
  PCV1 = 1 - PROBF(10 / (K * C1 * C1), V, 9, 0.0);
  IF TYPE = 'T' THEN
  PCTTAB1 = P1**10;
  ELSE IF TYPE = 'C' THEN
  PCTTAB1 = P1**9 * (P1 + 10*P2);
  LPROB1 = MAX(PCV1 + PCTTAB1 - 1, 0);
  OVERBDU = MAX(TPROBL2, LPROB1);
%mend cuulu;

%MACRO CALCUSP2;
DATA TABC;
 LENGTH TYPE $ 1;
   D=&D1;
   TYPE = "&FORM";
   Z = PROBIT((1 + SQRT(&CILEVEL/100))/2);
   NN = &NUM;
   L = &LOC;
   N = NN*L;
   CALL SYMPUT("TOT",PUT(N, 5.0));
   CHIERR = CINV(1 - SQRT(&CILEVEL / 100), L*(NN - 1));
   CHILOC = CINV(1 - SQRT(&CILEVEL / 100),L-1);
   SEBOUND = 9.2;
   SMLIM = 9.2;
   NEXTL = 84.9;
   NEXTU = 115.1;
  DO SE = D TO SEBOUND BY D;
   MEANL = NEXTL;
   MEANU = NEXTU;
   SMBOUND = SMLIM;
   SE2 = SE * SE;
   H2 = L * (NN - 1) / CHIERR - 1;
   SEC = ((1 - 1/NN)*H2*SE2)**2;
  DO SM = D TO SMBOUND BY D;
   IF MEANL = . THEN GOTO OVER;
   SL2 = SM * SM * NN;
   SL2UB = (L - 1) * SL2 / CHILOC;
   H1 = (L - 1) / CHILOC - 1;
   FIRST = ((1 / NN)*H1*SL2)**2;
      PTEST = (1 / NN) * SL2 + (1 - 1/NN) * SE2;
      VAR = PTEST + SQRT(FIRST + SEC);
      MVAR = SL2UB;
```

```
   SIGMA = SQRT(VAR);
   DO MEAN = MEANL - D TO 115.5 BY D;
%cullu
   IF OVERBDL > &LBOUND/100 THEN DO;
      MEANL = MEAN;
      GOTO UPPER;
   END;
 END;
    MEANL = .;
    MEANU = .;
    IF SE=D THEN DO;
     SMLIM = SM - D;
     OUTPUT;
     SM=10;
     GOTO OVER;
                 END;
    IF SM=D THEN DO; SE = 10; GOTO OVER; END;
    GOTO SKIP;
 UPPER:

 DO MEAN = MEANU + D TO 84.9 BY -D;
%cuulu
   IF OVERBDU > &LBOUND/100 THEN DO;
      MEANU = MEAN;
      GOTO OUT;
   END;
 END;
 OUT:
 IF MEANU <= MEANL OR MEAN <= MEANL THEN DO;
    MEANL = .;
    MEANU = .;
    IF SE=D THEN DO;
     SMLIM = SM - D;
     OUTPUT;
     SM=10;
     GOTO OVER;
     END;
    IF SM=D THEN DO; SE = 10; GOTO OVER; END;
 END;

 SKIP: OUTPUT;
    IF SM = D THEN DO;
      NEXTL = MEANL;
      NEXTU = MEANU;
       END;
 OVER:
   END;
  END;
 KEEP N NN L D MEAN SE SM MEANL MEANU OVERBDL OVERBDU;
data tabc;
  set tabc;
  if SE = 10 or SM = 10 then delete;
PROC SORT DATA=TABC; BY SE SM;

%MEND CALCUSP2;

%MACRO PRTCUSP2;
options ls=132;
PROC TRANSPOSE DATA = TABC OUT = LDAT PREFIX = L;
   VAR MEANL;
   BY SE;

PROC TRANSPOSE DATA = TABC OUT = UDAT PREFIX = U;
   VAR MEANU;
   BY SE;

DATA together;
   MERGE LDAT UDAT;
   BY SE;
```

```
proc sort data=together; by se;
data miss;
  l1=.; u1=.;
  l2=.; u2=.;
  l3=.; u3=.;
  l4=.; u4=.;
  l5=.; u5=.;
  l6=.; u6=.;
  l7=.; u7=.;
  l8=.; u8=.;
  l9=.; u9=.;
  l10=.; u10=.;
  l11=.; u11=.;
  l12=.; u12=.;
  l13=.; u13=.;
  l14=.; u14=.;
  l15=.; u15=.;
  l16=.; u16=.;
  l17=.; u17=.;
  l18=.; u18=.;
  l19=.; u19=.;
  l20=.; u20=.;
  l21=.; u21=.;
  l22=.; u22=.;
  l23=.; u23=.;
  l24=.; u24=.;
  l25=.; u25=.;
  l26=.; u26=.;
  l27=.; u27=.;
  l28=.; u28=.;
  l29=.; u29=.;
  l30=.; u30=.;
  l31=.; u31=.;
  l32=.; u32=.;
  l33=.; u33=.;
  l34=.; u34=.;
  l35=.; u35=.;
  l36=.; u36=.;
  l37=.; u37=.;
  l38=.; u38=.;
  l39=.; u39=.;
  l40=.; u40=.;
  l41=.; u41=.;
  l42=.; u42=.;
  l43=.; u43=.;
  l44=.; u44=.;
  l45=.; u45=.;
  l46=.; u46=.;
  l47=.; u47=.;
  l48=.; u48=.;
  l49=.; u49=.;
  l50=.; u50=.;
  l51=.; u51=.;
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  l54=.; u54=.;
  l55=.; u55=.;
  l56=.; u56=.;
  l57=.; u57=.;
  l58=.; u58=.;
  l59=.; u59=.;
  l60=.; u60=.;
  l61=.; u61=.;
  l62=.; u62=.;
  l63=.; u63=.;
  l64=.; u64=.;
  l65=.; u65=.;
  l66=.; u66=.;
  l67=.; u67=.;
```

```
   l68=.; u68=.;
   l69=.; u69=.;
   l70=.; u70=.;
   l71=.; u71=.;
   l72=.; u72=.;
data all;
   merge miss together;
DATA _NULL_;
   SET ALL;
   IF L1 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L1 U1 L2 U2 L3 U3 L4 U4 L5 U5 L6 U6 L7 U7 L8 U8 L9 U9)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '0.1' +10 '0.2' +10 '0.3' +10 '0.4' +10 '0.5' +10
              '0.6' +10 '0.7' +10 '0.8' +10 '0.9' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
TITLE1 "ACCEPTANCE LIMITS FOR &FORM CONTENT UNIFORMITY";
TITLE2 'SAMPLING PLAN 2';
TITLE3 "LOWER BOUND = &LBOUND, CONFIDENCE LEVEL = &CILEVEL";
TITLE4 'TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN';
TITLE5 "OF &TOT ASSAYS-&NUM ASSAYS AT EACH OF &LOC DIFFERENT LOCATIONS";
TITLE6 'SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION';
TITLE7 'STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM';
TITLE9 'STANDARD DEVIATION OF LOCATION MEANS';

DATA _NULL_;
   SET ALL;
   IF L10 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L10 U10 L11 U11 L12 U12 L13 U13 L14 U14
      L15 U15 L16 U16 L17 U17 L18 U18)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '1.0' +10 '1.1' +10 '1.2' +10 '1.3' +10 '1.4' +10
              '1.5' +10 '1.6' +10 '1.7' +10 '1.8' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L19 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L19 U19 L20 U20 L21 U21 L22 U22 L23 U23
      L24 U24 L25 U25 L26 U26 L27 U27)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '1.9' +10 '2.0' +10 '2.1' +10 '2.2' +10 '2.3' +10
              '2.4' +10 '2.5' +10 '2.6' +10 '2.7' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L28 = . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L28 U28 L29 U29 L30 U30 L31 U31 L32 U32
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```
      L33 U33 L34 U34 L35 U35 L36 U36)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '2.8' +10 '2.9' +10 '3.0' +10 '3.1' +10 '3.2' +10
              '3.3' +10 '3.4' +10 '3.5' +10 '3.6' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L37 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L37 U37 L38 U38 L39 U39 L40 U40 L41 U41
      L42 U42 L43 U43 L44 U44 L45 U45)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '3.7' +10 '3.8' +10 '3.9' +10 '4.0' +10 '4.1' +10
              '4.2' +10 '4.3' +10 '4.4' +10 '4.5' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L46 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L46 U46 L47 U47 L48 U48 L49 U49 L50 U50
      L51 U51 L52 U52 L53 U53 L54 U54)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '4.6' +10 '4.7' +10 '4.8' +10 '4.9' +10 '5.0' +10
              '5.1' +10 '5.2' +10 '5.3' +10 '5.4' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L55 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L55 U55 L56 U56 L57 U57 L58 U58 L59 U59
      L60 U60 L61 U61 L62 U62 L63 U63)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '5.5' +10 '5.6' +10 '5.7' +10 '5.8' +10 '5.9' +10
              '6.0' +10 '6.1' +10 '6.2' +10 '6.3' //
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;
DATA _NULL_;
   SET ALL;
   IF L64 EQ . THEN RETURN;
   FILE PRINT HEADER = TOP;
   PUT @1 SE 3.1 +1
     (L64 U64 L65 U65 L66 U66 L67 U67 L68 U68
      L69 U69 L70 U70 L71 U71 L72 U72)
     (5.1 +1 5.1 +2);
   RETURN;
TOP: PUT / @9 '6.4' +10 '6.5' +10 '6.6' +10 '6.7' +10 '6.8' +10
              '6.9' +10 '7.0' +10 '7.1' +10 '7.2' //
```

```
           @1  'SE' @7 'LL' @12 'UL' @20 'LL' @25 'UL' @33 'LL'
           @38 'UL' @46 'LL' @51 'UL' @59 'LL' @64 'UL' @72 'LL'
           @77 'UL' @85 'LL' @90 'UL' @98 'LL' @103 'UL'
           @111 'LL' @116 'UL' //;
RETURN;

run;
%MEND PRTCUSP2;


%MACRO EVCUSP2;

DATA _NULL_; WINDOW SMAIN COLOR=GREY
#1 "TO EVALUATE LIMITS, THE USER MUST SPECIFY THE RANGE OF" C=yellow
#2 "POSSIBLE POPULATION VALUES FOR THE MEAN, WITHIN LOCATION" C=yellow
#3 "STD DEV AND BETWEEN LOCATION STD DEV" C=yellow
#5 "ENTER ALL VALUES AS POSITIVE INTEGERS" C=yellow
#7  "ENTER LOWER BOUND FOR MEAN:             " C=blue ULOW 4.0
    A=UNDERLINE
#8  "ENTER UPPER BOUND FOR MEAN:             " C=blue UHIGH 4.0
    A=UNDERLINE
#9  "ENTER INCREMENT FOR MEAN:               " C=blue UINCRE 4.0
    A=UNDERLINE
#10 "ENTER DIVISOR FOR MEAN:                 " C=blue UDIV 4.0
    A=UNDERLINE
#12 "ENTER LOWER BOUND FOR WITHIN STD DEV:  " C=blue SELOW 4.0
    A=UNDERLINE
#13 "ENTER UPPER BOUND FOR WITHIN STD DEV:  " C=blue SEHIGH 4.0
    A=UNDERLINE
#14 "ENTER INCREMENT FOR WITHIN STD DEV:    " C=blue SEINCRE 4.0
    A=UNDERLINE
#15 "ENTER DIVISOR FOR WITHIN STD DEV:      " C=blue SEDIV 4.0
    A=UNDERLINE
#17 "ENTER LOWER BOUND FOR BETWEEN STD DEV: " C=blue SMLOW 4.0
    A=UNDERLINE
#18 "ENTER UPPER BOUND FOR BETWEEN STD DEV: " C=blue SMHIGH 4.0
    A=UNDERLINE
#19 "ENTER INCREMENT FOR BETWEEN STD DEV:   " C=blue SMINCRE 4.0
    A=UNDERLINE
#20 "ENTER DIVISOR FOR BETWEEN STD DEV:     " C=blue SMDIV 4.0
    A=UNDERLINE;
WINDOW PINT COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST BE POSITIVE INTEGERS" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ORD  COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ERROR: UPPER BOUND IS LESS THAN LOWER BOUND" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
ULOW=950;
UHIGH=1000;
UINCRE=50;
UDIV=10;
SELOW=22;
SEHIGH=22;
SEINCRE=10;
SEDIV=10;
SMLOW=22;
SMHIGH=22;
SMINCRE=10;
SMDIV=10;
SMAIN:
DISPLAY SMAIN BELL;
IF ULOW LT 1 OR ROUND(ULOW) NE ULOW
OR UHIGH LT 1 OR ROUND(UHIGH) NE UHIGH
OR UINCRE LT 1 OR ROUND(UINCRE) NE UINCRE
OR UDIV LT 1 OR ROUND(UDIV) NE UDIV
OR SELOW LT 1 OR ROUND(SELOW) NE SELOW
OR SEHIGH LT 1 OR ROUND(SEHIGH) NE SEHIGH
```

```
OR SEINCRE LT 1 OR ROUND(SEINCRE) NE SEINCRE
OR SEDIV LT 1 OR ROUND(SEDIV) NE SEDIV
OR SMLOW LT 1 OR ROUND(SMLOW) NE SMLOW
OR SMHIGH LT 1 OR ROUND(SMHIGH) NE SMHIGH
OR SMINCRE LT 1 OR ROUND(SMINCRE) NE SMINCRE
OR SMDIV LT 1 OR ROUND(SMDIV) NE SMDIV
THEN DO;
DISPLAY PINT;
GOTO SMAIN;
END;
IF ULOW GT UHIGH
OR SELOW GT SEHIGH
OR SMLOW GT SMHIGH
THEN DO;
DISPLAY ORD;
GOTO SMAIN;
END;
CALL SYMPUT("ULOW",PUT(ULOW,4.0));
CALL SYMPUT("UHIGH",PUT(UHIGH,4.0));
CALL SYMPUT("UINCRE",PUT(UINCRE,4.0));
CALL SYMPUT("UDIV",PUT(UDIV,4.0));
CALL SYMPUT("SELOW",PUT(SELOW,4.0));
CALL SYMPUT("SEHIGH",PUT(SEHIGH,4.0));
CALL SYMPUT("SEINCRE",PUT(SEINCRE,4.0));
CALL SYMPUT("SEDIV",PUT(SEDIV,4.0));
CALL SYMPUT("SMLOW",PUT(SMLOW,4.0));
CALL SYMPUT("SMHIGH",PUT(SMHIGH,4.0));
CALL SYMPUT("SMINCRE",PUT(SMINCRE,4.0));
CALL SYMPUT("SMDIV",PUT(SMDIV,4.0)); STOP;
RUN;


%MACRO SIGCUSP2;
%calcusp2
   %DO U = &ULOW %TO &UHIGH %BY &UINCRE;
      %DO SIGSE = &SELOW %TO &SEHIGH %BY &SEINCRE;
         %DO SIGSM = &SMLOW %TO &SMHIGH %BY &SMINCRE;

  DATA SAVE2;
    SET TABC END = LAST;
   U = &U / &UDIV;
   D = &D1;
   SIGSE = &SIGSE / &SEDIV;
   SIGSM = &SIGSM / &SMDIV;
   SIGSM2 = SIGSM * SIGSM;
   EXPSE2 = SIGSE * SIGSE;
   EXPSM2 = EXPSE2 + NN * SIGSM * SIGSM;
   PMEAN = PROBNORM((MEANU - U) * SQRT((N) / EXPSM2))
             - PROBNORM((MEANL - U) * SQRT((N) / EXPSM2));
   PSE = PROBCHI(L * (NN - 1) * SE * SE / EXPSE2, L * (NN -1))
         - PROBCHI(L * (NN - 1) * (SE - D) * (SE - D) /
         EXPSE2, L * (NN - 1));
   PSM = PROBCHI((L - 1) * NN * SM * SM / EXPSM2, L - 1)
         - PROBCHI((L - 1) * NN * (SM - D) * (SM - D) /
         EXPSM2, L - 1);
   P = PMEAN * PSE * PSM;
   PSUM + P;
   IF LAST THEN OUTPUT;
   RUN;
   PROC APPEND BASE = SAVES2E DATA = SAVE2;
   RUN;

       %END;
      %END;
     %END;

%MEND SIGCUSP2;

%SIGCUSP2
```

```
PROC PRINT DATA = SAVES2E split = '*';
  label U = 'MEAN'
       SIGSE = 'WITHIN LOCATION*STD DEV'
       SIGSM = 'BETWEEN LOCATION* STD DEV'
       PSUM = 'PROBABILITY*OF*PASSING';
   VAR U SIGSE SIGSM PSUM;
TITLE1 "ACCEPTANCE LIMITS FOR &FORM CONTENT UNIFORMITY";
TITLE2 'SAMPLING PLAN 2';
TITLE3 "PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE";
TITLE4 "WITH &NUM ASSAYS AT EACH OF &LOC LOCATIONS";
TITLE5 "CONFIDENCE LEVEL = &CILEVEL & LOWER BOUND = &LBOUND";
RUN;
%MEND EVCUSP2;

%MACRO SMPCUSP2;

DATA _NULL_; WINDOW TMAIN COLOR=GREY
#3 "TO DETERMINE LOWER BOUND FOR FOUND SAMPLE RESULTS" C=yellow
#7  "ENTER SAMPLE MEAN (% CLAIM):            " C=blue MEAN 6.3 A=UNDERLINE
#9  "ENTER SAMPLE WITHIN STD DEV (% CLAIM):  " C=blue SE 6.3 A=UNDERLINE
#11 "ENTER SAMPLE BETWEEN STD DEV (% CLAIM): " C=blue SM 6.3 A=UNDERLINE
#12 "(I.E. STANDARD DEVIATION OF SAMPLE LOCATION MEANS)" C=blue;
WINDOW LTZ COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST BE NON NEGATIVE" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW RANGE COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "MEAN MUST BE BETWEEN 85.1 AND 114.9" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
MEAN=100.00;
SE=2.20;
SM=2.46;
TMAIN:
DISPLAY TMAIN BELL;
IF SE LE 0 OR SM LE 0
THEN DO;
DISPLAY LTZ;
GOTO TMAIN;
END;
IF MEAN LT 85.1 OR MEAN GT 114.9
THEN DO;
DISPLAY RANGE;
GOTO TMAIN;
END;
CALL SYMPUT("MEAN",PUT(MEAN,6.3));
CALL SYMPUT("SE",PUT(SE,6.3));
CALL SYMPUT("SM",PUT(SM,6.3)); STOP;
RUN;

DATA TAB;
 LENGTH TYPE $ 1;
   TYPE = "&FORM";
   Z = PROBIT((1 + SQRT(&CILEVEL/100))/2);
   NN = &NUM;
   L = &LOC;
   N = NN*L;
   SE = &SE;
   SM = &SM;
   MEAN = &MEAN;
   CILEVEL = &CILEVEL;
   CHIERR = CINV(1 - SQRT(&CILEVEL / 100), L*(NN - 1));
   CHILOC = CINV(1 - SQRT(&CILEVEL / 100),L-1);
   SE2 = SE * SE;
   H2 = L * (NN - 1) / CHIERR - 1;
   SEC = ((1 - 1/NN)*H2*SE2)**2;
   SL2 = SM * SM * NN;
   SL2UB = (L - 1) * SL2 / CHILOC;
```

```
     H1 = (L - 1) / CHILOC - 1;
     FIRST = ((1 / NN)*H1*SL2)**2;
        PTEST = (1 / NN) * SL2 + (1 - 1/NN) * SE2;
        VAR = PTEST + SQRT(FIRST + SEC);
        MVAR = SL2UB;
     SIGMA = SQRT(VAR);
  %cullu
  %cuulu
    OVERBD = MIN(OVERBDU, OVERBDL);
   KEEP SE MEAN SM OVERBD;
  PROC PRINT SPLIT='*';
   LABEL   SE = 'SAMPLE*WITHIN LOCATION*STD DEV'
           MEAN = 'SAMPLE*MEAN'
           SM = 'SAMPLE*BETWEEN LOCATION*STD DEV'
           OVERBD = 'LOWER BOUND';
    ID MEAN;
    VAR SE SM OVERBD;
  TITLE1 "ACCEPTANCE LIMITS FOR &FORM CONTENT UNIFORMITY";
  TITLE2 "SAMPLING PLAN 2 (&LOC LOCATIONS, &NUM PER LOCATION)";
  TITLE3 "PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST";
  TITLE4 "WITH &CILEVEL.% ASSURANCE";
  TITLE5 'FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV';
  RUN;
  %MEND SMPCUSP2;

  %MACRO ANACUSP2;
      %WINcusp2;
  %IF %UPCASE(&A1CUSP2)=Y %THEN %DO;
       %CALCUSP2;
       %PRTCUSP2;
      %END;
  %IF %UPCASE(&A2CUSP2)=Y %THEN %DO;
        %EVCUSP2;
  PROC DATASETS LIBRARY=WORK;
     DELETE SAVES2E;
      %END;
  %IF %UPCASE(&A3CUSP2)=Y %THEN %DO;
       %SMPCUSP2;
      %END;
  %MEND ANACUSP2;

  %ANACUSP2

  RUN;
  %MEND CUSP2;
  %CUSP2
```

DISP1.SAS

```
%MACRO DISP1;
%macro winDISP1;
DATA _NULL_;
WINDOW MDISP1 COLOR=grey
#1 "DISSOLUTION ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 1 (ONE SAMPLE PER LOCATION)" C=yellow
#4 "ENTER Q VALUE: " C=blue  Q 4.1 A=UNDERLINE
#5  "ENTER SAMPLE SIZE:  " C=blue NUMBER 4.0 A=UNDERLINE
#7  "ENTER BOUND ON FUTURE PERCENTAGE PASSING (50.0-99.0):  "
     C=blue LBOUND 4.1 A=UNDERLINE
#8  "ENTER CONFIDENCE LEVEL (50.0-99.0):  " C=blue CILEVEL 4.1 A=UNDERLINE
#10 "DO YOU WANT TO PRINT THE ACCEPTANCE LIMIT TABLE?" C=blue
#11 "ENTER Y OR N ="  C=blue A1DISP1 $1.
#13 "DO YOU WANT TO EVALUATE THE ACCEPTANCE LIMIT TABLE?" C=blue
#14 "ENTER Y OR N ="  C=blue A2DISP1 $1.
#16 "DO YOU WANT THE LOWER BOUND FOR A SPECIFIC SAMPLE RESULT?"
    C=blue
#17 "ENTER Y OR N ="  C=blue A3DISP1 $1.;
WINDOW SDISP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "SAMPLE SIZE MUST BE AN INTEGER GREATER THAN 2" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW BDISP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "THE LOWER BOUND ON THE PERCENTAGE OF ALL FUTURE BATCHES" C=YELLOW
#2 "PASSING THE USP TEST MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#3 "(TYPICAL VALUES ARE 50.0 AND 95.0)" C=YELLOW
#5 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW QDISP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "VALUES FOR Q MUST BE BETWEEN 40 AND 95" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW CIDISP1 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "CONFIDENCE INTERVAL VALUES MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#2 "(TYPICAL VALUES ARE 90.0, 95.0, OR 99.0)" C=YELLOW
#4 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ANSDISP1 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "REQUESTS REQUIRE A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
Q=80.0;
NUMBER=6;
LBOUND = 95;
CILEVEL = 95;
A1DISP1 = 'Y';
A2DISP1 = 'N';
A3DISP1 = 'N';
MAINDI1:
DISPLAY MDISP1 BELL;
IF NUMBER  LE 2 OR NUMBER NE ROUND(NUMBER) THEN DO;
DISPLAY SDISP1 BELL;
GOTO MAINDI1;
END;
IF Q GT 95.0 OR Q LT 40.0 THEN DO;
DISPLAY QDISP1 BELL;
```

```
GOTO MAINDI1;
END;
IF LBOUND GT 99.0 OR LBOUND LT 50.0 THEN DO;
DISPLAY BDISP1 BELL;
GOTO MAINDI1;
END;
IF CILEVEL GT 99.0 OR CILEVEL LT 50.0 THEN DO;
DISPLAY CIDISP1 BELL;
GOTO MAINDI1;
END;
IF A1DISP1 NE 'Y' AND A1DISP1 NE 'N' AND A1DISP1 NE 'y' AND
   A1DISP1 NE 'n' THEN DO;
DISPLAY ANSDISP1 BELL;
GOTO MAINDI1;
END;
IF A2DISP1 NE 'Y' AND A2DISP1 NE 'N' AND A2DISP1 NE 'y' AND
   A2DISP1 NE 'n' THEN DO;
DISPLAY ANSDISP1 BELL;
GOTO MAINDI1;
END;
IF A3DISP1 NE 'Y' AND A3DISP1 NE 'N' AND A3DISP1 NE 'y' AND
   A3DISP1 NE 'n' THEN DO;
DISPLAY ANSDISP1 BELL;
GOTO MAINDI1;
END;
CALL SYMPUT("Q",PUT(Q,4.1));
CALL SYMPUT("A1DISP1",PUT(UPCASE(A1DISP1),$1.));
CALL SYMPUT("A2DISP1",PUT(UPCASE(A2DISP1),$1.));
CALL SYMPUT("A3DISP1",PUT(UPCASE(A3DISP1),$1.));
CALL SYMPUT("NUMBER",PUT(NUMBER,4.0));
CALL SYMPUT("LBOUND",PUT(LBOUND,4.1));
CALL SYMPUT("CILEVEL",PUT(CILEVEL,4.1)); STOP;
RUN;
%mend winDISP1;
%MACRO COMPUTE;
   F1 = (1 - PROBNORM((5 - LLU)/SIGMA)) ** 6;
   SN2 = SQRT(12);
   PM2 = PROBNORM (SN2 * -LLU / SIGMA);
   PB2 = 1 - PROBNORM ((-15 - LLU) / SIGMA);
   F2 = PB2 ** 12 - PM2;
   SN3 = SQRT(24);
   PM3 = PROBNORM (SN3 * -LLU / SIGMA);
   P2 = PROBNORM ((-15 - LLU) / SIGMA) - PROBNORM ((-25 - LLU) / SIGMA);
   P3 = 1 - PROBNORM ((-15 - LLU) / SIGMA);
   F3 = P3**24 + 24*P2*P3**23 + 276*P2*P2*P3**22 - PM3;
   OVERBD = MAX(F1, F2, F3);
%mend compute;
%MACRO CALDISP1;
DATA D1ONE;
   Q = &Q;
   LIM = 100 - Q;
   N = &NUMBER;
```

```
   D=0.2;
   Z = PROBIT(SQRT(&CILEVEL / 100));
   CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);
   STARTSD = 0.002;
   DO MEANADJ = D TO LIM BY D;
      BEGIN = STARTSD;
    DO SAMPSD = BEGIN TO 60.0 BY 0.001;
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
    LLU = MEANADJ - Z *SIGMA / SQRT(N);
%COMPUTE
   IF OVERBD < &LBOUND/100 AND SAMPSD <= 0.00201 then do;
   CV = 0; OUTPUT; SAMPLSD = 65.0; GOTO NEXT; END;
   IF OVERBD < &LBOUND/100 THEN DO;
      SAMPSD = SAMPSD - 0.001;
      STARTSD = SAMPSD;
      MEAN = MEANADJ + Q;
      CV = 100 * SAMPSD / MEAN;
       OUTPUT;
       SAMPSD = 65.0;
       END;
    NEXT:
     END;
    END;
  KEEP CV MEAN ;
PROC SORT DATA=D1ONE; BY MEAN;
DATA
     ONE(RENAME = (MEAN = X1 CV = CV1))
     TWO(RENAME = (MEAN = X2 CV = CV2))
     THREE(RENAME = (MEAN = X3 CV = CV3))
     FOUR(RENAME = (MEAN = X4 CV = CV4))
     FIVE(RENAME = (MEAN = X5 CV = CV5));
 SET D1ONE;
    Q = &Q;
    LIM = 100 - Q;
 IF Q                  < MEAN <= Q+ LIM/5   + 0.0001 THEN OUTPUT ONE;
 IF Q+LIM/5   + 0.0001 < MEAN <= Q+ 2*LIM/5 + 0.0001 THEN OUTPUT TWO;
 IF Q+2*LIM/5 + 0.0001 < MEAN <= Q+ 3*lIM/5 + 0.0001 THEN OUTPUT THREE;
 IF Q+3*LIM/5 + 0.0001 < MEAN <= Q+ 4*LIM/5 + 0.0001 THEN OUTPUT FOUR;
 IF Q+4*LIM/5 + 0.0001 < MEAN <= Q+ LIM     + 0.0001 THEN OUTPUT FIVE;
DATA D1ALL;
   MERGE ONE TWO THREE FOUR FIVE;
RUN;

%MEND CALDISP1;

%MACRO PRTDISP1;
OPTIONS MISSING = ' ' NODATE NONUMBER;
OPTIONS LS=132;
PROC PRINT DATA=D1ALL SPLIT = '*';
   FORMAT CV1 CV2 CV3 CV4 CV5 5.2;
   LABEL
         X1 = '  MEAN*(% CLAIM)'
         X2 = '  MEAN*(% CLAIM)'
         X3 = '  MEAN*(% CLAIM)'
         X4 = '  MEAN*(% CLAIM)'
         X5 = '  MEAN*(% CLAIM)'
         CV1 = 'CV*(%)'
```

```
            CV2 = 'CV*(%)'
            CV3 = 'CV*(%)'
            CV4 = 'CV*(%)'
            CV5 = 'CV*(%)';
      VAR CV1 X2 CV2 X3 CV3 X4 CV4 X5 CV5;
      ID X1;
TITLE "ACCEPTANCE LIMITS FOR DISSOLUTION (N = &NUMBER, Q = &Q)";
TITLE2 'SAMPLING PLAN 1';
TITLE3 "(MEETING LIMITS GUARANTEES WITH &CILEVEL % ASSURANCE,";
TITLE4 "THAT AT LEAST &LBOUND% OF ALL FUTURE SAMPLES TESTED";
TITLE5 'FOR DISSOLUTION WILL PASS THE USP TEST)';
TITLE6 "TABLE ENTRY IS UPPER LIMIT ON CV OF &NUMBER DISSOLUTION ASSAYS";
%MEND PRTDISP1;


%MACRO EVDISP1;

DATA _NULL_; WINDOW SMAIN COLOR=GREY
#1  "TO EVALUATE LIMITS, THE USER MUST SPECIFY THE RANGE OF" C=yellow
#2  "POSSIBLE POPULATION VALUES FOR THE MEAN AND CV" C=yellow
#3  "ENTER ALL VALUES AS POSITIVE INTEGERS" C=yellow
#5  "ENTER LOWER BOUND FOR MEAN: " C=blue ULOW 4.0 A=UNDERLINE
#6  "ENTER UPPER BOUND FOR MEAN: " C=blue UHIGH 4.0 A=UNDERLINE
#7  "ENTER INCREMENT FOR MEAN:   " C=blue UINCRE 4.0 A=UNDERLINE
#8  "ENTER DIVISOR FOR MEAN:     " C=blue UDIV 4.0 A=UNDERLINE
#10 "ENTER LOWER BOUND FOR CV:   " C=blue CVLOW 4.0 A=UNDERLINE
#11 "ENTER UPPER BOUND FOR CV:   " C=blue CVHIGH 4.0 A=UNDERLINE
#12 "ENTER INCREMENT FOR CV:     " C=blue CVINCRE 4.0 A=UNDERLINE
#13 "ENTER DIVISOR FOR CV:       " C=blue CVDIV 4.0 A=UNDERLINE;
WINDOW PINT COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST BE POSITIVE INTEGERS" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ORD  COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ERROR: UPPER BOUND IS LESS THAN LOWER BOUND" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
ULOW=950;
UHIGH=1000;
UINCRE=50;
UDIV=10;
CVLOW=10;
CVHIGH=40;
CVINCRE=30;
CVDIV=10;
SMAIN:
DISPLAY SMAIN BELL;
IF ULOW LT 1 OR ROUND(ULOW) NE ULOW
OR UHIGH LT 1 OR ROUND(UHIGH) NE UHIGH
OR UINCRE LT 1 OR ROUND(UINCRE) NE UINCRE
OR UDIV LT 1 OR ROUND(UDIV) NE UDIV
OR CVLOW LT 1 OR ROUND(CVLOW) NE CVLOW
OR CVHIGH LT 1 OR ROUND(CVHIGH) NE CVHIGH
OR CVINCRE LT 1 OR ROUND(CVINCRE) NE CVINCRE
OR CVDIV LT 1 OR ROUND(CVDIV) NE CVDIV
THEN DO;
DISPLAY PINT;
```

DISP1.SAS (CON’T)

```
GOTO SMAIN;
END;
IF ULOW GT UHIGH
OR CVLOW GT CVHIGH
THEN DO;
DISPLAY ORD;
GOTO SMAIN;
END;
CALL SYMPUT("ULOW",PUT(ULOW,4.0));
CALL SYMPUT("UHIGH",PUT(UHIGH,4.0));
CALL SYMPUT("UINCRE",PUT(UINCRE,4.0));
CALL SYMPUT("UDIV",PUT(UDIV,4.0));
CALL SYMPUT("CVLOW",PUT(CVLOW,4.0));
CALL SYMPUT("CVHIGH",PUT(CVHIGH,4.0));
CALL SYMPUT("CVINCRE",PUT(CVINCRE,4.0));
CALL SYMPUT("CVDIV",PUT(CVDIV,4.0)); STOP;
RUN;

DATA DIONE;
   SET d1one;
   x = mean;
   std = x*cv/100;
   N = &NUMBER;

%MACRO SIGDISP1;

   %DO CV = &CVLOW %TO &CVHIGH %BY &CVINCRE;
      %DO U = &ULOW %TO &UHIGH %BY &UINCRE;

         DATA D1SAVE;
            SET DIONE END = LAST;
            U = &U / &UDIV;
            CV = &CV / &CVDIV;
            SIGMA = U * CV / 100;
            PMEAN = PROBNORM((x - U) * SQRT(N) / SIGMA)
                    - PROBNORM((LAG(X) - U) * SQRT(N) / SIGMA);
            AVEHT = (STD + LAG(STD)) / 2;
            PSTD = PROBCHI((N - 1) * AVEHT * AVEHT
                   / ( SIGMA * SIGMA), N - 1);
            PT = PMEAN * PSTD ;
            PTRAP + PT;
            IF X > 99.9 THEN DO;
               PMEAN = 1 - PROBNORM((X - U) * SQRT (N) / SIGMA);
               PSTD = PROBCHI((N - 1) * STD * STD
                      / ( SIGMA * SIGMA), N - 1);
               PT = PMEAN * PSTD;
               PTRAP + PT;
            END;
            IF LAST THEN OUTPUT;
         RUN;

PROC APPEND BASE = D1SAVALL DATA = D1SAVE;

       %END;
    %END;

%MEND SIGDISP1;
```

```

%SIGDISP1

PROC PRINT DATA = D1SAVALL split = '*';
   label ptrap = 'PROBABILITY*OF*PASSING';
   VAR CV PTRAP;
   ID U;
TITLE  "ACCEPTANCE LIMITS FOR DISSOLUTION (N = &NUMBER, Q = &Q)";
TITLE2 'SAMPLING PLAN 1';
TITLE3 'PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE';
TITLE4 "CONFIDENCE LEVEL = &CILEVEL AND LOWER BOUND = &LBOUND";
RUN;
%MEND EVDISP1;

%MACRO SMPDISP1;

DATA _NULL_; WINDOW TMAIN COLOR=GREY
#3 "TO DETERMINE LOWER BOUND FOR FOUND SAMPLE RESULTS" C=yellow
#5  "ENTER SAMPLE MEAN (% CLAIM): " C=blue MEAN 6.3 A=UNDERLINE
#6  "ENTER SAMPLE CV (%):         " C=blue CV 6.3 A=UNDERLINE;
WINDOW LTZ COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "CV MUST BE NON NEGATIVE" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW RANGE COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "MEAN MUST BE GREATER THAN Q" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
MEAN= 100.00;
CV=4.00;
TMAIN:
DISPLAY TMAIN BELL;
IF CV LE 0 THEN DO;
DISPLAY LTZ;
GOTO TMAIN;
END;
IF MEAN LE &Q THEN DO;
DISPLAY RANGE;
GOTO TMAIN;
END;
CALL SYMPUT("MEAN",PUT(MEAN,6.3));
CALL SYMPUT("CV",PUT(CV,6.3)); STOP;
RUN;

DATA DI1SMP;
LABEL OVERBD = 'OVERALL LOWER BOUND'
       MEAN = 'SAMPLE MEAN(%CLAIM)';
   Q = &Q;
   N = &NUMBER;
   CILEVEL = &CILEVEL;
   Z = PROBIT(SQRT(&CILEVEL / 100));
   N = &NUMBER;
   CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);
      MEAN = &MEAN;
      MEANADJ = MEAN - Q;
      CV = &CV;
      SAMPSD= &MEAN * CV/100;
```

```
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
    LLU = MEANADJ - Z *SIGMA / SQRT(N);
%COMPUTE
PROC PRINT SPLIT = '*';
  LABEL SAMPSD = 'SAMPLE*STD DEV*(% CLAIM)'
        MEAN = 'SAMPLE* MEAN*(% CLAIM)'
        OVERBD = 'LOWER BOUND';

  ID MEAN;
  VAR SAMPSD CV OVERBD;
TITLE  "ACCEPTANCE LIMITS FOR DISSOLUTION (N = &NUMBER, Q = &Q)";
TITLE2 'SAMPLING PLAN 1';
TITLE3 "PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST";
TITLE4 "FOR A GIVEN SAMPLE MEAN AND CV WITH &CILEVEL.% ASSURANCE";
run;
%MEND SMPDISP1;

%MACRO ANADISP1;
    %winDIsp1;
%IF %UPCASE(&A1DISP1)=Y OR %UPCASE(&A2DISP1)=Y %THEN %DO;
     %CALDISP1;
    %END;
%IF %UPCASE(&A1DISP1)=Y %THEN %DO;
      %PRTDISP1;
    %END;
%IF %UPCASE(&A2DISP1)=Y %THEN %DO;
      %EVDISP1;
PROC DATASETS LIBRARY = WORK;
   DELETE D1SAVALL;
    %END;
%IF %UPCASE(&A3DISP1)=Y %THEN %DO;
      %SMPDISP1;
    %END;
%MEND ANADISP1;

%ANADISP1
RUN;
%MEND DISP1;
%DISP1
```

DISP2.SAS

```
%MACRO DISP2;
%MACRO WINDISP2;
DATA _NULL_;
WINDOW MDISP2 COLOR=grey
#1 "DISSOLUTION ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 2 (GREATER THAN ONE SAMPLE PER LOCATION)" C=yellow
#4  "ENTER Q:  " C=blue Q 4.1 A=UNDERLINE
#5  "ENTER NUMBER OF LOCATIONS:  " C=blue LOC 4.0 A=UNDERLINE
#6  "ENTER NUMBER PER LOCATION:  " C=blue NUM 4.0 A=UNDERLINE
#9 "ENTER BOUND ON FUTURE PERCENTAGE PASSING (50.0-99.0):  " C=blue
    LBOUND 4.1 A=UNDERLINE
#10 "ENTER CONFIDENCE LEVEL (50.0-99.0):  " C=blue CILEVEL 4.1 A=UNDERLINE
#12 "ENTER INCREMENT FOR SE:  " C=blue DSE  4.2 A=UNDERLINE
#13 "ENTER INCREMENT FOR BETWEEN LOCATION STD DEV:  " C=blue DSM 4.2
     A=UNDERLINE
#15 "DO YOU WANT TO PRINT THE ACCEPTANCE LIMIT TABLE?" C=BLUE
#16 "ENTER Y OR N ="  C=BLUE A1DISP2 $1.
#18 "DO YOU WANT TO EVALUATE THE ACCEPTANCE LIMIT TABLE?" C=BLUE
#19 "ENTER Y OR N ="  C=BLUE A2DISP2 $1.
#21 "DO YOU WANT THE LOWER BOUND FOR A SPECIFIC SAMPLE RESULT?" C=BLUE
#22 "ENTER Y OR N ="  C=BLUE A3DISP2 $1.;
WINDOW DSESM COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "THE INCREMENT FOR SE AND BETWEEN LOCATION STD DEV" C=YELLOW
#2 "MUST BE GREATER THAN ZERO" C=YELLOW
#3 "(TYPICAL VALUES ARE 0.1, 0.2, 0.25, OR 0.50)" C=YELLOW
#5 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW DILOCAT COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS= 10 IROW=5
#1 "NUMBER OF LOCATIONS MUST BE AN INTEGER GREATER THAN 2" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW DINUMB COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS= 10 IROW=5
#1 "NUMBER PER LOCATION MUST BE AN INTEGER GREATER THAN 1" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW BDISP2 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "THE LOWER BOUND ON THE PERCENTAGE OF ALL FUTURE BATCHES" C=YELLOW
#2 "PASSING THE USP TEST MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#3 "(TYPICAL VALUES ARE 50.0 AND 95.0)" C=YELLOW
#5 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW QDISP2 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "VALUES FOR Q MUST BE BETWEEN 40 AND 95" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW CIDISP2 COLOR=RED
    COLUMNS=60 ICOLUMN=10 ROWS=10 IROW=5
#1 "CONFIDENCE INTERVAL VALUES MUST BE BETWEEN 50.0 AND 99.0" C=YELLOW
#2 "(TYPICAL VALUES ARE 90.0, 95.0, OR 99.0)" C=YELLOW
#4 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ANSDISP2 COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "REQUEST REQUIRES A RESPONSE OF: Y OR N" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
LOC=10;
NUM=6;
Q=80;
DSE = 0.25;
DSM = 0.25;
LBOUND = 95;
CILEVEL = 95;
A1DISP2 = 'Y';
A2DISP2 = 'N';
A3DISP2 = 'N';
MAINDI2:
DISPLAY MDISP2 BELL;
IF LOC LE 2 OR LOC NE ROUND(LOC) THEN DO;
DISPLAY DILOCAT BELL;
GOTO MAINDI2;
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END;
IF NUM LE 1 OR NUM NE ROUND(NUM) THEN DO;
DISPLAY DINUMB BELL;
GOTO MAINDI2;
END;
IF Q GT 95.0 OR Q LT 40.0 THEN DO;
DISPLAY QDISP2 BELL;
GOTO MAINDI2;
END;
IF DSE LE 0 OR DSM LE 0 THEN DO;
DISPLAY DSESM BELL;
GOTO MAINDI2;
END;
IF LBOUND GT 99.0 OR LBOUND LT 50.0 THEN DO;
DISPLAY BDISP2 BELL;
GOTO MAINDI2;
END;
IF CILEVEL GT 99.0 OR CILEVEL LT 50.0 THEN DO;
DISPLAY CIDISP2 BELL;
GOTO MAINDI2;
END;
IF A1DISP2 NE 'Y' AND A1DISP2 NE 'N' AND
   A1DISP2 NE 'y' AND A1DISP2 NE 'n' THEN DO;
DISPLAY ANSDISP2 BELL;
GOTO MAINDI2;
END;
IF A2DISP2 NE 'Y' AND A2DISP2 NE 'N' AND
   A2DISP2 NE 'y' AND A2DISP2 NE 'n' THEN DO;
DISPLAY ANSDISP2 BELL;
GOTO MAINDI2;
END;
IF A3DISP2 NE 'Y' AND A3DISP2 NE 'N' AND
   A3DISP2 NE 'y' AND A3DISP2 NE 'n' THEN DO;
DISPLAY ANSDISP2 BELL;
GOTO MAINDI2;
END;
CALL SYMPUT("Q",PUT(Q,4.1));
CALL SYMPUT("DSE",PUT(DSE,4.2));
CALL SYMPUT("DSM",PUT(DSM,4.2));
CALL SYMPUT("A1DISP2",PUT(UPCASE(A1DISP2),$1.));
CALL SYMPUT("A2DISP2",PUT(UPCASE(A2DISP2),$1.));
CALL SYMPUT("A3DISP2",PUT(UPCASE(A3DISP2),$1.));
CALL SYMPUT("LOC",PUT(LOC,4.0));
CALL SYMPUT("NUM",PUT(NUM,4.0));
CALL SYMPUT("LBOUND",PUT(LBOUND,4.1));
CALL SYMPUT("CILEVEL",PUT(CILEVEL,4.1)); STOP;
RUN;

%MEND WINDISP2;

OPTIONS NODATE NONUMBER;
%MACRO COMPUTE;
   F1 = (1 - PROBNORM((5 - LLU)/SIGMA)) ** 6;
   SN2 = SQRT(12);
   PM2 = PROBNORM (SN2 * -LLU / SIGMA);
   PB2 = 1 - PROBNORM ((-LLU - 15) / SIGMA);
   F2 = PB2 ** 12 - PM2;
   SN3 = SQRT(24);
   PM3 = PROBNORM (SN3 * -LLU / SIGMA);
   P2 = PROBNORM ((-LLU - 15) / SIGMA) - PROBNORM ((-LLU - 25) / SIGMA);
   P3 = 1 - PROBNORM ((-LLU - 15) / SIGMA);
   F3 = P3**24 + 24*P2*P3**23 + 276*P2*P2*P3**22 - PM3;
   OVERBD = MAX(F1, F2, F3);
%mend compute;



%MACRO CALDISP2;
DATA TABD;
```

```
    DM =0.10;
    DSE = &DSE;
    DSM = &DSM;
    Q = &Q;
    LIM = 100 - Q;
    NN = &NUM;
    L = &LOC;
    N = NN*L;
    CALL SYMPUT("TOT",PUT(N, 5.0));
    Z = PROBIT(SQRT(&CILEVEL / 100));
    CHIERR = CINV(1 - SQRT(&CILEVEL / 100), L*(NN - 1));
    CHILOC = CINV(1 - SQRT(&CILEVEL / 100),L-1);
    SEBOUND = 60;
    SMLIM = 60;
    NEXTM = 0.2;
   DO SE = DSE TO SEBOUND BY DSE;
    MEANL = NEXTM;
    SMBOUND = SMLIM;
    SE2 = SE * SE;
    H2 = L * (NN - 1) / CHIERR - 1;
    SEC = ((1 - 1/NN)*H2*SE2)**2;
   DO SM = DSM TO SMBOUND BY DSM;
    IF MEANL =. THEN GOTO OVER;
    SL2 = SM * SM * NN;
    SL2UB = (L - 1) * SL2 / CHILOC;
    H1 = (L - 1) / CHILOC - 1;
    FIRST = ((1 / NN)*H1*SL2)**2;
       PTEST = (1 / NN) * SL2 + (1 - 1/NN) * SE2;
       VAR = PTEST + SQRT(FIRST + SEC);
       MVAR = SL2UB;
    SIGMA = SQRT(VAR);
    DO MEANADJ = MEANL TO LIM BY DM;
    LLU = MEANADJ - Z *SQRT(MVAR / N);
%COMPUTE
    IF OVERBD > &LBOUND/100 THEN DO;
      MEANL = MEANADJ;
      GOTO SKIP;
                                END;
    END;
     MEANL =.;
  IF SE=DSE THEN DO;
    SMLIM = SM - DSM;
    MEAN = MEANL + Q;
    OUTPUT;
    SM = 90;
    GOTO OVER;
                  END;
  IF SM=DSM THEN DO; SE = 90; GOTO OVER; END;
SKIP:
    MEAN = MEANL + Q;
    OUTPUT;
IF SM = DSM THEN NEXTM = MEANL;
OVER:
   END;
  END;
KEEP N NN L MEAN SE SM OVERBD;
PROC SORT DATA=TABD; BY SE SM;


%MEND CALDISP2;

%MACRO PRTDISP2;
options ls=132;

PROC TABULATE DATA=TABD FORMAT=6.2 FORMCHAR='           ';
  CLASS SE SM;
  FORMAT SE 6.2 SM 6.2;
  VAR MEAN;
  TABLE SE, SUM*MEAN = ' ' * (SM = ' ')/rts=8;
```

```
  KEYLABEL SUM = 'STANDARD DEVIATION OF LOCATION MEANS';
TITLE "ACCEPTANCE LIMITS FOR DISSOLUTION (Q = &Q) ";
TITLE2 'SAMPLING PLAN 2';
TITLE3 "LOWER BOUND = &LBOUND, CONFIDENCE LEVEL = &CILEVEL";
TITLE4 'TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN';
TITLE5 "OF &TOT ASSAYS-&NUM ASSAYS AT EACH OF &LOC DIFFERENT LOCATIONS";
TITLE6 'SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION';
TITLE7 'STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM';
run;

%MEND PRTDISP2;


%MACRO EVDISP2;

DATA _NULL_; WINDOW SMAIN COLOR=GREY
#1 "TO EVALUATE LIMITS, THE USER MUST SPECIFY THE RANGE OF" C=yellow
#2 "POSSIBLE POPULATION VALUES FOR THE MEAN, WITHIN LOCATION" C=yellow
#3 "STD DEV AND BETWEEN LOCATION STD DEV" C=yellow
#5 "ENTER ALL VALUES AS POSITIVE INTEGERS" C=yellow
#7  "ENTER LOWER BOUND FOR MEAN:            " C=blue ULOW 4.0
    A=UNDERLINE
#8  "ENTER UPPER BOUND FOR MEAN:            " C=blue UHIGH 4.0
    A=UNDERLINE
#9  "ENTER INCREMENT FOR MEAN:              " C=blue UINCRE 4.0
    A=UNDERLINE
#10 "ENTER DIVISOR FOR MEAN:                " C=blue UDIV 4.0
    A=UNDERLINE
#12 "ENTER LOWER BOUND FOR WITHIN STD DEV:  " C=blue SELOW 4.0
    A=UNDERLINE
#13 "ENTER UPPER BOUND FOR WITHIN STD DEV:  " C=blue SEHIGH 4.0
    A=UNDERLINE
#14 "ENTER INCREMENT FOR WITHIN STD DEV:    " C=blue SEINCRE 4.0
    A=UNDERLINE
#15 "ENTER DIVISOR FOR WITHIN STD DEV:      " C=blue SEDIV 4.0
    A=UNDERLINE
#17 "ENTER LOWER BOUND FOR BETWEEN STD DEV: " C=blue SMLOW 4.0
    A=UNDERLINE
#18 "ENTER UPPER BOUND FOR BETWEEN STD DEV: " C=blue SMHIGH 4.0
    A=UNDERLINE
#19 "ENTER INCREMENT FOR BETWEEN STD DEV:   " C=blue SMINCRE 4.0
    A=UNDERLINE
#20 "ENTER DIVISOR FOR BETWEEN STD DEV:     " C=blue SMDIV 4.0
    A=UNDERLINE;
WINDOW DI2PINT COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST BE POSITIVE INTEGERS" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW DI2ORD  COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ERROR: UPPER BOUND IS LESS THAN LOWER BOUND" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
ULOW=950;
UHIGH=1000;
UINCRE=50;
UDIV=10;
SELOW=22;
SEHIGH=22;
SEINCRE=10;
SEDIV=10;
SMLOW=22;
SMHIGH=22;
SMINCRE=10;
SMDIV=10;
MAINDI2:
DISPLAY SMAIN BELL;
IF ULOW LT 1 OR ROUND(ULOW) NE ULOW
OR UHIGH LT 1 OR ROUND(UHIGH) NE UHIGH
OR UINCRE LT 1 OR ROUND(UINCRE) NE UINCRE
```

```
OR UDIV LT 1 OR ROUND(UDIV) NE UDIV
OR SELOW LT 1 OR ROUND(SELOW) NE SELOW
OR SEHIGH LT 1 OR ROUND(SEHIGH) NE SEHIGH
OR SEINCRE LT 1 OR ROUND(SEINCRE) NE SEINCRE
OR SEDIV LT 1 OR ROUND(SEDIV) NE SEDIV
OR SMLOW LT 1 OR ROUND(SMLOW) NE SMLOW
OR SMHIGH LT 1 OR ROUND(SMHIGH) NE SMHIGH
OR SMINCRE LT 1 OR ROUND(SMINCRE) NE SMINCRE
OR SMDIV LT 1 OR ROUND(SMDIV) NE SMDIV
THEN DO;
DISPLAY DI2PINT;
GOTO MAINDI2;
END;
IF ULOW GT UHIGH
OR SELOW GT SEHIGH
OR SMLOW GT SMHIGH
THEN DO;
DISPLAY DI2ORD;
GOTO MAINDI2;
END;
CALL SYMPUT("ULOW",PUT(ULOW,4.0));
CALL SYMPUT("UHIGH",PUT(UHIGH,4.0));
CALL SYMPUT("UINCRE",PUT(UINCRE,4.0));
CALL SYMPUT("UDIV",PUT(UDIV,4.0));
CALL SYMPUT("SELOW",PUT(SELOW,4.0));
CALL SYMPUT("SEHIGH",PUT(SEHIGH,4.0));
CALL SYMPUT("SEINCRE",PUT(SEINCRE,4.0));
CALL SYMPUT("SEDIV",PUT(SEDIV,4.0));
CALL SYMPUT("SMLOW",PUT(SMLOW,4.0));
CALL SYMPUT("SMHIGH",PUT(SMHIGH,4.0));
CALL SYMPUT("SMINCRE",PUT(SMINCRE,4.0));
CALL SYMPUT("SMDIV",PUT(SMDIV,4.0)); STOP;
RUN;


%MACRO SIGDISP2;
%CALDISP2
   %DO U = &ULOW %TO &UHIGH %BY &UINCRE;
      %DO SIGSE = &SELOW %TO &SEHIGH %BY &SEINCRE;
         %DO SIGSM = &SMLOW %TO &SMHIGH %BY &SMINCRE;

  DATA SAVE2;
    SET TABD END = LAST;
   U = &U / &UDIV;
   DSE = &DSE;
   DSM = &DSM;
   SIGSE = &SIGSE / &SEDIV;
   SIGSM = &SIGSM / &SMDIV;
   SIGSM2 = SIGSM * SIGSM;
   EXPSE2 = SIGSE * SIGSE;
   EXPSM2 = EXPSE2 + NN * SIGSM * SIGSM;
   PMEAN = 1 - PROBNORM((MEAN - U) * SQRT((N) / EXPSM2));
   PSE = PROBCHI(L * (NN - 1) * SE * SE / EXPSE2, L * (NN -1))
         - PROBCHI(L * (NN - 1) * (SE - DSE) * (SE - DSE) /
         EXPSE2, L * (NN - 1));
   PSM = PROBCHI((L - 1) * NN * SM * SM / EXPSM2, L - 1)
         - PROBCHI((L - 1) * NN * (SM - DSM) * (SM - DSM) /
         EXPSM2, L - 1);
   P = PMEAN * PSE * PSM;
   PSUM + P;
   IF LAST THEN OUTPUT;
   RUN;
   PROC APPEND BASE = SAVES2E DATA = SAVE2;
   RUN;

       %END;
      %END;
     %END;

```

```
%MEND SIGDISP2;

%SIGDISP2

PROC PRINT DATA = SAVES2E split = '*';
  label U = 'MEAN'
       SIGSE = 'WITHIN LOCATION*STD DEV'
       SIGSM = 'BETWEEN LOCATION* STD DEV'
       PSUM = 'PROBABILITY*OF*PASSING';
   VAR U SIGSE SIGSM PSUM;
TITLE1 "ACCEPTANCE LIMITS FOR DISSOLUTION (Q = &Q) ";
TITLE2 'SAMPLING PLAN 2';
TITLE3 "PROBABILITY OF PASSING DISSOLUTION ACCEPTANCE LIMIT TABLE";
TITLE4 "WITH &NUM ASSAYS AT EACH OF &LOC LOCATIONS";
TITLE5 "CONFIDENCE LEVEL = &CILEVEL & LOWER BOUND = &LBOUND";
RUN;
%MEND EVDISP2;

%MACRO SMPDISP2;

DATA _NULL_; WINDOW TMAIN COLOR=GREY
#3 "TO DETERMINE LOWER BOUND FOR FOUND SAMPLE RESULTS" C=yellow
#7  "ENTER SAMPLE MEAN (% CLAIM):            " C=blue MEAN 6.3 A=UNDERLINE
#9  "ENTER SAMPLE WITHIN STD DEV (% CLAIM):  " C=blue SE 6.3 A=UNDERLINE
#11 "ENTER SAMPLE BETWEEN STD DEV (% CLAIM): " C=blue SM 6.3 A=UNDERLINE
#12 "(I.E. STANDARD DEVIATION OF SAMPLE LOCATION MEANS)" C=blue;
WINDOW LTZ COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST BE NON NEGATIVE" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW RANGE COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "MEAN MUST BE GREATER THAN Q" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
MEAN=100.00;
SE=2.20;
SM=2.46;
TMAIN:
DISPLAY TMAIN BELL;
IF SM LE 0 OR SE LT 0
THEN DO;
DISPLAY LTZ;
GOTO TMAIN;
END;
IF MEAN LE Q
THEN DO;
DISPLAY RANGE;
GOTO TMAIN;
END;
CALL SYMPUT("MEAN",PUT(MEAN,6.3));
CALL SYMPUT("SE",PUT(SE,6.3));
CALL SYMPUT("SM",PUT(SM,6.3)); STOP;
RUN;

DATA TAB;
   Z = PROBIT(SQRT(&CILEVEL/100));
   NN = &NUM;
   L = &LOC;
   N = NN*L;
   SE = &SE;
   SM = &SM;
   MEAN = &MEAN;
   Q = &Q;
   MEANADJ = MEAN - Q;
   CILEVEL = &CILEVEL;
   CHIERR = CINV(1 - SQRT(&CILEVEL / 100), L*(NN - 1));
   CHILOC = CINV(1 - SQRT(&CILEVEL / 100),L-1);
   SE2 = SE * SE;
   H2 = L * (NN - 1) / CHIERR - 1;
```

```
   SEC = ((1 - 1/NN)*H2*SE2)**2;
   SL2 = SM * SM * NN;
   SL2UB = (L - 1) * SL2 / CHILOC;
   H1 = (L - 1) / CHILOC - 1;
   FIRST = ((1 / NN)*H1*SL2)**2;
      PTEST = (1 / NN) * SL2 + (1 - 1/NN) * SE2;
      VAR = PTEST + SQRT(FIRST + SEC);
      MVAR = SL2UB;
   SIGMA = SQRT(VAR);
   LLU = MEANADJ - Z *SQRT(MVAR / N);
%COMPUTE
     KEEP SE MEAN SM OVERBD;
PROC PRINT SPLIT='*';
 LABEL   SE = 'SAMPLE*WITHIN LOCATION*STD DEV'
         MEAN = 'SAMPLE*MEAN'
         SM = 'SAMPLE*BETWEEN LOCATION*STD DEV'
         OVERBD = 'LOWER BOUND';
  ID MEAN;
  VAR SE SM OVERBD;
TITLE "ACCEPTANCE LIMITS FOR DISSOLUTION (Q = &Q) ";
TITLE2 "SAMPLING PLAN 2 (&LOC LOCATIONS, &NUM PER LOCATION)";
TITLE3 'PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST';
TITLE4 "WITH &CILEVEL.% ASSURANCE";
TITLE5 'GIVEN THE SAMPLE MEAN, WITHIN AND BETWEEN STD DEV';
RUN;
%MEND SMPDISP2;

%MACRO ANADISP2;
    %WINDISP2;
%IF %UPCASE(&A1DISP2)=Y %THEN %DO;
     %CALDISP2;
     %PRTDISP2;
    %END;
%IF %UPCASE(&A2DISP2)=Y %THEN %DO;
      %EVDISP2;
PROC DATASETS LIBRARY=WORK;
   DELETE SAVES2E;
    %END;
%IF %UPCASE(&A3DISP2)=Y %THEN %DO;
     %SMPDISP2;
    %END;
%MEND ANADISP2;

%ANADISP2

RUN;
%MEND DISP2;
%DISP2
```

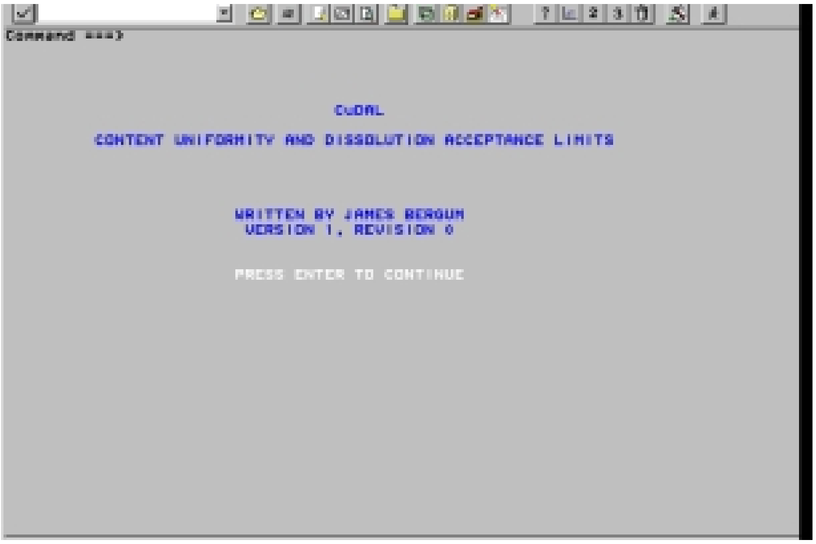
APPENDIX B
PRIMARY WINDOWS

PROGRAM	PRIMARY WINDOWS	ERROR WINDOWS
FILES.SAS		
MANAGER.SAS	STARTER	
	MAIN	ANSWIN
	GOBACK	ANSBACK
CUSP1.SAS	MCUSP1	DOSCUSP1
		SCUSP1
		BCUSP1
		CICUSP1
		ANSCUSP1
	SMAIN	PINT
		ORD
	TMAIN	LTZ
CUSP2.SAS	MCUSP2	DOSCUSP2
		LOCAT
		NUMB
		BCUSP2
		CICUSP2
		ANSCUSP2
	SMAIN	PINT
		ORD
	TMAIN	LTZ
DISP1.SAS	MDISP1	SDISP1
		BDISP1
		QDISP1
		CIDISP1
		ANSDISP1
	SMAIN	PINT
		ORD
	TMAIN	LTZ
DISP2.SAS	MDISP2	DSESUM
		DILOCAT
		DINUMB
		BDISP2
		QDISP2
		CIDISP2
		ANSDISP2
	SMAIN	DI2PINT
		DI2ORD
	TMAIN	LTZ

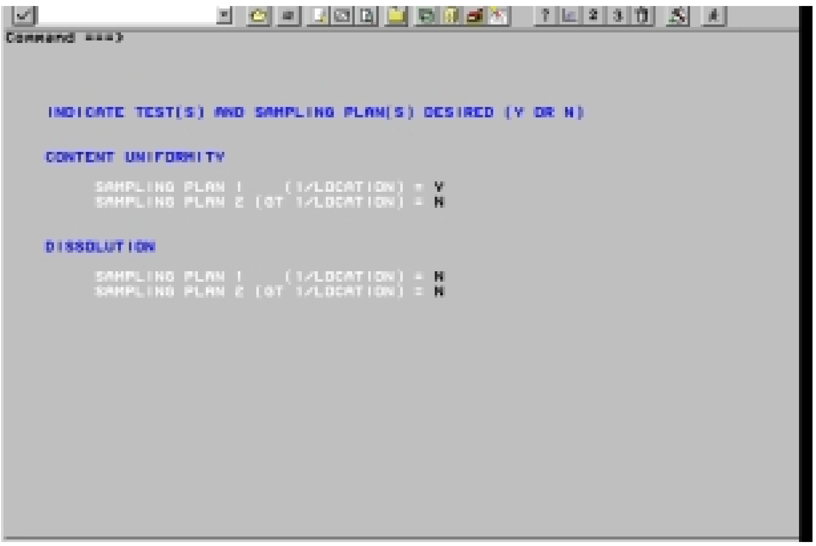
PRIMARY WINDOWS:

FILE: MANAGER.SAS

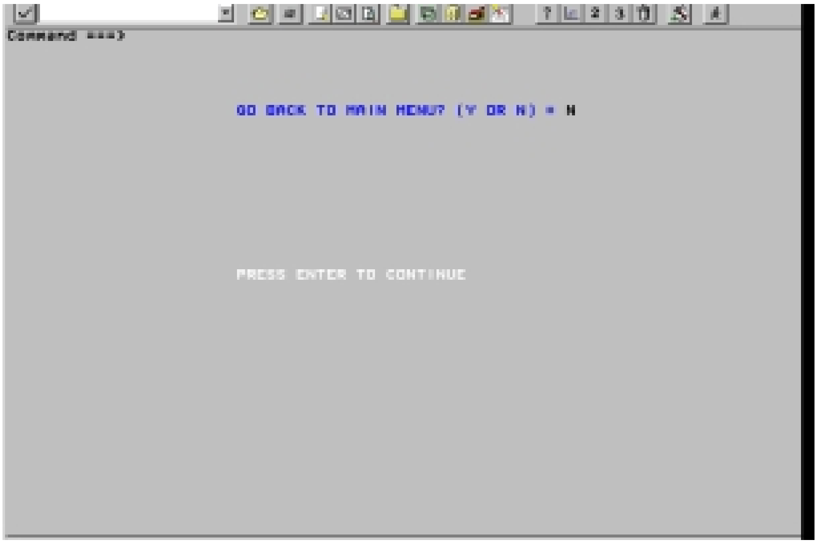
WINDOW: STARTER



WINDOW: MAIN

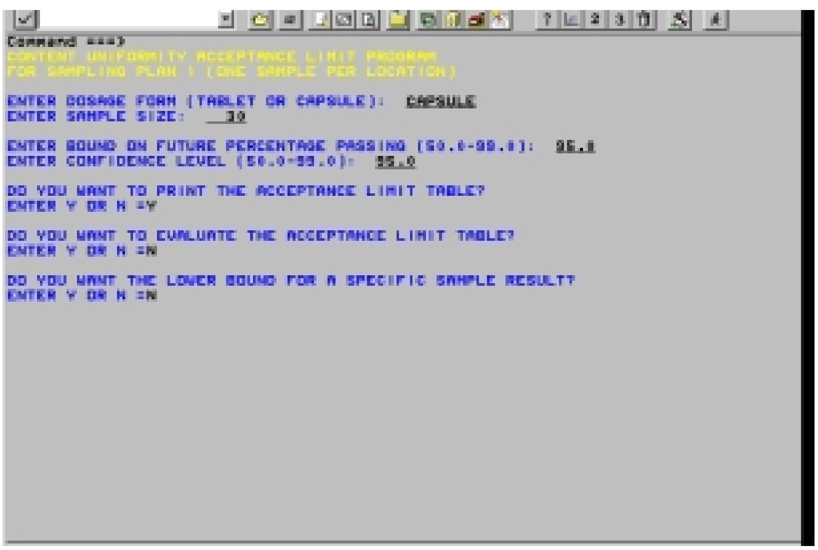


WINDOW: GOBACK

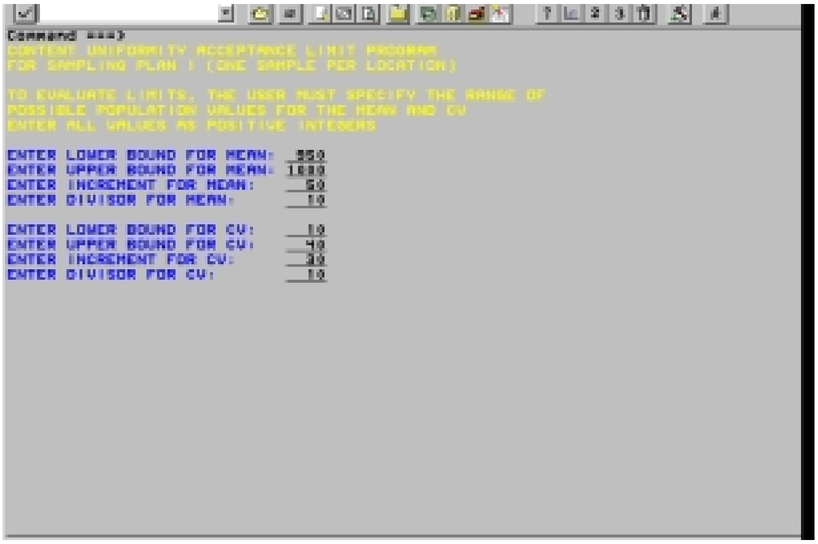


FILE: MACRO CUSP1

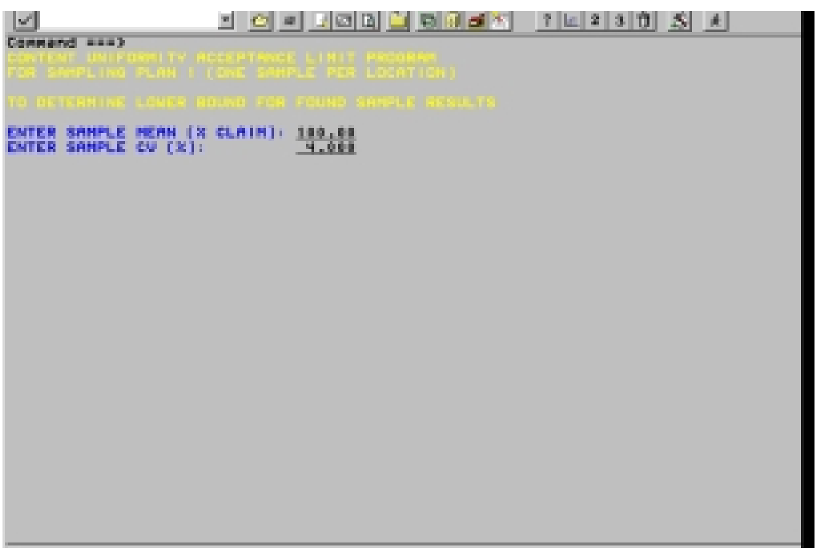
WINDOW: MCUSP1



WINDOW: SMAIN

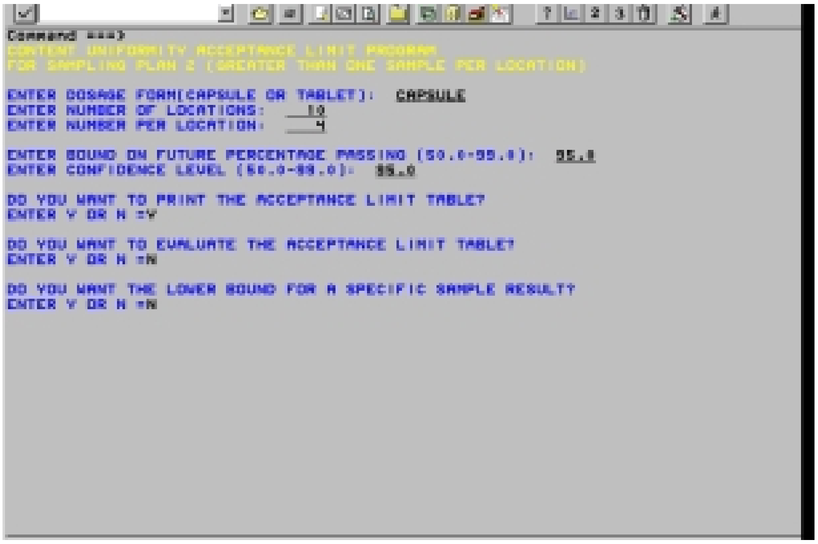


WINDOW: TMAIN

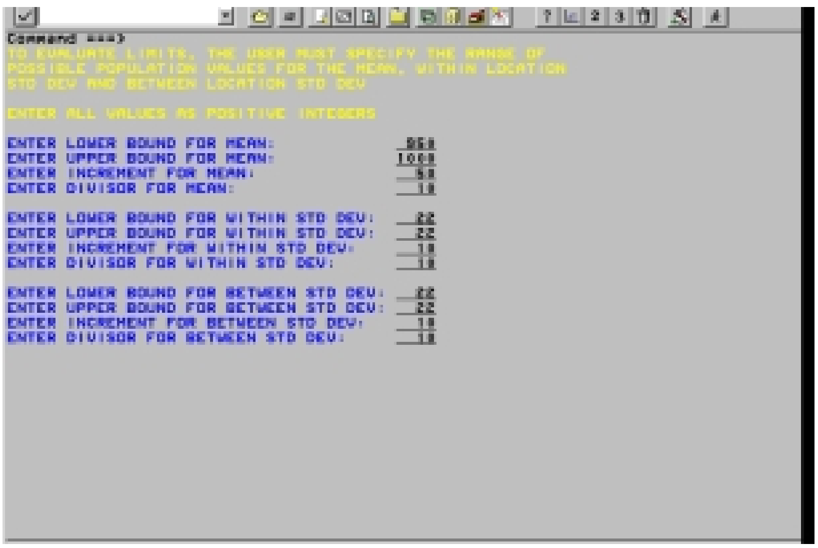


FILE: MACRO CUSP2

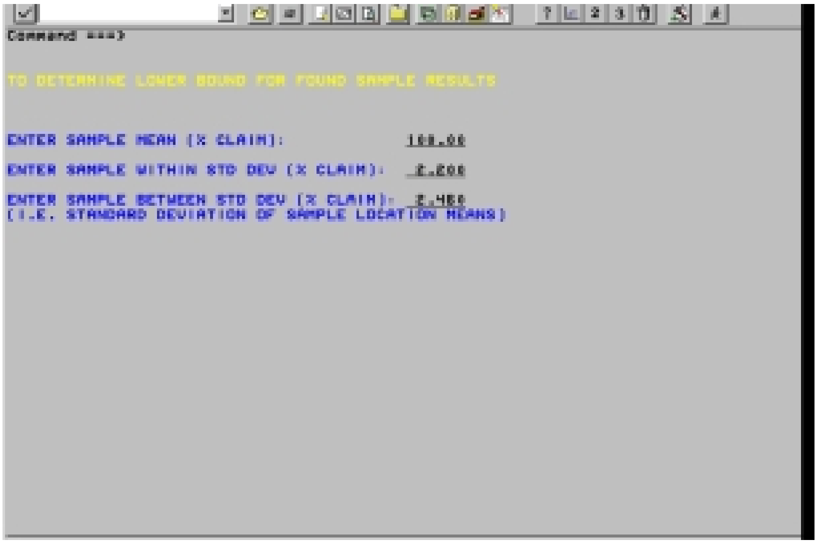
WINDOW: MCUSP2



WINDOW: SMAIN

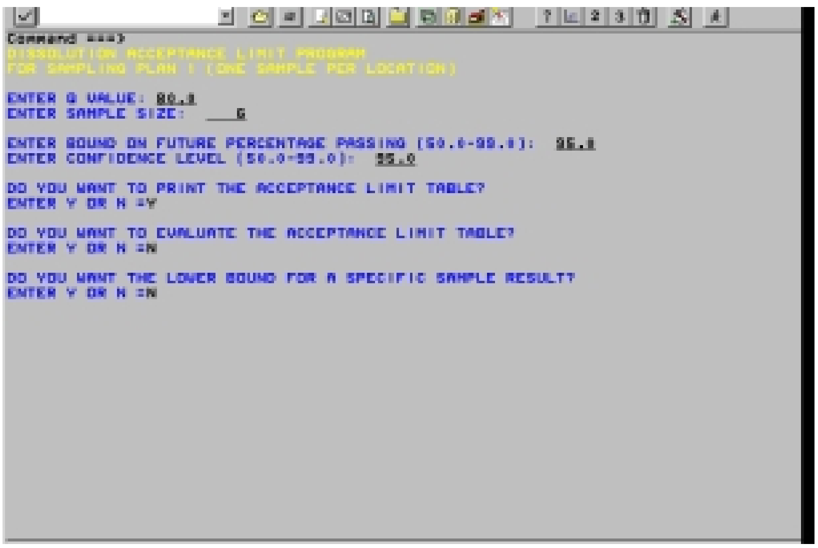


WINDOW: TMAIN

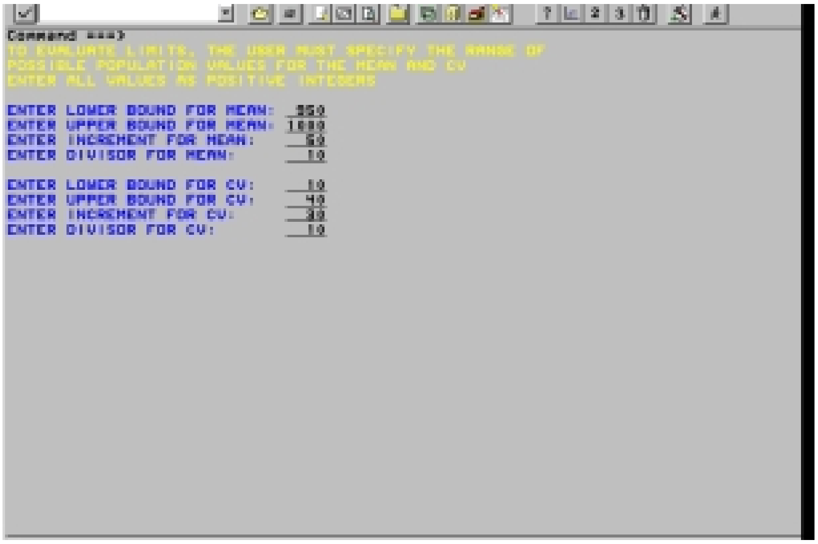


FILE: MACRO DISP1

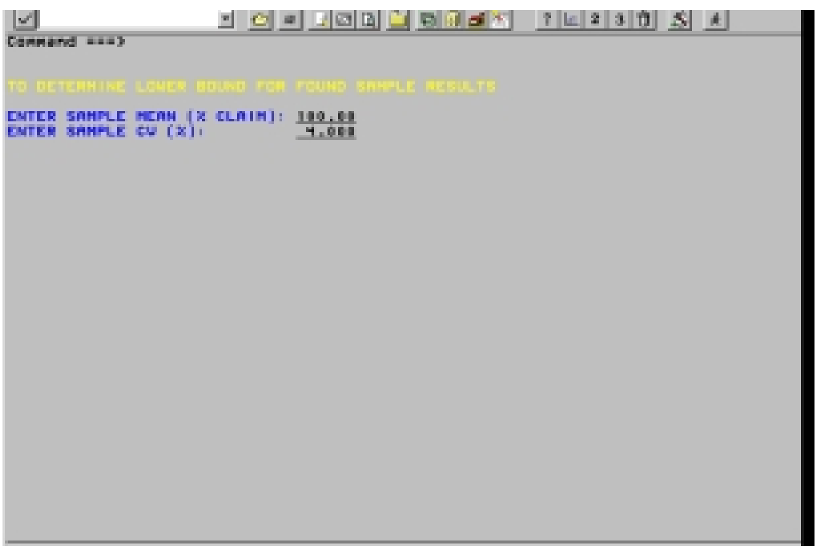
WINDOW: MDISP1



WINDOW: SMAIN

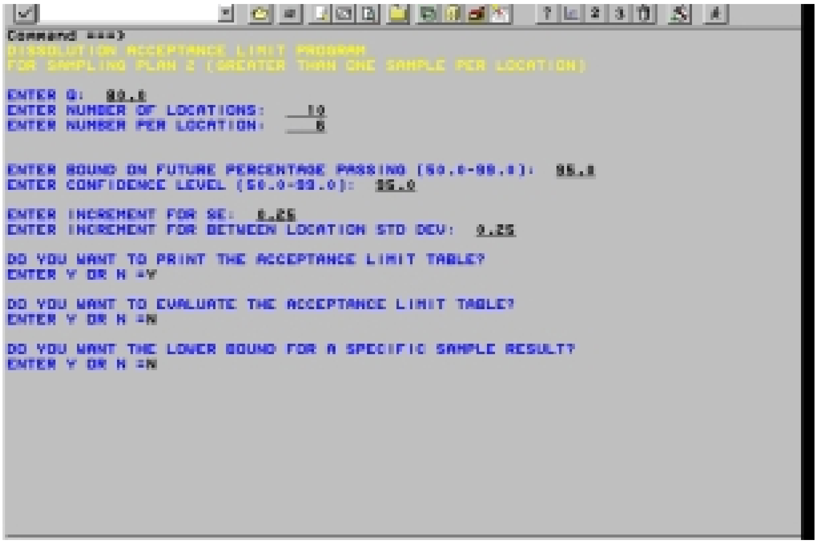


WINDOW: TMAIN

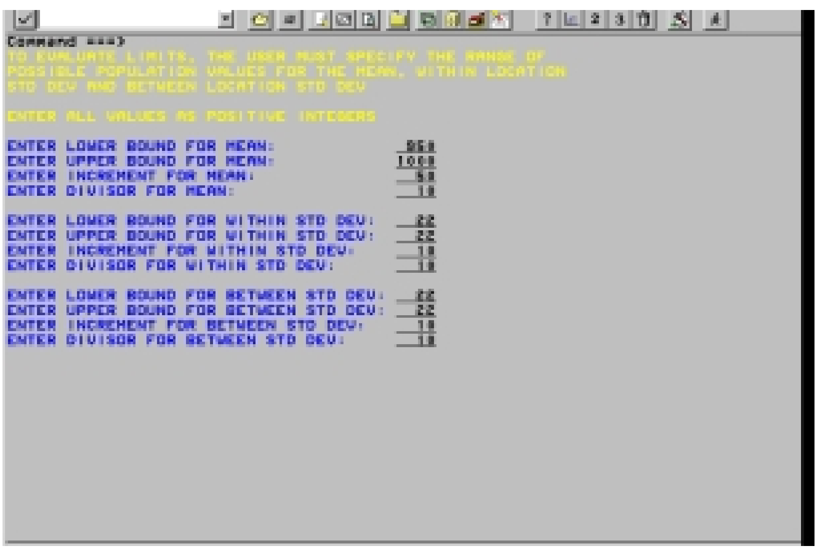


FILE: MACRO DISP2

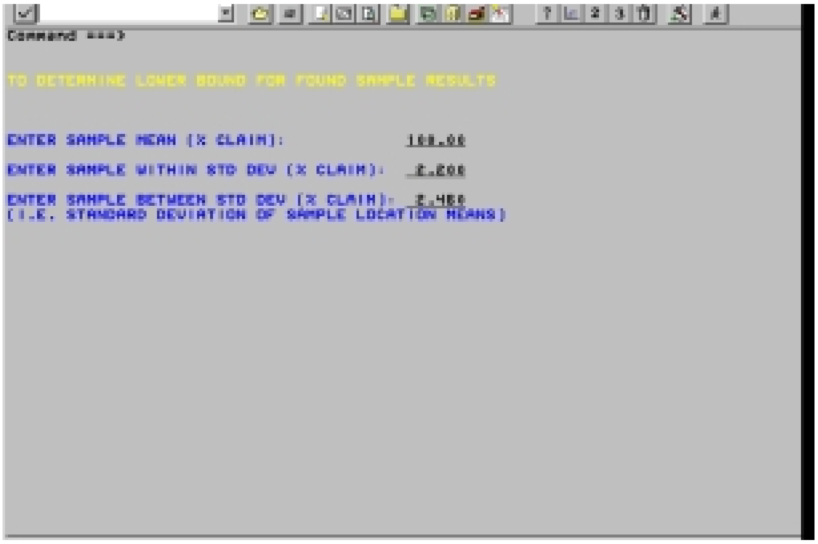
WINDOW: MDISP2



WINDOW: SMAIN



TMAIN


Command ===>
TO DETERMINE LOWER BOUND FOR FOUND SAMPLE RESULTS
ENTER SAMPLE MEAN (% CLAIM): 100.00
ENTER SAMPLE WITHIN STD DEV (% CLAIM): 2.200
ENTER SAMPLE BETWEEN STD DEV (% CLAIM): 2.400
(I.E. STANDARD DEVIATION OF SAMPLE LOCATION MEANS)

APPENDIX C
DEFAULT WINDOW OUTPUT

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 30)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 95.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)
85.1	0.04	90.1	2.02	95.1	3.78	100.1	4.61	105.1	3.35	110.1	1.59
85.2	0.08	90.2	2.06	95.2	3.81	100.2	4.62	105.2	3.32	110.2	1.56
85.3	0.13	90.3	2.10	95.3	3.84	100.3	4.62	105.3	3.28	110.3	1.52
85.4	0.17	90.4	2.13	95.4	3.87	100.4	4.62	105.4	3.25	110.4	1.49
85.5	0.21	90.5	2.17	95.5	3.91	100.5	4.62	105.5	3.21	110.5	1.45
85.6	0.25	90.6	2.21	95.6	3.94	100.6	4.63	105.6	3.17	110.6	1.42
85.7	0.29	90.7	2.24	95.7	3.97	100.7	4.63	105.7	3.14	110.7	1.39
85.8	0.33	90.8	2.28	95.8	4.00	100.8	4.63	105.8	3.10	110.8	1.35
85.9	0.37	90.9	2.32	95.9	4.03	100.9	4.63	105.9	3.06	110.9	1.32
86.0	0.42	91.0	2.35	96.0	4.06	101.0	4.63	106.0	3.03	111.0	1.29
86.1	0.46	91.1	2.39	96.1	4.08	101.1	4.63	106.1	2.99	111.1	1.25
86.2	0.50	91.2	2.43	96.2	4.11	101.2	4.62	106.2	2.96	111.2	1.22
86.3	0.54	91.3	2.46	96.3	4.14	101.3	4.60	106.3	2.92	111.3	1.19
86.4	0.58	91.4	2.50	96.4	4.16	101.4	4.57	106.4	2.88	111.4	1.15
86.5	0.62	91.5	2.54	96.5	4.19	101.5	4.55	106.5	2.85	111.5	1.12
86.6	0.66	91.6	2.57	96.6	4.22	101.6	4.53	106.6	2.81	111.6	1.09
86.7	0.70	91.7	2.61	96.7	4.24	101.7	4.50	106.7	2.78	111.7	1.05
86.8	0.74	91.8	2.64	96.8	4.26	101.8	4.48	106.8	2.74	111.8	1.02
86.9	0.78	91.9	2.68	96.9	4.28	101.9	4.45	106.9	2.70	111.9	0.99
87.0	0.82	92.0	2.72	97.0	4.31	102.0	4.42	107.0	2.67	112.0	0.96
87.1	0.86	92.1	2.75	97.1	4.33	102.1	4.40	107.1	2.63	112.1	0.92
87.2	0.90	92.2	2.79	97.2	4.35	102.2	4.37	107.2	2.60	112.2	0.89
87.3	0.94	92.3	2.82	97.3	4.36	102.3	4.34	107.3	2.56	112.3	0.86
87.4	0.98	92.4	2.86	97.4	4.38	102.4	4.31	107.4	2.53	112.4	0.83
87.5	1.02	92.5	2.90	97.5	4.40	102.5	4.27	107.5	2.49	112.5	0.79
87.6	1.06	92.6	2.93	97.6	4.41	102.6	4.24	107.6	2.46	112.6	0.76
87.7	1.10	92.7	2.97	97.7	4.43	102.7	4.21	107.7	2.42	112.7	0.73
87.8	1.14	92.8	3.00	97.8	4.44	102.8	4.18	107.8	2.38	112.8	0.70
87.9	1.18	92.9	3.04	97.9	4.46	102.9	4.14	107.9	2.35	112.9	0.66
88.0	1.22	93.0	3.07	98.0	4.47	103.0	4.11	108.0	2.31	113.0	0.63
88.1	1.26	93.1	3.11	98.1	4.48	103.1	4.07	108.1	2.28	113.1	0.60
88.2	1.29	93.2	3.14	98.2	4.49	103.2	4.04	108.2	2.24	113.2	0.57
88.3	1.33	93.3	3.17	98.3	4.50	103.3	4.00	108.3	2.21	113.3	0.54
88.4	1.37	93.4	3.21	98.4	4.51	103.4	3.97	108.4	2.17	113.4	0.50
88.5	1.41	93.5	3.24	98.5	4.52	103.5	3.93	108.5	2.14	113.5	0.47
88.6	1.45	93.6	3.28	98.6	4.53	103.6	3.90	108.6	2.10	113.6	0.44
88.7	1.49	93.7	3.31	98.7	4.54	103.7	3.86	108.7	2.07	113.7	0.41
88.8	1.53	93.8	3.35	98.8	4.55	103.8	3.82	108.8	2.03	113.8	0.38
88.9	1.57	93.9	3.38	98.9	4.56	103.9	3.79	108.9	2.00	113.9	0.34
89.0	1.60	94.0	3.41	99.0	4.56	104.0	3.75	109.0	1.97	114.0	0.31
89.1	1.64	94.1	3.45	99.1	4.57	104.1	3.72	109.1	1.93	114.1	0.28
89.2	1.68	94.2	3.48	99.2	4.58	104.2	3.68	109.2	1.90	114.2	0.25
89.3	1.72	94.3	3.52	99.3	4.58	104.3	3.64	109.3	1.86	114.3	0.22
89.4	1.76	94.4	3.55	99.4	4.59	104.4	3.61	109.4	1.83	114.4	0.19
89.5	1.80	94.5	3.58	99.5	4.59	104.5	3.57	109.5	1.79	114.5	0.16
89.6	1.83	94.6	3.62	99.6	4.60	104.6	3.54	109.6	1.76	114.6	0.12
89.7	1.87	94.7	3.65	99.7	4.60	104.7	3.50	109.7	1.73	114.7	0.09
89.8	1.91	94.8	3.68	99.8	4.60	104.8	3.46	109.8	1.69	114.8	0.06
89.9	1.95	94.9	3.71	99.9	4.61	104.9	3.43	109.9	1.66	114.9	0.03
90.0	1.98	95.0	3.75	100.0	4.61	105.0	3.39	110.0	1.62		

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 40 ASSAYS- 4 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8		0.9	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	85.5	114.5	85.9	114.1	86.4	113.6	86.8	113.2	87.2	112.8	87.7	112.3	88.1	111.9	88.5	111.5	89.0	111.0
0.2	85.6	114.4	86.0	114.0	86.4	113.6	86.8	113.2	87.2	112.8	87.7	112.3	88.1	111.9	88.5	111.5	89.0	111.0
0.3	85.8	114.2	86.1	113.9	86.5	113.5	86.9	113.1	87.3	112.7	87.7	112.3	88.1	111.9	88.6	111.4	89.0	111.0
0.4	86.0	114.0	86.2	113.8	86.5	113.5	86.9	113.1	87.3	112.7	87.7	112.3	88.2	111.8	88.6	111.4	89.0	111.0
0.5	86.2	113.8	86.4	113.6	86.7	113.3	87.0	113.0	87.4	112.6	87.8	112.2	88.2	111.8	88.6	111.4	89.1	110.9
0.6	86.4	113.6	86.5	113.5	86.8	113.2	87.1	112.9	87.5	112.5	87.9	112.1	88.3	111.7	88.7	111.3	89.1	110.9
0.7	86.5	113.5	86.7	113.3	86.9	113.1	87.2	112.8	87.6	112.4	88.0	112.0	88.3	111.7	88.7	111.3	89.2	110.8
0.8	86.7	113.3	86.9	113.1	87.1	112.9	87.4	112.6	87.7	112.3	88.0	112.0	88.4	111.6	88.8	111.2	89.2	110.8
0.9	86.9	113.1	87.1	112.9	87.3	112.7	87.5	112.5	87.8	112.2	88.2	111.8	88.5	111.5	88.9	111.1	89.3	110.7
1.0	87.1	112.9	87.3	112.7	87.5	112.5	87.7	112.3	88.0	112.0	88.3	111.7	88.6	111.4	89.0	111.0	89.4	110.6
1.1	87.3	112.7	87.5	112.5	87.6	112.4	87.9	112.1	88.1	111.9	88.4	111.6	88.7	111.3	89.1	110.9	89.4	110.6
1.2	87.5	112.5	87.7	112.3	87.8	112.2	88.0	112.0	88.3	111.7	88.5	111.5	88.8	111.2	89.2	110.8	89.5	110.5
1.3	87.7	112.3	87.9	112.1	88.0	112.0	88.2	111.8	88.4	111.6	88.7	111.3	89.0	111.0	89.3	110.7	89.6	110.4
1.4	87.9	112.1	88.0	112.0	88.2	111.8	88.4	111.6	88.6	111.4	88.8	111.2	89.1	110.9	89.4	110.6	89.8	110.2
1.5	88.1	111.9	88.2	111.8	88.4	111.6	88.6	111.4	88.8	111.2	89.0	111.0	89.3	110.7	89.6	110.4	89.9	110.1
1.6	88.3	111.7	88.4	111.6	88.6	111.4	88.8	111.2	89.0	111.0	89.2	110.8	89.4	110.6	89.7	110.3	90.0	110.0
1.7	88.5	111.5	88.6	111.4	88.8	111.2	88.9	111.1	89.1	110.9	89.3	110.7	89.6	110.4	89.9	110.1	90.1	109.9
1.8	88.7	111.3	88.8	111.2	89.0	111.0	89.1	110.9	89.3	110.7	89.5	110.5	89.8	110.2	90.0	110.0	90.3	109.7
1.9	88.9	111.1	89.0	111.0	89.2	110.8	89.3	110.7	89.5	110.5	89.7	110.3	89.9	110.1	90.2	109.8	90.4	109.6
2.0	89.1	110.9	89.2	110.8	89.3	110.7	89.5	110.5	89.7	110.3	89.9	110.1	90.1	109.9	90.3	109.7	90.6	109.4
2.1	89.3	110.7	89.4	110.6	89.5	110.5	89.7	110.3	89.9	110.1	90.1	109.9	90.3	109.7	90.5	109.5	90.7	109.3
2.2	89.4	110.6	89.6	110.4	89.7	110.3	89.9	110.1	90.1	109.9	90.2	109.8	90.4	109.6	90.7	109.3	90.9	109.1
2.3	89.6	110.4	89.8	110.2	89.9	110.1	90.1	109.9	90.2	109.8	90.4	109.6	90.6	109.4	90.8	109.2	91.1	108.9
2.4	89.8	110.2	90.0	110.0	90.1	109.9	90.3	109.7	90.4	109.6	90.6	109.4	90.8	109.2	91.0	109.0	91.2	108.8
2.5	90.0	110.0	90.2	109.8	90.3	109.7	90.5	109.5	90.6	109.4	90.8	109.2	91.0	109.0	91.2	108.8	91.4	108.6
2.6	90.2	109.8	90.4	109.6	90.5	109.5	90.7	109.3	90.8	109.2	91.0	109.0	91.2	108.8	91.4	108.6	91.6	108.4
2.7	90.4	109.6	90.6	109.4	90.7	109.3	90.8	109.2	91.0	109.0	91.2	108.8	91.4	108.6	91.5	108.5	91.8	108.2
2.8	90.6	109.4	90.7	109.3	90.9	109.1	91.0	109.0	91.2	108.8	91.4	108.6	91.5	108.5	91.7	108.3	91.9	108.1
2.9	90.8	109.2	90.9	109.1	91.1	108.9	91.2	108.8	91.4	108.6	91.6	108.4	91.7	108.3	91.9	108.1	92.1	107.9
3.0	91.0	109.0	91.1	108.9	91.3	108.7	91.4	108.6	91.6	108.4	91.7	108.3	91.9	108.1	92.1	107.9	92.3	107.7
3.1	91.2	108.8	91.3	108.7	91.5	108.5	91.6	108.4	91.8	108.2	91.9	108.1	92.1	107.9	92.3	107.7	92.5	107.5
3.2	91.4	108.6	91.5	108.5	91.7	108.3	91.8	108.2	92.0	108.0	92.1	107.9	92.3	107.7	92.5	107.5	92.7	107.3
3.3	91.6	108.4	91.7	108.3	91.9	108.1	92.0	108.0	92.2	107.8	92.3	107.7	92.5	107.5	92.7	107.3	92.8	107.2
3.4	91.8	108.2	91.9	108.1	92.1	107.9	92.2	107.8	92.3	107.7	92.5	107.5	92.7	107.3	92.8	107.2	93.0	107.0
3.5	92.0	108.0	92.1	107.9	92.2	107.8	92.4	107.6	92.5	107.5	92.7	107.3	92.9	107.1	93.0	107.0	93.2	106.8
3.6	92.2	107.8	92.3	107.7	92.4	107.6	92.6	107.4	92.7	107.3	92.9	107.1	93.1	106.9	93.2	106.8	93.4	106.6
3.7	92.4	107.6	92.5	107.5	92.6	107.4	92.8	107.2	92.9	107.1	93.1	106.9	93.2	106.8	93.4	106.6	93.6	106.4
3.8	92.6	107.4	92.7	107.3	92.8	107.2	93.0	107.0	93.1	106.9	93.3	106.7	93.4	106.6	93.6	106.4	93.8	106.2
3.9	92.8	107.2	92.9	107.1	93.0	107.0	93.2	106.8	93.3	106.7	93.5	106.5	93.6	106.4	93.8	106.2	94.0	106.0
4.0	93.0	107.0	93.1	106.9	93.2	106.8	93.4	106.6	93.5	106.5	93.7	106.3	93.8	106.2	94.0	106.0	94.2	105.8
4.1	93.2	106.8	93.3	106.7	93.4	106.6	93.6	106.4	93.7	106.3	93.9	106.1	94.0	106.0	94.2	105.8	94.4	105.6
4.2	93.4	106.6	93.5	106.5	93.6	106.4	93.8	106.2	93.9	106.1	94.1	105.9	94.2	105.8	94.4	105.6	94.6	105.4
4.3	93.6	106.4	93.7	106.3	93.8	106.2	94.0	106.0	94.1	105.9	94.3	105.7	94.4	105.6	94.6	105.4	94.8	105.2

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 40 ASSAYS- 4 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8		0.9	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
4.4	93.8	106.2	93.9	106.1	94.1	106.0	94.2	105.8	94.3	105.7	94.5	105.5	94.6	105.4	94.8	105.2	95.0	105.0
4.5	94.0	106.0	94.1	105.9	94.3	105.8	94.4	105.6	94.6	105.5	94.7	105.3	94.9	105.2	95.0	105.0	95.2	104.8
4.6	94.2	105.8	94.4	105.7	94.5	105.5	94.6	105.4	94.8	105.3	94.9	105.1	95.1	105.0	95.3	104.8	95.4	104.6
4.7	94.5	105.6	94.6	105.5	94.7	105.3	94.9	105.2	95.0	105.0	95.2	104.9	95.4	104.7	95.5	104.6	95.7	104.4
4.8	94.7	105.4	94.9	105.3	95.0	105.1	95.2	105.0	95.3	104.8	95.5	104.7	95.6	104.5	95.8	104.4	96.0	104.2
4.9	95.0	105.2	95.2	105.0	95.3	104.9	95.5	104.8	95.6	104.6	95.8	104.5	96.0	104.3	96.1	104.1	96.3	104.0
5.0	95.4	104.9	95.5	104.8	95.7	104.7	95.8	104.5	96.0	104.4	96.2	104.2	96.3	104.1	96.5	103.9	96.7	103.7
5.1	95.8	104.7	96.0	104.6	96.1	104.4	96.3	104.3	96.4	104.1	96.6	104.0	96.8	103.8	97.0	103.7	97.2	103.5
5.2	96.4	104.4	96.5	104.3	96.7	104.1	96.8	104.0	97.0	103.9	97.2	103.7	97.4	103.5	97.6	103.4	97.9	103.2
5.3	97.1	104.1	97.3	104.0	97.4	103.8	97.6	103.7	97.8	103.5	98.0	103.4	98.2	103.2	98.5	103.0	98.8	102.8
5.4	98.2	103.7	98.3	103.6	98.5	103.4	98.7	103.3	98.9	103.1	99.2	102.9	99.4	102.8	99.7	102.6	100.1	102.3
5.5	99.7	103.1	99.8	103.0	100.0	102.8	100.2	102.6	100.5	102.4	100.8	102.2	101.1	102.0	101.5	101.7		

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 40 ASSAYS- 4 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	1.0		1.1		1.2		1.3		1.4		1.5		1.6		1.7		1.8	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	89.4	110.6	89.8	110.2	90.3	109.7	90.7	109.3	91.1	108.9	91.6	108.4	92.0	108.0	92.4	107.6	92.9	107.1
0.2	89.4	110.6	89.8	110.2	90.3	109.7	90.7	109.3	91.1	108.9	91.6	108.4	92.0	108.0	92.4	107.6	92.9	107.1
0.3	89.4	110.6	89.9	110.1	90.3	109.7	90.7	109.3	91.2	108.8	91.6	108.4	92.0	108.0	92.5	107.5	92.9	107.1
0.4	89.4	110.6	89.9	110.1	90.3	109.7	90.7	109.3	91.2	108.8	91.6	108.4	92.0	108.0	92.5	107.5	92.9	107.1
0.5	89.5	110.5	89.9	110.1	90.3	109.7	90.8	109.2	91.2	108.8	91.6	108.4	92.1	107.9	92.5	107.5	92.9	107.1
0.6	89.5	110.5	89.9	110.1	90.4	109.6	90.8	109.2	91.2	108.8	91.6	108.4	92.1	107.9	92.5	107.5	92.9	107.1
0.7	89.6	110.4	90.0	110.0	90.4	109.6	90.8	109.2	91.3	108.7	91.7	108.3	92.1	107.9	92.5	107.5	93.0	107.0
0.8	89.6	110.4	90.0	110.0	90.4	109.6	90.9	109.1	91.3	108.7	91.7	108.3	92.1	107.9	92.6	107.4	93.0	107.0
0.9	89.7	110.3	90.1	109.9	90.5	109.5	90.9	109.1	91.3	108.7	91.8	108.2	92.2	107.8	92.6	107.4	93.0	107.0
1.0	89.8	110.2	90.2	109.8	90.6	109.4	91.0	109.0	91.4	108.6	91.8	108.2	92.2	107.8	92.6	107.4	93.1	106.9
1.1	89.8	110.2	90.2	109.8	90.6	109.4	91.0	109.0	91.4	108.6	91.8	108.2	92.3	107.7	92.7	107.3	93.1	106.9
1.2	89.9	110.1	90.3	109.7	90.7	109.3	91.1	108.9	91.5	108.5	91.9	108.1	92.3	107.7	92.7	107.3	93.1	106.9
1.3	90.0	110.0	90.4	109.6	90.8	109.2	91.2	108.8	91.6	108.4	92.0	108.0	92.4	107.6	92.8	107.2	93.2	106.8
1.4	90.1	109.9	90.5	109.5	90.9	109.1	91.2	108.8	91.6	108.4	92.0	108.0	92.4	107.6	92.8	107.2	93.3	106.7
1.5	90.2	109.8	90.6	109.4	90.9	109.1	91.3	108.7	91.7	108.3	92.1	107.9	92.5	107.5	92.9	107.1	93.3	106.7
1.6	90.3	109.7	90.7	109.3	91.0	109.0	91.4	108.6	91.8	108.2	92.2	107.8	92.6	107.4	93.0	107.0	93.4	106.6
1.7	90.5	109.5	90.8	109.2	91.1	108.9	91.5	108.5	91.9	108.1	92.3	107.7	92.6	107.4	93.0	107.0	93.4	106.6
1.8	90.6	109.4	90.9	109.1	91.3	108.7	91.6	108.4	92.0	108.0	92.3	107.7	92.7	107.3	93.1	106.9	93.5	106.5
1.9	90.7	109.3	91.0	109.0	91.4	108.6	91.7	108.3	92.1	107.9	92.4	107.6	92.8	107.2	93.2	106.8	93.6	106.4
2.0	90.9	109.1	91.2	108.8	91.5	108.5	91.8	108.2	92.2	107.8	92.5	107.5	92.9	107.1	93.3	106.7	93.7	106.3
2.1	91.0	109.0	91.3	108.7	91.6	108.4	91.9	108.1	92.3	107.7	92.6	107.4	93.0	107.0	93.4	106.6	93.8	106.2
2.2	91.2	108.8	91.5	108.5	91.8	108.2	92.1	107.9	92.4	107.6	92.7	107.3	93.1	106.9	93.5	106.5	93.8	106.2
2.3	91.3	108.7	91.6	108.4	91.9	108.1	92.2	107.8	92.5	107.5	92.9	107.1	93.2	106.8	93.6	106.4	93.9	106.1
2.4	91.5	108.5	91.7	108.3	92.0	108.0	92.3	107.7	92.6	107.4	93.0	107.0	93.3	106.7	93.7	106.3	94.0	106.0
2.5	91.6	108.4	91.9	108.1	92.2	107.8	92.5	107.5	92.8	107.2	93.1	106.9	93.4	106.6	93.8	106.2	94.1	105.9
2.6	91.8	108.2	92.1	107.9	92.3	107.7	92.6	107.4	92.9	107.1	93.2	106.8	93.6	106.4	93.9	106.1	94.2	105.8
2.7	92.0	108.0	92.2	107.8	92.5	107.5	92.8	107.2	93.1	106.9	93.4	106.6	93.7	106.3	94.0	106.0	94.4	105.6
2.8	92.2	107.8	92.4	107.6	92.6	107.4	92.9	107.1	93.2	106.8	93.5	106.5	93.8	106.2	94.1	105.9	94.5	105.5
2.9	92.3	107.7	92.6	107.4	92.8	107.2	93.1	106.9	93.3	106.7	93.6	106.4	93.9	106.1	94.3	105.7	94.6	105.4
3.0	92.5	107.5	92.7	107.3	93.0	107.0	93.2	106.8	93.5	106.5	93.8	106.2	94.1	105.9	94.4	105.6	94.7	105.3
3.1	92.7	107.3	92.9	107.1	93.1	106.9	93.4	106.6	93.7	106.3	93.9	106.1	94.2	105.8	94.5	105.5	94.9	105.1
3.2	92.9	107.1	93.1	106.9	93.3	106.7	93.6	106.4	93.8	106.2	94.1	105.9	94.4	105.6	94.7	105.3	95.0	105.0
3.3	93.0	107.0	93.3	106.7	93.5	106.5	93.7	106.3	94.0	106.0	94.2	105.8	94.5	105.5	94.8	105.2	95.1	104.9
3.4	93.2	106.8	93.4	106.6	93.7	106.3	93.9	106.1	94.1	105.9	94.4	105.6	94.7	105.3	95.0	105.0	95.3	104.7
3.5	93.4	106.6	93.6	106.4	93.8	106.2	94.1	105.9	94.3	105.7	94.6	105.4	94.8	105.2	95.1	104.9	95.4	104.6
3.6	93.6	106.4	93.8	106.2	94.0	106.0	94.2	105.8	94.5	105.5	94.7	105.3	95.0	105.0	95.3	104.7	95.6	104.4
3.7	93.8	106.2	94.0	106.0	94.2	105.8	94.4	105.6	94.6	105.4	94.9	105.1	95.2	104.8	95.4	104.6	95.7	104.3
3.8	94.0	106.0	94.2	105.8	94.4	105.6	94.6	105.4	94.8	105.2	95.1	104.9	95.3	104.7	95.6	104.4	95.9	104.1
3.9	94.2	105.8	94.4	105.6	94.6	105.4	94.8	105.2	95.0	105.0	95.2	104.8	95.5	104.5	95.8	104.2	96.0	104.0
4.0	94.4	105.6	94.5	105.5	94.7	105.3	95.0	105.0	95.2	104.8	95.4	104.6	95.7	104.3	95.9	104.1	96.2	103.8
4.1	94.5	105.5	94.7	105.3	94.9	105.1	95.1	104.9	95.4	104.6	95.6	104.4	95.9	104.2	96.1	103.9	96.4	103.6
4.2	94.7	105.3	94.9	105.1	95.1	104.9	95.3	104.7	95.6	104.5	95.8	104.2	96.0	104.0	96.3	103.7	96.6	103.5
4.3	95.0	105.1	95.1	104.9	95.3	104.7	95.5	104.5	95.8	104.3	96.0	104.0	96.3	103.8	96.5	103.6	96.8	103.3

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 40 ASSAYS- 4 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	1.0		1.1		1.2		1.3		1.4		1.5		1.6		1.7		1.8	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
4.4	95.2	104.9	95.3	104.7	95.5	104.5	95.8	104.3	96.0	104.1	96.2	103.8	96.5	103.6	96.8	103.4	97.1	103.1
4.5	95.4	104.7	95.6	104.5	95.8	104.3	96.0	104.1	96.2	103.9	96.5	103.7	96.7	103.4	97.0	103.2	97.3	102.9
4.6	95.6	104.5	95.8	104.3	96.0	104.1	96.2	103.9	96.5	103.7	96.7	103.5	97.0	103.2	97.3	103.0	97.7	102.7
4.7	95.9	104.2	96.1	104.1	96.3	103.9	96.5	103.7	96.8	103.5	97.0	103.2	97.3	103.0	97.7	102.8	98.0	102.5
4.8	96.2	104.0	96.4	103.8	96.6	103.7	96.8	103.5	97.1	103.3	97.4	103.0	97.7	102.8	98.1	102.5	98.5	102.3
4.9	96.5	103.8	96.7	103.6	97.0	103.4	97.2	103.2	97.5	103.0	97.8	102.8	98.2	102.5	98.6	102.3	99.1	102.0
5.0	96.9	103.6	97.2	103.4	97.4	103.2	97.7	103.0	98.0	102.8	98.4	102.5	98.8	102.3	99.3	102.0	99.9	101.7
5.1	97.5	103.3	97.7	103.1	98.0	102.9	98.3	102.7	98.7	102.5	99.1	102.2	99.7	101.9	100.3	101.6	101.1	101.2
5.2	98.1	103.0	98.4	102.8	98.8	102.6	99.2	102.4	99.6	102.1	100.2	101.8	100.9	101.5				
5.3	99.1	102.6	99.5	102.4	99.9	102.2	100.4	101.9	101.0	101.6								
5.4	100.5	102.1	100.9	101.8	101.4	101.5												

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
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SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	1.9		2.0		2.1		2.2		2.3		2.4		2.5		2.6		2.7	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	93.3	106.7	93.7	106.3	94.2	105.8	94.6	105.4	95.0	105.0	95.5	104.5	95.9	104.1	96.4	103.6	96.8	103.2
0.2	93.3	106.7	93.7	106.3	94.2	105.8	94.6	105.4	95.1	104.9	95.5	104.5	95.9	104.1	96.4	103.6	96.8	103.2
0.3	93.3	106.7	93.8	106.2	94.2	105.8	94.6	105.4	95.1	104.9	95.5	104.5	95.9	104.1	96.4	103.6	96.8	103.2
0.4	93.3	106.7	93.8	106.2	94.2	105.8	94.6	105.4	95.1	104.9	95.5	104.5	96.0	104.0	96.4	103.6	96.8	103.2
0.5	93.3	106.7	93.8	106.2	94.2	105.8	94.6	105.4	95.1	104.9	95.5	104.5	96.0	104.0	96.4	103.6	96.9	103.1
0.6	93.4	106.6	93.8	106.2	94.2	105.8	94.7	105.3	95.1	104.9	95.5	104.5	96.0	104.0	96.4	103.6	96.9	103.1
0.7	93.4	106.6	93.8	106.2	94.3	105.7	94.7	105.3	95.1	104.9	95.6	104.4	96.0	104.0	96.4	103.6	96.9	103.1
0.8	93.4	106.6	93.8	106.2	94.3	105.7	94.7	105.3	95.1	104.9	95.6	104.4	96.0	104.0	96.5	103.5	96.9	103.1
0.9	93.5	106.5	93.9	106.1	94.3	105.7	94.7	105.3	95.2	104.8	95.6	104.4	96.0	104.0	96.5	103.5	96.9	103.1
1.0	93.5	106.5	93.9	106.1	94.3	105.7	94.8	105.2	95.2	104.8	95.6	104.4	96.1	103.9	96.5	103.5	97.0	103.0
1.1	93.5	106.5	93.9	106.1	94.4	105.6	94.8	105.2	95.2	104.8	95.7	104.3	96.1	103.9	96.5	103.5	97.0	103.0
1.2	93.6	106.4	94.0	106.0	94.4	105.6	94.8	105.2	95.3	104.7	95.7	104.3	96.1	103.9	96.6	103.4	97.0	103.0
1.3	93.6	106.4	94.0	106.0	94.5	105.5	94.9	105.1	95.3	104.7	95.7	104.3	96.2	103.8	96.6	103.4	97.1	103.0
1.4	93.7	106.3	94.1	105.9	94.5	105.5	94.9	105.1	95.4	104.6	95.8	104.2	96.2	103.8	96.6	103.4	97.1	102.9
1.5	93.7	106.3	94.1	105.9	94.6	105.4	95.0	105.0	95.4	104.6	95.8	104.2	96.3	103.7	96.7	103.3	97.1	102.9
1.6	93.8	106.2	94.2	105.8	94.6	105.4	95.0	105.0	95.4	104.6	95.9	104.1	96.3	103.7	96.7	103.3	97.2	102.8
1.7	93.8	106.2	94.3	105.7	94.7	105.3	95.1	104.9	95.5	104.5	95.9	104.1	96.3	103.7	96.8	103.2	97.2	102.8
1.8	93.9	106.1	94.3	105.7	94.7	105.3	95.1	104.9	95.6	104.4	96.0	104.0	96.4	103.6	96.8	103.2	97.3	102.7
1.9	94.0	106.0	94.4	105.6	94.8	105.2	95.2	104.8	95.6	104.4	96.0	104.0	96.5	103.5	96.9	103.1	97.3	102.7
2.0	94.1	105.9	94.5	105.5	94.9	105.1	95.3	104.7	95.7	104.3	96.1	103.9	96.5	103.5	96.9	103.1	97.4	102.6
2.1	94.1	105.9	94.5	105.5	94.9	105.1	95.3	104.7	95.7	104.3	96.2	103.8	96.6	103.4	97.0	103.0	97.5	102.6
2.2	94.2	105.8	94.6	105.4	95.0	105.0	95.4	104.6	95.8	104.2	96.2	103.8	96.6	103.4	97.1	102.9	97.5	102.5
2.3	94.3	105.7	94.7	105.3	95.1	104.9	95.5	104.5	95.9	104.1	96.3	103.7	96.7	103.3	97.1	102.9	97.6	102.4
2.4	94.4	105.6	94.8	105.2	95.2	104.8	95.6	104.4	96.0	104.0	96.4	103.6	96.8	103.2	97.2	102.8	97.7	102.4
2.5	94.5	105.5	94.9	105.1	95.3	104.7	95.7	104.3	96.0	104.0	96.5	103.6	96.9	103.1	97.3	102.7	97.8	102.3
2.6	94.6	105.4	95.0	105.0	95.4	104.6	95.7	104.3	96.1	103.9	96.5	103.5	97.0	103.1	97.4	102.6	97.9	102.2
2.7	94.7	105.3	95.1	104.9	95.5	104.5	95.8	104.2	96.2	103.8	96.6	103.4	97.0	103.0	97.5	102.6	98.0	102.1
2.8	94.8	105.2	95.2	104.8	95.6	104.4	95.9	104.1	96.3	103.7	96.7	103.3	97.1	102.9	97.6	102.5	98.1	102.1
2.9	94.9	105.1	95.3	104.7	95.7	104.3	96.0	104.0	96.4	103.6	96.8	103.2	97.2	102.8	97.7	102.4	98.2	102.0
3.0	95.1	104.9	95.4	104.6	95.8	104.2	96.1	103.9	96.5	103.5	96.9	103.1	97.3	102.7	97.8	102.3	98.3	101.9
3.1	95.2	104.8	95.5	104.5	95.9	104.1	96.3	103.8	96.6	103.4	97.0	103.0	97.5	102.6	97.9	102.2	98.4	101.8
3.2	95.3	104.7	95.7	104.3	96.0	104.0	96.4	103.6	96.7	103.3	97.1	102.9	97.6	102.5	98.1	102.1	98.6	101.7
3.3	95.4	104.6	95.8	104.2	96.1	103.9	96.5	103.5	96.9	103.2	97.3	102.8	97.7	102.4	98.2	102.0	98.8	101.6
3.4	95.6	104.4	95.9	104.1	96.3	103.8	96.6	103.4	97.0	103.0	97.4	102.7	97.9	102.3	98.4	101.9	99.0	101.5
3.5	95.7	104.3	96.1	104.0	96.4	103.6	96.8	103.3	97.1	102.9	97.6	102.5	98.0	102.2	98.6	101.8	99.2	101.3
3.6	95.9	104.1	96.2	103.8	96.5	103.5	96.9	103.1	97.3	102.8	97.7	102.4	98.2	102.0	98.8	101.6	99.5	101.2
3.7	96.0	104.0	96.3	103.7	96.7	103.3	97.0	103.0	97.4	102.7	97.9	102.3	98.4	101.9	99.0	101.5	99.8	101.0
3.8	96.2	103.8	96.5	103.5	96.8	103.2	97.2	102.9	97.6	102.5	98.1	102.2	98.6	101.8	99.3	101.4	100.2	100.9
3.9	96.3	103.7	96.7	103.4	97.0	103.1	97.4	102.7	97.8	102.4	98.3	102.0	98.9	101.6	99.6	101.2	100.6	100.7
4.0	96.5	103.5	96.8	103.2	97.2	102.9	97.6	102.6	98.0	102.2	98.6	101.9	99.2	101.5	100.0	101.0		
4.1	96.7	103.4	97.0	103.1	97.4	102.7	97.8	102.4	98.3	102.1	98.9	101.7	99.6	101.3	100.6	100.8		
4.2	96.9	103.2	97.3	102.9	97.6	102.6	98.1	102.3	98.6	101.9	99.2	101.5	100.1	101.1				
4.3	97.1	103.0	97.5	102.7	97.9	102.4	98.4	102.1	99.0	101.7	99.7	101.3	100.7	100.8				

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 40 ASSAYS- 4 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	1.9		2.0		2.1		2.2		2.3		2.4		2.5		2.6		2.7	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
4.4	97.4	102.8	97.8	102.5	98.2	102.2	98.7	101.9	99.4	101.5	100.3	101.1						
4.5	97.7	102.6	98.1	102.3	98.6	102.0	99.2	101.7	100.0	101.3								
4.6	98.0	102.4	98.5	102.1	99.1	101.8	99.8	101.4	100.7	101.0								
4.7	98.5	102.2	99.0	101.9	99.7	101.5	100.5	101.1										
4.8	99.0	102.0	99.6	101.6	100.5	101.2												
4.9	99.7	101.7	100.5	101.3														
5.0	100.7	101.3																

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
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STANDARD DEVIATION OF LOCATION MEANS

	2.8		2.9		3.0		3.1		3.2		3.3		3.4		3.5		3.6	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	97.3	102.7	97.8	102.3	98.3	101.8	98.9	101.3	99.6	100.8								
0.2	97.3	102.7	97.8	102.3	98.3	101.8	98.9	101.3	99.6	100.8								
0.3	97.3	102.7	97.8	102.3	98.3	101.8	98.9	101.3	99.6	100.8								
0.4	97.3	102.7	97.8	102.3	98.3	101.8	98.9	101.3	99.6	100.8								
0.5	97.3	102.7	97.8	102.2	98.3	101.8	98.9	101.3	99.6	100.8								
0.6	97.3	102.7	97.8	102.2	98.3	101.8	98.9	101.3	99.7	100.8								
0.7	97.3	102.7	97.8	102.2	98.4	101.8	99.0	101.3	99.7	100.8								
0.8	97.4	102.6	97.9	102.2	98.4	101.7	99.0	101.3	99.7	100.8								
0.9	97.4	102.6	97.9	102.2	98.4	101.7	99.0	101.2	99.8	100.7								
1.0	97.4	102.6	97.9	102.1	98.4	101.7	99.1	101.2	99.8	100.7								
1.1	97.4	102.6	97.9	102.1	98.5	101.7	99.1	101.2	99.9	100.7								
1.2	97.5	102.5	98.0	102.1	98.5	101.6	99.1	101.2	99.9	100.6								
1.3	97.5	102.5	98.0	102.1	98.6	101.6	99.2	101.1	100.0	100.6								
1.4	97.6	102.5	98.1	102.0	98.6	101.6	99.3	101.1	100.1	100.6								
1.5	97.6	102.4	98.1	102.0	98.7	101.5	99.3	101.0	100.2	100.5								
1.6	97.6	102.4	98.1	101.9	98.7	101.5	99.4	101.0	100.3	100.5								
1.7	97.7	102.3	98.2	101.9	98.8	101.4	99.5	100.9	100.4	100.4								
1.8	97.8	102.3	98.3	101.8	98.9	101.4	99.6	100.9										
1.9	97.8	102.2	98.3	101.8	98.9	101.3	99.7	100.8										
2.0	97.9	102.2	98.4	101.7	99.0	101.3	99.8	100.8										
2.1	97.9	102.1	98.5	101.7	99.1	101.2	99.9	100.7										
2.2	98.0	102.1	98.6	101.6	99.2	101.2	100.1	100.6										
2.3	98.1	102.0	98.7	101.6	99.3	101.1	100.2	100.6										
2.4	98.2	101.9	98.8	101.5	99.5	101.0	100.4	100.5										
2.5	98.3	101.9	98.9	101.4	99.6	100.9												
2.6	98.4	101.8	99.0	101.3	99.8	100.9												
2.7	98.5	101.7	99.1	101.3	100.0	100.8												
2.8	98.6	101.6	99.3	101.2	100.2	100.7												
2.9	98.8	101.5	99.5	101.1	100.4	100.6												
3.0	98.9	101.4	99.7	101.0														
3.1	99.1	101.3	99.9	100.9														
3.2	99.3	101.2	100.2	100.7														
3.3	99.5	101.1	100.5	100.6														
3.4	99.8	101.0																
3.5	100.1	100.9																
3.6	100.4	100.7																

ACCEPTANCE LIMITS FOR DISSOLUTION (N = 6, Q = 80.0)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES WITH 95.0 % ASSURANCE,
THAT AT LEAST 95.0% OF ALL FUTURE SAMPLES TESTED
FOR DISSOLUTION WILL PASS THE USP TEST)
TABLE ENTRY IS UPPER LIMIT ON CV OF 6 DISSOLUTION ASSAYS

MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)
80.2	0.09	84.2	1.80	88.2	3.34	92.2	4.28	96.2	4.69
80.4	0.18	84.4	1.88	88.4	3.41	92.4	4.31	96.4	4.70
80.6	0.27	84.6	1.96	88.6	3.47	92.6	4.33	96.6	4.72
80.8	0.36	84.8	2.04	88.8	3.54	92.8	4.36	96.8	4.73
81.0	0.44	85.0	2.12	89.0	3.60	93.0	4.38	97.0	4.75
81.2	0.53	85.2	2.20	89.2	3.66	93.2	4.41	97.2	4.77
81.4	0.62	85.4	2.28	89.4	3.71	93.4	4.43	97.4	4.78
81.6	0.71	85.6	2.36	89.6	3.77	93.6	4.45	97.6	4.80
81.8	0.79	85.8	2.44	89.8	3.82	93.8	4.47	97.8	4.81
82.0	0.88	86.0	2.52	90.0	3.87	94.0	4.49	98.0	4.82
82.2	0.96	86.2	2.59	90.2	3.92	94.2	4.51	98.2	4.84
82.4	1.05	86.4	2.67	90.4	3.96	94.4	4.53	98.4	4.85
82.6	1.13	86.6	2.75	90.6	4.00	94.6	4.55	98.6	4.87
82.8	1.22	86.8	2.82	90.8	4.04	94.8	4.57	98.8	4.88
83.0	1.30	87.0	2.90	91.0	4.08	95.0	4.59	99.0	4.90
83.2	1.39	87.2	2.98	91.2	4.12	95.2	4.60	99.2	4.91
83.4	1.47	87.4	3.05	91.4	4.15	95.4	4.62	99.4	4.92
83.6	1.55	87.6	3.12	91.6	4.19	95.6	4.64	99.6	4.94
83.8	1.63	87.8	3.20	91.8	4.22	95.8	4.65	99.8	4.95
84.0	1.72	88.0	3.27	92.0	4.25	96.0	4.67	100.0	4.97

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 60 ASSAYS- 6 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25
0.25	80.50	80.90	81.40	81.80	82.20	82.70	83.10	83.50	84.00	84.40	84.80	85.30	85.70	86.10	86.60	87.00	87.50
0.50	80.60	81.00	81.40	81.80	82.20	82.70	83.10	83.50	84.00	84.40	84.80	85.30	85.70	86.10	86.60	87.10	87.50
0.75	80.60	81.00	81.40	81.80	82.30	82.70	83.10	83.50	84.00	84.40	84.80	85.30	85.70	86.20	86.60	87.10	87.60
1.00	80.70	81.10	81.50	81.90	82.30	82.70	83.10	83.60	84.00	84.40	84.90	85.30	85.70	86.20	86.60	87.10	87.60
1.25	80.80	81.10	81.50	81.90	82.30	82.70	83.20	83.60	84.00	84.40	84.90	85.30	85.70	86.20	86.60	87.10	87.60
1.50	80.90	81.20	81.60	82.00	82.40	82.80	83.20	83.60	84.00	84.50	84.90	85.30	85.80	86.20	86.60	87.10	87.60
1.75	81.00	81.30	81.60	82.00	82.40	82.80	83.20	83.60	84.10	84.50	84.90	85.30	85.80	86.20	86.70	87.10	87.60
2.00	81.10	81.40	81.70	82.10	82.50	82.90	83.30	83.70	84.10	84.50	84.90	85.40	85.80	86.20	86.70	87.10	87.70
2.25	81.20	81.50	81.80	82.20	82.50	82.90	83.30	83.70	84.10	84.50	85.00	85.40	85.80	86.30	86.70	87.20	87.70
2.50	81.30	81.60	81.90	82.20	82.60	83.00	83.40	83.80	84.20	84.60	85.00	85.40	85.80	86.30	86.70	87.20	87.70
2.75	81.40	81.70	82.00	82.30	82.70	83.00	83.40	83.80	84.20	84.60	85.00	85.50	85.90	86.30	86.80	87.20	87.80
3.00	81.50	81.80	82.10	82.40	82.70	83.10	83.50	83.90	84.30	84.70	85.10	85.50	85.90	86.30	86.80	87.30	87.80
3.25	81.60	81.90	82.20	82.50	82.80	83.20	83.50	83.90	84.30	84.70	85.10	85.50	86.00	86.40	86.80	87.30	87.90
3.50	81.70	82.00	82.30	82.60	82.90	83.20	83.60	84.00	84.40	84.80	85.20	85.60	86.00	86.40	86.90	87.40	87.90
3.75	81.80	82.10	82.30	82.70	83.00	83.30	83.70	84.00	84.40	84.80	85.20	85.60	86.00	86.50	86.90	87.50	88.00
4.00	81.90	82.10	82.40	82.70	83.10	83.40	83.80	84.10	84.50	84.90	85.30	85.70	86.10	86.50	87.00	87.50	88.10
4.25	82.00	82.20	82.50	82.80	83.20	83.50	83.80	84.20	84.60	84.90	85.30	85.70	86.20	86.60	87.10	87.60	88.20
4.50	82.00	82.30	82.60	82.90	83.20	83.60	83.90	84.30	84.60	85.00	85.40	85.80	86.20	86.70	87.20	87.70	88.30
4.75	82.10	82.40	82.70	83.00	83.30	83.70	84.00	84.30	84.70	85.10	85.50	85.90	86.30	86.70	87.20	87.80	88.40
5.00	82.20	82.50	82.80	83.10	83.40	83.70	84.10	84.40	84.80	85.10	85.50	85.90	86.40	86.80	87.30	87.90	88.60

(CONTINUED)

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 60 ASSAYS- 6 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25
5.25	82.30	82.60	82.90	83.20	83.50	83.80	84.20	84.50	84.90	85.20	85.60	86.00	86.40	86.90	87.40	88.00	88.70
5.50	82.40	82.70	83.00	83.30	83.60	83.90	84.20	84.60	84.90	85.30	85.70	86.10	86.60	87.00	87.60	88.20	88.90
5.75	82.50	82.80	83.10	83.40	83.70	84.00	84.30	84.70	85.00	85.40	85.80	86.20	86.70	87.20	87.70	88.40	89.10
6.00	82.60	82.90	83.20	83.50	83.80	84.10	84.40	84.80	85.10	85.50	85.90	86.30	86.80	87.30	87.90	88.60	89.30
6.25	82.70	83.00	83.30	83.60	83.90	84.20	84.60	84.90	85.30	85.60	86.00	86.50	87.00	87.50	88.10	88.80	89.60
6.50	82.90	83.10	83.40	83.70	84.00	84.40	84.70	85.00	85.40	85.80	86.20	86.60	87.10	87.70	88.30	89.00	89.90
6.75	83.00	83.30	83.60	83.90	84.20	84.50	84.80	85.20	85.50	85.90	86.40	86.80	87.30	87.90	88.60	89.30	90.20
7.00	83.10	83.40	83.70	84.00	84.30	84.70	85.00	85.30	85.70	86.10	86.60	87.00	87.60	88.20	88.90	89.70	90.60
7.25	83.30	83.60	83.90	84.20	84.50	84.80	85.20	85.50	85.90	86.30	86.80	87.30	87.90	88.50	89.20	90.00	91.00
7.50	83.50	83.80	84.10	84.40	84.70	85.10	85.40	85.80	86.20	86.60	87.10	87.60	88.20	88.80	89.60	90.40	91.40
7.75	83.80	84.10	84.40	84.70	85.00	85.30	85.70	86.10	86.50	86.90	87.40	87.90	88.60	89.30	90.00	90.90	91.80
8.00	84.10	84.40	84.70	85.00	85.30	85.60	86.00	86.40	86.80	87.30	87.80	88.40	89.00	89.70	90.50	91.40	92.30
8.25	84.40	84.70	85.00	85.30	85.70	86.00	86.40	86.80	87.20	87.70	88.20	88.80	89.50	90.20	91.00	91.90	92.80
8.50	84.80	85.10	85.40	85.80	86.10	86.40	86.80	87.20	87.70	88.20	88.70	89.30	90.00	90.70	91.50	92.40	93.40
8.75	85.30	85.60	85.90	86.20	86.60	86.90	87.30	87.80	88.20	88.70	89.30	89.90	90.60	91.30	92.10	93.00	93.90
9.00	85.80	86.10	86.50	86.80	87.10	87.50	87.90	88.30	88.80	89.30	89.90	90.50	91.20	91.90	92.70	93.50	94.50
9.25	86.50	86.80	87.10	87.40	87.80	88.10	88.50	89.00	89.40	90.00	90.50	91.10	91.80	92.50	93.30	94.10	95.00
9.50	87.10	87.40	87.70	88.10	88.40	88.80	89.20	89.60	90.10	90.60	91.20	91.80	92.40	93.20	93.90	94.70	95.60
9.75	87.80	88.10	88.40	88.80	89.10	89.50	89.90	90.30	90.80	91.30	91.90	92.50	93.10	93.80	94.60	95.40	96.20
10.00	88.50	88.80	89.20	89.50	89.80	90.20	90.60	91.10	91.50	92.00	92.60	93.10	93.80	94.50	95.20	96.00	96.80

(CONTINUED)

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 60 ASSAYS- 6 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25
10.25	89.30	89.60	89.90	90.20	90.60	91.00	91.40	91.80	92.20	92.70	93.30	93.80	94.50	95.10	95.90	96.60	97.40
10.50	90.00	90.30	90.60	91.00	91.30	91.70	92.10	92.50	93.00	93.50	94.00	94.50	95.20	95.80	96.50	97.30	98.10
10.75	90.80	91.10	91.40	91.70	92.10	92.40	92.80	93.30	93.70	94.20	94.70	95.30	95.90	96.50	97.20	97.90	98.70
11.00	91.50	91.80	92.10	92.50	92.80	93.20	93.60	94.00	94.40	94.90	95.40	96.00	96.60	97.20	97.90	98.60	99.40
11.25	92.30	92.60	92.90	93.20	93.60	94.00	94.30	94.80	95.20	95.70	96.20	96.70	97.30	97.90	98.60	99.30	100.00
11.50	93.10	93.40	93.70	94.00	94.30	94.70	95.10	95.50	95.90	96.40	96.90	97.40	98.00	98.60	99.30	100.00	
11.75	93.80	94.10	94.40	94.80	95.10	95.50	95.90	96.30	96.70	97.20	97.60	98.20	98.70	99.30	100.00		
12.00	94.60	94.90	95.20	95.50	95.90	96.30	96.60	97.00	97.50	97.90	98.40	98.90	99.50				
12.25	95.40	95.70	96.00	96.30	96.70	97.00	97.40	97.80	98.20	98.70	99.20	99.70					
12.50	96.20	96.50	96.80	97.10	97.40	97.80	98.20	98.60	99.00	99.40	99.90						
12.75	96.90	97.20	97.60	97.90	98.20	98.60	99.00	99.40	99.80								
13.00	97.70	98.00	98.30	98.70	99.00	99.40	99.70										
13.25	98.50	98.80	99.10	99.50	99.80												
13.50	99.30	99.60	99.90														

(CONTINUED)

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 60 ASSAYS- 6 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25
0.25	88.10	88.70	89.50	90.30	91.40	92.60	94.00	95.40	96.90	98.40	99.90	
0.50	88.10	88.70	89.50	90.40	91.40	92.60	94.00	95.40	96.90	98.40	99.90	
0.75	88.10	88.70	89.50	90.40	91.40	92.70	94.00	95.50	96.90	98.40	99.90	
1.00	88.10	88.80	89.50	90.40	91.50	92.70	94.10	95.50	97.00	98.50	100.00	
1.25	88.10	88.80	89.50	90.40	91.50	92.80	94.10	95.60	97.00	98.50	100.00	
1.50	88.20	88.80	89.60	90.50	91.60	92.80	94.20	95.60	97.10	98.60		
1.75	88.20	88.90	89.60	90.50	91.60	92.90	94.30	95.70	97.20	98.60		
2.00	88.20	88.90	89.70	90.60	91.70	93.00	94.40	95.80	97.20	98.70		
2.25	88.30	88.90	89.70	90.70	91.80	93.10	94.50	95.90	97.30	98.80		
2.50	88.30	89.00	89.80	90.80	91.90	93.20	94.60	96.00	97.50	98.90		
2.75	88.40	89.10	89.90	90.90	92.00	93.30	94.70	96.10	97.60	99.10		
3.00	88.40	89.10	90.00	91.00	92.20	93.50	94.80	96.30	97.70	99.20		
3.25	88.50	89.20	90.10	91.10	92.30	93.60	95.00	96.40	97.90	99.30		
3.50	88.60	89.30	90.20	91.30	92.50	93.80	95.20	96.60	98.00	99.50		
3.75	88.70	89.40	90.30	91.40	92.60	93.90	95.30	96.70	98.20	99.60		
4.00	88.80	89.60	90.50	91.60	92.80	94.10	95.50	96.90	98.40	99.80		
4.25	88.90	89.70	90.70	91.80	93.00	94.30	95.70	97.10	98.60	100.00		
4.50	89.00	89.90	90.80	92.00	93.20	94.60	95.90	97.30	98.80			
4.75	89.20	90.00	91.00	92.20	93.50	94.80	96.20	97.60	99.00			
5.00	89.30	90.20	91.30	92.40	93.70	95.00	96.40	97.80	99.20			

(CONTINUED)

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 60 ASSAYS- 6 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25
5.25	89.50	90.40	91.50	92.70	94.00	95.30	96.70	98.00	99.50			
5.50	89.70	90.70	91.80	93.00	94.30	95.60	96.90	98.30	99.70			
5.75	90.00	90.90	92.10	93.30	94.50	95.90	97.20	98.60	100.00			
6.00	90.20	91.20	92.40	93.60	94.90	96.20	97.50	98.90				
6.25	90.50	91.60	92.70	93.90	95.20	96.50	97.80	99.20				
6.50	90.80	91.90	93.00	94.30	95.50	96.80	98.10	99.50				
6.75	91.20	92.30	93.40	94.60	95.90	97.20	98.50	99.80				
7.00	91.60	92.60	93.80	95.00	96.20	97.50	98.80					
7.25	92.00	93.10	94.20	95.40	96.60	97.90	99.20					
7.50	92.40	93.50	94.60	95.80	97.00	98.30	99.50					
7.75	92.90	93.90	95.10	96.20	97.40	98.70	99.90					
8.00	93.30	94.40	95.50	96.70	97.80	99.10						
8.25	93.80	94.90	96.00	97.10	98.30	99.50						
8.50	94.30	95.40	96.50	97.60	98.70	99.90						
8.75	94.90	95.90	96.90	98.10	99.20							
9.00	95.40	96.40	97.50	98.50	99.70							
9.25	96.00	96.90	98.00	99.00								
9.50	96.50	97.50	98.50	99.60								
9.75	97.10	98.10	99.10									
10.00	97.70	98.60	99.60									

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(CONTINUED)

ACCEPTANCE LIMITS FOR DISSOLUTION (Q = 80.0)
SAMPLING PLAN 2
LOWER BOUND = 95.0, CONFIDENCE LEVEL = 95.0
TABLE ENTRIES ARE LOWER LIMITS ON THE MEAN
OF 60 ASSAYS- 6 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

SE	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	7.25
10.25	98.30	99.20										
10.50	98.90	99.80										
10.75	99.60											
11.00												
11.25												
11.50												
11.75												
12.00												
12.25												
12.50												
12.75												
13.00												
13.25												
13.50												

APPENDIX D
WINDOW INPUT ERROR CHECKING
TEST DATA

MANAGER WINDOWS

PRIMARY WINDOW	INPUT REQUESTED	INPUT	EXPECTED RESPONSE	FOUND RESPONSE	AGREE? (Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MAIN	CU PLAN 1	Y	N	N	Y
		y	N	N	Y
		N	N	N	Y
		n	N	N	Y
		G	ES	ES	Y
		7	ES	ES	Y
	CU PLAN 2	Y	N	N	Y
		y	N	N	Y
		N	N	N	Y
		n	N	N	Y
		h	ES	ES	Y
		8	ES	ES	Y
	DISS PLAN 1	Y	N	N	Y
		y	N	N	Y
		N	N	N	Y
		n	N	N	Y
		T	ES	ES	Y
		.	ES	ES	Y
	DISS PLAN 2	Y	N	N	Y
		y	N	N	Y
		N	N	N	Y
		n	N	N	Y
		G	ES	ES	Y
		0	ES	ES	Y
GOBACK	MAIN MENU	Y	N	N	Y
		y	N	N	Y
		N	N	N	Y
		n	N	N	Y
		k	ES	ES	Y
		6	ES	ES	Y

CONTENT UNIFORMITY
SAMPLING PLAN 1
WINDOWS

PRIMARY WINDOW	INPUT REQUESTED	INPUT	EXPECTED RESPONSE	FOUND RESPONSE	AGREE? (Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MCUSP1	DOSAGE FORM	CAPSULE	N	N	Y
		caPSULE	ES	ES	Y
		567	ES	ES	Y
		TABLET	N	N	~~N~~ Y JB
		Tablet	ES	ES	Y
		&	ES	ES	Y
	SAMPLE SIZE	5	N	N	Y
		4	ES	ES	Y
		A	ES	ES	Y
		2000	N	N	Y
	BOUND	50	N	N	Y
		99	N	N	Y
		49.9	ES	ES	Y
		99.1	ES	ES	Y
		75	N	N	Y
		A	ES	ES	Y
	CONFIDENCE LEVEL	50	N	N	Y } must include a decimal
		99	N	N	Y }
		49.9	ES	ES	Y
		99.1	ES	ES	Y
		65	N	N	~~N~~ Y JB
		B	ES	ES	Y
	ACCEPTANCE TABLE	Y	N	N	Y
		N	N	N	Y
		y	N	N	Y
		n	N	N	Y
		k	ES	ES	Y
		6	ES	ES	Y
	EVALUATE	Y	N	N	Y
		y	N	N	Y
		N	N	N	Y
		n	N	N	Y
		L	ES	ES	Y
		4	ES	ES	Y
	LOWER BOUND	Y	N	N	Y
		y	N	N	Y
		N	N	N	Y
		n	N	N	Y
		m	ES	ES	Y
		9	ES	ES	Y
SMAIN	LOWER BOUND MEAN	1	N	N	Y
		200	N	N	Y
		0	ES	ES	Y
		H	ES	ES	Y

		4.1	ES	ES	Y
	UPPER BOUND MEAN	1	N	N	Y*
		200	N	N	Y*
		0	ES	ES	Y
		P	ES	ES	Y
		4.1	ES	ES	Y
	INCREMENT MEAN	1	N	N	Y
		200	N	N	Y
		0	ES	ES	Y
		Q	ES	ES	Y
		5.6	ES	ES	Y
	LOWER BOUND CV	1	N	N	Y*
		200	N	N	Y*
		0	ES	ES	Y
		R	ES	ES	Y
		6.2	ES	ES	Y
	UPPER BOUND CV	1	N	N	Y*
		200	N	N	Y*
		0	ES	ES	Y
		S	ES	ES	Y
		0.2	ES	ES	Y
	INCREMENT CV	1	N	N	Y
		200	N	N	Y
		0	ES	ES	Y
		T	ES	ES	Y
		6.7	ES	ES	Y
TMAIN	SAMPLE MEAN	85.1	N	N	Y
		114.9	N	N	Y
		85.0	ES	ES	Y
		115.0	ES	ES	Y
		100.123	N	N	Y
		S	ES	ES	Y
	SAMPLE CV	0.1	N	N	Y
		0	ES	ES	Y
		15	N	N	Y
		A	ES	ES	Y
		-3	ES	ES	Y

} must agree w upperbou[nd]

{ only takes 2 decim[als]

* Must agree with other bound, i.e, a lower bound must be lower than (or <=) the upper bound and an upper bound must be >= lower bound

CONTENT UNIFORMITY
SAMPLING PLAN 2
WINDOWS

PRIMARY WINDOW	INPUT REQUESTED	INPUT	EXPECTED RESPONSE	FOUND RESPONSE	AGREE? (Y or N)
			N = NONE		
			ES = ERROR SCREEN		

MCUSP2	DOSAGE FORM	CAPSULE	N	N	Y	
		caPSULE	ES	ES	Y	
		567	ES	ES	Y	
		TABLET	N	N	Y	
		Tablet	ES	ES	Y	
		&	ES	ES	Y	
	NUMBER LOCATIONS	3	N	N	Y	
		2	ES	ES	Y	
		A	ES	ES	Y	
		2000	N	N	Y	
	NUMBER PER LOCATION	2	N	N	Y	
		1	ES	ES	Y	
		B	ES	ES	Y	
		2000	N	N	Y	
	BOUND	50	N	N	Y	← must use decimal
		99	N	N	Y	← "
		49.9	ES	ES	Y	
		99.1	ES	ES	Y	
		80	N	~~ES~~ N	Y	← "
		B	ES	ES	Y	
	CONFIDENCE LEVEL	50	N	N	Y	← "
		99	N	N	Y	← "
		49.9	ES	ES	Y	
		99.1	ES	ES	Y	
		70	N	N	Y	←
		C	ES	ES	Y	
	ACCEPTANCE TABLE	Y	N	N	Y	
		N	N	N	Y	
		y	N	N	Y	
		n	N	N	Y	
		k	ES	ES	Y	
		6	ES	ES	Y	
	EVALUATE	Y	N	N	Y	
		y	N	N	Y	
		N	N	N	Y	
		n	N	N	Y	
		d	ES	ES	Y	
		7	ES	ES	Y	
	LOWER BOUND	Y	N	N	Y	
		y	N	N	Y	
		N	N	N	Y	
		n	N	N	Y	
		f	ES	ES	Y	
		8	ES	ES	Y	
SMAIN	LOWER BOUND MEAN	1	N	N	Y	
		200	N	N	Y	
		0	ES	ES	Y	
		G	ES	ES	Y	
		4.1	ES	ES	Y	
	UPPER BOUND MEAN	1	N	N	Y*	
		200	N	N	Y*	

* See p 3

		0	ES	ES	Y
		H	ES	ES	Y
		0.4	ES	ES	Y
	INCREMENT MEAN	1	N	N	Y
		200	N	N	Y
		0	ES	ES	Y
		H	ES	ES	Y
		6.2	ES	ES	Y
	LOWER BOUND WITHIN SD	1	N	N	Y
		200	N	N	Y *
		0	ES	ES	Y
		J	ES	ES	Y
		1.4	ES	ES	Y
	UPPER BOUND WITHIN SD	1	N	N	Y *
		200	N	N	Y
		0	ES	ES	Y
		H	ES	ES	Y
		5.1	ES	ES	Y
	INCREMENT WITHIN SD	1	N	N	Y
		200	N	N	Y
		0	ES	ES	Y
		K	ES	ES	Y
		9.2	ES	ES	Y
	LOWER BOUND BETWEEN SD	1	N	N	Y
		200	N	N	Y *
		0	ES	ES	Y
		L	ES	ES	Y
		1.6	ES	ES	Y
	UPPER BOUND BETWEEN SD	1	N	N	Y *
		200	N	N	Y *
		0	ES	ES	Y
		M	ES	ES	Y
		2.1	ES	ES	Y
	INCREMENT BETWEEN SD	1	N	N	Y
		200	N	N	Y
		0	ES	ES	Y
		N	ES	ES	Y
		4.1	ES	ES	Y
TMAIN	SAMPLE MEAN	85.1	N	N	Y
		114.9	N	N	Y
		85.0	ES	ES	Y
		115.0	ES	ES	Y
		100.123	N	N	Y (2)
		S	ES	ES	Y
	SAMPLE WITHIN SD	0.1	N	N	Y
		0	ES	ES	Y
		15	N	N	Y
		A	ES	ES	Y
		-3	ES	ES	Y
	SAMPLE BETWEEN SD	0.1	N	N	Y
		0	ES	ES	Y

(2) can only input two decimals
* See p3

		15	N	N	Y
		A	ES	ES	Y
		-3	ES	ES	Y

DISSOLUTION
SAMPLING PLAN 1
WINDOWS

PRIMARY WINDOW	INPUT REQUESTED	INPUT	EXPECTED RESPONSE	FOUND RESPONSE	AGREE? (Y or N)	
			N = NONE			
			ES = ERROR SCREEN			
MDISP1	Q	40.0	N	N	Y	
		85.0	N	N	Y	
		39.9	ES	ES	Y	
	95.1	~~85.1~~	ES	ES	Y	(3)
		P	ES	ES	Y	
	SAMPLE SIZE	3	N	N	Y	
		2	ES	ES	Y	
		A	ES	ES	Y	
		2000	N	N	Y	

(3) Error in protocol. The program gives an error message when the Q value exceeds 95.0, as stated in the error screen.

	BOUND	50	N	N	Y	
		99	N	N	Y	
		49.9	ES	ES	Y	
		99.1	ES	ES	Y	
		75	N	N	Y	
		B	ES	ES	Y	
	CONFIDENCE LEVEL	50	N	N	Y	
		99	N	N	Y	
		49.9	ES	ES	Y	
		99.1	ES	ES	Y	
		80	N	N	Y	
		C	ES	ES	Y	
	ACCEPTANCE TABLE	Y	N	N	Y	
		N	N	N	Y	
		y	N	N	Y	
		n	N	N	Y	
		K	ES	ES	Y	
		7	ES	ES	Y	
	EVALUATE	Y	N	N	Y	
		y	N	N	Y	
		N	N	N	Y	
		n	N	N	Y	
		k	ES	ES	Y	
		6	ES	ES	Y	
	LOWER BOUND	Y	N	N	Y	
		y	N	N	Y	
		N	N	N	Y	
		n	N	N	Y	
		C	ES	ES	Y	
		2	ES	ES	Y	
SMAIN	LOWER BOUND MEAN	1	N	N	Y	
		200	N	N	Y	
		0	ES	ES	Y	
		D	ES	ES	Y	
		4.9	ES	ES	Y	
	UPPER BOUND MEAN	1	N	N	Y	*
		200	N	N	Y	*
		0	ES	ES	Y	
		E	ES	ES	Y	
		9.7	ES	ES	Y	
	INCREMENT MEAN	1	N	N	Y	
		200	N	N	Y	
		0	ES	ES	Y	
		F	ES	ES	Y	
		1.4	ES	ES	Y	
	LOWER BOUND CV	1	N	N	Y	*
		200	N	N	Y	*
		0	ES	ES	Y	
		G	ES	ES	Y	
		2.2	ES	ES	Y	
	UPPER BOUND CV	1	N	N	Y	*

* upper bound must be greater or equal than low bound or else error generated as it should be.

		200	N	N	Y
		0	ES	ES	Y
		H	ES	ES	Y
		1.1	ES	ES	Y
	INCREMENT CV	1	N	N	Y
		200	N	N	Y
		0	ES	ES	Y
		J	ES	ES	Y
		5.1	ES	ES	Y
TMAIN	SAMPLE MEAN	85.1	N	N	Y
		114.9	N	N	Y
		85.0	ES	N	N **
		115.0	ES	N	~~Y~~ N JB **
		100.123	N	N	Y *
		S	ES	ES ~~ES~~ JB	Y
	SAMPLE CV	0.1	N	N	Y
		0	ES	ES	Y
		15	N	N	Y
		A	ES	ES	Y
		-3	ES	ES	Y
	DISSOLUTION				
	SAMPLING PLAN 2				
	WINDOWS				
PRIMARY	INPUT	INPUT	EXPECTED	FOUND	AGREE?
WINDOW	REQUESTED		RESPONSE	RESPONSE	(Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MDISP2	Q	40.0	N	N	Y
		85.0	N	N	Y
		39.9	ES	ES	Y
		85.1	ES	N	N ***
		P	ES	ES	Y
	NUMBER LOCATIONS	3	N	N	Y
		2	ES	ES	Y
		A	ES	ES	Y
		2000	N	N	Y
	NUMBER PER LOCATION	2	N	N	Y
		1	ES	ES	Y
		F	ES	ES	Y
		2000	N	N	Y
	BOUND	50	N	N	Y
		99	N	N	Y

* can only input 2 decimals

** no reason for these inputs to generate an error. Value must be greater than Q.

*** 85.1 should not generate an error screen (40 ≤ Q ≤ 95) - Protocol error

		49.9	ES	ES	Y	
		99.1	ES	ES	Y	
		65	N	N	Y	
		A	ES	ES	Y	
	CONFIDENCE LEVEL	50	N	N	Y	
		99	N	N	Y	
		49.9	ES	ES	Y	
		99.1	ES	ES	Y	
		80	N	N	Y	
		D	ES	ES	Y	
	ACCEPTANCE TABLE	Y	N	N	Y	
		N	N	N	Y	
		y	N	N	Y	
		n	N	N	Y	
		k	ES	ES	Y	
		6	ES	ES	Y	
	EVALUATE	Y	N	N	Y	
		y	N	N	Y	
		N	N	N	Y	
		n	N	N	Y	
		D	ES	ES	Y	
		7	ES	ES	Y	
	LOWER BOUND	Y	N	N	Y	
		y	N	N	Y	
		N	N	N	Y	
		n	N	N	Y	
		b	ES	ES	Y	
		2	ES	ES	Y	
SMAIN	LOWER BOUND MEAN	1	N	N	Y	*
		200	N	N	Y	*
		0	ES	ES	Y	
		C	ES	ES	Y	
		7.1	ES	ES	Y	
	UPPER BOUND MEAN	1	N	N	Y	*
		200	N	N	Y	*
		0	ES	ES	Y	
		D	ES	ES	Y	
		3.1	ES	ES	Y	
	INCREMENT MEAN	1	N	N	Y	
		200	N	N	Y	
		0	ES	ES	Y	
		E	ES	ES	Y	
		4.2	ES	ES	Y	
	LOWER BOUND WITHIN SD	1	N	N	Y	
		200	N	N	Y	
		0	ES	ES	Y	
		F	ES	ES	Y	
		5.3	ES	ES	Y	
	UPPER BOUND WITHIN SD	1	N	N	Y	*
		200	N	N	Y	*
		0	ES	ES	Y	

* Must conform to other bound, as is appropriate

		G	ES	ES	Y	
		6.4	ES	ES	Y	
	INCREMENT WITHIN SD	1	N	N	Y	
		200	N	N	Y	
		0	ES	ES	Y	
		H	ES	ES	Y	
		7.5	ES	ES	Y	
	LOWER BOUND BETWEEN SD	1	N	N	Y	
		200	N	N	Y	*
		0	ES	ES	Y	
		L	ES	ES	Y	
		6.3	ES	ES	Y	
	UPPER BOUND BETWEEN SD	1	N	N	Y	
		200	N	N	Y	
		0	ES	ES	Y	
		J	ES	ES	Y	
		9.7	ES	ES	Y	
	INCREMENT BETWEEN SD	1	N	N	Y	
		200	N	N	Y	
		0	ES	ES	Y	
		K	ES	ES	Y	
		7.9	ES	ES	Y	
TMAIN	SAMPLE MEAN	85.1	N	N	Y	
		114.9	N	N	Y	
		85.0	ES	N	N	**
		115.0	ES	N	N	**
		100.123	N	N	Y	***
		S	ES	ES	Y	
	SAMPLE WITHIN SD	0.1	N	N	Y	
		0	ES	ES	Y	
		15	N	N	Y	
		A	ES	ES	Y	
		-3	ES	ES	Y	
	SAMPLE BETWEEN SD	0.1	N	N	Y	
		0	ES	N	N	
		15	N	N	Y	
		A	ES	N	N	
		-3	ES	N	N	

** Same note as on p7 – Protocol error
*** Can only accept 2 decimals

10A

		G	ES		
		6.4	ES		
	INCREMENT WITHIN SD	1	N		
		200	N		
		0	ES		
		H	ES		
		7.5	ES		
	LOWER BOUND BETWEEN SD	1	N		
		200	N		
		0	ES		
		L	ES		
		6.3	ES		
	UPPER BOUND BETWEEN SD	1	N		
		200	N		
		0	ES		
		J	ES		
		9.7	ES		
	INCREMENT BETWEEN SD	1	N		
		200	N		
		0	ES		
		K	ES		
		7.9	ES		
TMAIN	SAMPLE MEAN	85.1	N		
		114.9	N		
		85.0	ES		
		115.0	ES		
		100.123	N		
		S	ES		
	SAMPLE WITHIN SD	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		
	SAMPLE BETWEEN SD	0.1	N	N	Y
		0	ES	ES	Y
		15	N	N	Y
		A	ES	ES	Y
		-3	ES	ES	Y

The retesting of "Sample Between SD" was performed after a revised copy of DISP2.SAS was received from Jim Bergum on 10/10/01

J Blanchard
10/10/01

The following inputs were evaluated in the revised protocol.
The program was found to operate as indicated in the protocol.

J Blanchard
10/12/01

DISSOLUTION
SAMPLING PLAN 1
WINDOWS

PRIMARY WINDOW	INPUT REQUESTED	INPUT	EXPECTED RESPONSE	FOUND RESPONSE	AGREE? (Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MDISP1	Q	40.0	N	N	Y
		95.0	N	N	Y
		39.9	ES	ES	Y
		95.1	ES	ES	Y
		P	ES	ES	Y
	SAMPLE SIZE	3	N		
		2	ES		
		A	ES		
		2000	N		
	BOUND	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		75	N		
		B	ES		
	CONFIDENCE LEVEL	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		80	N		
		C	ES		
	ACCEPTANCE TABLE	Y	N		
		N	N		
		y	N		
		n	N		
		K	ES		
		7	ES		
	EVALUATE	Y	N		
		y	N		
		N	N		
		n	N		
		k	ES		
		6	ES		
	LOWER BOUND	Y	N		
		y	N		
		N	N		
		n	N		
		C	ES		

		2	ES		
SMAIN	LOWER BOUND MEAN	1	N		
		200	N		
		0	ES		
		D	ES		
		4.9	ES		
	UPPER BOUND MEAN	1	N		
		200	N		
		0	ES		
		E	ES		
		9.7	ES		
	INCREMENT MEAN	1	N		
		200	N		
		0	ES		
		F	ES		
		1.4	ES		
	LOWER BOUND CV	1	N		
		200	N		
		0	ES		
		G	ES		
		2.2	ES		
	UPPER BOUND CV	1	N		
		200	N		
		0	ES		
		H	ES		
		1.1	ES		
	INCREMENT CV	1	N		
		200	N		
		0	ES		
		J	ES		
		5.1	ES		
TMAIN	SAMPLE MEAN	75.1	N	N	Y
	(Q ≐ 75)	100.0	N	N	Y
		85.5	N	N	Y
		75.0	ES	ES	Y
		S	ES	ES	Y
	SAMPLE CV	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		

DISSOLUTION
SAMPLING PLAN 2
WINDOWS

PRIMARY	INPUT	INPUT	EXPECTED	FOUND	AGREE?
WINDOW	REQUESTED		RESPONSE	RESPONSE	(Y or N)
			N = NONE		
			ES = ERROR SCREEN		
MDISP2	Q	40.0	N	N	Y
		95.0	N	N	Y
		39.9	ES	ES	Y
		95.1	ES	ES	Y
		P	ES	ES	Y
	NUMBER LOCATIONS	3	N		
		2	ES		
		A	ES		
		2000	N		
	NUMBER PER LOCATION	2	N		
		1	ES		
		F	ES		
		2000	N		
	BOUND	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		65	N		
		A	ES		
	CONFIDENCE LEVEL	50	N		
		99	N		
		49.9	ES		
		99.1	ES		
		80	N		
		D	ES		
	ACCEPTANCE TABLE	Y	N		
		N	N		
		y	N		
		n	N		
		k	ES		
		6	ES		
	EVALUATE	Y	N		
		y	N		
		N	N		
		n	N		
		D	ES		
		7	ES		
	LOWER BOUND	Y	N		
		y	N		

		N	N		
		n	N		
		b	ES		
		2	ES		
SMAIN	LOWER BOUND MEAN	1	N		
		200	N		
		0	ES		
		C	ES		
		7.1	ES		
	UPPER BOUND MEAN	1	N		
		200	N		
		0	ES		
		D	ES		
		3.1	ES		
	INCREMENT MEAN	1	N		
		200	N		
		0	ES		
		E	ES		
		4.2	ES		
	LOWER BOUND WITHIN SD	1	N		
		200	N		
		0	ES		
		F	ES		
		5.3	ES		
	UPPER BOUND WITHIN SD	1	N		
		200	N		
		0	ES		
		G	ES		
		6.4	ES		
	INCREMENT WITHIN SD	1	N		
		200	N		
		0	ES		
		H	ES		
		7.5	ES		
	LOWER BOUND BETWEEN SD	1	N		
		200	N		
		0	ES		
		L	ES		
		6.3	ES		
	UPPER BOUND BETWEEN SD	1	N		
		200	N		
		0	ES		
		J	ES		
		9.7	ES		
	INCREMENT BETWEEN SD	1	N		
		200	N		
		0	ES		

		K	ES		
		7.9	ES		
TMAIN	SAMPLE MEAN	60.1	N	N	Y
	(Q = 60)	100.0	N	N	Y
		80.6	N	N	Y
		60.0	ES	ES	Y
		S	ES	ES	Y
	SAMPLE WITHIN SD	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		
	SAMPLE BETWEEN SD	0.1	N		
		0	ES		
		15	N		
		A	ES		
		-3	ES		

APPENDIX E
LOWER BOUND CALCULATIONS

From the Bergum paper, the lower bound on passing a multiple stage test such as the USP content uniformity and dissolution test can be determined by using the following set of inequalities:

P(passing Content Uniformity 2 stage test) ≥ Max {P(meeting stage 1), P(meeting stage 2)} ≥ Max {P(passing 1st criteria of stage 1) + P(passing 2nd criteria of stage 1) - 1, P(passing 1st criteria of stage 2) + P(passing 2nd criteria of stage 2) - 1}

P(passing Dissolution stage test) ≥ Max {P(meeting stage 1), P(meeting stage 2), P(meeting stage 3)} ≥ Max {P(meeting criteria of stage 1), P(passing 1st criteria of stage 2) + P(passing 2nd criteria of stage 2) - 1, P(passing 1st criteria of stage 3) + P(passing 2nd criteria of stage 3) - 1}

The inequalities hold because these types of tests have the following property: If criteria at a given stage of the test result in failure of the overall test, it is impossible to pass the overall test at later stages.

The calculations used for Content Uniformity are described below:

i) CV:

The probability calculation for the CV is done by noting that $\sqrt{n}/cv$ has a noncentral T distribution with noncentrality parameter $\sqrt{n}\mu / \sigma$ where n is the sample size, μ is the population mean, and σ is the population standard deviation. To compute the noncentral T probability, the program uses a central F distribution critical value to approximate a non-central F distribution (Note: The T distribution squared is an F) with noncentrality parameter $n\mu^2 / \sigma^2$ where n is the sample size, μ is the population mean, and σ is the population standard deviation. This approximation can be found in Johnson & Kotz, "Distributions in Statistics: Continuous Univariate Distributions-2", published by John Wiley and Sons, 1970, p. 194. The noncentral F with numerator degrees of freedom, v_1, denominator degrees of freedom v_2, and noncentrality parameter ϕ can be approximated by $(1 + \phi/v_1)$ times a central F with v numerator degrees of freedom and v_2 denominator degrees of freedom where $v = (v_1 + \phi)^2/(v_1 + 2\phi)$. So, in SAS,

$$\text{PROBF}(x, v_1,v_2,\phi) = \text{PROBF}(x/(1 + \phi/v_1), v, v_2, 0).$$

ii) INDIVIDUAL VALUES:

Assuming a normal distribution for individual results, say x

Let P1 = Prob($85 < x < 115$)

and P2 = Prob($75 < x < 85$) + Prob($115 < x < 125$)

For Tablets, the USP test and the calculation is as follows:

Stage 1) Test 10 units.

Pass if following criteria are met:

1) CV ≤ 6.0%

2) No value is outside 85% to 115% of Claim

Calculation:

P(passing 1st criteria of stage 1)

Use Johnson Kotz approximation with

$x = 10/0.06^2$
$v_1 = 1$
$v_2 = 9$
$\phi = 10(\mu/\sigma)^2$

P(passing 2nd criteria of stage 1)

$= P1^{10}$

Stage 2) Test 20 additional units.

Pass if for all 30 units the following criteria are met:

1) CV ≤ 7.8%

2) No more than one value is outside 85% to 115% of claim and no value is outside 75% to 125% of claim.

Calculation:

P(passing 1st criteria of stage 2)

Use Johnson Kotz approximation with

$x = 30/0.078^2$
$v_1 = 1$
$v_2 = 29$
$\phi = 30(\mu/\sigma)^2$

P(passing 2nd criteria of stage 2)

$= P1^{30} + 30P1^{29} * P2$

For capsules, the test and calculations are:

Stage 1) Test 10 units.

Pass if the following criteria are met:

1) CV $\leq$ 6.0%

2) No more than one value outside 85% to 115% of Claim with no value outside 75% to 125% of claim

Calculation:

P(passing 1st criteria of stage 1)

Use Johnson Kotz approximation with

$x = 10/0.06^2$
$v_1 = 1$
$v_2 = 9$
$\phi = 10(\mu/\sigma)^2$

P(passing 2nd criteria of stage 1)

$= P1^{10} + 10\ P1^{9}P2$

Stage 2) Test 20 additional units.

Pass if for all 30 units the following criteria are met:

1) $CV \leq 7.8\%$

2) No more than three values are outside 85% to 115% of claim and no value is outside 75% to 125% of claim.

Calculation:

P(passing 1st criteria of stage 2)

Use Johnson Kotz approximation with

$x = 30/0.078^2$
$v_1 = 1$
$v_2 = 29$
$\phi = 30(\mu/\sigma)^2$

P(passing 2nd criteria of stage 2)

$= P1^{30} + 30P1^{29}P2 + 435P1^{28}P2^{2} + 4060\ P1^{27}P2^{3}$

The USP dissolution test and calculations are as follows:

Stage 1) Test 6 units (Result = % released at specified dissolution time point)

Pass if the following criteria are met:

1) All 6 results $\geq Q + 5$

Calculation:

P(meeting criteria of stage 1)

$= [P(x \geq Q + 5)]^6$

Stage 2) Test 6 additional units

Pass if for all 12 units the following criteria are met:

1) Mean result $\geq$ Q

2) No result $\leq$ Q - 15

Calculation:

P(passing 1st criteria of stage 2)

$= P(\text{Mean} \geq Q)$

P(passing 2nd criteria of stage 2)

$= [P(x \geq Q - 15)]^{12}$

Stage 3) Test 12 additional units

Pass if for all 24 units the following criteria are met:

1) Mean result $\geq$ Q

2) No more than two results $\leq$ Q – 15
with no results $\leq$ Q - 25

Calculation:

P(passing 1st criteria of stage 3)

$= P(\text{Mean result} \geq Q)$

P(passing 2nd criteria of stage 3)

$$= [P(x \geq Q - 15)]^{24} + 24\,[P(Q - 25 \leq x \leq Q - 15)]\,[P(x \geq Q - 15)]^{23} + 276[P(Q - 25 \leq x \leq Q - 15)]^2\,[P(x \geq Q - 15)]^{22}$$

APPENDIX F
PROGRAM DESCRIPTION

Each of the six program included in CuDAL are described below. Macros are italicized. To aid in locating the macro's and windows in the SAS™ programs, brackets enclose the associated program line numbers.

PROGRAM: FILES.SAS - Used to define file locations

The file FILES.SAS shown below provides the location of the manager macro (MANAGER.SAS) and the four analysis macro's (CUSP1.SAS, CUSP2.SAS, DISP1.SAS, and DISP2.SAS). In each of these lines of code, the user replaces A:\ with the appropriate directory locations. This is the only file that requires editing.

```
**** DIRECTORY FOR MANAGER MACRO ********;

%LET MANAGER = 'A:\MANAGER.SAS';

****  DIRECTORIES FOR ANALYSIS MACROS  *********;

%LET CU1 = 'A:\CUSP1.SAS';
%LET CU2 = 'A:\CUSP2.SAS';
%LET DI1 = 'A:\DISP1.SAS';
%LET DI2 = 'A:\DISP2.SAS';

**********************************************;

%INCLUDE "&MANAGER";
```

PROGRAM: MANAGER.SAS - Used to selects analysis macros

The macros contained in MANAGER.SAS are defined below:

start [2-14]

Defines first window (STARTER [4-9]) that appears when executing the program

win [16-60]-

Defines the second window (MAIN [18-25]) that allows the user to select the desired analysis macros. The user selects analysis macros by entering Y or N.

Defines an error window (ANSWIN [27-30]) for incorrect input.

again [62-82]-

Defines a window (GOBACK [64-66]) that allows the user to go back to the main menu (MAIN). The user enters Y or N response.

Defines an error window (ANSBACK [68-71]) for incorrect input.

analyze [83-100]-

Reads the input from the macro *win* and calls the selected analysis macros (indicated in *win* by Y)

calls the macro *again* after selected analyses are performed.

PROGRAM: CUSP1.SAS - Used to generate Content Uniformity acceptance limits using Sampling Plan 1

The macros contained in CUSP1.SAS are described below:

WinCUSP1 [3-94]-

Defines window (MCUSP1 [5-21]) requesting input for dosage form (FORM), sample size (NUMBER), lower bound (LBOUND) and confidence level (CILEVEL). The user can select whether or not to have the acceptance limit table printed, the acceptance limit table evaluated against various values of population parameters, or the lower bound calculated for a specific sample result.

Several windows are defined to respond to errors in user input [22-44]. Windows are created for misspelling of the dosage form (DOSCUSP1), sample size integer greater than one (SCUSP1), lower probability bound (BCUSP1) and confidence interval (CICUSP1) between 50.0 and 99.9, and Y/N input (ANSCUSP1).

c1calc [95-149]-

This macro is used to calculate the lower bound on passing the USP content uniformity test given a pair of specific values for μ and σ. The macro *calcusp1* passes two points in the confidence region for μ and σ to evaluate. Both of these points have the largest value of σ (SIGMA) in the confidence region. One point has the smallest value of μ (LLU) and the other the largest value for μ (ULU). The pair LLU, SIGMA is evaluated first, then the pair ULU, SIGMA. PROBNORM is used to calculate the probability of meeting the CV criteria and to calculate the normal probability of an individual value falling within a given interval. Since the criteria for tablets and capsules is different, the probability calculation depends on dosage form. Since the probability of passing the USP test is greater than or equal to the probability of passing any individual stage, the maximum probability of passing is selected from stage 1 (LPROB1) and stage 2 (LPROB2) for each point. Finally, the lowest probability of passing the USP test occurs with the pair with the lowest probability of passing so the minimum probability (OVERBD) is selected from the two evaluated points.

calcusp1[150-228]-

This macro determines the largest value for the sample CV such that for all points in the confidence region for μ and σ, the probability of passing the USP test for content uniformity is greater than the user specified lower bound (LBOUND). The confidence interval is a triangle. The only two points to evaluate on the triangle are the two points with the maximum value of sigma. So, for a given value of the sample mean, the strategy is to start with a very small value for the sample standard deviation and then construct the corresponding confidence region

for μ and σ. Then evaluate the two points corresponding to the largest value of σ and the smallest and largest values for μ . If both of the points result in probabilities greater than LBOUND, this means that all of the points in the entire confidence region would give a probability of passing the USP content uniformity test greater than LBOUND. Therefore, given the same sample mean, a larger value of the standard deviation can be evaluated. The value of the sample standard deviation is increased until one of the two points evaluated in the confidence region is less than LBOUND. The last value of the standard deviation is kept for the acceptance limit table. At a value of the sample mean around 100, the sample standard deviation will reach its maximum acceptance limit table value. The next sample mean evaluated after this maximum has been reached will have a lower value of the sample standard deviation. The program checks to determine when this occurs. At this point, the program starts generating the rest of the acceptance limit table by setting the sample mean to 114.9, resetting the sample standard deviation to a small value and works its way down from 114.9 to the value of the sample mean with the largest sample standard deviation.

The strategy describe above is performed by using a DO loop that starts with a sample mean of 85.1 and increases to 114.9 in increments of 0.1 (set by macro variable D). The standard deviation starts at 0.01 (STARTSD) and increments by 0.001. For each value of the standard deviation (SAMPSD), the upper bound for sigma (SIGMA) is calculated using the usual χ^2 based confidence bound formula. The two points in the confidence interval that will be evaluated are determined (LLU and ULU). LLU and ULU are the lower and upper ends of the confidence region associated with SIGMA. Since the sample mean and sample variance are independent, the overall confidence level is the product of the two individual confidence levels for μ and σ. So the two individual confidence levels are the square root of the overall confidence level. Then the portion of the overall α (1 - confidence level) used to estimate μ is divided equally to construct a 2-tailed test. Since the confidence interval for σ is one-sided, the portion of the overall α for σ is all put into one tail. The macro *c1calc* is called to calculate the lower bound on the probability of passing the USP test for LLU and ULU. The minimum of the two probabilities (OVERBD) is returned from *c1calc*. If the minimum is greater than the lower bound selected by the user (LBOUND), the standard deviation (SAMPSD) is incremented by 0.001 and a new LLU and ULU are computed and the minimum probability is found again. Once the minimum in less than the lower bound, 0.001 is subtracted from the standard deviation, and the CV is computed. A special case is when the starting value (STARTSD) of 0.01 gives a minimum less than the lower bound. In this case the CV is set to 0. The value of the standard deviation is used as a starting point for the next sample mean since the standard deviation must increase as the sample mean increases from 85.1 to around 100. At some value of the sample mean greater than 100, the standard deviation will start decreasing. In the macro, when a new sample mean is evaluated with the starting value of the previous standard deviation and the resulting OVERBD is less than the user pre-specified lower bound (LBOUND), this means that the maximum tabled sample standard deviation has been reached.

Therefore, the macro saves the value of this mean (STARTM), goes to the label UPPER, sets the starting standard deviation back to 0.01, and starts a DO loop that starts with a sample mean (MEAN) at 114.9 and decreases by 0.1 to STARTM. The same procedure is used as described above to find the sample standard deviation for each sample mean.

Once the entire set of sample mean, CV combinations are determined, the data is sorted by MEAN and a data set is prepared for use in printing the table. This is done by creating six data sets. Each of these data sets contains the data for two columns of the printed acceptance table (one for the sample mean and one for the CV). Data set ONE contains the mean and CV for values of the sample mean between 85.1 and 90.0, data set TWO from 90.1 to 95.0, etc. All six of these data sets are then merged together to form data set SEVEN.

PRTCUSP1 [230-254]-

This macro prints the acceptance limit table by printing out data set SEVEN prepared by the macro *calcusp1*.

EVCUSP1[256-376]-

This macro starts by defining a window (SMAIN [258-271]) for the user to specify the range of possible population values for the mean and CV. For the population mean, the user specifies the lower bound for the mean (ULOW), the upper bound for the mean (UHIGH), the increment (UINCRE), and the divisor (UDIV). Each of these values must be a positive integer. So if the user wants to evaluate population means from 98.0 to 102.0 by 0.5, the following values would be specified: ULOW = 980, UHIGH = 1020, UINCRE = 5, and UDIV = 10. The upper and lower values for the CV as well as the increment and divisor are input in the same manner as those are for the mean. Two windows are also defined for error checking (PINT and ORD [272-279]). PINT checks for integer values and ORD checks for the upper bound being greater than lower bound. Default values are given for all of the input variables which is followed by the code to check for input errors. Finally, data set SEVEN is read into data set TAB. The macro DSCUSP1 [321-329] reads TAB and creates 6 data sets containing the sample means and standard deviations from TAB. The 6 data sets are appended to one another and stored in data set ONE.

The macro *SIGCUSP1* [337-362] performs the calculations for each population mean and CV combination. The strategy is as follows: The acceptance limit table consists of pairs of sample means with an upper bound on the sample CV. Data set ONE contains the sample mean and sample standard deviation pairs that make up the entire acceptance limit table. The table begins with a sample mean of 85.1 and ends with a sample mean of 114.9. To calculate the probability of passing the acceptance limit table for specified values for the population mean and population CV, the probability is calculated of a sample mean falling between adjacent means in the table and the sample standard deviation falling below the average standard deviation at the two endpoints. So, suppose the standard deviation at a sample mean of 85.1 was 0.2 and the sample standard deviation bound at a sample mean of 85.2 was 0.5. If the evaluation was at a population mean of 100 with standard deviation of 3, then the first calculation would be to find the probability of getting a sample mean between 85.1 and 85.2 and a sample standard deviation less than (0.2 + 0.5)/2 or 0.35. This is done using the SAS functions - PROBNORM and PROBCHI. The second calculation would calculate the probability of getting a sample means between 85.2 to 85.3 with a sample standard deviation less than the average of the corresponding standard deviations for 85.2 and 85.3. These probabilities are summed across all the intervals from 85.1 to 114.9. The sum of these probabilities (PTRAP) is the probability of passing the table for specific population values for the mean and standard deviation. To perform the calculation, the lag function in SAS is used to obtain the previous value for the sample mean and sample standard deviation. The last value of PTRAP is output. PROC APPEND is used to save the PTRAP value for each combination of CV and U in the DO loop. These values are stored in the data set SAVEALL. Finally, the data set SAVEALL is printed.

SMPCUSP1 [378-440]

This macro is used to calculate the lower bound of passing the USP content uniformity test given the sample mean and sample standard deviation. The macro displays the window TMAIN [380-385]for the user to input the sample mean and sample standard deviation. Error checks (LTZ & RANGE [386-393]) are made to make sure that a positive integer has been entered and is within the range of 85.1 to 114.9. The data set TAB determines the endpoints of the confidence interval based on the user input values for the sample mean and standard deviation and prior information such as dosage form type, confidence level, and sample size. The overall α is divided into two portions as described above in the macro *calcusp1*. The macro *c1calc* is called to determine the lower bound. Finally, the lower bound is printed.

ANACUSP1 [442-458]

This macro is used to respond to the user input from *WinCUSP1*. If the user requests printing of the acceptance limit table or evaluation of a table, then the macro *calcusp1* is called. If the user requests a printout of the acceptance limit table, the macro *PRTCUSP1* is called. If an evaluation is requested, the macro *EVCUSP1* is called. After the evaluation macro is finished the dataset SAVEALL is deleted. Finally, if the user requests a lower bound for a sample mean and standard deviation, the macro *SMPCUSP1* is called.

PROGRAM: CUSP2.SAS - Content Uniformity using Sampling Plan 2

The macros contained in CUSP2.SAS are defined below:

WinCUSP2 [4-105]

Defines window (MCUSP2 [7-22]) requesting input for dosage form (FORM), number of locations (LOC), number of samples per location (NUM), lower bound (LBOUND) and confidence level (CILEVEL). User can select whether or not to have the acceptance limit table printed, the acceptance limit table evaluated against various values of population parameters, or the lower bound calculated for a specific sample result.

Several windows are defined to respond to errors in user input [23-49]. Windows are created for misspelling of the dosage form (DOSCUSP2), number of locations being an integer greater than one (LOCAT), sample size per location integer greater than one (NUMB), lower probability bound (BCUSP2) and confidence interval between 50.0 and 99.9 (CICUSP2), and Y/N input (ANSCUSP2).

Cullu [109-141]

This macro performs the lower probability bound calculation for the point in the confidence region with the smallest value of μ (LLU) and largest value of σ (SIGMA). The calculation is performed as in *c1calc* using the SAS function PROBNORM. The probability calculation depends on the dosage form (Tablet or Capsule). Since the probability of passing the USP test is greater than or equal to the probability of passing any individual stage, the maximum probability of passing is selected from stage 1 (LPROB1) and stage 2 (TPROBL2).

Cuulu [142-174]

This macro performs the lower probability bound calculation for the point in the confidence region with the largest value of μ (ULU) and largest value of σ (SIGMA). The calculation is performed as in *c1calc* using the SAS function PROBNORM. The probability calculation depends on the dosage form (Tablet or Capsule). Since the probability of passing the USP test is greater than or equal to the probability of passing any individual stage, the maximum probability of passing is selected from stage 1 (LPROB1) and stage 2 (TPROBL2).

calcusp2 [176-262]

This macro finds the acceptance limit on the CV for a given mean. The confidence interval is a triangle. The only two points to evaluate on the triangle are the two points with the maximum value of sigma. However, the value of sigma is a function of both the between and within variance components. A method to construct a confidence interval for the sum of the within and between variance components is given in Graybill, F.A. & Wang, C., "Confidence Intervals on Nonnegative Linear Combinations of Variances", Journal of the American Statistical Association, December 1980, Volume 75, Number 372, p. 869 - 873.

Let

MS_L = Mean Square Between Locations from One-Way Anova
MS_E = Mean Square Within Locations from One-Way Anova
L = Number of Locations
n = Number observations at each location

Then the upper confidence limit for the sum of the between location and within location variance components (i.e. σ) is

$$[1/n\ MS_L + (1 - 1/n)\ MS_E] + \{[1/n\ ((L - 1)/\chi^2_{L-1} - 1)\ MS_L]^2$$

$$+ [(1 - 1/n)\ (L\ (n - 1)/\chi^2_{L(n-1)} - 1)\ MS_E]^2\}^{1/2}$$

The strategy is as follows: Given the sample within location standard deviation (SE) and the sample between location standard deviation (SM), a confidence interval for σ (SIGMA) was computed using the Graybill Wang method. Since the sample mean and mean squares for the between location and within location are independent, the overall α level (1- confidence level) is the product of the two individual α levels for μ and σ. So the two individual confidence levels are the square root of the overall α. Then the portion of the overall α used to estimate μ is divided equally to construct a 2-tailed test. Since the confidence interval for σ is one-sided, the portion of the overall α for σ is all put into one tail. [Note that SM is not the between location variance component. It's the standard deviation of the location means.] Then, for increasing values of the sample mean starting at 84.9, the lower bound is calculated by calling the macro *cullu*. Once the lower bound (OVERBDL) is greater than the specified lower bound (LBOUND), the lower limit for the sample mean has been identified (MEANL) and program goes to the label UPPER to find the upper limit for the sample mean. This time the sample mean starts at 115.1, calls the macro *cuulu*, and decreases until the overall bound (OVERBU) is greater than LBOUND. The upper bound for the mean (MEANU) has been identified. So for the given values for SE and SM, the lower and upper limits for the sample mean have been found.

The SAS code is written to handle two special situations. The first is when the value of SM equals D (D is the starting value for both SM and SE in the DO loops). If SM equals D, this means that for the first value of SM, the upper bound was greater than the specified lower bound. Therefore, there is no sample mean that results in an evaluated lower bound less than the specified bound. The symbol '.' is output indicating that there is no sample mean that meets the requirements for the lower bound and confidence level specified. The second situation is if SE equals D. This means that the largest value of SM that needs to be evaluated anywhere in the table has been found. So, the code resets the largest value of SM that needs to be evaluated.

The set of means and standard deviations is stored in the data set TABC.

PRTCUSP2 [264-491]

This macro prints the acceptance limit table by reading the data set TABC, transposing it, and printing out data.

EVCUSP2 [494-635]

This macro starts by defining a window (SMAIN [496-524]) for the user to specify the range of possible population values for the mean, within location standard deviation, and between location standard deviation. [Note that the between location standard deviation is the between location variance component and not the standard deviation of the location means.] For the population mean, the user specifies the lower bound for the mean (ULOW), the upper bound for the mean (UHIGH), the increment (UINCRE), and the divisor (UDIV). Each of these values must be a positive integer. So if the user wants to evaluate population means from 98.0 to 102.0 by 0.5, the following values would be specified: ULOW = 980, UHIGH = 1020, UINCRE = 5, and UDIV = 10. The upper and lower values for the within location standard deviation and between location standard deviation as well as the increment and divisor are input in the same manner as those for the mean. Two windows are also defined for error checking (PINT and ORD [525-532]). PINT checks for integer values and ORD checks for upper bound being greater than lower bound. Default values are given for all of the input variables followed by the code to determine input errors.

The macro *SIGCUSP2* [585-619] performs the calculations for each population mean (U), within location standard deviation (SIGSE), between location standard deviation (SIGSM) combination. The strategy is as follows: The acceptance limit table consists of a pair of sample means for each combination of within location standard deviation (SE) and standard deviation of location means (SM). Data set TABC contains the lower limit for the sample mean (MEANL), the upper limit for the sample mean (MEANU), the value of the within location standard deviation (SE), and the standard deviation of the between location means (SM).

To calculate the probability of passing the acceptance limit tables for specified values for the population mean, within location standard deviation, and between location standard deviation, the probability is calculated of a sample mean falling between the upper and lower mean limits. So, suppose one line from TABC is se = 0.4, sm = 0.2, meanl = 98.0, and meanu = 101.5. Then the program would calculate the probability that the sample mean would lie within 98.0 and 101.5, se would lie between 0.3 and 0.4, and sm would lie between 0.1 and 0.2. This is done using the SAS functions - PROBNORM and PROBCHI. The same calculation would be performed for each observation in the data set TABC. These probabilities are summed for all observation in the data set. The sum of these probabilities (PSUM) is the probability of passing the table for specific population values for the mean, within and between location standard deviations. The last value of PSUM is output. PROC APPEND is used to save the PSUM value for each combination of U, SIGSE, and SIGSM in the DO loop. These values are stored in the data set SAVES2E. Finally, the data set SAVES2E is printed.

SMPCUSP2 [637-714]

This macro is used to calculate the lower bound of passing the USP content uniformity test given the sample mean, sample within location standard deviation, and the standard deviation of location means. The macro displays the window TMAIN [639-644] for the user to input the sample mean, sample within location standard deviation, and standard deviation of location means. Error checks (LTZ & RANGE [645-652]) are made to make sure that a positive integer has been entered and is within the range of 85.1 to 114.9. The data set TAB determines the endpoints of the confidence interval based on the user input values for the sample mean, sample within location standard deviation, and standard deviation of location means and prior information such as dosage form type, confidence level, number of locations and number of samples at each location. The overall α is divided into two portions as described in the macro *calcusp2*. The macro's *cullu* and *cuulu* are called to determine the lower bound. Finally, the lower bound is printed.

ANACUSP2 [716-730]

This macro is used to respond to the user input from *WinCUSP2*. If the user requests printing of the acceptance limit table or evaluation of a table, then the macro *calcusp2* is called. If the user requests a printout of the acceptance limit table, the macro *PRTCUSP2* is called. If an evaluation is requested, the macro *EVCUSP2* is called. After the evaluation macro is finished the dataset SAVES2E is deleted. Finally, if the user requests a lower bound for a sample mean and standard deviation, the macro *SMPCUSP2* is called.

PROGRAM: DISP1.SAS - Used to generate Dissolution acceptance limits using Sampling Plan 1

The macros contained in DISP1.SAS are defined below:

WinDISP1 [3-93]-

Defines window (MDISP1 [5-19]) requesting input for Q (Q), sample size (NUMBER), lower bound (LBOUND) and confidence level (CILEVEL). The user can select whether or not to have the acceptance limit table printed, the acceptance limit table evaluated against various values of population parameters, or the lower bound calculated for a specific sample result.

Several windows are defined to respond to errors in user input [20-42]. Windows are created for sample size integer greater than one (SDISP1), lower probability bound (BDISP1) and confidence interval (CIDISP1) between 50.0 and 99.9, Q between 40 and 95 (QDISP1) and Y/N input (ANSDISP1).

COMPUTE [95-107]-

For specific values of the population mean and standard deviation, this macro performs the lower probability bound calculation.

Each time this macro is called there is one value for μ (LLU) and one value for σ (SIGMA). The pair LLU, SIGMA is evaluated. PROBNORM is used to calculate the normal probability of an individual value falling within a given interval. Since the probability of passing the USP test is greater than or equal to the probability of passing any individual stage, the maximum probability of passing is selected from stage 1 (F1), stage 2 (F2), and stage 3 (F3).

caldisp1 [110-158]-

This macro finds the acceptance limit on the CV for a given sample mean. The confidence interval is a triangle. For dissolution, only one point needs to be evaluated. This is the point with the smallest value of the population mean and the maximum value of sigma. So, for a given value of the sample mean, one can just keep increasing the sample value of the standard deviation until the evaluation of the point on the triangle has a lower bound probability less than pre-specified lower bound. Also note that the probability of passing the dissolution test only depends on the distance from Q and not the actual value of Q. So, the lower bound on passing the dissolution test with a Q of 80 and sample mean of 85 would be the same as passing the dissolution test with a Q of 85 and a sample mean of 90 since they both are 5 units away from Q. Therefore, this macro generates the acceptance limits on the interval from 0 to (100 -Q). Once the table has been generated, the value of Q is added to each value of the sample mean. The table is generated by using a DO loop that starts with a sample mean of 0.2

and goes to (100 - Q) in increments of 0.2 (set by macro variable D). The standard deviation starts at 0.002 (STARTSD) and increments by 0.001. For each value of the standard deviation (SAMPSD), the upper bound for sigma (SIGMA) is calculated using the usual confidence bound formula. The point in the confidence interval that will be evaluated is determined (LLU). LLU is the lower end of the confidence region associated with SIGMA. Since the sample mean and sample variance are independent, the overall confidence level is the product of the two individual confidence levels for μ and σ. So each of the two individual confidence levels is the square root of the overall confidence level. The macro *COMPUTE* is called to find the lower bound on the probability of passing the USP test for LLU. If the minimum is greater than the lower bound selected by the user (LBOUND), the standard deviation (SAMPSD) is incremented by 0.001 and a new LLU is computed and the minimum probability is found again. Once the minimum is less than the lower bound, 0.001 is subtracted from the standard deviation, and the CV is computed. A special case is when the starting value (STARTSD) of 0.002 gives a minimum less than the lower bound. In this case the CV is set to 0. The value of the standard deviation is used as a starting point for the next sample mean since we know that the standard deviation must increase as the sample mean increases.

Once the entire set of sample mean, CV combinations are determined, the data is sorted by MEAN and a data set is prepared for use in printing the table. This is done by creating five data sets. Each of these data sets contains the data for two columns of the printed acceptance table. Data set ONE contains the mean and CV for the first fifth of the values of the sample mean, data set TWO the second fifth, etc. All five of these data sets are then merged together to form data set D1ALL.

PRTDISP1 [160-184]-

This macro prints the acceptance limit table by printing out data set D1ALL prepared by the macro *caldisp1*.

EVDISP1 [187-311]-

This macro starts by defining a window (SMAIN [189-200]) for the user to specify the range of possible population values for the mean and CV. For the population mean, the user specifies the lower bound for the mean (ULOW), the upper bound for the mean (UHIGH), the increment (UINCRE), and the divisor (UDIV). Each of these values must be a positive integer. So if the user wants to evaluate population means from 90.0 to 92.0 by 0.5, the following values would be specified: ULOW = 900, UHIGH = 920, UINCRE = 5, and UDIV = 10. The upper and lower values for the CV as well as the increment and divisor are input in the same manner as those are for the mean. Two windows are also defined for error checking (PINT and ORD [201-208]). PINT checks for integer values and ORD checks for upper bound being greater than lower bound. Default values are given for all of the input variables followed by the code to determine input errors.

DIONE is created from D1ONE and contains the sample mean and sample standard deviation pairs that make up the entire acceptance limit table.

The macro *SIGDISP1* [253-285] performs the calculations for each population mean and CV combination. The strategy is as follows: The acceptance limit table consists of pairs of sample means with an upper bound on the sample CV. Data set DIONE contains the sample mean and sample standard deviation pairs that make up the entire acceptance limit table beginning with a sample mean of Q + 0.2 and ending with a sample mean of 100.0. To calculate the probability of passing the acceptance limit table for specified values for the population mean and population CV, the probability is calculated of a sample mean falling between adjacent means in the table and the sample standard deviation falling below the average standard deviation at the two endpoints. The product of these two probabilities is computed since the sample mean and sample variance are independent of one another. So, suppose the standard deviation at a sample mean of 75.2 was 0.2 and the sample standard deviation bound at a sample mean of 75.4 was 0.5. If the evaluation was at a population mean of 100 with standard deviation of 3, then the first calculation would be to find the probability of getting a sample mean between 75.2 and 75.4 and a sample standard deviation less than (0.2 + 0.5)/2 or 0.35. This is done using the SAS functions - PROBNORM and PROBCHI. The second calculation would calculate the probability of getting a sample means between 75.4 to 75.6 with a sample standard deviation less than the average of the corresponding standard deviations for 75.4 and 75.6. These probabilities are summed across all the intervals from Q + 0.2 to 100.0. The sum of these probabilities (PTRAP) is the probability of passing the table for specific population values for the mean and standard deviation. To perform the calculation, the lag function in SAS is used to obtain the previous value for the sample mean and sample standard deviation. The last value of PTRAP is output. PROC APPEND is used to save the PTRAP value for each combination of CV and U in the DO loop. These values are stored in the data set D1SAVALL. Finally, the data set D1SAVALL is printed.

SMPDISP1 [300-358]

This macro is used to calculate the lower bound of passing the USP dissolution test given the sample mean and sample standard deviation. The macro displays the window TMAIN [302-305] for the user to input the sample mean and sample standard deviation. Error checks (LTZ & RANGE [306-313]) are made to make sure that a positive integer has been entered and that the mean is greater than Q. The data set DI1SMP determines the endpoints of the confidence interval based on the user input values for the sample mean and standard deviation and prior information such as confidence level and sample size. The macro *COMPUTE* is called to determine the lower bound. Finally, the lower bound is printed.

ANADISP1 [360-376]

This macro is used to respond to the user input from *WinDISP1*. If the user requests printing of the acceptance limit table or evaluation of a table, then the macro *caldisp1* is called. If the user requests a printout of the acceptance limit table, the macro *PRTDISP1* is called. If an evaluation is requested, the macro *EVDISP1* is called. After the evaluation macro is finished the dataset D1SAVALL is deleted. Finally, if the user requests a lower bound for a sample mean and standard deviation, the macro *SMPDISP1* is called.

PROGRAM: DISP2.SAS - Used to generate Dissolution acceptance limits using Sampling Plan 2

The macros contained in DISP2.SAS are defined below:

WinDISP2 [2-118]

Defines window (MDISP2 [4-21]) requesting input for Q (Q), number of locations (LOC), number of samples per location (NUM), lower bound (LBOUND), confidence level (CILEVEL), increment for the within location standard deviation (DSE), and increment for the standard deviation of between location means (DSM). User can select whether or not to have the acceptance limit table printed, the acceptance limit table evaluated against various values of population parameters, or the lower bound calculated for a specific sample result.

Several windows are defined to respond to errors in user input [22-54]. Windows are created for checking that the increments for DSE and DSM are positive, the number of locations is an integer greater than one (DILOCAT), the sample size per location is an integer greater than one (DINUMB), lower probability bound (BDISP2), the value of Q is between 40 and 95 (QDISP2), and confidence interval between 50.0 and 99.9 (CIDISP2), and Y/N input (ANSCISP2).

COMPUTE [121-133]

For specific values of the population mean and standard deviation, this macro performs the lower probability bound calculation.

Each time this macro is called there is one value for μ (LLU) and one value for σ (SIGMA). The pair LLU, SIGMA is evaluated. PROBNORM is used to calculate the normal probability of an individual value falling within a given interval. Since the probability of passing the USP test is greater than or equal to the probability of passing any individual stage, the maximum probability of passing is selected from stage 1 (F1), stage 2 (F2), and stage 3 (F3).

caldisp2 [137-198]

This macro finds the acceptance limit on the CV for a given mean. The confidence interval is a triangle. The only point to evaluate on the triangle is the point with the smallest value of the population mean and the maximum value of sigma. However, the value of sigma is a function of both the between and within variance components. The confidence interval for the sum of the within and between variance components uses the Graybill, F.A. & Wang, C. method described above in the macro *calcusp2* of the content uniformity section for sampling plan 2. Since the sample mean and mean squares for the between location and within location are independent, the overall α level (1- confidence level) is the product of the two individual α levels for μ and σ. So the two individual confidence levels are the square root of the overall α.

The strategy was as follows: Given the sample within location standard deviation (SE) and the sample between location standard deviation (SM), a confidence interval for σ (SIGMA)was computed using the Graybill Wang method. Then, for increasing values of the sample mean starting at 0.2, the lower bound was calculated by calling the macro *COMPUTE*. Once the lower bound (OVERBD) is greater than the specified lower bound (LBOUND), the lower limit for the sample mean has been found (MEANL) for the given values of SE and SM.

As described in *calcusp2*,the SAS code is written to handle two special situations when either the value of SM or SE equals D.

These values are stored in the data set TABD.

PRTDISP2 [200-218]

This macro prints the acceptance limit table using the SAS procedure PROC TABULATE by reading the data set TABD and printing the output.

EVDISP2 [221-362]

This macro starts by defining a window (SMAIN [223-251]) for the user to specify the range of possible population values for the mean, within location standard deviation, and between location standard deviation. For the population mean, the user specifies the lower bound for the mean (ULOW), the upper bound for the mean (UHIGH), the increment (UINCRE), and the divisor (UDIV). Each of these values must be a positive integer. So if the user wants to evaluate population means from 90.0 to 92.0 by 0.5, the following values would be specified: ULOW = 900, UHIGH = 920, UINCRE = 5, and UDIV = 10. The upper and lower values for the within location standard deviation and between location standard deviation as well as the increment and divisor are input in the same manner as those for the mean. Two windows are also defined for error checking (DI2PINT and DI2ORD [252-259]). DI2PINT checks for integer values and DI2ORD checks for upper bound being greater than lower bound. Default values are given for all of the input variables followed by the code to determine input errors.

The macro *SIGDISP2* [312-346] performs the calculations for each population mean (U), within location (SIGSE), between location (SIGSM) combination. The strategy is as follows: The acceptance limit table consists of a sample mean for each combination of within location standard deviation (SE) and standard deviation of location means (SM). Data set TABD contains the lower limit for the sample mean (MEANL), the value of the within location standard deviation

(SE), and the standard deviation of the between location means (SM). To calculate the probability of passing the acceptance limit tables for specified values for the population mean, within location standard deviation, and between location standard deviation, the probability is calculated of a sample mean falling above lower mean limit. So, suppose one line from TABD is se = 0.4, sm = 0.2 and meanl = 98.0. Then the program would calculate the probability that the sample mean would be greater than 98.0, se would lie between 0.3 and 0.4, and sm would lie between 0.1 and 0.2. This is done using the SAS functions - PROBNORM and PROBCHI. The same calculation would be performed for each observation in the data set TABD. These probabilities are summed for all observation in the data set. The sum of these probabilities (PSUM) is the probability of passing the table for specific population values for the mean, within and between location standard deviations. The last value of PSUM is output. PROC APPEND is used to save the PSUM value for each combination of U, SIGSE, and SIGSM in the DO loop. These values are stored in the data set SAVES2E. Finally, the data set SAVES2E is printed.

SMPDISP2 [364-440]

This macro is used to calculate the lower bound of passing the USP dissolution test given the sample mean, sample within location standard deviation, and the standard deviation of location means. The macro displays the window TMAIN [366-371] for the user to input the sample mean (MEAN), sample within location standard deviation (SE), and standard deviation of location means (SM). Error checks (LTZ & RANGE [372-379]) are made to make sure that a positive integer has been entered and the mean is greater than Q. The data set TAB determines the endpoints of the confidence interval based on the user input values for the sample mean, sample within location standard deviation, and standard deviation of location means and prior information such as confidence level, number of locations and number of samples at each location. The macro *COMPUTE* is called to determine the lower bound. Finally, the lower bound is printed.

ANADISP2 [442-456]

This macro is used to respond to the user input from *WinDISP2*. If the user requests printing of the acceptance limit table or evaluation of a table, then the macro *caldisp2* is called. If the user requests a printout of the acceptance limit table, the macro *PRTDISP2* is called. If an evaluation is requested, the macro *EVDISP2* is called. After the evaluation macro is finished, the dataset SAVES2E is deleted. Finally, if the user requests a lower bound for a sample mean and standard deviation, the macro *SMPDISP2* is called.

APPENDIX G
TEST DATA

Appendix G
PART 1
MANAGER.SAS
Test Data & Results

		USER INPUT					Observed Matches
RUN	**CUSP1**	**CUSP2**	**DISP1**	**DISP2**	**CONTINUE**	EXPECTED RESULT	Expected Result (Y or N)
1	N	N	N	N	Y	No output	Y
						Return to Main Screen	
	Y	Y	Y	Y	N	Default Output (Appendix C)	Y
						Exits from Program	
2	Y	N	Y	N	Y	CUSP1 Output	Y
						No CUSP2 Output	
						DISP1 Output	
						No DISP2 Output	
						Return to Main Screen	
	N	Y	N	Y	N	No CUSP1 Output	Y
						CUSP2 Output	
						No DISP1 Output	
						DISP2 Output	
						Exits from Program	

PART 2
Content Uniformity
Sampling Plan 1
Test Data Set & Results

Dosage Form	CI Level	Lower Bound	Sample Size	Sample Mean	Expected CV	Program Result CV	Independent Result CV	All Agree? (Y or N)
Tablet	50.0	50.0	5	85.1	0.04	0.04	0.04	Y
				100.0	4.90	4.90	4.90	Y
				114.9	0.03	0.03	0.03	Y
			2000	85.1	0.08	0.08	0.08	Y
				100.0	7.05	7.05	7.05	Y
				114.9	0.06	0.06	0.06	Y
	99.0	50.0	5	85.1	0.00	0.00	0.00	Y
				100.0	1.20	1.20	1.20	Y
				114.9	0.00	0.00	0.00	Y
			2000	85.1	0.07	0.07	0.07	Y
				100.0	6.81	6.81	6.81	Y
				114.9	0.05	0.05	0.05	Y
	99.0	99.0	5	85.1	0.00	0.00	0.00	Y
				100.0	0.89	0.89	0.89	Y
				114.9	0.00	0.00	0.00	Y
			2000	85.1	0.04	0.04	0.04	Y
				100.0	5.11	5.11	5.11	Y
				114.9	0.03	0.03	0.03	Y
Capsule	50.0	50.0	5	85.1	0.06	0.06	0.06	Y
				100.0	5.33	5.33	5.33	Y
				114.9	0.04	0.04	0.04	Y
			2000	85.1	0.12	0.12	0.12	Y
				100.0	7.58	7.58	7.58	Y
				114.9	0.09	0.09	0.09	Y
	50.0	99.0	5	85.1	0.04	0.04	0.04	Y
				100.0	4.20	4.20	4.20	Y
				114.9	0.03	0.03	0.03	Y
			2000	85.1	0.06	0.06	0.06	Y
				100.0	5.87	5.87	5.87	Y
				114.9	0.04	0.04	0.04	Y
	99.0	99.0	5	85.1	0.00	0.00	0.00	Y
				100.0	1.08	1.08	1.08	Y
				114.9	0.00	0.00	0.00	Y
			2000	85.1	0.06	0.06	0.06	Y
				100.0	5.67	5.67	5.67	Y
				114.9	0.04	0.04	0.04	Y

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PART 2 (CON'T)
Content Uniformity
Sampling Plan 2
Test Data Set & Results

Dosage Form	CI Level	Lower Bound	# Loc	#/Location	SE	SM	Expected Result Mean (Lower)	Program Result Mean (Lower)	Indepenent Result Mean (Lower)	Expected Result Mean (Upper)	Program Result Mean (Upper)	Indepedent Result Mean (Upper)	All Agree? (Y or N)
Tablet	50.0	50.0	3	2	0.1	0.1	85.4	85.4	85.4	114.6	114.6	114.6	Y
					0.1	3	96.3	96.3	96.3	103.7	103.7	103.7	Y
					3	0.1	89.8	89.8	89.8	110.2	110.2	110.2	Y
					3	3	97.1	97.1	97.1	102.9	102.9	102.9	Y
				300	0.1	0.1	85.4	85.4	85.4	114.6	114.6	114.6	Y
					0.1	3	89.7	96.3	96.3	110.3	103.7	103.7	N
					3	0.1	96.3	89.7	89.7	103.7	110.3	110.3	N
					3	3	97.8	97.8	97.8	102.4	102.4	102.4	Y
			300	2	0.1	0.1	85.2	85.2	85.2	114.8	114.8	114.8	Y
					0.1	3	89.8	89.8	89.8	110.2	110.2	110.2	Y
					3	0.1	88.3	88.3	88.3	111.7	111.7	111.7	Y
					3	3	91.0	91.0	91.0	109.2	109.2	109.2	Y
				300	0.1	0.1	85.3	85.3	85.3	114.7	114.7	114.7	Y
					0.1	3	89.8	89.8	89.8	110.2	110.2	110.2	Y
					3	0.1	89.6	89.6	89.6	110.4	110.4	110.4	Y
					3	3	92.1	92.1	92.1	108.2	108.2	108.2	Y
	50.0	99.0	3	2	0.1	0.1	85.6	85.6	85.6	114.4	114.4	114.4	Y
					0.1	3	.	.	.	.	.	.	Y
					3	0.1	93.2	93.2	93.2	106.8	106.8	106.8	Y
					3	3	.	.	.	.	.	.	Y
				300	0.1	0.1	85.7	85.7	85.7	114.3	114.3	114.3	Y
					0.1	3	.	.	.	.	.	.	Y
					3	0.1	93.0	93.0	93.0	107.0	107.0	107.0	Y
					3	3	.	.	.	.	.	.	Y
			300	2	0.1	0.1	85.4	85.4	85.4	114.6	114.6	114.6	Y
					0.1	3	93.1	93.1	93.1	106.9	106.9	106.9	Y
					3	0.1	90.7	90.7	90.7	109.3	109.3	109.3	Y
					3	3	94.9	94.9	94.9	105.1	105.1	105.1	Y

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				300	0.1	0.1	85.4	85.4	85.4	114.6	114.6	114.6	Y
					0.1	3	93.1	93.1	93.1	106.9	106.9	106.9	Y
					3	0.1	92.8	92.8	92.8	107.2	107.2	107.2	Y
					3	3	96.3	96.3	96.3	103.7	103.7	103.7	Y
	99.0	99.0	3	2	0.1	0.1	91.0	91.0	91.0	109.0	109.0	109.0	Y
					0.1	3	.	.	.	.	.	.	Y
					3	0.1	.	.	.	.	.	.	Y
					3	3	.	.	.	.	.	.	Y
				300	0.1	0.1	91.0	91.0	91.0	109.0	109.0	109.0	Y
					0.1	3	.	.	.	.	.	.	Y
					3	0.1	.	96.0	96.0	.	104.0	104.0	N
					3	3	.	.	.	.	.	.	Y
			300	2	0.1	0.1	85.4	85.4	85.4	114.6	114.6	114.6	Y
					0.1	3	94.2	94.2	94.2	105.8	105.8	105.8	Y
					3	0.1	91.2	91.2	91.2	108.8	108.8	108.8	Y
					3	3	95.9	95.9	95.9	104.1	104.1	104.1	Y
				300	0.1	0.1	85.5	85.5	85.5	114.5	114.5	114.5	Y
					0.1	3	94.2	94.2	94.2	105.8	105.8	105.8	Y
					3	0.1	92.8	92.8	92.8	107.2	107.2	107.2	Y
					3	3	97.2	97.2	97.2	102.8	102.8	102.8	Y
Capsule	50.0	50.0	3	2	0.1	0.1	85.3	85.3	85.3	114.7	114.7	114.7	Y
					0.1	3	94.1	94.1	94.1	106.3	106.3	106.3	Y
					3	0.1	88.2	88.2	88.2	111.8	111.8	111.8	Y
					3	3	94.8	94.8	94.8	105.3	105.3	105.3	Y
				300	0.1	0.1	85.3	85.3	85.3	114.7	114.7	114.7	Y
					0.1	3	94.1	94.1	94.1	106.3	106.3	106.3	Y
					3	0.1	88.1	88.1	88.1	111.9	111.9	111.9	Y
					3	3	95.4	95.4	95.4	104.9	104.9	104.9	Y
			300	2	0.1	0.1	85.2	85.2	85.2	114.8	114.8	114.8	Y
					0.1	3	88.3	88.3	88.3	111.7	111.7	111.7	Y
					3	0.1	87.2	87.2	87.2	112.8	112.8	112.8	Y
					3	3	89.1	89.1	89.1	111.1	111.1	111.1	Y
				300	0.1	0.1	85.2	85.2	85.2	114.8	114.8	114.8	Y
					0.1	3	88.3	88.3	88.3	111.7	111.7	111.7	Y
					3	0.1	88.0	88.0	88.0	112.0	112.0	112.0	Y
					3	3	90.1	90.1	90.1	110.5	110.5	110.5	Y
	99.0	50.0	3	2	0.1	0.1	88.7	88.7	88.7	111.3	111.3	111.3	Y

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					0.1	3	.	.	.	.	.	.	Y
					3	0.1	.	.	.	.	.	.	Y
					3	3	.	.	.	.	.	.	Y
				300	0.1	0.1	88.7	88.7	88.7	111.3	111.3	111.3	Y
					0.1	3	.	.	.	.	.	.	Y
					3	0.1	90.7	90.7	90.7	109.4	109.4	109.4	Y
					3	3	.	.	.	.	.	.	Y
			300	2	0.1	0.1	85.2	85.2	85.2	114.8	114.8	114.8	Y
					0.1	3	88.9	88.9	88.9	111.1	111.1	111.1	Y
					3	0.1	87.4	87.4	87.4	112.6	112.6	112.6	Y
					3	3	89.8	89.8	89.8	110.5	110.5	110.5	Y
				300	0.1	0.1	85.2	85.2	85.2	114.8	114.8	114.8	Y
					0.1	3	88.9	88.9	88.9	111.1	111.1	111.1	Y
					3	0.1	88.0	88.0	88.0	112.0	112.0	112.0	Y
					3	3	90.9	90.9	90.9	109.9	109.9	109.9	Y
	99.0	99.0	3	2	0.1	0.1	90.0	90.0	90.0	110.0	110.0	110.0	Y
					0.1	3	.	.	.	.	.	.	Y
					3	0.1	.	.	.	.	.	.	Y
					3	3	.	.	.	.	.	.	Y
				300	0.1	0.1	90.0	90.0	90.0	110.0	110.0	110.0	Y
					0.1	3	.	.	.	.	.	.	Y
					3	0.1	93.7	93.7	93.7	106.3	106.3	106.3	Y
					3	3	.	.	.	.	.	.	Y
			300	2	0.1	0.1	85.3	85.3	85.3	114.7	114.7	114.7	Y
					0.1	3	92.0	92.0	92.0	108.0	108.0	108.0	Y
					3	0.1	89.6	89.6	89.6	110.4	110.4	110.4	Y
					3	3	93.2	93.2	93.2	106.8	106.8	106.8	Y
				300	0.1	0.1	85.4	85.4	85.4	114.6	114.6	114.6	Y
					0.1	3	92.0	92.0	92.0	108.0	108.0	108.0	Y
					3	0.1	90.8	90.8	90.8	109.2	109.2	109.2	Y
					3	3	94.2	94.2	94.2	105.8	105.8	105.8	Y

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PART 2 (CON'T)
Dissolution
Sampling Plan 1
Test Data Set & Results

CI Level	Lower Bound	Q	Sample Size	Sample Mean	Expected Result	Program Result	Independent Result	All Agree? (Y or N)
50.0	50.0	40	3	40.2	0.93	0.93	0.93	Y
				100.0	23.20	23.20	23.20	Y
			1000	40.2	18.07	18.07	18.07	Y
				100.0	46.13	46.13	46.13	Y
		85	3	85.2	0.44	0.44	0.44	Y
				100.0	10.10	10.10	10.10	Y
			1000	85.2	8.53	8.53	8.53	Y
				100.0	19.83	19.83	19.83	Y
	99.0	40	3	40.2	0.37	0.37	0.37	Y
				100.0	13.69	13.69	13.69	Y
			1000	40.2	1.00	1.00	1.00	Y
				100.0	25.00	25.00	25.00	Y
		85	3	85.2	0.17	0.17	0.17	Y
				100.0	6.41	6.41	6.41	Y
			1000	85.2	0.47	0.47	0.47	Y
				100.0	11.73	11.73	11.73	Y
99.0	50.0	40	3	40.2	0.02	0.02	0.02	Y
				100.0	1.76	1.76	1.76	Y
			1000	40.2	5.76	5.76	5.76	Y
				100.0	42.34	42.34	42.34	Y
		85	3	85.2	0.01	0.01	0.01	Y
				100.0	0.68	0.68	0.68	Y
			1000	85.2	2.72	2.72	2.72	Y
				100.0	18.27	18.27	18.27	Y
	99.0	40	3	40.2	0.02	0.02	0.02	Y
				100.0	1.25	1.25	1.25	Y
			1000	40.2	0.84	0.84	0.84	Y
				100.0	23.42	23.42	23.42	Y
		85	3	85.2	0.01	0.01	0.01	Y
				100.0	0.54	0.54	0.54	Y
			1000	85.2	0.40	0.40	0.40	Y
				100.0	10.98	10.98	10.98	Y

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PART 2 (CON'T)
Dissolution
Sampling Plan 2
Test Data Set & Results

CI Level	Lower Bound	Q	# Loc	#/Location	SE Increment	SM Increment	SE	SM	Expected Result	Program Result	Independent Result	All Agree? (Y or N)
50.0	50.0	40	3	2	0.10	5.00	0.10	5.00	43.10	43.10	43.10	Y
					0.10	5.00	0.10	20.00	89.70	89.70	89.70	Y
					0.10	5.00	5.00	5.00	43.20	43.40	43.40	N
					0.10	5.00	5.00	20.00	90.00	90.00	90.00	Y
				300	5.00	0.10	5.00	0.10	40.20	40.20	40.20	Y
					5.00	0.10	5.00	5.00	43.70	43.70	43.70	Y
					5.00	0.10	20.00	0.10	55.00	55.00	55.00	Y
					5.00	0.10	20.00	5.00	60.30	60.30	60.30	Y
			300	2	5.00	5.00	5.00	5.00	40.20	40.20	40.20	Y
					5.00	5.00	5.00	20.00	56.60	56.60	56.60	Y
					5.00	5.00	20.00	5.00	46.90	46.90	46.90	Y
					5.00	5.00	20.00	20.00	64.10	64.10	64.10	Y
				300	5.00	5.00	5.00	5.00	40.30	40.30	40.30	Y
					5.00	5.00	5.00	20.00	57.10	57.10	57.10	Y
					5.00	5.00	20.00	5.00	55.80	55.80	55.80	Y
					5.00	5.00	20.00	20.00	70.80	70.80	70.80	Y
		85	3	2	0.10	0.10	0.10	0.10	85.20	85.20	85.20	Y
					0.10	0.10	0.10	5.00	88.10	88.10	88.10	Y
					0.10	0.10	5.00	0.10	85.20	85.20	85.20	Y
					0.10	0.10	5.00	5.00	88.40	88.40	88.40	Y
			300	300	5.00	0.10	5.00	0.10	85.20	85.20	85.20	Y
					5.00	0.10	5.00	5.00	85.30	85.30	85.30	Y
					5.00	0.10	10.00	0.10	86.10	86.10	86.10	Y
					5.00	0.10	10.00	5.00	87.20	87.20	87.20	Y
50.0	99.0	40	3	2	5.00	5.00	5.00	5.00	49.40	49.40	49.40	Y
					5.00	5.00	5.00	20.00	.	.	.	Y
					5.00	5.00	20.00	5.00	89.40	89.40	89.40	Y
					5.00	5.00	20.00	20.00	.	.	.	Y
			300	300	5.00	5.00	5.00	5.00	43.70	43.70	43.70	Y

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					5.00	5.00	5.00	20.00	86.10	86.10	86.10	Y
					5.00	5.00	20.00	5.00	84.10	84.10	84.10	Y
					5.00	5.00	20.00	20.00	.	.	.	Y
		85	3	2	0.25	0.25	0.25	0.25	85.40	85.40	85.40	Y
					0.25	0.25	0.25	5.00	92.50	92.50	92.50	Y
					0.25	0.25	5.00	0.25	87.70	87.70	87.70	Y
					0.25	0.25	5.00	5.00	94.40	94.40	94.40	Y
99.0	50.0	40	3	2	0.25	0.25	0.25	0.25	45.30	45.30	45.30	Y
					0.25	0.25	0.25	5.00	.	.	.	Y
					0.25	0.25	5.00	0.25	64.90	64.90	64.90	Y
					0.25	0.25	5.00	5.00	.	.	.	Y
			300	300	5.00	5.00	5.00	5.00	41.00	41.00	41.00	Y
					5.00	5.00	5.00	20.00	63.00	63.00	63.00	Y
					5.00	5.00	20.00	5.00	56.80	56.80	56.80	Y
					5.00	5.00	20.00	20.00	76.00	76.00	76.00	Y
		85	3	2	0.25	0.25	0.25	0.25	90.30	90.30	90.30	Y
					0.25	0.25	0.25	5.00	.	.	.	Y
					0.25	0.25	5.00	0.25	.	.	.	Y
					0.25	0.25	5.00	5.00	.	.	.	Y
99.0	99.0	40	3	2	0.25	0.25	0.25	0.25	47.00	47.00	47.00	Y
					0.25	0.25	0.25	5.00	.	.	.	Y
					0.25	0.25	5.00	0.25	96.60	96.60	96.60	Y
					0.25	0.25	5.00	5.00	.	.	.	Y
				300	5.00	0.10	5.00	0.10	44.70	44.70	44.70	Y
					5.00	0.10	5.00	5.00	.	.	.	Y
					5.00	0.10	20.00	0.10	88.10	88.10	88.10	Y
					5.00	0.10	20.00	5.00	.	.	.	Y
			300	2	5.00	5.00	5.00	5.00	44.10	44.10	44.10	Y
					5.00	5.00	5.00	20.00	93.90	93.90	93.90	Y
					5.00	5.00	20.00	5.00	71.30	71.30	71.30	Y
					5.00	5.00	20.00	20.00	.	.	.	Y
				300	5.00	5.00	5.00	5.00	44.60	44.60	44.60	Y
					5.00	5.00	5.00	20.00	94.80	94.80	94.80	Y
					5.00	5.00	20.00	5.00	85.30	85.30	85.30	Y
					5.00	5.00	20.00	20.00	.	.	.	Y
		85	3	2	0.25	0.25	0.25	0.25	92.00	92.00	92.00	Y
					0.25	0.25	0.25	5.00	.	.	.	Y

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					0.25	0.25	5.00	0.25	.	.	.	Y
					0.25	0.25	5.00	5.00	.	.	.	Y
			300	300	0.10	5.00	0.10	5.00	88.50	88.50	88.50	Y
					0.10	5.00	0.10	10.00	99.20	99.20	99.20	Y
					0.10	5.00	5.00	5.00	89.60	89.60	89.60	Y
					0.10	5.00	5.00	10.00	.	.	.	Y

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FORMED FILLED OUT ON 02 JAN. 2002 BASED ON PRIOR PROGRAM RUNS.
[signature]

PART 3
Evaluation

*** EACH PDF FILE REFERRED IS A PRINT OUT OF THE CORRESPONDING MATHCAD PROGRAM USED TO VERIFY THE SAS INTEGRATION CODE.

Content Uniformity
Sampling Plan 1

Dosage Form	CI Level	Lower Bound	Sample Size	Population Mean	Population CV	Expected Result	Program Result	Independent Result	All Agree? (Y or N)	
Tablet	99.0	99.0	5	98.5	1.0	0.38250	0.38250	0.38250	Y	CUSP1 TAB A.PDF
				100.0	0.5	0.98529	0.98529	0.98529	Y	CUSP1 TAB B.PDF
Capsule	50.0	50.0	2000	·93.0	6.8	0.08688	0.08688	0.08688	Y	CUSP1 CAP A.PDF
				95.0	7.0	0.93923	0.93923	0.93923	Y	CUSP1 CAP B.PDF

Content Uniformity
Sampling Plan 2

Dosage Form	CI Level	Lower Bound	# Loc	#/Location	Population Mean	Population Within Location	Population Between Location	Expected Result	Program Result	Independent Result	All Agree? (Y or N)	
Tablet	50.0	50.0	3	2	100.0	1.0	1.0	0.99986	0.99986	0.99986	Y	CUSP2 TAB A.PDF
						3.0	3.0	0.52631	0.52631	0.52631	Y	CUSP2 TAB B.PDF
Capsule	99.0	99.0	300	300	97.5	3.5	3.5	0.99200	0.99200	0.99200	Y	CUSP2 CAP A.PDF
						3.5	4.0	0.24251	0.24251	0.24251	Y	CUSP2 CAP B.PDF

Dissolution
Sampling Plan 1

Q	CI Level	Lower Bound	Sample Size	Population Mean	Population CV	Expected Result	Program Result	Independent Result	All Agree? (Y or N)	
40	99.0	99.0	3	98.0	1.0	0.78665	0.78665	0.78665	Y	DISPICHK A.PDF
				100.0	3.0	0.15652	0.15652	0.15654	Y*	DISPICHK B.PDF
85	50.0	50.0	2000	85.3	4.0	0.90502	0.90502	0.90502	Y	Disp1b.pdf

*AGREE TO 4 decimal places

Dissolution
Sampling Plan 2

Q	CI Level	Lower Bound	# Loc	#/Location	Increment	Population Mean	Population Within Location	Population Between Location	Expected Result	Program Result	Independent Result	All Agree? (Y or N)	
40	50.0	50.0	3	2	0.25	75.0	6.0	6.0	0.98481	0.98481	0.98481	Y	DISP2 A.PDF
					0.25		10.0	10.0	0.76350	0.76350	0.76500	Y*	DISP2 B.PDF
85	99	99	300	300	0.25	87.0	2.0	2.0	0.76594	0.76594	0.76594	Y	DISP2 C.PDF
					0.25		3.0	2.0	0.01274	0.01274	0.01274	Y	DISP2 D.PDF

* only off by 0.0015 with over 13,000 data lines + 26,000 + estimations of extreme tail probabilities for the χ^2 distn.

PART 4
Content Uniformity
Sampling Plan 1

Case	Dosage Form	CI Level	Sample Size	Sample Mean	Sample CV	Expected Lower Bound	Program Lower Bound	Independent Lower Bound	All Agree? (Y or N)
1	Capsule	50	2000	110.00	2.650	0.95017	0.95017	0.95017	Y
2	Tablet	99	5	86.00	0.100	0.42512	0.42512	0.42512	Y
3	Capsule	83.2	48	94.42	4.919	0.84227	0.84227	0.84227	Y
4	Tablet	57.4	15	110.83	1.714	0.54160	0.54160	0.54160	Y

Content Uniformity
Sampling Plan 2

Case	Dosage Form	CI Level	# Locations	# / Location	Sample SE	Sample SM	Sample Mean	Expected Lower Bound	Program Lower Bound	Independent Lower Bound	All Agree? (Y or N)
1	Capsule	50	300	300	4.000	4.800	103.10	0.95164	0.95164	0.95164	Y
2	Tablet	99	3	2	0.100	0.100	90.50	0.95271	0.95271	0.95271	Y
3	Capsule	55.3	15	4	4.216	3.461	92.52	0.45013	0.45013	0.45013	Y
4	Tablet	88.8	30	2	1.842	1.016	111.21	0.62909	0.62909	0.62909	Y

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Dissolution
Sampling Plan 1

Case	Q	CI Level	Sample Size	Sample Mean	Sample CV	Expected Lower Bound	Program Lower Bound	Independent Lower Bound	All Agree? (Y or N)
1	40.0	99	1000	41.00	5.510	0.95004	0.95004	0.95004	Y
2	85.0	50	3	100.00	7.320	0.95018	0.95018	0.95018	Y
3	75.4	58.4	12	77.63	6.432	0.78157	0.78157	0.78157	Y

Dissolution
Sampling Plan 2

Case	Q	CI Level	# Locations	# / Location	Sample SE	Sample SM	Sample Mean	Expected Lower Bound	Program Lower Bound	Independent Lower Bound	All Agree? (Y or N)
1	40.0	50	3	300	1.000	1.000	41.20	0.99825	0.95102	0.95102	N
2	85.0	99	300	2	10.750	9.250	99.20	0.96410	0.95105	0.95105	N
3	55.7	67.4	15	3	6.251	5.752	59.11	0.77095	0.77095	0.77095	Y

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FORMS

FORM 1
LOAD AND RUN PROGRAM

Name: Merlin Utter

Computer Description:

PC

Manufacturer:	Dell
Model:	P6400
CPU Speed:	400 MHz
Hard Drive Size:	4.3 Gb
RAM Memory:	128 MB

SAS Version Number: Version 8

Sign below to indicate that the program, CuDAL, loaded and ran successfully on your PC.

Laura Foust:		Date:
MaryAnn Gorko		Date:
Douglas Lee:		Date:
Jerry Planchard:		Date:
Edith Senderak:		Date:
Helen Strickland		Date:
Merlin Utter:	Merlin L Utter	Date: 11/16/2000

Note: I initially ran it with the Enhanced Editor and it did not work. I needed to turn off the Enhanced Editor and use the Program Editor for it to work.

FORM 1
LOAD AND RUN PROGRAM

Name: DOUGLAS S. LEE

Computer Description:

PC

Manufacturer: TOSHIBA
Model: TECRA LAPTOP
CPU Speed: 266 Mhz
Hard Drive Size: 3.8 GB
RAM Memory: 96 MB

SAS Version Number: 6.12

Sign below to indicate that the program, CuDAL, loaded and ran successfully on your PC.

Laura Foust:		Date:
MaryAnn Gorko		Date:
Douglas Lee:	DM Lee	Date: 09 NOV. 2000
Jerry Planchard:		Date:
Edith Senderak:		Date:
Merlin Utter:		Date:

FORM 1
LOAD AND RUN PROGRAM

Name: Jerome Planchard

Computer Description:

PC

Manufacturer:	Compaq
Model:	Deskpro
CPU Speed:	166 MHz
Hard Drive Size:	2.2 GB
RAM Memory:	64 MB

SAS Version Number: 6.12

Sign below to indicate that the program, CuDAL, loaded and ran successfully on your PC.

Laura Foust:		Date:
MaryAnn Gorko		Date:
Douglas Lee:		Date:
Jerry Planchard:	JPlanchard	Date: 6/13/00
Edith Senderak:		Date:
Merlin Utter:		Date:

FORM 1
LOAD AND RUN PROGRAM

Name: Laura Foust

Computer Description:

PC

Manufacturer: Compac
Model: ?
CPU Speed: 133
Hard Drive Size: 1.06 GB
RAM Memory: 64 MB

SAS Version Number: 6.12

Sign below to indicate that the program, CuDAL, loaded and ran successfully on your PC.

Laura Foust: Laura B Foust Date: 09-01-00

MaryAnn Gorko ________ Date: ________

Douglas Lee: ________ Date: ________

Jerry Planchard: ________ Date: ________

Edith Senderak: ________ Date: ________

Helen Strickland ________ Date: ________

Merlin Utter: ________ Date: ________

FORM 1
LOAD AND RUN PROGRAM

Name: Mary Ann Gorko

Computer Description:

PC

Manufacturer:	Compaq
Model:	Desk Pro
CPU Speed:	450MHZ
Hard Drive Size:	2GB
RAM Memory:	64 MB

SAS Version Number: 6.12

Sign below to indicate that the program, CuDAL, loaded and ran successfully on your PC.

Laura Foust:		Date:
MaryAnn Gorko	Mary Ann Gorko	Date: 6/30/2000
Douglas Lee:		Date:
Jerry Planchard:		Date:
Edith Senderak:		Date:
Helen Strickland		Date:
Merlin Utter:		Date:

FORM 1
LOAD AND RUN PROGRAM

Name: Helen N. Strickland

Computer Description:

PC

Manufacturer: IBM
Model: Think Pad 600E
CPU Speed: intel Pentium III, 363 MHz
Hard Drive Size: 6.00GB
RAM Memory: 128 M

SAS Version Number: 6.12

Sign below to indicate that the program, CuDAL, loaded and ran successfully on your PC.

Laura Foust:		Date:
MaryAnn Gorko		Date:
Douglas Lee:		Date:
Jerry Planchard:		Date:
Edith Senderak:		Date:
Helen Strickland	Helen N. Strickland	Date: 11-07-2000
Merlin Utter:		Date:

FORM 2
PRIMARY WINDOW INPUT ERROR CHECKS

Sign below to indicate that all of the found responses agree with the expected results in Appendix D.

Jerry Planchard: JPlanchard   Date: 10/10/01

FORM 3
MATHEMATICAL CALCULATION VERIFICATION

Signing below indicates that the calculations described in Appendix E to determine lower bounds for content uniformity and dissolution are correct.

Laura Foust: Laura B Foust Date: 10-25-00

MaryAnn Gorko Mary Ann Gorko Date: 11-30-00

Edith Senderak: N/A (See Amendment 2) Date: ______________

FORM 4
PROGAM STRATEGY & SAS CODE VERIFICATION

Signing below indicates the following:

1) The calculations described in Appendix E to determine lower bounds for content uniformity and dissolution are implemented correctly in the macros.

2) The strategies described in Appendix F are appropriate.

3) The SAS code implements the strategies described in Appendix F correctly.

Laura Foust:	Laura B Foust	Date: 31 July 2001
MaryAnn Gorko	Mary Ann Gorko	Date: 23 July 2001
Edith Senderak:	N/A (see Amendment 2)	Date:
Helen Strickland:	Helen A. Strickland	Date: 08-08-2001

FORM 5
TEST DATA SET AGREEMENT

Part 1: Test the manager program

Signing below indicates that the primary window MAIN used to select the analysis macros successfully completed the test data in Appendix G (Part 1). The observed results agreed with the expected results.

Jerry Planchard: J Planchard Date: 10/10/01

Part 2: Test Table generation

Signing below indicates that the test data in Appendix G (Part 2) used to generate the acceptance limit tables agreed with the following:

1) The results from running CuDAL.

2) The results from an independent calculation.

Merlin Utter: Merlin Utter Date: 10/17/01

Part 3: Test Table Evaluation

Signing below indicates that the test data in Appendix G (Part 3) used to generate the acceptance limit tables agreed with the following:

1) The results from running CuDAL.

2) The results from an independent calculation.

Douglas Lee: D Lee Date: 12/09/01

Part 4: Test specific sample results

Signing below indicates that the test data in Appendix G (Part 4) used to generate the acceptance limit tables agreed with the following:

1) The results from running CuDAL.

2) The results from an independent calculation.

Merlin Utter: Merlin Utter Date: 10/17/01

FORM 6
PROBLEM/REQUEST REPORT

Name: __Mary Ann Gorko ________ Mary Ann Gorko 5/18/2001

Date: __May 18, 2001________________

Describe the error or discrepancy in expected result versus found result or in expected performance of the program.

In the program DISP1.SAS, there is a "&" missing on line 335. Lines 335-338 are used to check that the sample mean is greater than Q. The missing "&" causes Q to be undefined since Q is a macro variable.

Although DISP1.SAS is correct as is, there are several changes that could be made in order to make the program more efficient and easier to read. The changes are described below:

1) In lines 149-153, the cutoffs for the 5 data sets could be equal to a mean value. Due to rounding, this could cause an unequal number of rows in the data sets. The cutoff should be chosen so that it is impossible for the mean to be equal to the cutoff.

2) It appears that lines 247-260 are not needed. Instead of appending data sets 1 to 5 back together, it would be better to use data set D1ONE and create STD and X.

PROBLEM/REQUEST REPORT

Name: Jerry Planchard

Date: 10/4/01

Describe the error or discrepancy in expected result verses found result or in expected performance of the program.

In error checking the windows in the program the following issue was found:

> In Dissolution, Sampling Plan 2, in the TMAIN window, for the SAMPLE BETWEEN SD parameter - the error screens do not work. Values of 0, A, and -3 were inputted and errors were not indicated. The program ran.

The following issues were found in Appendix D of the protocol:

> For Dissolution, Sampling Plan 1, MDISP1 window, Q parameter – the protocol indicates that a value of 85.1 will produce an error screen. It does not. The program allows a Q value between 40 and 95.
>
> For Dissolution, Sampling Plan 1, TMAIN window, Sample Mean parameter – the protocol indicates that values of 85.0 and 115.0 should produce an error screen. The program allows a sample mean of 40 – 95 provided it is equal to or greater than Q.
>
> For Dissolution, Sampling Plan 2, MDISP2 window, Q parameter – the protocol indicates that an input of 85.1 will produce an error screen. It does not. The program allows a Q value between 40 and 95.
>
> For Dissolution, Sampling Plan 2, TMAIN window, Sample Mean parameter – the protocol indicates that values of 85.0 and 115.0 should produce an error screen. The program allows a sample mean of 40 – 95 provided it is equal to or greater than Q.

The following issues were found in Appendix F (or in a subsequent correction) –

> In the second paragraph describing the macro calcusp1 [150-228] it is stated that the overall α level (1-confidence level) is the product of the two individual α levels for μ and σ. So the two individual confidence levels are the square root of the overall α. Actually this should read the two individual confidence levels are the square root of the overall confidence level. This statement is repeated in describing the macro caldisp1[110-158].
>
> In the expression for the upper confidence limit for the sum of the between and within location variance components in Amendment 1 there are too many open parentheses in the expression following the first plus sign and too many closed parentheses in the expression following the second plus sign.

PROBLEM/REQUEST REPORT

Name: Merlin Utter

Date: 10/11/2001

Describe the error or discrepancy in expected result verses found result or in expected performance of the program.

Description:

Summary:

During the testing of parts 2 and 4 of the validation test data given in Appendix G of the protocol, nine (9) discrepancies between what I found during the testing and what was stated as the expected result were found. Seven of the nine discrepancies were in the part 2 evaluation (six for Sampling Plan 2 for Content Uniformity and one for Sampling Plan 2 for Dissolution). In addition, two discrepancies were found in the part 4 evaluation, both for Sampling Plan 2 for Dissolution. The nine discrepancies are detailed below.

Details:

Part 2
Content Uniformity
Sampling Plan 2

Discrepancies in the Lower and Upper Expected Results were found for the following cases:

Dosage Form	CI Level	Lower Bound	# Locations	#/ Location	SE	SM	Expected Result Mean (Lower)	Expected Result Mean (Upper)
Tablet	50.0	50.0	3	300	0.1	3.0	89.7	110.3
Tablet	50.0	50.0	3	300	3.0	0.1	96.3	103.7
Tablet	99.0	99.0	3	300	3.0	0.1	.	.

The discrepancies were:

89.7 was expected and 96.3 was found
110.3 was expected and 103.7 was found
96.3 was expected and 89.7 was found
103.7 was expected and 110.3 was found
The lower mean result . was expected and 96.0 was found
The upper mean result . was expected and 104.0 was found

Dissolution
Sampling Plan 2

A discrepancy in the Expected Result was found for the following case:

CI Level	Lower Bound	Q	# Locations	#/ Location	SE Increment	SM Increment	SE	SM	Expected Result Mean
50.0	50.0	40.0	3	2	0.1	5.00	5.00	5.00	43.20

The discrepancy was:

43.20 was expected and 43.40 was found

Part 4
Evaluation
Dissolution
Sampling Plan 2

Discrepancies were found in the Expected Lower Bound for the following cases:

Q	CI Level	# Locations	#/ Locations	Sample SE	Sample SM	Sample Mean	Expected Lower Bound
40.0	50	3	300	1.000	1.000	41.20	0.99825
85.0	99	300	2	10.750	9.250	99.20	0.96410

The discrepancies were:

0.99825 was expected and 0.95102 was found
0.96410 was expected and 0.95105 was found

M. Utter
10/11/2001

SUPPORT DOCUMENTATION

This program is split into three basic parts.

1. printing an acceptance limit table
2. evaluating the table (probabilities)
3. computing a lower bound for a sample result.

SAS lines 1-57, defining input screens and default values, are confirmed by use and examining Primary windows section of this validation package. SAS lines 58-84 are error messages that are being validated by other members of the team.

To verify part 3, Lines 86-92, C1CALC macro (SAS lines 95-149) and SMPCUSP1 macro (SAS lines 378-440), I temporarily added a PROC PRINT statement after DATA TAB in SMPCUSP1 Macro. Intermediate results are then confirmed using Excel. Lines 109 and 135 are correctly equivalent to $P_1^{30} + 30 \times P_1^{29} \times P_2 + 435 \times P_1^{28} \times P_2^2 + 4060 \times P_1^{27} \times P_2^3$, plus lines 119 and 145 are correctly equivalent to $P_1^{10} + 10 \times P_1^9 \times P_2$. These are verified by hand, since a tablet example was used to verify the following code. Input values were: form=TABLET, number=50, cilevel=95.0, mean=98.3, cv=5.

CuDAL output:

```
The SAS System

 OBS  TYPE   OVERBD  MEAN  CILEVEL     Z      N    CHI    CV  SAMPSD   SIGMA     LLU      ULU

  1    T    0.69879  98.3     95    2.23648  50  31.5950   5   4.915  6.12086  96.3641  100.236

 OBS    C2      K        V       PCV2     P1L      P1U       P1       P2L       P2U       P2

  1   0.078  2682.78  1341.64  0.98225  0.47822  0.50744  0.98567  .0063831  .0079046  0.014288

 OBS  PCTTAB2     LPROB2     C1       PCV1     PCTTAB1     LPROB1    OVERLBD    OVERUBD

  1   0.93052    0.91277    0.06    0.53332    0.86557    0.39890    0.69879    0.91277


                  ACCEPTANCE LIMIT TABLE FOR TABLET  CONTENT UNIFORMITY(N=  50)
                                           SAMPLING PLAN 1
                  DETERMINE PROBABILITY OF FUTURE SAMPLES PASSING THE USP TEST
                        WITH 95.0 ASSURANCE FOR GIVEN SAMPLE MEAN AND CV

                               SAMPLE       SAMPLE
                                MEAN        STD DEV             LOWER
                             (% CLAIM)    (% CLAIM)    CV      BOUND

                                98.3        4.915       5    0.69879
```

Excel results: Bold values correspond with SAS output (above)

Z	CHI	S	sigma	LLU	ULU
2.236483851	**31.59502524**	**4.915**	**6.120856655**	**96.3640552**	**100.235945**

k S2 L	k S2 U	k S1 L	k S1 U
7436.787541	8046.329097	2479.595847	**2682.776366**

v S2 L	v S2 U	v S1 L	v S1 U
3718.643787	4023.414564	1240.047974	**1341.638229**

PCV2 L	PCV2 U	PCV1 L	PCV1 U
0.960308598	**0.982250351**	0.46892965	**0.533320457**

L= results using lower bound on mean U= results using upper bound on mean (these values were the ones printed in SAS, the L values are generally overwritten except for OVERLBD. This value agrees, so other L values must agree.
Note: 1= value for stage 1 USP (n=10), 2= value for stage 2 USP (n=30)

P1 L	P1 U
0.967152091	**0.985667487**

P2 L	P2 U
0.032605241	**0.014287719**

PCTTAB2 L	PCTTAB2 U
0.738477288	**0.93051582**

PCTTAB1 L	PCTTAB1 U
0.716057256	**0.865574219**

LPROB1 L	LPROB1 U
0.184986906	**0.398894676**

LPROB2 L	LPROB2 U
0.698785886	**0.912766171**

OVERLBD	OVERUBD
0.698785886	**0.912766171**

Results were obtained from the following formulas (show formulas in Excel):

Z	CHI	S
=NORMINV((1+SQRT(0.95))/2,0,1)	=CHIINV(SQRT(0.95),49)	=5*0.983

k S2 L	k S2 U	k S1 L
=1+30*E2*E2/(D2*D2)	=1+30*F2*F2/(D2*D2)	=1+10*E2*E2/(D2*D2)

v S2 L	v S2 U	v S1 L
=A5*A5/(1+2*30*E2*E2 / (D2*D2))	=B5*B5/(1+2*30*F2*F2 / (D2*D2))	=C5*C5/(1+2*10*E2*E2 / (D2*D2))

PCV2 L	PCV2 U	PCV1 L
=FDIST(30/(A5*0.078*0.078),A8,29)	=FDIST(30/(B5*0.078*0.078),B8,29)	=FDIST(10/(C5*0.06*0.06),C8,9)

sigma	LLU	ULU
=SQRT(49*(C2)*C2/B2)	=98.3-(A2*D2/SQRT(50))	=98.3+(A2*D2/SQRT(50))

k S1 U
=1+10*F2*F2/(D2*D2)

v S1 U
=D5*D5/(1+2*10*F2*F2 / (D2*D2))

PCV1 U
=FDIST(10/(D5*0.06*0.06),D8,9)

P1 L
=NORMSDIST((115-E2)/D2)-NORMSDIST((85-E2)/D2)

P2 L
=NORMSDIST((85-E2)/D2)-NORMSDIST((75-E2)/D2)+ NORMSDIST((125-E2)/D2)-NORMSDIST((115-E2)/D2)

PCTTAB2 L

=(G2)^30+30*(G2)^29*G5

PCTTAB1 L
=(G2)^10

LPROB1 L
=MAX(C11+G11-1,0)

LPROB2 L
=MAX(A11+G8-1,0)

OVERLBD
=MAX(G14,G17)

P1 U
=NORMSDIST((115-F2)/D2)-NORMSDIST((85-F2)/D2)

P2 U
=NORMSDIST((85-F2)/D2)-NORMSDIST((75-F2)/D2)+ NORMSDIST((125-F2)/D2)-NORMSDIST((115-F2)/D2)

PCTTAB2 U
=(H2)^30+30*(H2)^29*H5

PCTTAB1 U
=(H2)^10

LPROB1 U
=MAX(D11+H11-1,0)

LPROB2 U
=MAX(B11+H8-1,0)

OVERUBD
=MAX(H14,H17)

To validate Macro CALCUSP1 (lines 150-229) and Macro PRTCUSP1 (lines 230-255), the full table of acceptance limits (generated from these two macros) was printed for a given form (capsule), sample number (100), assurance (90) and coverage (95). Then, the SMPCUSP1 macro (verified using Excel) was used to confirm that the table values are correct. To do this, the mean and CV from the table were entered into the last macro. The lower bound coverage should then equal the coverage (about 95%). Four table results were confirmed (low, medium and high means). The table is on the following 2 pages, the confirmed results are bolded. The lower bound results from SMPCUSP1 macro are then provided.

CuDAL output:

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 100)

SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 90.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)
85.1	0.06	90.1	2.67	95.1	4.95	100.1	5.57	105.1	4.41	110.1	2.10
85.2	0.11	90.2	2.72	95.2	4.98	100.2	5.57	105.2	4.37	110.2	2.06
85.3	0.17	90.3	2.77	95.3	5.02	100.3	5.58	105.3	4.32	110.3	2.01
85.4	0.22	90.4	2.82	95.4	5.05	100.4	5.58	105.4	4.27	110.4	1.97
85.5	**0.27**	90.5	2.87	95.5	5.08	100.5	5.58	105.5	4.23	110.5	1.92
85.6	0.33	90.6	2.92	95.6	5.11	100.6	5.58	105.6	4.18	110.6	1.88
85.7	0.39	90.7	2.97	95.7	5.14	100.7	5.58	105.7	4.13	110.7	1.83
85.8	0.44	90.8	3.01	95.8	5.17	100.8	5.58	105.8	4.09	110.8	1.79
85.9	0.49	90.9	3.06	95.9	5.20	100.9	5.58	105.9	4.04	110.9	1.74
86.0	0.55	91.0	3.11	96.0	5.22	101.0	5.58	106.0	3.99	111.0	1.70
86.1	0.60	91.1	3.16	96.1	5.25	101.1	5.58	106.1	3.95	111.1	1.66
86.2	0.66	91.2	3.21	96.2	5.27	101.2	5.58	106.2	3.90	111.2	1.61
86.3	0.71	91.3	3.26	96.3	5.29	101.3	5.58	106.3	3.85	111.3	1.57
86.4	0.76	91.4	3.30	96.4	5.31	101.4	5.57	106.4	3.80	111.4	1.53
86.5	0.82	91.5	3.35	96.5	5.33	101.5	5.57	106.5	3.76	111.5	1.48
86.6	0.87	91.6	3.40	96.6	5.35	101.6	5.57	106.6	3.71	111.6	1.44
86.7	0.93	91.7	3.45	96.7	5.36	101.7	5.56	106.7	3.66	111.7	1.39
86.8	0.98	91.8	3.49	96.8	5.38	101.8	5.55	106.8	3.62	111.8	1.35
86.9	1.03	91.9	3.54	96.9	5.39	101.9	5.53	106.9	3.57	111.9	1.31
87.0	1.08	92.0	3.59	97.0	5.41	102.0	5.51	107.0	3.52	112.0	1.26
87.1	1.14	92.1	3.64	97.1	5.42	102.1	5.50	107.1	3.48	112.1	1.22
87.2	1.19	92.2	3.68	97.2	5.43	102.2	5.48	107.2	3.43	112.2	1.18
87.3	1.24	92.3	3.73	97.3	5.45	102.3	5.46	107.3	3.38	112.3	1.13
87.4	1.30	92.4	3.78	97.4	5.46	102.4	5.44	107.4	3.34	112.4	1.09
87.5	1.35	92.5	3.82	97.5	5.47	102.5	5.41	107.5	3.29	112.5	1.05
87.6	1.40	92.6	3.87	97.6	5.48	102.6	5.39	107.6	3.24	112.6	1.01
87.7	1.45	92.7	3.92	97.7	5.48	102.7	5.36	107.7	3.20	112.7	0.96
87.8	1.50	92.8	3.96	97.8	5.49	102.8	5.34	107.8	3.15	112.8	0.92
87.9	1.56	92.9	4.01	97.9	5.50	102.9	5.31	107.9	3.10	112.9	0.88
88.0	1.61	93.0	4.05	98.0	5.51	103.0	5.28	108.0	3.06	113.0	0.83
88.1	1.66	93.1	4.10	98.1	5.51	103.1	5.25	108.1	3.01	113.1	0.79
88.2	1.71	93.2	4.14	98.2	5.52	103.2	5.21	108.2	2.96	113.2	0.75
88.3	1.76	93.3	4.19	98.3	5.52	103.3	5.18	108.3	2.92	113.3	0.71
88.4	1.81	93.4	4.24	98.4	5.53	103.4	5.15	108.4	2.87	113.4	0.67
88.5	1.87	93.5	4.28	98.5	5.53	103.5	5.11	108.5	2.83	113.5	0.62
88.6	1.92	93.6	4.32	98.6	5.54	103.6	5.07	108.6	2.78	113.6	0.58
88.7	1.97	93.7	4.37	98.7	5.54	103.7	5.03	108.7	2.74	113.7	0.54

88.8	2.02	93.8	4.41	98.8	5.55	103.8	4.99	108.8	2.69	113.8	0.50
88.9	2.07	93.9	4.46	98.9	5.55	103.9	4.95	108.9	2.64	113.9	0.46
89.0	2.12	94.0	4.50	99.0	5.55	**104.0**	**4.91**	109.0	2.60	114.0	0.41
89.1	2.17	94.1	4.54	99.1	5.56	104.1	4.86	109.1	2.55	114.1	0.37
89.2	2.22	94.2	4.59	99.2	5.56	104.2	4.82	109.2	2.51	114.2	0.33
89.3	2.27	94.3	4.63	99.3	5.56	104.3	4.78	109.3	2.46	114.3	0.29
89.4	2.32	94.4	4.67	99.4	5.56	104.4	4.73	109.4	2.41	114.4	0.25
89.5	2.37	**94.5**	**4.71**	99.5	5.56	104.5	4.69	109.5	2.37	114.5	0.21
89.6	2.42	94.6	4.75	99.6	5.57	104.6	4.64	109.6	2.32	114.6	0.16
89.7	2.47	94.7	4.80	99.7	5.57	104.7	4.60	109.7	2.28	114.7	0.12

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 90.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)
89.8	2.52	94.8	4.83	99.8	5.57	104.8	4.55	109.8	2.23	**114.8**	**0.08**
89.9	2.57	94.9	4.87	99.9	5.57	104.9	4.50	109.9	2.19	114.9	0.04
90.0	2.62	95.0	4.91	100.0	5.57	105.0	4.46	110.0	2.14		

```
ACCEPTANCE LIMIT TABLE FOR CAPSULE CONTENT UNIFORMITY(N= 100)
                      SAMPLING PLAN 1
 DETERMINE PROBABILITY OF FUTURE SAMPLES PASSING THE USP TEST
      WITH 90.0 ASSURANCE FOR GIVEN SAMPLE MEAN AND CV

            SAMPLE       SAMPLE
             MEAN       STD DEV              LOWER
          (% CLAIM)    (% CLAIM)     CV      BOUND

             104         5.1064     4.91    0.94971
```

```
ACCEPTANCE LIMIT TABLE FOR CAPSULE CONTENT UNIFORMITY(N= 100)
                      SAMPLING PLAN 1
 DETERMINE PROBABILITY OF FUTURE SAMPLES PASSING THE USP TEST
      WITH 90.0 ASSURANCE FOR GIVEN SAMPLE MEAN AND CV

            SAMPLE       SAMPLE
             MEAN       STD DEV              LOWER
          (% CLAIM)    (% CLAIM)     CV      BOUND

             94.5       4.45095     4.71    0.95057
```

```
ACCEPTANCE LIMIT TABLE FOR CAPSULE CONTENT UNIFORMITY(N= 100)
                      SAMPLING PLAN 1
 DETERMINE PROBABILITY OF FUTURE SAMPLES PASSING THE USP TEST
      WITH 90.0 ASSURANCE FOR GIVEN SAMPLE MEAN AND CV

            SAMPLE       SAMPLE
             MEAN       STD DEV              LOWER
          (% CLAIM)    (% CLAIM)     CV      BOUND

             85.5       0.23085     0.27    0.96181
```

GOING TO A CV=0.28 PRODUCES 94% LOWER BOUND. 96% IS AT LEAST 95%.

```
ACCEPTANCE LIMIT TABLE FOR CAPSULE CONTENT UNIFORMITY(N= 100)
                      SAMPLING PLAN 1
 DETERMINE PROBABILITY OF FUTURE SAMPLES PASSING THE USP TEST
      WITH 90.0 ASSURANCE FOR GIVEN SAMPLE MEAN AND CV

            SAMPLE       SAMPLE
             MEAN       STD DEV              LOWER
          (% CLAIM)    (% CLAIM)     CV      BOUND

             114.8      0.09184     0.08    0.96436
```

GOING TO A CV=0.09 PRODUCES LESS THAN 90% LOWER BOUND. 96% IS AT LEAST 95%.

Note: The entered N, assurance, form, mean, and CV were correctly used and displayed in output.

Macro EVCUSP1 (SAS lines 256-377) is validated by adding PROC PRINT to the code, limiting the range of data in DATA seven, and printing all values, not just END. The changed code is provided on the next page. Changes are in bold.

Changed part of the CUSP1.SAS code:

```
%MACRO CALCUSP1;
DATA TAB;
LENGTH TYPE $1;
LABEL OVERBD = 'OVERALL LOWER BOUND'
       MEAN = 'SAMPLE MEAN(%CLAIM)';
   TYPE = "&FORM";
   D=&D;
   Z = PROBIT((1 + SQRT(&CILEVEL / 100)) / 2);
   N = &NUMBER;
   CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);
   SDOLD = 0;
   STARTSD = 0.01;
   DO MEAN = 90 TO 100 BY 1;                              changed to verify
      BEGIN = STARTSD;
    DO SAMPSD = BEGIN TO 7.8 BY 0.001;
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
    LLU = MEAN - Z *SIGMA / SQRT(N);
    ULU = MEAN + Z * SIGMA / SQRT(N);
%c1calc
   IF OVERBD < &LBOUND/100 AND SAMPSD <= 0.0101 THEN DO;
   CV = 0; OUTPUT; SAMPSD = 20.0; GOTO NEXTT; END;
   IF OVERBD < &LBOUND/100 THEN DO;
      SAMPSD = SAMPSD - 0.001;
      IF SAMPSD < SDOLD THEN DO;
         STARTM = MEAN;
         GOTO UPPER;
          END;
      SDOLD = SAMPSD;
      STARTSD = SAMPSD;
      CV = 100 * SAMPSD / MEAN;
       OUTPUT;
       SAMPSD = 20.0;
       END;
    NEXTT:
     END;
    END;
    GOTO FINISH;
    UPPER:
          STARTSD = 0.01;

   DO MEAN = 114.9 TO STARTM BY -D;
    DO SAMPSD = STARTSD TO 7.8 BY 0.001;
    SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);
    LLU = MEAN - Z *SIGMA / SQRT(N);
    ULU = MEAN + Z * SIGMA / SQRT(N);
%c1calc
   IF OVERBD < &LBOUND/100 AND SAMPSD <= 0.0101 THEN DO;
   CV = 0; OUTPUT; SAMPSD = 20.0; GOTO NEXTB; END;
   IF OVERBD < &LBOUND/100 THEN DO;
      SAMPSD = SAMPSD - 0.001;
      STARTSD = SAMPSD;
      CV = 100 * SAMPSD / MEAN;
       OUTPUT;
       SAMPSD = 20.0;
       END;
    NEXTB:
     END;
    END;
  FINISH:
  KEEP CV MEAN;
PROC SORT DATA=TAB; BY MEAN;
DATA
     ONE(RENAME = (MEAN = X1 CV = CV1))
     TWO(RENAME = (MEAN = X2 CV = CV2))
     THREE(RENAME = (MEAN = X3 CV = CV3))
     FOUR(RENAME = (MEAN = X4 CV = CV4))
     FIVE(RENAME = (MEAN = X5 CV = CV5))
     SIX(RENAME = (MEAN = X6 CV = CV6));
 SET TAB;
 IF MEAN <= 90.05 THEN OUTPUT ONE;
 IF 90.05 < MEAN <=  95.05 THEN OUTPUT TWO;
 IF 95.05   < MEAN <= 100.05  THEN OUTPUT THREE;
 IF 100.05  < MEAN <= 105.05  THEN OUTPUT FOUR;
 IF 105.05  < MEAN <= 110.05  THEN OUTPUT FIVE;
 IF 110.05  < MEAN <= 115.0  THEN OUTPUT SIX;
DATA SEVEN;
   MERGE ONE TWO THREE FOUR FIVE SIX;
RUN;
%MEND CALCUSP1;

%MACRO PRTCUSP1;
OPTIONS MISSING = ' ' NODATE NONUMBER;
```

```
OPTIONS LS=132;
PROC PRINT DATA=SEVEN SPLIT = '*';
   FORMAT CV1 CV2 CV3 CV4 CV5 CV6 5.2;
   LABEL
         X1 = '  MEAN*(% CLAIM)'
         X2 = '  MEAN*(% CLAIM)'
         X3 = '  MEAN*(% CLAIM)'
         X4 = '  MEAN*(% CLAIM)'
         X5 = '  MEAN*(% CLAIM)'
         X6 = '  MEAN*(% CLAIM)'
         CV1 = 'CV*(%)'
         CV2 = 'CV*(%)'
         CV3 = 'CV*(%)'
         CV4 = 'CV*(%)'
         CV5 = 'CV*(%)'
         CV6 = 'CV*(%)';
      VAR CV1 X2 CV2 X3 CV3 X4 CV4 X5 CV5 X6 CV6;
      ID X1;
TITLE1 "ACCEPTANCE LIMITS FOR &FORM CONTENT UNIFORMITY(N=&NUMBER)";
TITLE2 "SAMPLING PLAN 1";
TITLE3 "(MEETING LIMITS GUARANTEES, WITH &CILEVEL.% ASSURANCE, THAT AT LEAST";
TITLE4 "&LBOUND.% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)";
%MEND PRTCUSP1;

%MACRO EVCUSP1;

DATA _NULL_; WINDOW SMAIN COLOR=GREY
#1 "CONTENT UNIFORMITY ACCEPTANCE LIMIT PROGRAM" C=yellow
#2 "FOR SAMPLING PLAN 1 (ONE SAMPLE PER LOCATION)" C=yellow
#4 "TO EVALUATE LIMITS, THE USER MUST SPECIFY THE RANGE OF" C=yellow
#5 "POSSIBLE POPULATION VALUES FOR THE MEAN AND CV" C=yellow
#6 "ENTER ALL VALUES AS POSITIVE INTEGERS" C=yellow
#8  "ENTER LOWER BOUND FOR MEAN: " C=BLUE ULOW 4.0 A=UNDERLINE
#9  "ENTER UPPER BOUND FOR MEAN: " C=BLUE UHIGH 4.0  A=UNDERLINE
#10 "ENTER INCREMENT FOR MEAN:   " C=BLUE UINCRE 4.0 A=UNDERLINE
#11 "ENTER DIVISOR FOR MEAN:     " C=BLUE UDIV 4.0  A=UNDERLINE
#13 "ENTER LOWER BOUND FOR CV:   " C=BLUE CVLOW 4.0 A=UNDERLINE
#14 "ENTER UPPER BOUND FOR CV:   " C=BLUE CVHIGH 4.0 A=UNDERLINE
#15 "ENTER INCREMENT FOR CV:     " C=BLUE CVINCRE 4.0 A=UNDERLINE
#16 "ENTER DIVISOR FOR CV:       " C=BLUE CVDIV 4.0 A=UNDERLINE;
WINDOW PINT COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ALL VALUES MUST POSITIVE INTEGERS" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
WINDOW ORD  COLOR=RED
    COLUMNS=50 ICOLUMN=10 ROWS= 10 IROW=5
#1 "ERROR: UPPER BOUND IS LESS THAN LOWER BOUND" C=YELLOW
#3 "PRESS ENTER TO CONTINUE" C=YELLOW;
ULOW=950;
UHIGH=1000;
UINCRE=50;
UDIV=10;
CVLOW=10;
CVHIGH=40;
CVINCRE=30;
CVDIV=10;
SMAIN:
DISPLAY SMAIN BELL;
IF ULOW LT 1 OR ROUND(ULOW) NE ULOW
OR UHIGH LT 1 OR ROUND(UHIGH) NE UHIGH
OR UINCRE LT 1 OR ROUND(UINCRE) NE UINCRE
OR UDIV LT 1 OR ROUND(UDIV) NE UDIV
OR CVLOW LT 1 OR ROUND(CVLOW) NE CVLOW
OR CVHIGH LT 1 OR ROUND(CVHIGH) NE CVHIGH
OR CVINCRE LT 1 OR ROUND(CVINCRE) NE CVINCRE
OR CVDIV LT 1 OR ROUND(CVDIV) NE CVDIV
THEN DO;
DISPLAY PINT;
GOTO SMAIN;
END;
IF ULOW GT UHIGH
OR CVLOW GT CVHIGH
THEN DO;
DISPLAY ORD;
GOTO SMAIN;
END;
CALL SYMPUT("ULOW",PUT(ULOW,4.0));
CALL SYMPUT("UHIGH",PUT(UHIGH,4.0));
CALL SYMPUT("UINCRE",PUT(UINCRE,4.0));
CALL SYMPUT("UDIV",PUT(UDIV,4.0));
CALL SYMPUT("CVLOW",PUT(CVLOW,4.0));
CALL SYMPUT("CVHIGH",PUT(CVHIGH,4.0));
CALL SYMPUT("CVINCRE",PUT(CVINCRE,4.0));
CALL SYMPUT("CVDIV",PUT(CVDIV,4.0)); STOP;
```

```
RUN;

DATA TAB;
      SET SEVEN;
 PROC PRINT;                                                Added to show data range
%MACRO DSCUSP1;
   %DO I = 1 %TO 6;
      DATA DATA&I;
         SET TAB;
         STD = X&I * CV&I / 100; RENAME X&I = X;
         KEEP X&I STD;
   %END;

%MEND DSCUSP1;

%DSCUSP1

DATA ONE;
   SET DATA1 DATA2 DATA3 DATA4 DATA5 DATA6;
   N = &NUMBER;

%MACRO SIGCUSP1;

   %DO CV = &CVLOW %TO &CVHIGH %BY &CVINCRE;
      %DO U = &ULOW %TO &UHIGH %BY &UINCRE;

         DATA SAVE;
            SET ONE END = LAST;
            U = &U / &UDIV;
            CV = &CV / &CVDIV;
            SIGMA = U * CV / 100;
            PMEAN = PROBNORM((x - U) * SQRT(N) / SIGMA)
                   - PROBNORM((LAG(X) - U) * SQRT(N) / SIGMA);
            AVEHT = (STD + LAG(STD)) / 2;
            PSTD = PROBCHI((N - 1) * AVEHT * AVEHT
                   / ( SIGMA * SIGMA), N - 1);
            PT = PMEAN * PSTD ;
            PTRAP + PT;
            *IF LAST THEN OUTPUT;                           Hidden to show all results
         RUN;
 PROC PRINT;                                                added to print all results
```

Following values were entered into the program: ulow=975, uhigh=980, uincre=1, udiv=10, cvlow=10, cvhigh=55, cvincre=5, cvdiv=10. The values are correctly used to construct a summary table, verifying lines 256 to 316 and part of Macro SIGCUSP1 (lines 337-362). Means and CVs are in 6 sets of columns, broken out by range of values. Many values and columns will be blank, because of the more narrow range (mean=90-110). For the rows with an X value, PTRAP is being computed correctly.

The logic of the code (using the sum of the probability of independent events) was also reviewed and found to be satisfactory.

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 90.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)	MEAN (% CLAIM)	CV (%)
90	2.62	91	3.11	96	5.22						
		92	3.59	97	5.41						
		93	4.05	98	5.51						
		94	4.50	99	5.55						
		95	4.91	100	5.57						

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 90.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

OBS	X1	CV1	X2	CV2	X3	CV3	X4	CV4	X5	CV5	X6	CV6
1	90	2.62111	91	3.11099	96	5.22188						
2			92	3.58913	97	5.40825						
3			93	4.05376	98	5.50612						
4			94	4.50106	99	5.55253						
5			95	4.91053	100	5.57300						

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 90.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

OBS	X	STD	N	U	CV	SIGMA	PMEAN	AVEHT	PSTD	PT	PTRAP
1	90	2.359	100	95	1	0.95					0.00000
2			100	95	1	0.95					0.00000
3			100	95	1	0.95					0.00000
4			100	95	1	0.95					0.00000
5			100	95	1	0.95					0.00000
6	91	2.831	100	95	1	0.95					0.00000
7	92	3.302	100	95	1	0.95	0.00000	3.0665	1	0.00000	0.00000
8	93	3.770	100	95	1	0.95	0.00000	3.5360	1	0.00000	0.00000
9	94	4.231	100	95	1	0.95	0.00000	4.0005	1	0.00000	0.00000
10	95	4.665	100	95	1	0.95	0.50000	4.4480	1	0.50000	0.50000
11	96	5.013	100	95	1	0.95	0.50000	4.8390	1	0.50000	1.00000
12	97	5.246	100	95	1	0.95	0.00000	5.1295	1	0.00000	1.00000
13	98	5.396	100	95	1	0.95	0.00000	5.3210	1	0.00000	1.00000
14	99	5.497	100	95	1	0.95	0.00000	5.4465	1	0.00000	1.00000
15	100	5.573	100	95	1	0.95	0.00000	5.5350	1	0.00000	1.00000
16			100	95	1	0.95					1.00000
17			100	95	1	0.95					1.00000
18			100	95	1	0.95					1.00000
19			100	95	1	0.95					1.00000
20			100	95	1	0.95					1.00000
21			100	95	1	0.95					1.00000
22			100	95	1	0.95					1.00000
23			100	95	1	0.95					1.00000
24			100	95	1	0.95					1.00000
25			100	95	1	0.95					1.00000
26			100	95	1	0.95					1.00000
27			100	95	1	0.95					1.00000
28			100	95	1	0.95					1.00000
29			100	95	1	0.95					1.00000
30			100	95	1	0.95					1.00000

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 90.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

OBS	X	STD	N	U	CV	SIGMA	PMEAN	AVEHT	PSTD	PT	PTRAP
1	90	2.359	100	96	1	0.96					0.00000
2			100	96	1	0.96					0.00000
3			100	96	1	0.96					0.00000
4			100	96	1	0.96					0.00000
5			100	96	1	0.96					0.00000
6	91	2.831	100	96	1	0.96					0.00000
7	92	3.302	100	96	1	0.96	0.00000	3.0665	1	0.00000	0.00000
8	93	3.770	100	96	1	0.96	0.00000	3.5360	1	0.00000	0.00000

9	94	4.231	100	96	1	0.96	0.00000	4.0005	1	0.00000	0.00000
10	95	4.665	100	96	1	0.96	0.00000	4.4480	1	0.00000	0.00000
11	96	5.013	100	96	1	0.96	0.50000	4.8390	1	0.50000	0.50000
12	97	5.246	100	96	1	0.96	0.50000	5.1295	1	0.50000	1.00000
13	98	5.396	100	96	1	0.96	0.00000	5.3210	1	0.00000	1.00000
14	99	5.497	100	96	1	0.96	0.00000	5.4465	1	0.00000	1.00000
15	100	5.573	100	96	1	0.96	0.00000	5.5350	1	0.00000	1.00000
16			100	96	1	0.96					1.00000
17			100	96	1	0.96					1.00000
18			100	96	1	0.96					1.00000
19			100	96	1	0.96					1.00000
20			100	96	1	0.96					1.00000
21			100	96	1	0.96					1.00000
22			100	96	1	0.96					1.00000
23			100	96	1	0.96					1.00000
24			100	96	1	0.96					1.00000
25			100	96	1	0.96					1.00000
26			100	96	1	0.96					1.00000
27			100	96	1	0.96					1.00000
28			100	96	1	0.96					1.00000
29			100	96	1	0.96					1.00000
30			100	96	1	0.96					1.00000

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 90.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

OBS	X	STD	N	U	CV	SIGMA	PMEAN	AVEHT	PSTD	PT	PTRAP
1	90	2.359	100	97	1	0.97					0.00000
2			100	97	1	0.97					0.00000
3			100	97	1	0.97					0.00000
4			100	97	1	0.97					0.00000
5			100	97	1	0.97					0.00000
6	91	2.831	100	97	1	0.97					0.00000
7	92	3.302	100	97	1	0.97	0.00000	3.0665	1	0.00000	0.00000
8	93	3.770	100	97	1	0.97	0.00000	3.5360	1	0.00000	0.00000
9	94	4.231	100	97	1	0.97	0.00000	4.0005	1	0.00000	0.00000
10	95	4.665	100	97	1	0.97	0.00000	4.4480	1	0.00000	0.00000
11	96	5.013	100	97	1	0.97	0.00000	4.8390	1	0.00000	0.00000
12	97	5.246	100	97	1	0.97	0.50000	5.1295	1	0.50000	0.50000
13	98	5.396	100	97	1	0.97	0.50000	5.3210	1	0.50000	1.00000
14	99	5.497	100	97	1	0.97	0.00000	5.4465	1	0.00000	1.00000
15	100	5.573	100	97	1	0.97	0.00000	5.5350	1	0.00000	1.00000
16			100	97	1	0.97					1.00000
17			100	97	1	0.97					1.00000
18			100	97	1	0.97					1.00000
19			100	97	1	0.97					1.00000
20			100	97	1	0.97					1.00000
21			100	97	1	0.97					1.00000
22			100	97	1	0.97					1.00000
23			100	97	1	0.97					1.00000
24			100	97	1	0.97					1.00000
25			100	97	1	0.97					1.00000
26			100	97	1	0.97					1.00000
27			100	97	1	0.97					1.00000
28			100	97	1	0.97					1.00000
29			100	97	1	0.97					1.00000
30			100	97	1	0.97					1.00000

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 90.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

OBS	X	STD	N	U	CV	SIGMA	PMEAN	AVEHT	PSTD	PT	PTRAP
1	90	2.359	100	95	4	3.8					0.00
2			100	95	4	3.8					.00000
3			100	95	4	3.8					0.00000
4			100	95	4	3.8					0.00000
5			100	95	4	3.8					0.00000
6	91	2.831	100	95	4	3.8					0.00000
7	92	3.302	100	95	4	3.8	0.00000	3.0665	0.00282	0.00000	0.00000
8	93	3.770	100	95	4	3.8	0.00000	3.5360	0.17322	0.00000	0.00000
9	94	4.231	100	95	4	3.8	0.00425	4.0005	0.78322	0.00333	0.00333
10	95	4.665	100	95	4	3.8	0.49575	4.4480	0.99144	0.49151	0.49484
11	96	5.013	100	95	4	3.8	0.49575	4.8390	0.99991	0.49571	0.99054
12	97	5.246	100	95	4	3.8	0.00425	5.1295	1.00000	0.00425	0.99479
13	98	5.396	100	95	4	3.8	0.00000	5.3210	1.00000	0.00000	0.99479
14	99	5.497	100	95	4	3.8	0.00000	5.4465	1.00000	0.00000	0.99479
15	100	5.573	100	95	4	3.8	0.00000	5.5350	1.00000	0.00000	0.99479
16			100	95	4	3.8					0.99479

17			100	95	4	3.8					0.99479
18			100	95	4	3.8					0.99479
19			100	95	4	3.8					0.99479
20			100	95	4	3.8					0.99479
21			100	95	4	3.8					0.99479
22			100	95	4	3.8					0.99479
23			100	95	4	3.8					0.99479
24			100	95	4	3.8					0.99479
25			100	95	4	3.8					0.99479
26			100	95	4	3.8					0.99479
27			100	95	4	3.8					0.99479
28			100	95	4	3.8					0.99479
29			100	95	4	3.8					0.99479
30			100	95	4	3.8					0.99479

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 90.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

OBS	X	STD	N	U	CV	SIGMA	PMEAN	AVEHT	PSTD	PT	PTRAP
1	90	2.359	100	96	4	3.84					0.00000
2			100	96	4	3.84					0.00000
3			100	96	4	3.84					0.00000
4			100	96	4	3.84					0.00000
5			100	96	4	3.84					0.00000
6	91	2.831	100	96	4	3.84					0.00000
7	92	3.302	100	96	4	3.84	0.00000	3.0665	0.00189	0.00000	0.00000
8	93	3.770	100	96	4	3.84	0.00000	3.5360	0.13975	0.00000	0.00000
9	94	4.231	100	96	4	3.84	0.00000	4.0005	0.73605	0.00000	0.00000
10	95	4.665	100	96	4	3.84	0.00460	4.4480	0.98682	0.00454	0.00454
11	96	5.013	100	96	4	3.84	0.49540	4.8390	0.99982	0.49531	0.49985
12	97	5.246	100	96	4	3.84	0.49540	5.1295	1.00000	0.49539	0.99524
13	98	5.396	100	96	4	3.84	0.00460	5.3210	1.00000	0.00460	0.99985
14	99	5.497	100	96	4	3.84	0.00000	5.4465	1.00000	0.00000	0.99985
15	100	5.573	100	96	4	3.84	0.00000	5.5350	1.00000	0.00000	0.99985
16			100	96	4	3.84					0.99985
17			100	96	4	3.84					0.99985
18			100	96	4	3.84					0.99985
19			100	96	4	3.84					0.99985
20			100	96	4	3.84					0.99985
21			100	96	4	3.84					0.99985
22			100	96	4	3.84					0.99985
23			100	96	4	3.84					0.99985
24			100	96	4	3.84					0.99985
25			100	96	4	3.84					0.99985
26			100	96	4	3.84					0.99985
27			100	96	4	3.84					0.99985
28			100	96	4	3.84					0.99985
29			100	96	4	3.84					0.99985
30			100	96	4	3.84					0.99985

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
(MEETING LIMITS GUARANTEES, WITH 90.0% ASSURANCE, THAT AT LEAST
95.0% OF SAMPLES TESTED FOR CONTENT UNIFORMITY WILL PASS THE USP TEST)

OBS	X	STD	N	U	CV	SIGMA	PMEAN	AVEHT	PSTD	PT	PTRAP
1	90	2.359	100	97	4	3.88					0.00000
2			100	97	4	3.88					0.00000
3			100	97	4	3.88					0.00000
4			100	97	4	3.88					0.00000
5			100	97	4	3.88					0.00000
6	91	2.831	100	97	4	3.88					0.00000
7	92	3.302	100	97	4	3.88	0.00000	3.0665	0.00126	0.00000	0.00000
8	93	3.770	100	97	4	3.88	0.00000	3.5360	0.11141	0.00000	0.00000
9	94	4.231	100	97	4	3.88	0.00000	4.0005	0.68508	0.00000	0.00000
10	95	4.665	100	97	4	3.88	0.00000	4.4480	0.98032	0.00000	0.00000
11	96	5.013	100	97	4	3.88	0.00498	4.8390	0.99966	0.00498	0.00498
12	97	5.246	100	97	4	3.88	0.49502	5.1295	0.99999	0.49502	0.50000
13	98	5.396	100	97	4	3.88	0.49502	5.3210	1.00000	0.49502	0.99502
14	99	5.497	100	97	4	3.88	0.00498	5.4465	1.00000	0.00498	1.00000
15	100	5.573	100	97	4	3.88	0.00000	5.5350	1.00000	0.00000	1.00000
16			100	97	4	3.88					1.00000
17			100	97	4	3.88					1.00000
18			100	97	4	3.88					1.00000
19			100	97	4	3.88					1.00000
20			100	97	4	3.88					1.00000
21			100	97	4	3.88					1.00000
22			100	97	4	3.88					1.00000
23			100	97	4	3.88					1.00000
24			100	97	4	3.88					1.00000

25	100	97	4	3.88	1.00000
26	100	97	4	3.88	1.00000
27	100	97	4	3.88	1.00000
28	100	97	4	3.88	1.00000
29	100	97	4	3.88	1.00000
30	100	97	4	3.88	1.00000

ACCEPTANCE LIMIT TABLE FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
DETERMINE PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE
CONFIDENCE LEVEL = 90.0 AND LOWER BOUND = 95.0

U	CV	PROBABILITY OF PASSING
95	1	0.00000
95	1	0.00000
95	1	0.00000
95	1	0.00000
95	1	0.00000
95	1	0.00000
95	1	0.00000
95	1	0.00000
95	1	0.00000
95	1	0.50000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
95	1	1.00000
96	1	0.00000
96	1	0.00000
96	1	0.00000
96	1	0.00000
96	1	0.00000
96	1	0.00000
96	1	0.00000
96	1	0.00000
96	1	0.00000
96	1	0.00000
96	1	0.50000
96	1	1.00000
96	1	1.00000
96	1	1.00000
96	1	1.00000
96	1	1.00000

ACCEPTANCE LIMIT TABLE FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
DETERMINE PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE
CONFIDENCE LEVEL = 90.0 AND LOWER BOUND = 95.0

U	CV	PROBABILITY OF PASSING
96	1	1.00000
96	1	1.00000
96	1	1.00000
96	1	1.00000
96	1	1.00000
96	1	1.00000
96	1	1.00000
96	1	1.00000
96	1	1.00000
96	1	1.00000
96	1	1.00000

96	1	1.00000
96	1	1.00000
96	1	1.00000
97	1	0.00000
97	1	0.00000
97	1	0.00000
97	1	0.00000
97	1	0.00000
97	1	0.00000
97	1	0.00000
97	1	0.00000
97	1	0.00000
97	1	0.00000
97	1	0.00000
97	1	0.50000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
97	1	1.00000
95	4	0.00000
95	4	0.00000

ACCEPTANCE LIMIT TABLE FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
DETERMINE PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE
CONFIDENCE LEVEL = 90.0 AND LOWER BOUND = 95.0

U	CV	PROBABILITY OF PASSING
95	4	0.00000
95	4	0.00000
95	4	0.00000
95	4	0.00000
95	4	0.00000
95	4	0.00000
95	4	0.00333
95	4	0.49484
95	4	0.99054
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
95	4	0.99479
96	4	0.00000
96	4	0.00000
96	4	0.00000
96	4	0.00000
96	4	0.00000
96	4	0.00000
96	4	0.00000
96	4	0.00000
96	4	0.00000
96	4	0.00454
96	4	0.49985

96	4	0.99524
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985

ACCEPTANCE LIMIT TABLE FOR CAPSULE CONTENT UNIFORMITY(N= 100)
SAMPLING PLAN 1
DETERMINE PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE
CONFIDENCE LEVEL = 90.0 AND LOWER BOUND = 95.0

U	CV	PROBABILITY OF PASSING
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985
96	4	0.99985
97	4	0.00000
97	4	0.00000
97	4	0.00000
97	4	0.00000
97	4	0.00000
97	4	0.00000
97	4	0.00000
97	4	0.00000
97	4	0.00000
97	4	0.00000
97	4	0.00498
97	4	0.50000
97	4	0.99502
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000
97	4	1.00000

CONCLUSION:

Given these verifications, I believe the strategy is correct, the code implements the strategy, and that the mathematical calculations are correct in CUSP1.SAS

The validation of CUSP1.SAS will be used to help validate CUSP2.SAS. As with CUSP1.SAS, This program is split into three basic parts.

1. printing an acceptance limit table
2. evaluating the table (probabilities)
3. computing a lower bound for a sample result.

Macro WINCUSP2 (SAS lines 1-105) creates the original input windows and default properties. These are confirmed in the primary windows section of the validation (and were confirmed to perform as stated).

Macros CULLU (SAS lines 109-141) and CUULU (SAS lines 142-174) are confirmed by careful visual review to be the same code as macro C1CALC in CUSP1.SAS. C1CALC was verified to accurately compute lower bounds per Bergum's theory, so lines 109-174 compute the correct values. Macro SMPCUSP2 (SAS lines 637-714) completes task 3 using CULLU and CUULU. Generally, Macro SMPCUSP2 is the same as Macro SMPCUSP1 from CUSP1.SAS except that the standard deviation is estimated from 2 components in the second program. To run the lower bound macros, a single value is required. The data table from both macros are shown below.

From CUSP1.SAS:	From CUSP2.SAS:
DATA TAB; LENGTH TYPE $1; LABEL OVERBD = 'OVERALL LOWER BOUND' MEAN = 'SAMPLE MEAN(%CLAIM)'; CILEVEL = &CILEVEL; TYPE = "&FORM"; Z = PROBIT((1 + SQRT(&CILEVEL / 100)) / 2); N = &NUMBER; **CHI = CINV(1 - SQRT(&CILEVEL / 100),N - 1);** MEAN = &MEAN; CV = &CV; SAMPSD= &MEAN * CV/100; **SIGMA = SQRT((N - 1) * SAMPSD * SAMPSD / CHI);** LLU = MEAN - Z *SIGMA / SQRT(N); ULU = MEAN + Z * SIGMA / SQRT(N); %c1calc	DATA TAB; LENGTH TYPE $ 1; TYPE = "&FORM"; Z = PROBIT((1 + SQRT(&CILEVEL/100))/2); NN = &NUM; L = &LOC; N = NN*L; SE = &SE; SM = &SM; MEAN = &MEAN; CILEVEL = &CILEVEL; **CHIERR = CINV(1 - SQRT(&CILEVEL / 100), L*(NN - 1));** **CHILOC = CINV(1 - SQRT(&CILEVEL / 100),L-1);** SE2 = SE * SE; H2 = L * (NN - 1) / CHIERR - 1; SEC = ((1 - 1/NN)*H2*SE2)**2; SL2 = SM * SM * NN; SL2UB = (L - 1) * SL2 / CHILOC; H1 = (L - 1) / CHILOC - 1; FIRST = ((1 / NN)*H1*SL2)**2; PTEST = (1 / NN) * SL2 + (1 - 1/NN) * SE2; VAR = PTEST + SQRT(FIRST + SEC); MVAR = SL2UB; **SIGMA = SQRT(VAR);** %cullu %cuulu

In the program description section of the validation, the formula for computing a variance given the sum of the 2 components is provided. The code in CUSP2.SAS does agree with this formula, since:

MSE = SE^2, SEC = $\left\{\left(1-\frac{1}{n}\right)\times\left(\frac{L\times(n-1)}{\lambda^2_{L(n-1)}}-1\right)\times MSE\right\}^2$, MSL = SL2 = $\left(S^2_{loc}\times n\right)$, so SL2UB = $\frac{(L-1)\times MSL}{\lambda^2_{L-1}}$

FIRST = $\left\{\left(\frac{1}{n}\right)\times\left[\frac{(L-1)}{\lambda^2_{L-1}}-1\right]\times MSL\right\}^2$, and PTEST = $\left[\frac{1}{n}\times MSL+\left(1-\frac{1}{n}\right)\times MSE\right]$. So,

$$\text{VAR} = \left[\frac{1}{n}\times MSL+\left(1-\frac{1}{n}\right)\times MSE\right] + \left\{\left[\left(1-\frac{1}{n}\right)\times\left(\frac{L\times(n-1)}{\lambda^2_{L(n-1)}}-1\right)\times MSE\right]^2+\left\{\left(\frac{1}{n}\right)\times\left[\frac{(L-1)}{\lambda^2_{L-1}}-1\right]\times MSL\right\}^2\right\}^{1/2}$$

So, SL2UB = MVAR, which is the upper bound on variance for location mean (this goes to the macro to get the upper bound for the mean). And SIGMA = $\left(\sqrt{VAR}\right)$ is the combined estimate to be used in the macro for individual values.

Therefore, part 3 is performing the formulas and lower bound computations as desired.

Part 1, consisting of macros: CALCUSP2 (SAS lines 176-262) and PRTCUSP2 (SAS lines 263-491) can be verified by comparing the endpoint results in the table to the results obtained from part 3. Inputting into SMPCUSP2 a 'within sigma', 'location sigma', and the lower or upper mean (from the table) should result in the lower bound chosen to create the table in part 1. If these program outputs agree, then the table from Part 1 is performing as required. This is verified by entering the following parameters: lower bound=90%, confidence level=98%, form=capsules, sample plan=5 per 10 locations and printing the acceptance table.

The table generated by this request is printed on the following 8 pages. Then, throughout the table (checking low to high values of S), results are chosen to enter into part 3, computing a lower bound. The following table results were checked by part 3 (SMPCUSP2):

SE	S Location	Lower mean	Upper mean
0.3	0.1	85.8	114.2
2.3	0.7	90.8	109.2
5.4	0.9	100.2	102.2
0.7	2.3	96.5	103.5
2.0	2.0	95.5	104.5
0.9	2.8	99.4	100.9

CuDAL output for these are on pages 11-13. For the cases with the smallest S Location (<0.8), the computed lower bound was bigger than 90% (used to generate the table). But, if a mean just outside the interval is checked, the lower bound is less than 90%. So in all cases, the computed lower bound supports the table results.

CuDAL output:

Tabled values that are compared using the lower bound option appear in BOLD.

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY

SAMPLING PLAN 2
LOWER BOUND = 90.0, CONFIDENCE LEVEL = 98.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 50 ASSAYS- 5 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	0.1		0.2		0.3		0.4		0.5		0.6		**0.7**		0.8		0.9	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	85.6	114.4	86.1	113.9	86.5	113.5	87.0	113.0	87.5	112.5	88.0	112.0	88.5	111.5	89.0	111.0	89.5	110.5
0.2	85.7	114.3	86.1	113.9	86.6	113.4	87.1	112.9	87.5	112.5	88.0	112.0	88.5	111.5	89.0	111.0	89.5	110.5
0.3	**85.8**	**114.2**	86.2	113.8	86.6	113.4	87.1	112.9	87.6	112.4	88.1	111.9	88.5	111.5	89.0	111.0	89.5	110.5
0.4	86.0	114.0	86.3	113.7	86.7	113.3	87.1	112.9	87.6	112.4	88.1	111.9	88.6	111.4	89.1	110.9	89.5	110.5
0.5	86.2	113.8	86.4	113.6	86.8	113.2	87.2	112.8	87.7	112.3	88.1	111.9	88.6	111.4	89.1	110.9	89.6	110.4
0.6	86.4	113.6	86.6	113.4	86.9	113.1	87.3	112.7	87.7	112.3	88.2	111.8	88.7	111.3	89.1	110.9	89.6	110.4
0.7	86.5	113.5	86.8	113.2	87.0	113.0	87.4	112.6	87.8	112.2	88.3	111.7	88.7	111.3	89.2	110.8	89.6	110.4
0.8	86.7	113.3	86.9	113.1	87.2	112.8	87.5	112.5	87.9	112.1	88.3	111.7	88.8	111.2	89.2	110.8	89.7	110.3
0.9	86.9	113.1	87.1	112.9	87.4	112.6	87.7	112.3	88.0	112.0	88.4	111.6	88.9	111.1	89.3	110.7	89.8	110.2
1.0	87.1	112.9	87.3	112.7	87.5	112.5	87.8	112.2	88.2	111.8	88.5	111.5	88.9	111.1	89.4	110.6	89.8	110.2
1.1	87.3	112.7	87.5	112.5	87.7	112.3	88.0	112.0	88.3	111.7	88.6	111.4	89.0	111.0	89.5	110.5	89.9	110.1
1.2	87.5	112.5	87.7	112.3	87.9	112.1	88.1	111.9	88.4	111.6	88.8	111.2	89.2	110.8	89.6	110.4	90.0	110.0
1.3	87.7	112.3	87.8	112.2	88.1	111.9	88.3	111.7	88.6	111.4	88.9	111.1	89.3	110.7	89.7	110.3	90.1	109.9
1.4	87.8	112.2	88.0	112.0	88.2	111.8	88.5	111.5	88.7	111.3	89.0	111.0	89.4	110.6	89.8	110.2	90.2	109.8
1.5	88.0	112.0	88.2	111.8	88.4	111.6	88.6	111.4	88.9	111.1	89.2	110.8	89.5	110.5	89.9	110.1	90.3	109.7
1.6	88.2	111.8	88.4	111.6	88.6	111.4	88.8	111.2	89.1	110.9	89.3	110.7	89.7	110.3	90.0	110.0	90.4	109.6
1.7	88.4	111.6	88.6	111.4	88.8	111.2	89.0	111.0	89.2	110.8	89.5	110.5	89.8	110.2	90.1	109.9	90.5	109.5
1.8	88.6	111.4	88.8	111.2	89.0	111.0	89.2	110.8	89.4	110.6	89.7	110.3	90.0	110.0	90.3	109.7	90.6	109.4
1.9	88.8	111.2	89.0	111.0	89.2	110.8	89.4	110.6	89.6	110.4	89.8	110.2	90.1	109.9	90.4	109.6	90.8	109.2
2.0	89.0	111.0	89.1	110.9	89.3	110.7	89.5	110.5	89.8	110.2	90.0	110.0	90.3	109.7	90.6	109.4	90.9	109.1
2.1	89.2	110.8	89.3	110.7	89.5	110.5	89.7	110.3	89.9	110.1	90.2	109.8	90.4	109.6	90.7	109.3	91.0	109.0
2.2	89.3	110.7	89.5	110.5	89.7	110.3	89.9	110.1	90.1	109.9	90.4	109.6	90.6	109.4	90.9	109.1	91.2	108.8
2.3	89.5	110.5	89.7	110.3	89.9	110.1	90.1	109.9	90.3	109.7	90.5	109.5	**90.8**	**109.2**	91.0	109.0	91.3	108.7
2.4	89.7	110.3	89.9	110.1	90.1	109.9	90.3	109.7	90.5	109.5	90.7	109.3	90.9	109.1	91.2	108.8	91.5	108.5
2.5	89.9	110.1	90.1	109.9	90.3	109.7	90.5	109.5	90.7	109.3	90.9	109.1	91.1	108.9	91.4	108.6	91.7	108.3
2.6	90.1	109.9	90.3	109.7	90.5	109.5	90.6	109.4	90.8	109.2	91.1	108.9	91.3	108.7	91.5	108.5	91.8	108.2
2.7	90.3	109.7	90.5	109.5	90.6	109.4	90.8	109.2	91.0	109.0	91.2	108.8	91.5	108.5	91.7	108.3	92.0	108.0
2.8	90.5	109.5	90.6	109.4	90.8	109.2	91.0	109.0	91.2	108.8	91.4	108.6	91.6	108.4	91.9	108.1	92.1	107.9
2.9	90.7	109.3	90.8	109.2	91.0	109.0	91.2	108.8	91.4	108.6	91.6	108.4	91.8	108.2	92.1	107.9	92.3	107.7
3.0	90.8	109.2	91.0	109.0	91.2	108.8	91.4	108.6	91.6	108.4	91.8	108.2	92.0	108.0	92.2	107.8	92.5	107.5
3.1	91.0	109.0	91.2	108.8	91.4	108.6	91.6	108.4	91.8	108.2	92.0	108.0	92.2	107.8	92.4	107.6	92.7	107.3
3.2	91.2	108.8	91.4	108.6	91.6	108.4	91.8	108.2	92.0	108.0	92.2	107.8	92.4	107.6	92.6	107.4	92.8	107.2
3.3	91.4	108.6	91.6	108.4	91.8	108.2	91.9	108.1	92.1	107.9	92.3	107.7	92.6	107.4	92.8	107.2	93.0	107.0
3.4	91.6	108.4	91.8	108.2	91.9	108.1	92.1	107.9	92.3	107.7	92.5	107.5	92.7	107.3	93.0	107.0	93.2	106.8
3.5	91.8	108.2	92.0	108.0	92.1	107.9	92.3	107.7	92.5	107.5	92.7	107.3	92.9	107.1	93.1	106.9	93.4	106.6
3.6	92.0	108.0	92.1	107.9	92.3	107.7	92.5	107.5	92.7	107.3	92.9	107.1	93.1	106.9	93.3	106.7	93.5	106.5
3.7	92.2	107.8	92.3	107.7	92.5	107.5	92.7	107.3	92.9	107.1	93.1	106.9	93.3	106.7	93.5	106.5	93.7	106.3
3.8	92.4	107.6	92.5	107.5	92.7	107.3	92.9	107.1	93.1	106.9	93.3	106.7	93.5	106.5	93.7	106.3	93.9	106.1
3.9	92.5	107.5	92.7	107.3	92.9	107.1	93.1	106.9	93.3	106.7	93.5	106.5	93.7	106.3	93.9	106.1	94.1	105.9

4.0	92.7	107.3	92.9	107.1	93.1	106.9	93.3	106.7	93.5	106.5	93.7	106.3	93.9	106.1	94.1	105.9	94.3	105.7

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 90.0, CONFIDENCE LEVEL = 98.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 50 ASSAYS- 5 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	0.1		0.2		0.3		0.4		0.5		0.6		0.7		0.8		**0.9**	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
4.1	92.9	107.1	93.1	106.9	93.3	106.7	93.5	106.5	93.7	106.3	93.9	106.2	94.1	106.0	94.3	105.7	94.5	105.5
4.2	93.1	106.9	93.3	106.7	93.5	106.5	93.7	106.3	93.9	106.2	94.0	106.0	94.2	105.8	94.5	105.6	94.7	105.3
4.3	93.3	106.7	93.5	106.5	93.7	106.3	93.9	106.1	94.1	106.0	94.3	105.8	94.5	105.6	94.7	105.4	94.9	105.1
4.4	93.5	106.5	93.7	106.3	93.9	106.1	94.1	105.9	94.3	105.8	94.5	105.6	94.7	105.4	94.9	105.2	95.1	105.0
4.5	93.8	106.3	93.9	106.1	94.1	105.9	94.3	105.7	94.5	105.6	94.7	105.4	94.9	105.2	95.1	105.0	95.3	104.8
4.6	94.0	106.1	94.2	105.9	94.4	105.7	94.5	105.5	94.7	105.4	94.9	105.2	95.1	105.0	95.3	104.8	95.6	104.6
4.7	94.3	105.9	94.4	105.7	94.6	105.5	94.8	105.3	95.0	105.2	95.2	105.0	95.4	104.8	95.6	104.6	95.8	104.4
4.8	94.5	105.7	94.7	105.5	94.9	105.3	95.1	105.1	95.3	104.9	95.5	104.8	95.7	104.6	95.9	104.4	96.1	104.1
4.9	94.9	105.4	95.1	105.3	95.2	105.1	95.4	104.9	95.6	104.7	95.8	104.5	96.0	104.3	96.3	104.1	96.5	103.9
5.0	95.3	105.2	95.4	105.0	95.6	104.9	95.8	104.7	96.0	104.5	96.2	104.3	96.4	104.1	96.7	103.9	96.9	103.7
5.1	95.7	105.0	95.9	104.8	96.1	104.6	96.3	104.4	96.5	104.2	96.7	104.0	96.9	103.8	97.2	103.6	97.4	103.4
5.2	96.3	104.7	96.5	104.5	96.7	104.3	96.9	104.1	97.1	103.9	97.3	103.8	97.5	103.6	97.8	103.3	98.1	103.1
5.3	97.0	104.3	97.2	104.2	97.4	104.0	97.6	103.8	97.8	103.6	98.1	103.4	98.4	103.2	98.6	103.0	99.0	102.7
5.4	98.0	103.9	98.2	103.8	98.4	103.6	98.6	103.4	98.9	103.2	99.2	103.0	99.5	102.7	99.8	102.5	**100.2**	**102.2**
5.5	99.4	103.3	99.6	103.1	99.8	103.0	100.1	102.7	100.4	102.5	100.7	102.3	101.0	102.0	101.4	101.7	.	.

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 90.0, CONFIDENCE LEVEL = 98.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
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STANDARD DEVIATION OF LOCATION MEANS

	1.0		1.1		1.2		1.3		1.4		1.5		1.6		1.7		1.8	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	90.0	110.0	90.5	109.5	91.0	109.0	91.5	108.5	91.9	108.1	92.4	107.6	92.9	107.1	93.4	106.6	93.9	106.1
0.2	90.0	110.0	90.5	109.5	91.0	109.0	91.5	108.5	92.0	108.0	92.4	107.6	92.9	107.1	93.4	106.6	93.9	106.1
0.3	90.0	110.0	90.5	109.5	91.0	109.0	91.5	108.5	92.0	108.0	92.5	107.5	92.9	107.1	93.4	106.6	93.9	106.1
0.4	90.0	110.0	90.5	109.5	91.0	109.0	91.5	108.5	92.0	108.0	92.5	107.5	93.0	107.0	93.5	106.5	93.9	106.1
0.5	90.1	109.9	90.5	109.5	91.0	109.0	91.5	108.5	92.0	108.0	92.5	107.5	93.0	107.0	93.5	106.5	94.0	106.0

0.6	90.1	109.9	90.6	109.4	91.1	108.9	91.5	108.5	92.0	108.0	92.5	107.5	93.0	107.0	93.5	106.5	94.0	106.0
0.7	90.1	109.9	90.6	109.4	91.1	108.9	91.6	108.4	92.1	107.9	92.5	107.5	93.0	107.0	93.5	106.5	94.0	106.0
0.8	90.2	109.8	90.6	109.4	91.1	108.9	91.6	108.4	92.1	107.9	92.6	107.4	93.1	106.9	93.5	106.5	94.0	106.0
0.9	90.2	109.8	90.7	109.3	91.2	108.8	91.6	108.4	92.1	107.9	92.6	107.4	93.1	106.9	93.6	106.4	94.1	105.9
1.0	90.3	109.7	90.7	109.3	91.2	108.8	91.7	108.3	92.2	107.8	92.6	107.4	93.1	106.9	93.6	106.4	94.1	105.9
1.1	90.4	109.6	90.8	109.2	91.3	108.7	91.7	108.3	92.2	107.8	92.7	107.3	93.2	106.8	93.6	106.4	94.1	105.9
1.2	90.4	109.6	90.9	109.1	91.3	108.7	91.8	108.2	92.3	107.7	92.7	107.3	93.2	106.8	93.7	106.3	94.2	105.8
1.3	90.5	109.5	90.9	109.1	91.4	108.6	91.9	108.1	92.3	107.7	92.8	107.2	93.3	106.7	93.7	106.3	94.2	105.8
1.4	90.6	109.4	91.0	109.0	91.5	108.5	91.9	108.1	92.4	107.6	92.8	107.2	93.3	106.7	93.8	106.2	94.3	105.7
1.5	90.7	109.3	91.1	108.9	91.5	108.5	92.0	108.0	92.4	107.6	92.9	107.1	93.4	106.6	93.8	106.2	94.3	105.7
1.6	90.8	109.2	91.2	108.8	91.6	108.4	92.1	107.9	92.5	107.5	93.0	107.0	93.4	106.6	93.9	106.1	94.4	105.6
1.7	90.9	109.1	91.3	108.7	91.7	108.3	92.1	107.9	92.6	107.4	93.0	107.0	93.5	106.5	93.9	106.1	94.4	105.6
1.8	91.0	109.0	91.4	108.6	91.8	108.2	92.2	107.8	92.7	107.3	93.1	106.9	93.6	106.4	94.0	106.0	94.5	105.5
1.9	91.1	108.9	91.5	108.5	91.9	108.1	92.3	107.7	92.8	107.2	93.2	106.8	93.6	106.4	94.1	105.9	94.5	105.5
2.0	91.3	108.7	91.6	108.4	92.0	108.0	92.4	107.6	92.8	107.2	93.3	106.7	93.7	106.3	94.2	105.8	94.6	105.4
2.1	91.4	108.6	91.7	108.3	92.1	107.9	92.5	107.5	92.9	107.1	93.4	106.6	93.8	106.2	94.2	105.8	94.7	105.3
2.2	91.5	108.5	91.9	108.1	92.2	107.8	92.6	107.4	93.0	107.0	93.5	106.5	93.9	106.1	94.3	105.7	94.8	105.2
2.3	91.7	108.3	92.0	108.0	92.4	107.6	92.8	107.2	93.1	106.9	93.6	106.4	94.0	106.0	94.4	105.6	94.8	105.2
2.4	91.8	108.2	92.1	107.9	92.5	107.5	92.9	107.1	93.3	106.7	93.7	106.3	94.1	105.9	94.5	105.5	94.9	105.1
2.5	92.0	108.0	92.3	107.7	92.6	107.4	93.0	107.0	93.4	106.6	93.8	106.2	94.2	105.8	94.6	105.4	95.0	105.0
2.6	92.1	107.9	92.4	107.6	92.8	107.2	93.1	106.9	93.5	106.5	93.9	106.1	94.3	105.7	94.7	105.3	95.1	104.9
2.7	92.3	107.7	92.6	107.4	92.9	107.1	93.3	106.7	93.6	106.4	94.0	106.0	94.4	105.6	94.8	105.2	95.2	104.8
2.8	92.4	107.6	92.7	107.3	93.0	107.0	93.4	106.6	93.7	106.3	94.1	105.9	94.5	105.5	94.9	105.1	95.3	104.7
2.9	92.6	107.4	92.9	107.1	93.2	106.8	93.5	106.5	93.9	106.1	94.2	105.8	94.6	105.4	95.0	105.0	95.4	104.6
3.0	92.8	107.2	93.0	107.0	93.3	106.7	93.7	106.3	94.0	106.0	94.4	105.6	94.7	105.3	95.1	104.9	95.5	104.5
3.1	92.9	107.1	93.2	106.8	93.5	106.5	93.8	106.2	94.1	105.9	94.5	105.5	94.9	105.1	95.2	104.8	95.6	104.4
3.2	93.1	106.9	93.4	106.6	93.7	106.3	94.0	106.0	94.3	105.7	94.6	105.4	95.0	105.0	95.4	104.6	95.8	104.2
3.3	93.3	106.7	93.5	106.5	93.8	106.2	94.1	105.9	94.4	105.6	94.8	105.2	95.1	104.9	95.5	104.5	95.9	104.1
3.4	93.4	106.6	93.7	106.3	94.0	106.0	94.3	105.7	94.6	105.4	94.9	105.1	95.3	104.7	95.6	104.4	96.0	104.0
3.5	93.6	106.4	93.9	106.1	94.1	105.9	94.4	105.6	94.7	105.3	95.1	104.9	95.4	104.6	95.8	104.2	96.2	103.9
3.6	93.8	106.2	94.0	106.0	94.3	105.7	94.6	105.4	94.9	105.1	95.2	104.8	95.6	104.4	95.9	104.1	96.3	103.7
3.7	94.0	106.0	94.2	105.8	94.5	105.5	94.8	105.2	95.1	104.9	95.4	104.6	95.7	104.3	96.1	103.9	96.4	103.6
3.8	94.1	105.9	94.4	105.6	94.7	105.3	94.9	105.1	95.2	104.8	95.5	104.5	95.9	104.1	96.2	103.8	96.6	103.4
3.9	94.3	105.7	94.6	105.4	94.8	105.2	95.1	104.9	95.4	104.6	95.7	104.3	96.0	104.0	96.4	103.7	96.8	103.3
4.0	94.5	105.5	94.8	105.2	95.0	105.0	95.3	104.7	95.6	104.4	95.9	104.1	96.2	103.8	96.6	103.5	96.9	103.1

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 90.0, CONFIDENCE LEVEL = 98.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 50 ASSAYS- 5 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	1.0		1.1		1.2		1.3		1.4		1.5		1.6		1.7		1.8	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
4.1	94.7	105.3	94.9	105.1	95.2	104.8	95.5	104.6	95.8	104.3	96.1	104.0	96.4	103.7	96.7	103.3	97.1	103.0
4.2	94.9	105.1	95.1	104.9	95.4	104.6	95.7	104.4	95.9	104.1	96.3	103.8	96.6	103.5	97.0	103.2	97.4	102.8
4.3	95.1	104.9	95.3	104.7	95.6	104.4	95.9	104.2	96.2	103.9	96.5	103.6	96.8	103.3	97.2	103.0	97.6	102.7

4.4	95.3	104.7	95.6	104.5	95.8	104.3	96.1	104.0	96.4	103.7	96.7	103.4	97.0	103.1	97.4	102.8	97.9	102.5
4.5	95.5	104.5	95.8	104.3	96.0	104.1	96.3	103.8	96.6	103.5	97.0	103.3	97.3	103.0	97.7	102.6	98.2	102.3
4.6	95.8	104.3	96.0	104.1	96.3	103.9	96.6	103.6	96.9	103.4	97.2	103.1	97.6	102.8	98.1	102.4	98.6	102.1
4.7	96.1	104.1	96.3	103.9	96.6	103.7	96.9	103.4	97.2	103.1	97.6	102.9	98.0	102.6	98.5	102.2	99.0	101.9
4.8	96.4	103.9	96.6	103.7	96.9	103.5	97.2	103.2	97.6	102.9	98.0	102.6	98.4	102.3	98.9	102.0	99.6	101.6
4.9	96.8	103.7	97.0	103.5	97.3	103.2	97.7	103.0	98.0	102.7	98.5	102.4	99.0	102.1	99.6	101.7	100.3	101.3
5.0	97.2	103.5	97.5	103.2	97.8	103.0	98.2	102.7	98.6	102.4	99.1	102.1	99.7	101.8	100.4	101.4	.	.
5.1	97.7	103.2	98.1	103.0	98.4	102.7	98.8	102.4	99.3	102.1	99.9	101.8	100.6	101.4	.	.	.	.
5.2	98.4	102.9	98.8	102.6	99.2	102.4	99.7	102.1	100.3	101.7	100.9	101.3	.	.	.	.	.	.
5.3	99.3	102.5	99.8	102.2	100.3	101.9	100.9	101.6	.	.	.	.	.	.	.	.	.	.
5.4	100.6	101.9	101.1	101.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 90.0, CONFIDENCE LEVEL = 98.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
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STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	1.9		**2.0**		2.1		2.2		**2.3**		2.4		2.5		2.6		2.7	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
0.1	94.4	105.6	94.9	105.1	95.4	104.6	95.9	104.1	96.4	103.6	96.9	103.1	97.4	102.6	98.0	102.1	98.6	101.6
0.2	94.4	105.6	94.9	105.1	95.4	104.6	95.9	104.1	96.4	103.6	96.9	103.1	97.4	102.6	98.0	102.1	98.6	101.5
0.3	94.4	105.6	94.9	105.1	95.4	104.6	95.9	104.1	96.4	103.6	96.9	103.1	97.4	102.6	98.0	102.1	98.6	101.5
0.4	94.4	105.6	94.9	105.1	95.4	104.6	95.9	104.1	96.4	103.6	96.9	103.1	97.4	102.6	98.0	102.1	98.6	101.5
0.5	94.4	105.6	94.9	105.1	95.4	104.6	95.9	104.1	96.4	103.6	96.9	103.1	97.5	102.6	98.0	102.0	98.6	101.5
0.6	94.5	105.5	95.0	105.0	95.5	104.5	96.0	104.0	96.5	103.6	97.0	103.0	97.5	102.5	98.0	102.0	98.6	101.5
0.7	94.5	105.5	95.0	105.0	95.5	104.5	96.0	104.0	**96.5**	**103.5**	97.0	103.0	97.5	102.5	98.0	102.0	98.6	101.5
0.8	94.5	105.5	95.0	105.0	95.5	104.5	96.0	104.0	96.5	103.5	97.0	103.0	97.5	102.5	98.1	102.0	98.7	101.5
0.9	94.5	105.5	95.0	105.0	95.5	104.5	96.0	104.0	96.5	103.5	97.0	103.0	97.5	102.5	98.1	102.0	98.7	101.5
1.0	94.6	105.4	95.1	104.9	95.5	104.5	96.0	104.0	96.5	103.5	97.0	103.0	97.6	102.5	98.1	101.9	98.7	101.4
1.1	94.6	105.4	95.1	104.9	95.6	104.4	96.1	103.9	96.6	103.4	97.1	102.9	97.6	102.4	98.1	101.9	98.8	101.4
1.2	94.6	105.4	95.1	104.9	95.6	104.4	96.1	103.9	96.6	103.4	97.1	102.9	97.6	102.4	98.2	101.9	98.8	101.4
1.3	94.7	105.3	95.2	104.8	95.7	104.3	96.1	103.9	96.6	103.4	97.1	102.9	97.7	102.4	98.2	101.9	98.8	101.3
1.4	94.7	105.3	95.2	104.8	95.7	104.3	96.2	103.8	96.7	103.3	97.2	102.8	97.7	102.3	98.3	101.8	98.9	101.3
1.5	94.8	105.2	95.3	104.7	95.7	104.3	96.2	103.8	96.7	103.3	97.2	102.8	97.7	102.3	98.3	101.8	98.9	101.3
1.6	94.8	105.2	95.3	104.7	95.8	104.2	96.3	103.7	96.8	103.2	97.3	102.8	97.8	102.3	98.4	101.7	99.0	101.2
1.7	94.9	105.1	95.4	104.6	95.8	104.2	96.3	103.7	96.8	103.2	97.3	102.7	97.8	102.2	98.4	101.7	99.1	101.2
1.8	94.9	105.1	95.4	104.6	95.9	104.1	96.4	103.6	96.9	103.2	97.4	102.7	97.9	102.2	98.5	101.7	99.1	101.1
1.9	95.0	105.0	95.5	104.5	95.9	104.1	96.4	103.6	96.9	103.1	97.4	102.6	97.9	102.1	98.5	101.6	99.2	101.1
2.0	95.1	104.9	**95.5**	**104.5**	96.0	104.0	96.5	103.5	97.0	103.0	97.5	102.6	98.0	102.1	98.6	101.6	99.3	101.0
2.1	95.1	104.9	95.6	104.4	96.1	103.9	96.5	103.5	97.0	103.0	97.5	102.5	98.1	102.0	98.7	101.5	99.4	101.0
2.2	95.2	104.8	95.7	104.3	96.1	103.9	96.6	103.4	97.1	102.9	97.6	102.4	98.1	101.9	98.8	101.4	99.5	100.9
2.3	95.3	104.7	95.7	104.3	96.2	103.8	96.7	103.3	97.2	102.9	97.7	102.4	98.2	101.9	98.8	101.4	99.6	100.9
2.4	95.4	104.6	95.8	104.2	96.3	103.7	96.7	103.3	97.2	102.8	97.7	102.3	98.3	101.8	98.9	101.3	99.7	100.8
2.5	95.5	104.5	95.9	104.1	96.4	103.6	96.8	103.2	97.3	102.7	97.8	102.2	98.4	101.8	99.0	101.2	99.8	100.7
2.6	95.5	104.5	96.0	104.0	96.4	103.6	96.9	103.1	97.4	102.6	97.9	102.2	98.5	101.7	99.2	101.2	100.0	100.6
2.7	95.6	104.4	96.1	103.9	96.5	103.5	97.0	103.0	97.5	102.6	98.0	102.1	98.6	101.6	99.3	101.1	100.1	100.5

2.8	95.7	104.3	96.2	103.8	96.6	103.4	97.1	102.9	97.6	102.5	98.1	102.0	98.7	101.5	99.4	101.0	100.3	100.5
2.9	95.8	104.2	96.3	103.7	96.7	103.3	97.2	102.9	97.7	102.4	98.2	101.9	98.8	101.4	99.6	100.9	.	.
3.0	95.9	104.1	96.4	103.6	96.8	103.2	97.3	102.8	97.8	102.3	98.3	101.8	99.0	101.3	99.8	100.8	.	.
3.1	96.1	103.9	96.5	103.5	96.9	103.1	97.4	102.7	97.9	102.2	98.5	101.7	99.1	101.3	100.0	100.7	.	.
3.2	96.2	103.8	96.6	103.4	97.0	103.0	97.5	102.6	98.0	102.1	98.6	101.6	99.3	101.1	100.2	100.6	.	.
3.3	96.3	103.7	96.7	103.3	97.2	102.9	97.6	102.5	98.2	102.0	98.8	101.5	99.5	101.0	100.4	100.5	.	.
3.4	96.4	103.6	96.8	103.2	97.3	102.8	97.8	102.3	98.3	101.9	99.0	101.4	99.7	100.9	.	.	.	.
3.5	96.5	103.5	97.0	103.1	97.4	102.7	97.9	102.2	98.5	101.8	99.2	101.3	100.0	100.8	.	.	.	.
3.6	96.7	103.3	97.1	102.9	97.6	102.5	98.1	102.1	98.7	101.7	99.4	101.2	100.3	100.7	.	.	.	.
3.7	96.8	103.2	97.3	102.8	97.7	102.4	98.3	102.0	98.9	101.5	99.6	101.0	.	.	.	.	.	.
3.8	97.0	103.1	97.4	102.7	97.9	102.3	98.5	101.9	99.1	101.4	99.9	100.9	.	.	.	.	.	.
3.9	97.2	102.9	97.6	102.5	98.1	102.1	98.7	101.7	99.4	101.3	100.3	100.7	.	.	.	.	.	.
4.0	97.4	102.8	97.8	102.4	98.4	102.0	99.0	101.6	99.7	101.1	.	.	.	.	.	.	.	.

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 90.0, CONFIDENCE LEVEL = 98.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
OF 50 ASSAYS- 5 ASSAYS AT EACH OF 10 DIFFERENT LOCATIONS
SE IS THE POOLED WITHIN LOCATION STANDARD DEVIATION
STANDARD DEVIATIONS AND MEANS ARE EXPRESSED IN % CLAIM

STANDARD DEVIATION OF LOCATION MEANS

	1.9		2.0		2.1		2.2		2.3		2.4		2.5		2.6		2.7	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL
4.1	97.6	102.6	98.1	102.3	98.6	101.8	99.3	101.4	100.1	100.9	.	.	.	.	.	.	.	.
4.2	97.8	102.5	98.3	102.1	98.9	101.7	99.6	101.2	100.6	100.7	.	.	.	.	.	.	.	.
4.3	98.1	102.3	98.6	101.9	99.3	101.5	100.1	101.0	.	.	.	.	.	.	.	.	.	.
4.4	98.4	102.1	99.0	101.7	99.7	101.3	100.6	100.8	.	.	.	.	.	.	.	.	.	.
4.5	98.7	101.9	99.4	101.5	100.2	101.1	.	.	.	.	.	.	.	.	.	.	.	.
4.6	99.2	101.7	99.9	101.3	100.8	100.8	.	.	.	.	.	.	.	.	.	.	.	.
4.7	99.7	101.5	100.5	101.0	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4.8	100.4	101.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
LOWER BOUND = 90.0, CONFIDENCE LEVEL = 98.0
TABLE ENTRIES ARE LOWER(LL) AND UPPER(UL) LIMITS ON THE MEAN
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STANDARD DEVIATION OF LOCATION MEANS

	2.8		2.9		3.0		3.1		3.2		3.3		3.4		3.5		3.6	
SE	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL	LL	UL

0.1	99.2	101.0	100.0	100.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.2	99.2	101.0	100.0	100.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.3	99.2	101.0	100.0	100.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.4	99.2	101.0	100.1	100.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.5	99.3	101.0	100.1	100.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.6	99.3	101.0	100.1	100.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.7	99.3	101.0	100.1	100.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.8	99.3	100.9	100.2	100.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0.9	**99.4**	**100.9**	100.2	100.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.0	99.4	100.9	100.3	100.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.1	99.5	100.9	100.3	100.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.2	99.5	100.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.3	99.6	100.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.4	99.6	100.8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.5	99.7	100.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.6	99.7	100.7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.7	99.8	100.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.8	99.9	100.6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1.9	100.0	100.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.0	100.1	100.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.1	100.2	100.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2.2	100.4	100.4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
85.8	0.3	0.1	0.93623

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
114.2	0.3	0.1	0.93623

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
85.7	0.3	0.1	0.79660

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
90.8	2.3	0.7	0.91332

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
109.2	2.3	0.7	0.91332

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
109.3	2.3	0.7	0.89497

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
100.2	5.4	0.9	0.90124

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
102.2	5.4	0.9	0.90344

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
96.5	0.7	2.3	0.90894

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
103.5	0.7	2.3	0.90908

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
95.5	2	2	0.90204

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
104.5	2	2	0.90206

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
99.4	0.9	2.8	0.90572

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2 (10 LOCATIONS, 5 PER LOCATION)
PROPORTION OF FUTURE SAMPLES PASSING THE USP TEST
WITH 98.0% ASSURANCE
FOR GIVEN SAMPLE MEAN, WITHIN AND BETWEEN LOCATION STD DEV

SAMPLE MEAN	SAMPLE WITHIN LOCATION STD DEV	SAMPLE BETWEEN LOCATION STD DEV	LOWER BOUND
100.9	0.9	2.8	0.90594

To verify that the second part (evaluating the table) is performing as promised, the code in Macro EVCUSP2 (SAS lines 494-636) is compared to that in CUSP1.SAS. They are similar. The major difference is in Macro SIGCUSP2. The code are provided in the following table:

Macro SIGCUSP1 in CUSP1.SAS

```
342.    DATA SAVE;
  343.     SET ONE END = LAST;
  344.     U = &U / &UDIV;
  345.     CV = &CV / &CVDIV;
  346.     SIGMA = U * CV / 100;
  347.     PMEAN = PROBNORM((x - U) *
SQRT(N) / SIGMA)
  348.    - PROBNORM((LAG(X) - U) * SQRT(N)
/ SIGMA);
  349.    AVEHT = (STD + LAG(STD)) / 2;
  350.    PSTD = PROBCHI((N - 1) * AVEHT *
AVEHT
  351.    / ( SIGMA * SIGMA), N - 1);
  352.    PT = PMEAN * PSTD ;
  353.    PTRAP + PT;
  354.    IF LAST THEN OUTPUT;
```

Macro SIGCUSP2 in CUSP2.SAS

```
591.    DATA SAVE2;
  592.     SET TABC END = LAST;
  593.     U = &U / &UDIV;
  594.     D = &D1;
  595.     SIGSE = &SIGSE / &SEDIV;
  596.     SIGSM = &SIGSM / &SMDIV;
  597.     SIGSM2 = SIGSM * SIGSM;
  598.     EXPSE2 = SIGSE * SIGSE;
  599.     EXPSM2 = EXPSE2 + NN * SIGSM *
SIGSM;
  600.     PMEAN = PROBNORM((MEANU - U) *
SQRT((N) / EXPSM2))
  601.              - PROBNORM((MEANL - U) *
SQRT((N) / EXPSM2));
  602.     PSE = PROBCHI(L * (NN - 1) * SE *
SE / EXPSE2, L * (NN -1))
  603.            - PROBCHI(L * (NN - 1) *
(SE - D) * (SE - D) /
  604.            EXPSE2, L * (NN - 1));
  605.     PSM = PROBCHI((L - 1) * NN * SM *
SM / EXPSM2, L - 1)
  606.            - PROBCHI((L - 1) * NN *
(SM - D) * (SM - D) /
  607.            EXPSM2, L - 1);
  608.     P = PMEAN * PSE * PSM;
  609.     PSUM + P;
  610.     IF LAST THEN OUTPUT;
```

The differences make sense. In CUSP1.SAS, the table of means is partitioned by subtracting the cumulative normal (lines 347-348). In CUSP2.SAS the table is partitioned by the 2 CVs (lines 602-607). The uses of Chi Sqr and Inverse normal probability are similar. The mean in CUSP2 is not partitioned, but it is an interval (based upon the interval from the table). The error estimate for the mean is for population, thus it uses variance components (lines 599-600) rather than MSL. In both programs, probabilities are summed over the entire space. The following inputs were used to check if the table was appropriately created: FORM=CAPSULE, CILEVEL=98,LBOUND=90, LOC=10, NUM=5, ULOW=980, UHIGH=1020, UINCRE=10, UDIV=10, SELOW=5, SEHIGH=25, SEINCRE=10, SEDIV=10, SMLOW=5, SMHIGH=35, SMINCRE=15, SMDIV=10. The output is listed below and the table is correct.

CuDAL output:

ACCEPTANCE LIMITS FOR CAPSULE CONTENT UNIFORMITY
SAMPLING PLAN 2
PROBABILITY OF PASSING ACCEPTANCE LIMIT TABLE
WITH 5 ASSAYS AT EACH OF 10 LOCATIONS
CONFIDENCE LEVEL = 98.0 & LOWER BOUND = 90.0

OBS	MEAN	WITHIN LOCATION STD DEV	BETWEEN LOCATION STD DEV	PROBABILITY OF PASSING
1	98	0.5	0.5	1.00000
2	98	0.5	2.0	0.88380
3	98	0.5	3.5	0.14597
4	98	1.5	0.5	1.00000
5	98	1.5	2.0	0.80681
6	98	1.5	3.5	0.11912
7	98	2.5	0.5	0.99984
8	98	2.5	2.0	0.61073
9	98	2.5	3.5	0.07576
10	99	0.5	0.5	1.00000

11	99	0.5	2.0	0.93426
12	99	0.5	3.5	0.18983
13	99	1.5	0.5	1.00000
14	99	1.5	2.0	0.87892
15	99	1.5	3.5	0.15745
16	99	2.5	0.5	0.99998
17	99	2.5	2.0	0.71411
18	99	2.5	3.5	0.10300
19	100	0.5	0.5	1.00000
20	100	0.5	2.0	0.95540
21	100	0.5	3.5	0.21167
22	100	1.5	0.5	1.00000
23	100	1.5	2.0	0.91248
24	100	1.5	3.5	0.17696
25	100	2.5	0.5	1.00000
26	100	2.5	2.0	0.76780
27	100	2.5	3.5	0.11733
28	101	0.5	0.5	1.00000
29	101	0.5	2.0	0.94024
30	101	0.5	3.5	0.19529
31	101	1.5	0.5	1.00000
32	101	1.5	2.0	0.88970
33	101	1.5	3.5	0.16301
34	101	2.5	0.5	0.99999
35	101	2.5	2.0	0.73543
36	101	2.5	3.5	0.10801
37	102	0.5	0.5	1.00000
38	102	0.5	2.0	0.88695
39	102	0.5	3.5	0.15059
40	102	1.5	0.5	1.00000
41	102	1.5	2.0	0.81378
42	102	1.5	3.5	0.12411
43	102	2.5	0.5	0.99986
44	102	2.5	2.0	0.62446
45	102	2.5	3.5	0.08041

After careful review of CUSP2.SAS (and with the comparison to CUSP1.SAS), I believe the strategy is correct, the code implements the strategy, and that the mathematical calculations are correct.

INDEPENDENT RESULTS FOR CUDAL PROGRAM VALIDATION

By:	Dr. Plinio De los Santos and Dr. Merlin Utter (Wyeth Ayerst Pharmaceuticals / Statistical Services)
Software Used:	S-PLUS Ver. 2000
Date:	10/11/2001

INTRODUCTION

This document provides for Part 2 and Part 4 of the CUDAL validation protocol:

- The SPlus code used for independent evaluation of the CUDAL program.
- The test output from the SPlus code; and
- The comparison of the SPlus results against expected CUDAL program results.

As requested by Dr. James Bergum, the comparison of results in Part 2 provide additional information for the validation of the test output results. That is, we provided lower bound and standard deviation or mean result information immediately before and after the algorithm convergence.

INDEPENDENT RESULTS

1. PART 2 / Content Uniformity - Sampling Plan 1

Exhibit 1.1: SPlus Code for Content Uniformity - Sampling Plan 1 (page 1 of 3)

```
"P2.CUSP1.c1calc"<-
function(SIGMA,LLU,ULU,TYPE)
{
   C2<-0.078
   K<-(1+30*LLU*LLU/(SIGMA*SIGMA))
   V<-((K^2)/(1+(2*30*(LLU^2)/(SIGMA^2))))
   PCV2<-(1-pf(30/(K*C2^2),V, 29,ncp=0))
   P1L<-pnorm((100-LLU)/SIGMA,0,1)-pnorm((85-LLU)/SIGMA,0,1)
   P1U<-pnorm((115-LLU)/SIGMA,0,1)-pnorm((100-LLU)/SIGMA,0,1)
   P1 <-P1L+P1U
   P2L<-pnorm((85-LLU)/SIGMA,0,1)-pnorm((75-LLU)/SIGMA,0,1)
   P2U<-pnorm((125-LLU)/SIGMA,0,1)-pnorm((115-LLU)/SIGMA,0,1)
   P2<-P2L+P2U
   if ((TYPE)=="T") (PCTTAB2<-(P1^30+30*(P1^29)*P2))
   if ((TYPE)=="C") (PCTTAB2<-(P1^27*(P1*P1*P1+30*P1*P1*P2+435*P1*P2*P2+4060*P2*P2*P2)))
   LPROB2<<-max(PCV2+PCTTAB2-1,0)
   C1<-0.060
   K<-(1 +10*LLU*LLU/(SIGMA*SIGMA))
   V<-(K*K/(1+2*10*LLU*LLU/(SIGMA*SIGMA)))
   PCV1<-(1-pf(10/(K*C1^2),V,9,ncp=0))
   if ((TYPE)=="T") (PCTTAB1<-P1^10)
   if ((TYPE)=="C") (PCTTAB1<-(P1^9)*(P1+10*P2))
   LPROB1<<-max(PCV1+PCTTAB1-1,0)
   OVERLBD<<-max(LPROB1,LPROB2)
   C2<-0.078
   K<-1+30*ULU*ULU/(SIGMA*SIGMA)
   V<-K*K/(1+2*30*ULU*ULU/(SIGMA*SIGMA))
   PCV2<-(1-pf(30/(K*C2*C2),V,29,ncp=0))
   P1L<-pnorm((100-ULU)/SIGMA,0,1)-pnorm((85-ULU)/SIGMA,0,1)
   P1U<-pnorm((115-ULU)/SIGMA,0,1)-pnorm((100-ULU)/SIGMA,0,1)
   P1<-P1L+P1U
   P2L<-pnorm((85-ULU)/SIGMA,0,1)-pnorm((75-ULU)/SIGMA,0,1)
   P2U<-pnorm((125-ULU)/SIGMA,0,1)-pnorm((115-ULU)/SIGMA,0,1)
   P2<-P2L+P2U
   if ((TYPE)=="T") (PCTTAB2<-(P1^30+30*(P1^29)*P2))
   if ((TYPE)=="C") (PCTTAB2<-(P1^27*(P1*P1*P1+30*P1*P1*P2+435*P1*P2*P2+4060*P2*P2*P2)))
   LPROB2<<-max(PCV2+PCTTAB2-1,0)
   C1<-0.060
   K<-1+10*ULU*ULU/(SIGMA*SIGMA)
   V<-K*K/(1+2*10*ULU*ULU/(SIGMA*SIGMA))
   PCV1<-(1-pf(10/(K*C1*C1),V,9,ncp=0))
   if ((TYPE)=="T") (PCTTAB1<-P1^10)
```

Exhibit 1.1 (page 2 of 3)

```
if ((TYPE)=="C") (PCTTAB1<-P1^9*(P1+10*P2))
   LPROB1<<-max(PCV1+PCTTAB1-1,0)
   OVERUBD<<-max(LPROB1,LPROB2)
   OVERBD<<-min(OVERLBD,OVERUBD)
}
"P2.CUSP1.CALCUSP1"<-
function(TYPE,CILEVEL,LBOUND,NUMBER,MEAN,Decimals)
{
        N<-NUMBER
        Z<- qnorm((1+sqrt(CILEVEL/100))/2,0,1)
        CHI <-qchisq(1-sqrt(CILEVEL/100),N-1)
        SDOLD<-0
        STARTSD<-0.01
        UPPER_IND<-0
        SAMPSD<<-STARTSD
        OVERBD.Previous<<-NA
        OVERBD<<-NA
        while (SAMPSD <=7.8)
                {
                SIGMA<- sqrt((N - 1) * SAMPSD * SAMPSD / CHI)
                LLU<- MEAN - Z *SIGMA / sqrt(N)
                ULU<- MEAN + Z * SIGMA / sqrt(N)
                OVERBD.Previous<<-OVERBD
                SAMPSD.After<<-SAMPSD
                P2.CUSP1.c1calc(SIGMA,LLU,ULU,TYPE)
                if (OVERBD<(LBOUND/100))
                        {
                        if (SAMPSD>0.0101)
                                {
                                SAMPSD<-SAMPSD-0.001
                                if (SAMPSD < SDOLD)
                                        {
                                        STARTM<-MEAN
                                        UPPER_IND<-1
                                        SAMPSD<-7.8
                                        }
                                else
                                        {
                                        SDOLD<-SAMPSD
                                        STARTSD<-SAMPSD
                                        CV<<-(100 * SAMPSD / MEAN)
                                        SAMPSD<-20.0
                                        }
                                }
                        else
                                {
                                CV<<-0
                                SAMPSD<-20.0
                                }
                        }
                else
                        {SAMPSD<-SAMPSD+0.001}
                }
        if (UPPER_IND==1)
                {
                STARTSD<-0.01
                while (SAMPSD<=7.8)
                        {
                        SIGMA<-SQRT((N - 1) * SAMPSD * SAMPSD / CHI)
                        LLU<-MEAN-Z*SIGMA/sqrt(N)
                        ULU<-MEAN+Z*SIGMA/sqrt(N)
                        OVERBD.Previous<<-OVERBD
                        SAMPSD.After<<-SAMPSD
                        P2.CUSP1.c1calc(SIGMA,LLU,ULU,TYPE)
                        if (OVERBD<(LBOUND/100))
                                {
                                if (SAMPSD>0.0101)
                                        {
                                        SAMPSD<-SAMPSD-0.001
                                        STARTSD<-SAMPSD
```

Exhibit 1.1 (page 3 of 3)

```
                                        CV<<-(100*SAMPSD/MEAN)
                                        SAMPSD<-20.0
                                        }
                                else
                                        {
                                        CV<<-0
                                        SAMPSD<-20.0
                                        }
                                }
                        else
                                {SAMPSD<-SAMPSD+0.001}
                        }
                }
        if(is.na(OVERBD.Previous)==T) {OVERBD.Previous<<-OVERBD}
        SAMPSD<<-(CV*MEAN/100)
        CV<<-round(CV,Decimals)
}
```

Exhibit 1.2: Test Output for Content Uniformity - Sampling Plan 1 (page 1 of 6)

```
> rm(results1)
> results1<- structure(.Data=rep(NA,216),.Dim=c(36,6))
> P2.CUSP1.CALCUSP1("T",50,50,5,85.1,2)
[1] 0.04
> results1[1,1]<-paste("T",50,50,5,85.1)
> results1[1,2]<-CV
> results1[1,3]<-SAMPSD
> results1[1,4]<-OVERBD.Previous
> results1[1,5]<-OVERBD
> results1[1,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",50,50,5,100,2)
[1] 4.9
> results1[2,1]<-paste("T",50,50,5,100)
> results1[2,2]<-CV
> results1[2,3]<-SAMPSD
> results1[2,4]<-OVERBD.Previous
> results1[2,5]<-OVERBD
> results1[2,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",50,50,5,114.9,2)
[1] 0.03
> results1[3,1]<-paste("T",50,50,5,114.9)
> results1[3,2]<-CV
> results1[3,3]<-SAMPSD
> results1[3,4]<-OVERBD.Previous
> results1[3,5]<-OVERBD
> results1[3,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",50,50,2000,85.1,2)
[1] 0.08
> results1[4,1]<-paste("T",50,50,2000,85.1)
> results1[4,2]<-CV
> results1[4,3]<-SAMPSD
> results1[4,4]<-OVERBD.Previous
> results1[4,5]<-OVERBD
> results1[4,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",50,50,2000,100,2)
[1] 7.05
> results1[5,1]<-paste("T",50,50,2000,100)
> results1[5,2]<-CV
> results1[5,3]<-SAMPSD
> results1[5,4]<-OVERBD.Previous
> results1[5,5]<-OVERBD
> results1[5,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",50,50,2000,114.9,2)
[1] 0.06
> results1[6,1]<-paste("T",50,50,2000,114.9)
> results1[6,2]<-CV
> results1[6,3]<-SAMPSD
```

Exhibit 1.2 (page 2 of 6)

```
> results1[6,4]<-OVERBD.Previous
> results1[6,5]<-OVERBD
> results1[6,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,50,5,85.1,2)
[1] 0
> results1[7,1]<-paste("T",99,50,5,85.1)
> results1[7,2]<-CV
> results1[7,3]<-SAMPSD
> results1[7,4]<-OVERBD.Previous
> results1[7,5]<-OVERBD
> results1[7,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,50,5,100,2)
[1] 1.2
> results1[8,1]<-paste("T",99,50,5,100)
> results1[8,2]<-CV
> results1[8,3]<-SAMPSD
> results1[8,4]<-OVERBD.Previous
> results1[8,5]<-OVERBD
> results1[8,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,50,5,114.9,2)
[1] 0
> results1[9,1]<-paste("T",99,50,5,114.9)
> results1[9,2]<-CV
> results1[9,3]<-SAMPSD
> results1[9,4]<-OVERBD.Previous
> results1[9,5]<-OVERBD
> results1[9,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,50,2000,85.1,2)
[1] 0.07
> results1[10,1]<-paste("T",99,50,2000,85.1)
> results1[10,2]<-CV
> results1[10,3]<-SAMPSD
> results1[10,4]<-OVERBD.Previous
> results1[10,5]<-OVERBD
> results1[10,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,50,2000,100,2)
[1] 6.81
> results1[11,1]<-paste("T",99,50,2000,100)
> results1[11,2]<-CV
> results1[11,3]<-SAMPSD
> results1[11,4]<-OVERBD.Previous
> results1[11,5]<-OVERBD
> results1[11,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,50,2000,114.9,2)
[1] 0.05
> results1[12,1]<-paste("T",99,50,2000,114.9)
> results1[12,2]<-CV
> results1[12,3]<-SAMPSD
> results1[12,4]<-OVERBD.Previous
> results1[12,5]<-OVERBD
> results1[12,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,99,5,85.1,2)
[1] 0
> results1[13,1]<-paste("T",99,99,5,85.1)
> results1[13,2]<-CV
> results1[13,3]<-SAMPSD
> results1[13,4]<-OVERBD.Previous
> results1[13,5]<-OVERBD
> results1[13,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,99,5,100,2)
[1] 0.89
> results1[14,1]<-paste("T",99,99,5,100)
> results1[14,2]<-CV
> results1[14,3]<-SAMPSD
> results1[14,4]<-OVERBD.Previous
> results1[14,5]<-OVERBD
> results1[14,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,99,5,114.9,2)
[1] 0
> results1[15,1]<-paste("T",99,99,5,114.9)
```

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```
> results1[15,2]<-CV
> results1[15,3]<-SAMPSD
> results1[15,4]<-OVERBD.Previous
> results1[15,5]<-OVERBD
> results1[15,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,99,2000,85.1,2)
[1] 0.04
> results1[16,1]<-paste("T",99,99,2000,85.1)
> results1[16,2]<-CV
> results1[16,3]<-SAMPSD
> results1[16,4]<-OVERBD.Previous
> results1[16,5]<-OVERBD
> results1[16,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,99,2000,100,2)
[1] 5.11
> results1[17,1]<-paste("T",99,99,2000,100)
> results1[17,2]<-CV
> results1[17,3]<-SAMPSD
> results1[17,4]<-OVERBD.Previous
> results1[17,5]<-OVERBD
> results1[17,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("T",99,99,2000,114.9,2)
[1] 0.03
> results1[18,1]<-paste("T",99,99,2000,114.9)
> results1[18,2]<-CV
> results1[18,3]<-SAMPSD
> results1[18,4]<-OVERBD.Previous
> results1[18,5]<-OVERBD
> results1[18,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,50,5,85.1,2)
[1] 0.06
> results1[19,1]<-paste("C",50,50,5,85.1)
> results1[19,2]<-CV
> results1[19,3]<-SAMPSD
> results1[19,4]<-OVERBD.Previous
> results1[19,5]<-OVERBD
> results1[19,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,50,5,100,2)
[1] 5.33
> results1[20,1]<-paste("C",50,50,5,100)
> results1[20,2]<-CV
> results1[20,3]<-SAMPSD
> results1[20,4]<-OVERBD.Previous
> results1[20,5]<-OVERBD
> results1[20,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,50,5,114.9,2)
[1] 0.04
> results1[21,1]<-paste("C",50,50,5,114.9)
> results1[21,2]<-CV
> results1[21,3]<-SAMPSD
> results1[21,4]<-OVERBD.Previous
> results1[21,5]<-OVERBD
> results1[21,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,50,2000,85.1,2)
[1] 0.12
> results1[22,1]<-paste("C",50,50,2000,85.1)
> results1[22,2]<-CV
> results1[22,3]<-SAMPSD
> results1[22,4]<-OVERBD.Previous
> results1[22,5]<-OVERBD
> results1[22,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,50,2000,100,2)
[1] 7.58
> results1[23,1]<-paste("C",50,50,2000,100)
> results1[23,2]<-CV
> results1[23,3]<-SAMPSD
> results1[23,4]<-OVERBD.Previous
> results1[23,5]<-OVERBD
```

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```
> results1[23,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,50,2000,114.9,2)
[1] 0.09
> results1[24,1]<-paste("C",50,50,2000,114.9)
> results1[24,2]<-CV
> results1[24,3]<-SAMPSD
> results1[24,4]<-OVERBD.Previous
> results1[24,5]<-OVERBD
> results1[24,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,99,5,85.1,2)
[1] 0.04
> results1[25,1]<-paste("C",50,99,5,85.1)
> results1[25,2]<-CV
> results1[25,3]<-SAMPSD
> results1[25,4]<-OVERBD.Previous
> results1[25,5]<-OVERBD
> results1[25,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,99,5,100,2)
[1] 4.2
> results1[26,1]<-paste("C",50,99,5,100)
> results1[26,2]<-CV
> results1[26,3]<-SAMPSD
> results1[26,4]<-OVERBD.Previous
> results1[26,5]<-OVERBD
> results1[26,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,99,5,114.9,2)
[1] 0.03
> results1[27,1]<-paste("C",50,99,5,114.9)
> results1[27,2]<-CV
> results1[27,3]<-SAMPSD
> results1[27,4]<-OVERBD.Previous
> results1[27,5]<-OVERBD
> results1[27,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,99,2000,85.1,2)
[1] 0.06
> results1[28,1]<-paste("C",50,99,2000,85.1)
> results1[28,2]<-CV
> results1[28,3]<-SAMPSD
> results1[28,4]<-OVERBD.Previous
> results1[28,5]<-OVERBD
> results1[28,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,99,2000,100,2)
[1] 5.87
> results1[29,1]<-paste("C",50,99,2000,100)
> results1[29,2]<-CV
> results1[29,3]<-SAMPSD
> results1[29,4]<-OVERBD.Previous
> results1[29,5]<-OVERBD
> results1[29,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",50,99,2000,114.9,2)
[1] 0.04
> results1[30,1]<-paste("C",50,99,2000,114.9)
> results1[30,2]<-CV
> results1[30,3]<-SAMPSD
> results1[30,4]<-OVERBD.Previous
> results1[30,5]<-OVERBD
> results1[30,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",99,99,5,85.1,2)
[1] 0
> results1[31,1]<-paste("C",99,99,5,85.1)
> results1[31,2]<-CV
> results1[31,3]<-SAMPSD
> results1[31,4]<-OVERBD.Previous
> results1[31,5]<-OVERBD
> results1[31,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",99,99,5,100,2)
[1] 1.08
> results1[32,1]<-paste("C",99,99,5,100)
```

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```
> results1[32,2]<-CV
> results1[32,3]<-SAMPSD
> results1[32,4]<-OVERBD.Previous
> results1[32,5]<-OVERBD
> results1[32,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",99,99,5,114.9,2)
[1] 0
> results1[33,1]<-paste("C",99,99,5,114.9)
> results1[33,2]<-CV
> results1[33,3]<-SAMPSD
> results1[33,4]<-OVERBD.Previous
> results1[33,5]<-OVERBD
> results1[33,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",99,99,2000,85.1,2)
[1] 0.06
> results1[34,1]<-paste("C",99,99,2000,85.1)
> results1[34,2]<-CV
> results1[34,3]<-SAMPSD
> results1[34,4]<-OVERBD.Previous
> results1[34,5]<-OVERBD
> results1[34,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",99,99,2000,100,2)
[1] 5.67
> results1[35,1]<-paste("C",99,99,2000,100)
> results1[35,2]<-CV
> results1[35,3]<-SAMPSD
> results1[35,4]<-OVERBD.Previous
> results1[35,5]<-OVERBD
> results1[35,6]<-SAMPSD.After
> P2.CUSP1.CALCUSP1("C",99,99,2000,114.9,2)
[1] 0.04
> results1[36,1]<-paste("C",99,99,2000,114.9)
> results1[36,2]<-CV
> results1[36,3]<-SAMPSD
> results1[36,4]<-OVERBD.Previous
> results1[36,5]<-OVERBD
> results1[36,6]<-SAMPSD.After
> results1
                      [,1]   [,2]                [,3]                [,4]
[,5]                [,6]
 [1,] "T 50 50 5 85.1"     "0.04" "0.037"              "0.510445704086448"
"0.47405742610883"  "0.038"
 [2,] "T 50 50 5 100"      "4.9"  "4.90099999999997"   "0.500141687795354"
"0.499274231900107" "4.90199999999997"
 [3,] "T 50 50 5 114.9"    "0.03" "0.037"              "0.510445704086448"
"0.47405742610883"  "0.038"
 [4,] "T 50 50 2000 85.1"  "0.08" "0.0650000000000001" "0.50186217568437"
"0.485763453589822" "0.066"
 [5,] "T 50 50 2000 100"   "7.05" "7.04700000000069"   "0.50049711616929"
"0.499869768707411" "7.04800000000069"
 [6,] "T 50 50 2000 114.9" "0.06" "0.065"              "0.50186217568437"
"0.485763453589822" "0.066"
 [7,] "T 99 50 5 85.1"     "0"    "0"                  "0.188790420080793"
"0.188790420080793" "0.01"
 [8,] "T 99 50 5 100"      "1.2"  "1.19599999999998"   "0.501306731965613"
"0.498634696069145" "1.19699999999998"
 [9,] "T 99 50 5 114.9"    "0"    "0"                  "0.188790420080793"
"0.188790420080793" "0.01"
[10,] "T 99 50 2000 85.1"  "0.07" "0.061"              "0.507815029340406"
"0.490171089286689" "0.062"
[11,] "T 99 50 2000 100"   "6.81" "6.80500000000061"   "0.500627506359422"
"0.499976548400432" "6.80600000000061"
[12,] "T 99 50 2000 114.9" "0.05" "0.061"              "0.507815029340406"
"0.490171089286689" "0.062"
[13,] "T 99 99 5 85.1"     "0"    "0"                  "0.188790420080793"
"0.188790420080793" "0.01"
[14,] "T 99 99 5 100"      "0.89" "0.891000000000001"  "0.990157383500014"
"0.989921383285414" "0.892000000000001"
[15,] "T 99 99 5 114.9"    "0"    "0"                  "0.188790420080793"
"0.188790420080793" "0.01"
```

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```
[16,] "T 99 99 2000 85.1"  "0.04" "0.036"              "0.991440566786075"
"0.98728760417366"  "0.037"
[17,] "T 99 99 2000 100"   "5.11" "5.10500000000004"   "0.990011733798309"
"0.989977494616212" "5.10600000000004"
[18,] "T 99 99 2000 114.9" "0.03" "0.036"              "0.991440566786075"
"0.987287604173661" "0.037"
[19,] "C 50 50 5 85.1"     "0.06" "0.05"               "0.51105912799483"
"0.486012493012596" "0.051"
[20,] "C 50 50 5 100"      "5.33" "5.33400000000012"   "0.500753267200037"
"0.499898928570249" "5.33500000000012"
[21,] "C 50 50 5 114.9"    "0.04" "0.05"               "0.51105912799483"
"0.486012493012596" "0.051"
[22,] "C 50 50 2000 85.1"  "0.12" "0.0980000000000001" "0.502380190799308"
"0.493489781376227" "0.0990000000000001"
[23,] "C 50 50 2000 100"   "7.58" "7.58300000000087"   "0.500087807935097"
"0.49955230156684"  "7.58400000000087"
[24,] "C 50 50 2000 114.9" "0.09" "0.0980000000000001" "0.502380190799308"
"0.493489781376227" "0.0990000000000001"
[25,] "C 50 99 5 85.1"     "0.04" "0.03"               "0.994452004435061"
"0.98956375660826"  "0.031"
[26,] "C 50 99 5 100"      "4.2"  "4.19699999999974"   "0.990034698400975"
"0.98997546943883"  "4.19799999999974"
[27,] "C 50 99 5 114.9"    "0.03" "0.03"               "0.994452004435062"
"0.989563756608258" "0.031"
[28,] "C 50 99 2000 85.1"  "0.06" "0.051"              "0.991230246157635"
"0.988266999784908" "0.052"
[29,] "C 50 99 2000 100"   "5.87" "5.8690000000003"    "0.990016097070516"
"0.989974433368419" "5.8700000000003"
[30,] "C 50 99 2000 114.9" "0.04" "0.051"              "0.991230246157634"
"0.988266999784908" "0.052"
[31,] "C 99 99 5 85.1"     "0"    "0"                  "0.531282116500297"
"0.531282116500297" "0.01"
[32,] "C 99 99 5 100"      "1.08" "1.07699999999999"   "0.990053153982176"
"0.989822213751579" "1.07799999999999"
[33,] "C 99 99 5 114.9"    "0"    "0"                  "0.531282116500298"
"0.531282116500298" "0.01"
[34,] "C 99 99 2000 85.1"  "0.06" "0.048"              "0.992272561022176"
"0.989345631934023" "0.049"
[35,] "C 99 99 2000 100"   "5.67" "5.66800000000023"   "0.990002179529304"
"0.989958890803266" "5.66900000000023"
[36,] "C 99 99 2000 114.9" "0.04" "0.048"              "0.992272561022177"
"0.989345631934022" "0.049"
```

Exhibit 1.3 Checking Independent Results against Expected Results (Content Uniformity - Sampling Plan 1)

Row within "results1"	Test	CV	Independent Results Agree with Program Result? (Y/N)	Additional Information for			
				Independent Test Results		Results Immediately Prior to Test Convergence	
				Standard Deviation	Lower Bound	Standard Deviation	Lower Bound
1	T 50 50 5 85.1	0.04	Y	0.037	0.510446	0.038	0.474057
2	T 50 50 5 100	4.90	Y	4.901	0.500142	4.902	0.499274
3	T 50 50 5 114.9	0.03	Y	0.037	0.510446	0.038	0.474057
4	T 50 50 2000 85.1	0.08	Y	0.065	0.501862	0.066	0.485763
5	T 50 50 2000 100	7.05	Y	7.047	0.500497	7.048	0.499870
6	T 50 50 2000 114.9	0.06	Y	0.065	0.501862	0.066	0.485763
7	T 99 50 5 85.1	0.00	Y	0.000	0.188790	0.01	0.188790
8	T 99 50 5 100	1.20	Y	1.196	0.501307	1.197	0.498635
9	T 99 50 5 114.9	0.00	Y	0.000	0.188790	0.01	0.188790
10	T 99 50 2000 85.1	0.07	Y	0.061	0.507815	0.062	0.490171
11	T 99 50 2000 100	6.81	Y	6.805	0.500628	6.806	0.499977
12	T 99 50 2000 114.9	0.05	Y	0.061	0.507815	0.062	0.490171
13	T 99 99 5 85.1	0.00	Y	0.000	0.188790	0.01	0.188790
14	T 99 99 5 100	0.89	Y	0.891	0.990157	0.892	0.989921
15	T 99 99 5 114.9	0.00	Y	0.000	0.188790	0.01	0.188790
16	T 99 99 2000 85.1	0.04	Y	0.036	0.991441	0.037	0.987288
17	T 99 99 2000 100	5.11	Y	5.105	0.990012	5.106	0.989977
18	T 99 99 2000 114.9	0.03	Y	0.036	0.991441	0.037	0.987288
19	C 50 50 5 85.1	0.06	Y	0.050	0.511059	0.051	0.486012
20	C 50 50 5 100	5.33	Y	5.334	0.500753	5.335	0.499899
21	C 50 50 5 114.9	0.04	Y	0.050	0.511059	0.051	0.486012
22	C 50 50 2000 85.1	0.12	Y	0.098	0.502380	0.099	0.493490
23	C 50 50 2000 100	7.58	Y	7.583	0.500088	7.584	0.499552
24	C 50 50 2000 114.9	0.09	Y	0.098	0.502380	0.099	0.493490
25	C 50 99 5 85.1	0.04	Y	0.030	0.994452	0.031	0.989564
26	C 50 99 5 100	4.20	Y	4.197	0.990035	4.198	0.989975
27	C 50 99 5 114.9	0.03	Y	0.030	0.994452	0.031	0.989564
28	C 50 99 2000 85.1	0.06	Y	0.051	0.991230	0.052	0.988267
29	C 50 99 2000 100	5.87	Y	5.869	0.990016	5.87	0.989974
30	C 50 99 2000 114.9	0.04	Y	0.051	0.991230	0.052	0.988267
31	C 99 99 5 85.1	0.00	Y	0.000	0.531282	0.01	0.531282
32	C 99 99 5 100	1.08	Y	1.077	0.990053	1.078	0.989822
33	C 99 99 5 114.9	0.00	Y	0.000	0.531282	0.01	0.531282
34	C 99 99 2000 85.1	0.06	Y	0.048	0.992273	0.049	0.989346
35	C 99 99 2000 100	5.67	Y	5.668	0.990002	5.669	0.989959
36	C 99 99 2000 114.9	0.04	Y	0.048	0.992273	0.049	0.989346

Note: For details regarding the "Expected Results", please refer to table "PART 2: Content Uniformity Sampling Plan 1, Test Data Set & Results" from the validation protocol forms.

2. PART 2 / Content Uniformity - Sampling Plan 2

Exhibit 2.1: SPlus Code for Content Uniformity - Sampling Plan 2 (page 1 of 3)

```
"P2.CUSP2.cullu"<-
function(MEAN,Z,MVAR,N,SIGMA,TYPE)
{
   LLU<-(MEAN-(Z*sqrt(MVAR/N)))
   C2<-0.078
   K<-(1+((30*LLU*LLU)/(SIGMA*SIGMA)))
   V<-((K*K)/(1+((2*30*LLU*LLU)/(SIGMA*SIGMA))))
   PCV2<-(1-pf(30/(K*C2*C2), V, 29, ncp=0))
   P1L<-(pnorm((100-LLU)/SIGMA,0,1)-pnorm((85-LLU)/SIGMA,0,1))
   P1U<-(pnorm((115-LLU)/SIGMA,0,1)-pnorm((100-LLU)/SIGMA,0,1))
   P1<-(P1L+P1U)
   P2L<-(pnorm((85-LLU)/SIGMA,0,1)-pnorm((75-LLU)/SIGMA,0,1))
   P2U<-(pnorm((125-LLU)/SIGMA,0,1)-pnorm((115-LLU)/SIGMA,0,1))
   P2<-(P2L+P2U)
   if (TYPE=="T") {PCTTAB2<-((P1^30)+30*(P1^29)*P2)}
   if (TYPE=="C") {PCTTAB2<-((P1^27)*(P1*P1*P1+30*P1*P1*P2+435*P1*P2*P2+4060*P2*P2*P2))}
   TPROBL2<-max(PCV2+PCTTAB2-1,0)
   C1<-0.060
   K<-(1+((10*LLU*LLU)/(SIGMA*SIGMA)))
   V<-((K*K)/(1+((2*10*LLU*LLU)/(SIGMA*SIGMA))))
   PCV1<-(1-pf(10/(K*C1*C1),V,9,ncp=0))
   if (TYPE=="T") {PCTTAB1<-(P1^10)}
   if (TYPE=="C") {PCTTAB1<-((P1^9)*(P1+10*P2))}
   LPROB1<-max(PCV1+PCTTAB1-1,0)
   OVERBDL<<-max(TPROBL2,LPROB1)
}

"P2.CUSP2.cuulu"<-
function(MEAN,Z,MVAR,N,SIGMA,TYPE)
{
   ULU<-(MEAN+(Z*sqrt(MVAR/N)))
   C2<-0.078
   K<-(1+((30*ULU*ULU)/(SIGMA*SIGMA)))
   V<-((K*K)/(1+((2*30*ULU*ULU)/(SIGMA*SIGMA))))
   PCV2<-(1-pf(30/(K*C2*C2),V,29,ncp=0))
   P1L<-(pnorm((100-ULU)/SIGMA,0,1)-pnorm((85-ULU)/SIGMA,0,1))
   P1U<-(pnorm((115-ULU)/SIGMA,0,1)-pnorm((100-ULU)/SIGMA,0,1))
   P1<-(P1L+P1U)
   P2L<-(pnorm((85-ULU)/SIGMA,0,1)-pnorm((75-ULU)/SIGMA,0,1))
   P2U<-(pnorm((125-ULU)/SIGMA,0,1)-pnorm((115-ULU)/SIGMA,0,1))
   P2<-(P2L+P2U)
   if (TYPE=="T") {PCTTAB2<-((P1^30)+30*(P1^29)*P2)}
   if (TYPE=="C") {PCTTAB2<-((P1^27)*(P1*P1*P1+30*P1*P1*P2+435*P1*P2*P2+4060*P2*P2*P2))}
   TPROBL2<-max(PCV2+PCTTAB2-1,0)
   C1<-0.060
   K<-(1+((10*ULU*ULU)/(SIGMA*SIGMA)))
   V<-((K*K)/(1+((2*10*ULU*ULU)/(SIGMA*SIGMA))))
   PCV1<-(1-pf(10/(K*C1*C1),V,9,ncp=0))
   if(TYPE=="T") {PCTTAB1<-(P1^10)}
   if(TYPE=="C") {PCTTAB1<-(P1^9*(P1+10*P2))}
   LPROB1<-max(PCV1+PCTTAB1-1,0)
   OVERBDU<<-max(TPROBL2, LPROB1)
}

"P2.CUSP2.CALCUSP2"<-
function(TYPE,CILEVEL,LBOUND,LOC,NUM,SE,SM,Decimals)
{
   D<-0.10
   Z<-qnorm((1+sqrt(CILEVEL/100))/2,0,1)
   NN<-NUM
   L<-LOC
   N<-NN*L
   CHIERR<-qchisq(1-sqrt(CILEVEL/100),L*(NN-1))
   CHILOC<-qchisq(1-sqrt(CILEVEL/100),L-1)
   SEBOUND<-9.2
   SMLIM<-9.2
```

Exhibit 2.1: (page 2 of 3)

```
NEXTL<-84.9
NEXTU<-115.1
MEANL<<-NEXTL
MEANU<<-NEXTU
SMBOUND<-SMLIM
SE2<-SE*SE
H2<-(L*(NN-1)/CHIERR-1)
SEC<-(((1-1/NN)*H2*SE2)^2)
OVERBDL.Previous<<-NA
OVERBDL<<-NA
OVERBDU.Previous<<-NA
OVERBDU<<-NA
if (is.na(MEANL)==F)
     {
     SL2<-(SM*SM*NN)
     SL2UB<-((L-1)*SL2/CHILOC)
     H1<-((L-1)/CHILOC-1)
     FIRST<-(((1/NN)*H1*SL2)^2)
     PTEST<-((1/NN)*SL2+(1-1/NN)*SE2)
     VAR<-(PTEST+sqrt(FIRST+SEC))
     MVAR<-SL2UB
     SIGMA<-sqrt(VAR)
     MEAN<-(MEANL-D)
     OUT<-0
     while (MEAN<=115.5)
             {
             OVERBDL.Previous<<-OVERBDL
             P2.CUSP2.cullu(MEAN,Z,MVAR,N,SIGMA,TYPE)
             if (OVERBDL>(LBOUND/100))
                     {
                     MEANL<<-MEAN
                     MEANL.Previous<<-max(MEANL-D,NEXTL-D)
                     OUT<-1
                     MEAN<-115.6
                     }
             MEAN<-(MEAN+D)
             }
     if(OUT==1) {MEAN<-MEANL}
     if (OVERBDL<=(LBOUND/100))
             {
             MEANL<<-NA
             MEANU<<-NA
             if (SE==D)
                     {
                     SMLIM<-(SM-D)
                     SM<-10
                     }
             else
                     {
                     if (SM==D)
                             {SE<-10}
                     else
                             {
                             if (SM==D)
                                     {
                                     NEXTL<-MEANL
                                     NEXTU<-MEANU
                                     }
                             }
                     }
             }
     else
             {
             MEAN<-(MEANU+D)
             OUT<-0
             while (MEAN>=84.9)
                     {
                     OVERBDU.Previous<<-OVERBDU
                     P2.CUSP2.cuulu(MEAN,Z,MVAR,N,SIGMA,TYPE)
```

Exhibit 2.1: (page 3 of 3)

```
                        if (OVERBDU >(LBOUND/100))
                                {
                                MEANU<<-MEAN
                                MEANU.Previous<<-min(MEAN+D,NEXTU+D)
                                OUT<-1
                                MEAN<-84.8
                                }
                        else
                                {MEAN<-(MEAN-D)}
                        }
                if (OUT==1) {MEAN<-MEANU}
                if((MEANU<=MEANL)||(MEAN<=MEANL))
                        {
                        MEANL<<-NA
                        MEANU<<-NA
                        if (SE==D)
                                {
                                SMLIM<-(SM - D)
                                SM<-10
                                }
                        else    {if (SM==D) {SE<-10}}
                        }
                }
        }
   MEANL<<-round(MEANL,Decimals)
   MEANU<<-round(MEANU,Decimals)
   if(is.na(OVERBDL.Previous)==T) {OVERBDL.Previous<<-OVERBDL}
   if(is.na(OVERBDU.Previous)==T) {OVERBDU.Previous<<-OVERBDU}
}
```

Exhibit 2.2: Test Output for Content Uniformity - Sampling Plan 2 (page 1 of 20)

```
> rm(results2)
> results2<- structure(.Data=rep(NA,864),.Dim=c(96,9))
> P2.CUSP2.CALCUSP2("T",50,50,3,2,0.1,0.1,2)
NULL
> results2[1,1]<-paste("T",50,50,3,2,0.1,0.1)
> results2[1,2]<-MEANL
> results2[1,3]<-MEANU
> results2[1,4]<-OVERBDL
> results2[1,5]<-OVERBDU
> results2[1,6]<-MEANL.Previous
> results2[1,7]<-MEANU.Previous
> results2[1,8]<-OVERBDL.Previous
> results2[1,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,3,2,0.1,3,2)
NULL
> results2[2,1]<-paste("T",50,50,3,2,0.1,3)
> results2[2,2]<-MEANL
> results2[2,3]<-MEANU
> results2[2,4]<-OVERBDL
> results2[2,5]<-OVERBDU
> results2[2,6]<-MEANL.Previous
> results2[2,7]<-MEANU.Previous
> results2[2,8]<-OVERBDL.Previous
> results2[2,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,3,2,3,0.1,2)
NULL
> results2[3,1]<-paste("T",50,50,3,2,3,0.1)
> results2[3,2]<-MEANL
> results2[3,3]<-MEANU
> results2[3,4]<-OVERBDL
> results2[3,5]<-OVERBDU
> results2[3,6]<-MEANL.Previous
> results2[3,7]<-MEANU.Previous
> results2[3,8]<-OVERBDL.Previous
> results2[3,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,3,2,3,3,2)
NULL
```

Exhibit 2.2 (2 of 20)

```
> results2[4,1]<-paste("T",50,50,3,2,3,3)
> results2[4,2]<-MEANL
> results2[4,3]<-MEANU
> results2[4,4]<-OVERBDL
> results2[4,5]<-OVERBDU
> results2[4,6]<-MEANL.Previous
> results2[4,7]<-MEANU.Previous
> results2[4,8]<-OVERBDL.Previous
> results2[4,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,3,300,0.1,0.1,2)
NULL
> results2[5,1]<-paste("T",50,50,3,300,0.1,0.1)
> results2[5,2]<-MEANL
> results2[5,3]<-MEANU
> results2[5,4]<-OVERBDL
> results2[5,5]<-OVERBDU
> results2[5,6]<-MEANL.Previous
> results2[5,7]<-MEANU.Previous
> results2[5,8]<-OVERBDL.Previous
> results2[5,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,3,300,0.1,3,2)
NULL
> results2[6,1]<-paste("T",50,50,3,300,0.1,3)
> results2[6,2]<-MEANL
> results2[6,3]<-MEANU
> results2[6,4]<-OVERBDL
> results2[6,5]<-OVERBDU
> results2[6,6]<-MEANL.Previous
> results2[6,7]<-MEANU.Previous
> results2[6,8]<-OVERBDL.Previous
> results2[6,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,3,300,3,0.1,2)
NULL
> results2[7,1]<-paste("T",50,50,3,300,3,0.1)
> results2[7,2]<-MEANL
> results2[7,3]<-MEANU
> results2[7,4]<-OVERBDL
> results2[7,5]<-OVERBDU
> results2[7,6]<-MEANL.Previous
> results2[7,7]<-MEANU.Previous
> results2[7,8]<-OVERBDL.Previous
> results2[7,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,3,300,3,3,2)
NULL
> results2[8,1]<-paste("T",50,50,3,300,3,3)
> results2[8,2]<-MEANL
> results2[8,3]<-MEANU
> results2[8,4]<-OVERBDL
> results2[8,5]<-OVERBDU
> results2[8,6]<-MEANL.Previous
> results2[8,7]<-MEANU.Previous
> results2[8,8]<-OVERBDL.Previous
> results2[8,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,300,2,0.1,0.1,2)
NULL
> results2[9,1]<-paste("T",50,50,300,2,0.1,0.1)
> results2[9,2]<-MEANL
> results2[9,3]<-MEANU
> results2[9,4]<-OVERBDL
> results2[9,5]<-OVERBDU
> results2[9,6]<-MEANL.Previous
> results2[9,7]<-MEANU.Previous
> results2[9,8]<-OVERBDL.Previous
> results2[9,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,300,2,0.1,3,2)
NULL
> results2[10,1]<-paste("T",50,50,300,2,0.1,3)
> results2[10,2]<-MEANL
> results2[10,3]<-MEANU
> results2[10,4]<-OVERBDL
```

Exhibit 2.2 (3 of 20)

```
> results2[10,5]<-OVERBDU
> results2[10,6]<-MEANL.Previous
> results2[10,7]<-MEANU.Previous
> results2[10,8]<-OVERBDL.Previous
> results2[10,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,300,2,3,0.1,2)
NULL
> results2[11,1]<-paste("T",50,50,300,2,3,0.1)
> results2[11,2]<-MEANL
> results2[11,3]<-MEANU
> results2[11,4]<-OVERBDL
> results2[11,5]<-OVERBDU
> results2[11,6]<-MEANL.Previous
> results2[11,7]<-MEANU.Previous
> results2[11,8]<-OVERBDL.Previous
> results2[11,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,300,2,3,3,2)
NULL
> results2[12,1]<-paste("T",50,50,300,2,3,3)
> results2[12,2]<-MEANL
> results2[12,3]<-MEANU
> results2[12,4]<-OVERBDL
> results2[12,5]<-OVERBDU
> results2[12,6]<-MEANL.Previous
> results2[12,7]<-MEANU.Previous
> results2[12,8]<-OVERBDL.Previous
> results2[12,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,300,300,0.1,0.1,2)
NULL
> results2[13,1]<-paste("T",50,50,300,300,0.1,0.1)
> results2[13,2]<-MEANL
> results2[13,3]<-MEANU
> results2[13,4]<-OVERBDL
> results2[13,5]<-OVERBDU
> results2[13,6]<-MEANL.Previous
> results2[13,7]<-MEANU.Previous
> results2[13,8]<-OVERBDL.Previous
> results2[13,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,300,300,0.1,3,2)
NULL
> results2[14,1]<-paste("T",50,50,300,300,0.1,3)
> results2[14,2]<-MEANL
> results2[14,3]<-MEANU
> results2[14,4]<-OVERBDL
> results2[14,5]<-OVERBDU
> results2[14,6]<-MEANL.Previous
> results2[14,7]<-MEANU.Previous
> results2[14,8]<-OVERBDL.Previous
> results2[14,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,300,300,3,0.1,2)
NULL
> results2[15,1]<-paste("T",50,50,300,300,3,0.1)
> results2[15,2]<-MEANL
> results2[15,3]<-MEANU
> results2[15,4]<-OVERBDL
> results2[15,5]<-OVERBDU
> results2[15,6]<-MEANL.Previous
> results2[15,7]<-MEANU.Previous
> results2[15,8]<-OVERBDL.Previous
> results2[15,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,50,300,300,3,3,2)
NULL
> results2[16,1]<-paste("T",50,50,300,300,3,3)
> results2[16,2]<-MEANL
> results2[16,3]<-MEANU
> results2[16,4]<-OVERBDL
> results2[16,5]<-OVERBDU
> results2[16,6]<-MEANL.Previous
> results2[16,7]<-MEANU.Previous
> results2[16,8]<-OVERBDL.Previous
```

Exhibit 2.2 (4 of 20)

```
> results2[16,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,3,2,0.1,0.1,2)
NULL
> results2[17,1]<-paste("T",50,99,3,2,0.1,0.1)
> results2[17,2]<-MEANL
> results2[17,3]<-MEANU
> results2[17,4]<-OVERBDL
> results2[17,5]<-OVERBDU
> results2[17,6]<-MEANL.Previous
> results2[17,7]<-MEANU.Previous
> results2[17,8]<-OVERBDL.Previous
> results2[17,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,3,2,0.1,3,2)
NULL
> results2[18,1]<-paste("T",50,99,3,2,0.1,3)
> results2[18,2]<-MEANL
> results2[18,3]<-MEANU
> results2[18,4]<-OVERBDL
> results2[18,5]<-OVERBDU
> results2[18,6]<-MEANL.Previous
> results2[18,7]<-MEANU.Previous
> results2[18,8]<-OVERBDL.Previous
> results2[18,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,3,2,3,0.1,2)
NULL
> results2[19,1]<-paste("T",50,99,3,2,3,0.1)
> results2[19,2]<-MEANL
> results2[19,3]<-MEANU
> results2[19,4]<-OVERBDL
> results2[19,5]<-OVERBDU
> results2[19,6]<-MEANL.Previous
> results2[19,7]<-MEANU.Previous
> results2[19,8]<-OVERBDL.Previous
> results2[19,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,3,2,3,3,2)
[1] NA
> results2[20,1]<-paste("T",50,99,3,2,3,3)
> results2[20,2]<-MEANL
> results2[20,3]<-MEANU
> results2[20,4]<-OVERBDL
> results2[20,5]<-OVERBDU
> results2[20,6]<-MEANL.Previous
> results2[20,7]<-MEANU.Previous
> results2[20,8]<-OVERBDL.Previous
> results2[20,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,3,300,0.1,0.1,2)
NULL
> results2[21,1]<-paste("T",50,99,3,300,0.1,0.1)
> results2[21,2]<-MEANL
> results2[21,3]<-MEANU
> results2[21,4]<-OVERBDL
> results2[21,5]<-OVERBDU
> results2[21,6]<-MEANL.Previous
> results2[21,7]<-MEANU.Previous
> results2[21,8]<-OVERBDL.Previous
> results2[21,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,3,300,0.1,3,2)
NULL
> results2[22,1]<-paste("T",50,99,3,300,0.1,3)
> results2[22,2]<-MEANL
> results2[22,3]<-MEANU
> results2[22,4]<-OVERBDL
> results2[22,5]<-OVERBDU
> results2[22,6]<-MEANL.Previous
> results2[22,7]<-MEANU.Previous
> results2[22,8]<-OVERBDL.Previous
> results2[22,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,3,300,3,0.1,2)
NULL
> results2[23,1]<-paste("T",50,99,3,300,3,0.1)
```

Exhibit 2.2 (5 of 20)

```
> results2[23,2]<-MEANL
> results2[23,3]<-MEANU
> results2[23,4]<-OVERBDL
> results2[23,5]<-OVERBDU
> results2[23,6]<-MEANL.Previous
> results2[23,7]<-MEANU.Previous
> results2[23,8]<-OVERBDL.Previous
> results2[23,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,3,300,3,3,2)
[1] NA
> results2[24,1]<-paste("T",50,99,3,300,3,3)
> results2[24,2]<-MEANL
> results2[24,3]<-MEANU
> results2[24,4]<-OVERBDL
> results2[24,5]<-OVERBDU
> results2[24,6]<-MEANL.Previous
> results2[24,7]<-MEANU.Previous
> results2[24,8]<-OVERBDL.Previous
> results2[24,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,300,2,0.1,0.1,2)
NULL
> results2[25,1]<-paste("T",50,99,300,2,0.1,0.1)
> results2[25,2]<-MEANL
> results2[25,3]<-MEANU
> results2[25,4]<-OVERBDL
> results2[25,5]<-OVERBDU
> results2[25,6]<-MEANL.Previous
> results2[25,7]<-MEANU.Previous
> results2[25,8]<-OVERBDL.Previous
> results2[25,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,300,2,0.1,3,2)
NULL
> results2[26,1]<-paste("T",50,99,300,2,0.1,3)
> results2[26,2]<-MEANL
> results2[26,3]<-MEANU
> results2[26,4]<-OVERBDL
> results2[26,5]<-OVERBDU
> results2[26,6]<-MEANL.Previous
> results2[26,7]<-MEANU.Previous
> results2[26,8]<-OVERBDL.Previous
> results2[26,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,300,2,3,0.1,2)
NULL
> results2[27,1]<-paste("T",50,99,300,2,3,0.1)
> results2[27,2]<-MEANL
> results2[27,3]<-MEANU
> results2[27,4]<-OVERBDL
> results2[27,5]<-OVERBDU
> results2[27,6]<-MEANL.Previous
> results2[27,7]<-MEANU.Previous
> results2[27,8]<-OVERBDL.Previous
> results2[27,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,300,2,3,3,2)
NULL
> results2[28,1]<-paste("T",50,99,300,2,3,3)
> results2[28,2]<-MEANL
> results2[28,3]<-MEANU
> results2[28,4]<-OVERBDL
> results2[28,5]<-OVERBDU
> results2[28,6]<-MEANL.Previous
> results2[28,7]<-MEANU.Previous
> results2[28,8]<-OVERBDL.Previous
> results2[28,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,300,300,0.1,0.1,2)
NULL
> results2[29,1]<-paste("T",50,99,300,300,0.1,0.1)
> results2[29,2]<-MEANL
> results2[29,3]<-MEANU
> results2[29,4]<-OVERBDL
> results2[29,5]<-OVERBDU
```

<u>Exhibit 2.2</u> (6 of 20)

```
> results2[29,6]<-MEANL.Previous
> results2[29,7]<-MEANU.Previous
> results2[29,8]<-OVERBDL.Previous
> results2[29,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,300,300,0.1,3,2)
NULL
> results2[30,1]<-paste("T",50,99,300,300,0.1,3)
> results2[30,2]<-MEANL
> results2[30,3]<-MEANU
> results2[30,4]<-OVERBDL
> results2[30,5]<-OVERBDU
> results2[30,6]<-MEANL.Previous
> results2[30,7]<-MEANU.Previous
> results2[30,8]<-OVERBDL.Previous
> results2[30,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,300,300,3,0.1,2)
NULL
> results2[31,1]<-paste("T",50,99,300,300,3,0.1)
> results2[31,2]<-MEANL
> results2[31,3]<-MEANU
> results2[31,4]<-OVERBDL
> results2[31,5]<-OVERBDU
> results2[31,6]<-MEANL.Previous
> results2[31,7]<-MEANU.Previous
> results2[31,8]<-OVERBDL.Previous
> results2[31,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",50,99,300,300,3,3,2)
NULL
> results2[32,1]<-paste("T",50,99,300,300,3,3)
> results2[32,2]<-MEANL
> results2[32,3]<-MEANU
> results2[32,4]<-OVERBDL
> results2[32,5]<-OVERBDU
> results2[32,6]<-MEANL.Previous
> results2[32,7]<-MEANU.Previous
> results2[32,8]<-OVERBDL.Previous
> results2[32,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,3,2,0.1,0.1,2)
NULL
> results2[33,1]<-paste("T",99,99,3,2,0.1,0.1)
> results2[33,2]<-MEANL
> results2[33,3]<-MEANU
> results2[33,4]<-OVERBDL
> results2[33,5]<-OVERBDU
> results2[33,6]<-MEANL.Previous
> results2[33,7]<-MEANU.Previous
> results2[33,8]<-OVERBDL.Previous
> results2[33,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,3,2,0.1,3,2)
[1] NA
> results2[34,1]<-paste("T",99,99,3,2,0.1,3)
> results2[34,2]<-MEANL
> results2[34,3]<-MEANU
> results2[34,4]<-OVERBDL
> results2[34,5]<-OVERBDU
> results2[34,6]<-MEANL.Previous
> results2[34,7]<-MEANU.Previous
> results2[34,8]<-OVERBDL.Previous
> results2[34,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,3,2,3,0.1,2)
[1] NA
> results2[35,1]<-paste("T",99,99,3,2,3,0.1)
> results2[35,2]<-MEANL
> results2[35,3]<-MEANU
> results2[35,4]<-OVERBDL
> results2[35,5]<-OVERBDU
> results2[35,6]<-MEANL.Previous
> results2[35,7]<-MEANU.Previous
> results2[35,8]<-OVERBDL.Previous
> results2[35,9]<-OVERBDU.Previous
```

Exhibit 2.2 (7 of 20)

```
> P2.CUSP2.CALCUSP2("T",99,99,3,2,3,3,2)
[1] NA
> results2[36,1]<-paste("T",99,99,3,2,3,3)
> results2[36,2]<-MEANL
> results2[36,3]<-MEANU
> results2[36,4]<-OVERBDL
> results2[36,5]<-OVERBDU
> results2[36,6]<-MEANL.Previous
> results2[36,7]<-MEANU.Previous
> results2[36,8]<-OVERBDL.Previous
> results2[36,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,3,300,0.1,0.1,2)
NULL
> results2[37,1]<-paste("T",99,99,3,300,0.1,0.1)
> results2[37,2]<-MEANL
> results2[37,3]<-MEANU
> results2[37,4]<-OVERBDL
> results2[37,5]<-OVERBDU
> results2[37,6]<-MEANL.Previous
> results2[37,7]<-MEANU.Previous
> results2[37,8]<-OVERBDL.Previous
> results2[37,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,3,300,0.1,3,2)
[1] NA
> results2[38,1]<-paste("T",99,99,3,300,0.1,3)
> results2[38,2]<-MEANL
> results2[38,3]<-MEANU
> results2[38,4]<-OVERBDL
> results2[38,5]<-OVERBDU
> results2[38,6]<-MEANL.Previous
> results2[38,7]<-MEANU.Previous
> results2[38,8]<-OVERBDL.Previous
> results2[38,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,3,300,3,0.1,2)
NULL
> results2[39,1]<-paste("T",99,99,3,300,3,0.1)
> results2[39,2]<-MEANL
> results2[39,3]<-MEANU
> results2[39,4]<-OVERBDL
> results2[39,5]<-OVERBDU
> results2[39,6]<-MEANL.Previous
> results2[39,7]<-MEANU.Previous
> results2[39,8]<-OVERBDL.Previous
> results2[39,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,3,300,3,3,2)
[1] NA
> results2[40,1]<-paste("T",99,99,3,300,3,3)
> results2[40,2]<-MEANL
> results2[40,3]<-MEANU
> results2[40,4]<-OVERBDL
> results2[40,5]<-OVERBDU
> results2[40,6]<-MEANL.Previous
> results2[40,7]<-MEANU.Previous
> results2[40,8]<-OVERBDL.Previous
> results2[40,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,300,2,0.1,0.1,2)
NULL
> results2[41,1]<-paste("T",99,99,300,2,0.1,0.1)
> results2[41,2]<-MEANL
> results2[41,3]<-MEANU
> results2[41,4]<-OVERBDL
> results2[41,5]<-OVERBDU
> results2[41,6]<-MEANL.Previous
> results2[41,7]<-MEANU.Previous
> results2[41,8]<-OVERBDL.Previous
> results2[41,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,300,2,0.1,3,2)
NULL
> results2[42,1]<-paste("T",99,99,300,2,0.1,3)
> results2[42,2]<-MEANL
```

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```
> results2[42,3]<-MEANU
> results2[42,4]<-OVERBDL
> results2[42,5]<-OVERBDU
> results2[42,6]<-MEANL.Previous
> results2[42,7]<-MEANU.Previous
> results2[42,8]<-OVERBDL.Previous
> results2[42,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,300,2,3,0.1,2)
NULL
> results2[43,1]<-paste("T",99,99,300,2,3,0.1)
> results2[43,2]<-MEANL
> results2[43,3]<-MEANU
> results2[43,4]<-OVERBDL
> results2[43,5]<-OVERBDU
> results2[43,6]<-MEANL.Previous
> results2[43,7]<-MEANU.Previous
> results2[43,8]<-OVERBDL.Previous
> results2[43,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,300,2,3,3,2)
NULL
> results2[44,1]<-paste("T",99,99,300,2,3,3)
> results2[44,2]<-MEANL
> results2[44,3]<-MEANU
> results2[44,4]<-OVERBDL
> results2[44,5]<-OVERBDU
> results2[44,6]<-MEANL.Previous
> results2[44,7]<-MEANU.Previous
> results2[44,8]<-OVERBDL.Previous
> results2[44,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,300,300,0.1,0.1,2)
NULL
> results2[45,1]<-paste("T",99,99,300,300,0.1,0.1)
> results2[45,2]<-MEANL
> results2[45,3]<-MEANU
> results2[45,4]<-OVERBDL
> results2[45,5]<-OVERBDU
> results2[45,6]<-MEANL.Previous
> results2[45,7]<-MEANU.Previous
> results2[45,8]<-OVERBDL.Previous
> results2[45,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,300,300,0.1,3,2)
NULL
> results2[46,1]<-paste("T",99,99,300,300,0.1,3)
> results2[46,2]<-MEANL
> results2[46,3]<-MEANU
> results2[46,4]<-OVERBDL
> results2[46,5]<-OVERBDU
> results2[46,6]<-MEANL.Previous
> results2[46,7]<-MEANU.Previous
> results2[46,8]<-OVERBDL.Previous
> results2[46,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,300,300,3,0.1,2)
NULL
> results2[47,1]<-paste("T",99,99,300,300,3,0.1)
> results2[47,2]<-MEANL
> results2[47,3]<-MEANU
> results2[47,4]<-OVERBDL
> results2[47,5]<-OVERBDU
> results2[47,6]<-MEANL.Previous
> results2[47,7]<-MEANU.Previous
> results2[47,8]<-OVERBDL.Previous
> results2[47,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("T",99,99,300,300,3,3,2)
NULL
> results2[48,1]<-paste("T",99,99,300,300,3,3)
> results2[48,2]<-MEANL
> results2[48,3]<-MEANU
> results2[48,4]<-OVERBDL
> results2[48,5]<-OVERBDU
> results2[48,6]<-MEANL.Previous
```

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```
> results2[48,7]<-MEANU.Previous
> results2[48,8]<-OVERBDL.Previous
> results2[48,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,3,2,0.1,0.1,2)
NULL
> results2[49,1]<-paste("C",50,50,3,2,0.1,0.1)
> results2[49,2]<-MEANL
> results2[49,3]<-MEANU
> results2[49,4]<-OVERBDL
> results2[49,5]<-OVERBDU
> results2[49,6]<-MEANL.Previous
> results2[49,7]<-MEANU.Previous
> results2[49,8]<-OVERBDL.Previous
> results2[49,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,3,2,0.1,3,2)
NULL
> results2[50,1]<-paste("C",50,50,3,2,0.1,3)
> results2[50,2]<-MEANL
> results2[50,3]<-MEANU
> results2[50,4]<-OVERBDL
> results2[50,5]<-OVERBDU
> results2[50,6]<-MEANL.Previous
> results2[50,7]<-MEANU.Previous
> results2[50,8]<-OVERBDL.Previous
> results2[50,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,3,2,3,0.1,2)
NULL
> results2[51,1]<-paste("C",50,50,3,2,3,0.1)
> results2[51,2]<-MEANL
> results2[51,3]<-MEANU
> results2[51,4]<-OVERBDL
> results2[51,5]<-OVERBDU
> results2[51,6]<-MEANL.Previous
> results2[51,7]<-MEANU.Previous
> results2[51,8]<-OVERBDL.Previous
> results2[51,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,3,2,3,3,2)
NULL
> results2[52,1]<-paste("C",50,50,3,2,3,3)
> results2[52,2]<-MEANL
> results2[52,3]<-MEANU
> results2[52,4]<-OVERBDL
> results2[52,5]<-OVERBDU
> results2[52,6]<-MEANL.Previous
> results2[52,7]<-MEANU.Previous
> results2[52,8]<-OVERBDL.Previous
> results2[52,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,3,300,0.1,0.1,2)
NULL
> results2[53,1]<-paste("C",50,50,3,300,0.1,0.1)
> results2[53,2]<-MEANL
> results2[53,3]<-MEANU
> results2[53,4]<-OVERBDL
> results2[53,5]<-OVERBDU
> results2[53,6]<-MEANL.Previous
> results2[53,7]<-MEANU.Previous
> results2[53,8]<-OVERBDL.Previous
> results2[53,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,3,300,0.1,3,2)
NULL
> results2[54,1]<-paste("C",50,50,3,300,0.1,3)
> results2[54,2]<-MEANL
> results2[54,3]<-MEANU
> results2[54,4]<-OVERBDL
> results2[54,5]<-OVERBDU
> results2[54,6]<-MEANL.Previous
> results2[54,7]<-MEANU.Previous
> results2[54,8]<-OVERBDL.Previous
> results2[54,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,3,300,3,0.1,2)
```

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```
NULL
> results2[55,1]<-paste("C",50,50,3,300,3,0.1)
> results2[55,2]<-MEANL
> results2[55,3]<-MEANU
> results2[55,4]<-OVERBDL
> results2[55,5]<-OVERBDU
> results2[55,6]<-MEANL.Previous
> results2[55,7]<-MEANU.Previous
> results2[55,8]<-OVERBDL.Previous
> results2[55,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,3,300,3,3,2)
NULL
> results2[56,1]<-paste("C",50,50,3,300,3,3)
> results2[56,2]<-MEANL
> results2[56,3]<-MEANU
> results2[56,4]<-OVERBDL
> results2[56,5]<-OVERBDU
> results2[56,6]<-MEANL.Previous
> results2[56,7]<-MEANU.Previous
> results2[56,8]<-OVERBDL.Previous
> results2[56,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,300,2,0.1,0.1,2)
NULL
> results2[57,1]<-paste("C",50,50,300,2,0.1,0.1)
> results2[57,2]<-MEANL
> results2[57,3]<-MEANU
> results2[57,4]<-OVERBDL
> results2[57,5]<-OVERBDU
> results2[57,6]<-MEANL.Previous
> results2[57,7]<-MEANU.Previous
> results2[57,8]<-OVERBDL.Previous
> results2[57,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,300,2,0.1,3,2)
NULL
> results2[58,1]<-paste("C",50,50,300,2,0.1,3)
> results2[58,2]<-MEANL
> results2[58,3]<-MEANU
> results2[58,4]<-OVERBDL
> results2[58,5]<-OVERBDU
> results2[58,6]<-MEANL.Previous
> results2[58,7]<-MEANU.Previous
> results2[58,8]<-OVERBDL.Previous
> results2[58,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,300,2,3,0.1,2)
NULL
> results2[59,1]<-paste("C",50,50,300,2,3,0.1)
> results2[59,2]<-MEANL
> results2[59,3]<-MEANU
> results2[59,4]<-OVERBDL
> results2[59,5]<-OVERBDU
> results2[59,6]<-MEANL.Previous
> results2[59,7]<-MEANU.Previous
> results2[59,8]<-OVERBDL.Previous
> results2[59,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,300,2,3,3,2)
NULL
> results2[60,1]<-paste("C",50,50,300,2,3,3)
> results2[60,2]<-MEANL
> results2[60,3]<-MEANU
> results2[60,4]<-OVERBDL
> results2[60,5]<-OVERBDU
> results2[60,6]<-MEANL.Previous
> results2[60,7]<-MEANU.Previous
> results2[60,8]<-OVERBDL.Previous
> results2[60,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,300,300,0.1,0.1,2)
NULL
> results2[61,1]<-paste("C",50,50,300,300,0.1,0.1)
```

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```
> results2[61,2]<-MEANL
> results2[61,3]<-MEANU
> results2[61,4]<-OVERBDL
> results2[61,5]<-OVERBDU
> results2[61,6]<-MEANL.Previous
> results2[61,7]<-MEANU.Previous
> results2[61,8]<-OVERBDL.Previous
> results2[61,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,300,300,0.1,3,2)
NULL
> results2[62,1]<-paste("C",50,50,300,300,0.1,3)
> results2[62,2]<-MEANL
> results2[62,3]<-MEANU
> results2[62,4]<-OVERBDL
> results2[62,5]<-OVERBDU
> results2[62,6]<-MEANL.Previous
> results2[62,7]<-MEANU.Previous
> results2[62,8]<-OVERBDL.Previous
> results2[62,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,300,300,3,0.1,2)
NULL
> results2[63,1]<-paste("C",50,50,300,300,3,0.1)
> results2[63,2]<-MEANL
> results2[63,3]<-MEANU
> results2[63,4]<-OVERBDL
> results2[63,5]<-OVERBDU
> results2[63,6]<-MEANL.Previous
> results2[63,7]<-MEANU.Previous
> results2[63,8]<-OVERBDL.Previous
> results2[63,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",50,50,300,300,3,3,2)
NULL
> results2[64,1]<-paste("C",50,50,300,300,3,3)
> results2[64,2]<-MEANL
> results2[64,3]<-MEANU
> results2[64,4]<-OVERBDL
> results2[64,5]<-OVERBDU
> results2[64,6]<-MEANL.Previous
> results2[64,7]<-MEANU.Previous
> results2[64,8]<-OVERBDL.Previous
> results2[64,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,3,2,0.1,0.1,2)
NULL
> results2[65,1]<-paste("C",99,50,3,2,0.1,0.1)
> results2[65,2]<-MEANL
> results2[65,3]<-MEANU
> results2[65,4]<-OVERBDL
> results2[65,5]<-OVERBDU
> results2[65,6]<-MEANL.Previous
> results2[65,7]<-MEANU.Previous
> results2[65,8]<-OVERBDL.Previous
> results2[65,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,3,2,0.1,3,2)
[1] NA
> results2[66,1]<-paste("C",99,50,3,2,0.1,3)
> results2[66,2]<-MEANL
> results2[66,3]<-MEANU
> results2[66,4]<-OVERBDL
> results2[66,5]<-OVERBDU
> results2[66,6]<-MEANL.Previous
> results2[66,7]<-MEANU.Previous
> results2[66,8]<-OVERBDL.Previous
> results2[66,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,3,2,3,0.1,2)
[1] NA
> results2[67,1]<-paste("C",99,50,3,2,3,0.1)
> results2[67,2]<-MEANL
> results2[67,3]<-MEANU
```

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```
> results2[67,4]<-OVERBDL
> results2[67,5]<-OVERBDU
> results2[67,6]<-MEANL.Previous
> results2[67,7]<-MEANU.Previous
> results2[67,8]<-OVERBDL.Previous
> results2[67,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,3,2,3,3,2)
[1] NA
> results2[68,1]<-paste("C",99,50,3,2,3,3)
> results2[68,2]<-MEANL
> results2[68,3]<-MEANU
> results2[68,4]<-OVERBDL
> results2[68,5]<-OVERBDU
> results2[68,6]<-MEANL.Previous
> results2[68,7]<-MEANU.Previous
> results2[68,8]<-OVERBDL.Previous
> results2[68,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,3,300,0.1,0.1,2)
NULL
> results2[69,1]<-paste("C",99,50,3,300,0.1,0.1)
> results2[69,2]<-MEANL
> results2[69,3]<-MEANU
> results2[69,4]<-OVERBDL
> results2[69,5]<-OVERBDU
> results2[69,6]<-MEANL.Previous
> results2[69,7]<-MEANU.Previous
> results2[69,8]<-OVERBDL.Previous
> results2[69,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,3,300,0.1,3,2)
[1] NA
> results2[70,1]<-paste("C",99,50,3,300,0.1,3)
> results2[70,2]<-MEANL
> results2[70,3]<-MEANU
> results2[70,4]<-OVERBDL
> results2[70,5]<-OVERBDU
> results2[70,6]<-MEANL.Previous
> results2[70,7]<-MEANU.Previous
> results2[70,8]<-OVERBDL.Previous
> results2[70,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,3,300,3,0.1,2)
NULL
> results2[71,1]<-paste("C",99,50,3,300,3,0.1)
> results2[71,2]<-MEANL
> results2[71,3]<-MEANU
> results2[71,4]<-OVERBDL
> results2[71,5]<-OVERBDU
> results2[71,6]<-MEANL.Previous
> results2[71,7]<-MEANU.Previous
> results2[71,8]<-OVERBDL.Previous
> results2[71,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,3,300,3,3,2)
[1] NA
> results2[72,1]<-paste("C",99,50,3,300,3,3)
> results2[72,2]<-MEANL
> results2[72,3]<-MEANU
> results2[72,4]<-OVERBDL
> results2[72,5]<-OVERBDU
> results2[72,6]<-MEANL.Previous
> results2[72,7]<-MEANU.Previous
> results2[72,8]<-OVERBDL.Previous
> results2[72,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,300,2,0.1,0.1,2)
NULL
> results2[73,1]<-paste("C",99,50,300,2,0.1,0.1)
> results2[73,2]<-MEANL
> results2[73,3]<-MEANU
> results2[73,4]<-OVERBDL
> results2[73,5]<-OVERBDU
```

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```
> results2[73,6]<-MEANL.Previous
> results2[73,7]<-MEANU.Previous
> results2[73,8]<-OVERBDL.Previous
> results2[73,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,300,2,0.1,3,2)
NULL
> results2[74,1]<-paste("C",99,50,300,2,0.1,3)
> results2[74,2]<-MEANL
> results2[74,3]<-MEANU
> results2[74,4]<-OVERBDL
> results2[74,5]<-OVERBDU
> results2[74,6]<-MEANL.Previous
> results2[74,7]<-MEANU.Previous
> results2[74,8]<-OVERBDL.Previous
> results2[74,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,300,2,3,0.1,2)
NULL
> results2[75,1]<-paste("C",99,50,300,2,3,0.1)
> results2[75,2]<-MEANL
> results2[75,3]<-MEANU
> results2[75,4]<-OVERBDL
> results2[75,5]<-OVERBDU
> results2[75,6]<-MEANL.Previous
> results2[75,7]<-MEANU.Previous
> results2[75,8]<-OVERBDL.Previous
> results2[75,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,300,2,3,3,2)
NULL
> results2[76,1]<-paste("C",99,50,300,2,3,3)
> results2[76,2]<-MEANL
> results2[76,3]<-MEANU
> results2[76,4]<-OVERBDL
> results2[76,5]<-OVERBDU
> results2[76,6]<-MEANL.Previous
> results2[76,7]<-MEANU.Previous
> results2[76,8]<-OVERBDL.Previous
> results2[76,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,300,300,0.1,0.1,2)
NULL
> results2[77,1]<-paste("C",99,50,300,300,0.1,0.1)
> results2[77,2]<-MEANL
> results2[77,3]<-MEANU
> results2[77,4]<-OVERBDL
> results2[77,5]<-OVERBDU
> results2[77,6]<-MEANL.Previous
> results2[77,7]<-MEANU.Previous
> results2[77,8]<-OVERBDL.Previous
> results2[77,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,300,300,0.1,3,2)
NULL
> results2[78,1]<-paste("C",99,50,300,300,0.1,3)
> results2[78,2]<-MEANL
> results2[78,3]<-MEANU
> results2[78,4]<-OVERBDL
> results2[78,5]<-OVERBDU
> results2[78,6]<-MEANL.Previous
> results2[78,7]<-MEANU.Previous
> results2[78,8]<-OVERBDL.Previous
> results2[78,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,300,300,3,0.1,2)
NULL
> results2[79,1]<-paste("C",99,50,300,300,3,0.1)
> results2[79,2]<-MEANL
> results2[79,3]<-MEANU
> results2[79,4]<-OVERBDL
> results2[79,5]<-OVERBDU
> results2[79,6]<-MEANL.Previous
> results2[79,7]<-MEANU.Previous
```

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```
> results2[79,8]<-OVERBDL.Previous
> results2[79,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,50,300,300,3,3,2)
NULL
> results2[80,1]<-paste("C",99,50,300,300,3,3)
> results2[80,2]<-MEANL
> results2[80,3]<-MEANU
> results2[80,4]<-OVERBDL
> results2[80,5]<-OVERBDU
> results2[80,6]<-MEANL.Previous
> results2[80,7]<-MEANU.Previous
> results2[80,8]<-OVERBDL.Previous
> results2[80,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,3,2,0.1,0.1,2)
NULL
> results2[81,1]<-paste("C",99,99,3,2,0.1,0.1)
> results2[81,2]<-MEANL
> results2[81,3]<-MEANU
> results2[81,4]<-OVERBDL
> results2[81,5]<-OVERBDU
> results2[81,6]<-MEANL.Previous
> results2[81,7]<-MEANU.Previous
> results2[81,8]<-OVERBDL.Previous
> results2[81,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,3,2,0.1,3,2)
[1] NA
> results2[82,1]<-paste("C",99,99,3,2,0.1,3)
> results2[82,2]<-MEANL
> results2[82,3]<-MEANU
> results2[82,4]<-OVERBDL
> results2[82,5]<-OVERBDU
> results2[82,6]<-MEANL.Previous
> results2[82,7]<-MEANU.Previous
> results2[82,8]<-OVERBDL.Previous
> results2[82,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,3,2,3,0.1,2)
[1] NA
> results2[83,1]<-paste("C",99,99,3,2,3,0.1)
> results2[83,2]<-MEANL
> results2[83,3]<-MEANU
> results2[83,4]<-OVERBDL
> results2[83,5]<-OVERBDU
> results2[83,6]<-MEANL.Previous
> results2[83,7]<-MEANU.Previous
> results2[83,8]<-OVERBDL.Previous
> results2[83,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,3,2,3,3,2)
[1] NA
> results2[84,1]<-paste("C",99,99,3,2,3,3)
> results2[84,2]<-MEANL
> results2[84,3]<-MEANU
> results2[84,4]<-OVERBDL
> results2[84,5]<-OVERBDU
> results2[84,6]<-MEANL.Previous
> results2[84,7]<-MEANU.Previous
> results2[84,8]<-OVERBDL.Previous
> results2[84,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,3,300,0.1,0.1,2)
NULL
> results2[85,1]<-paste("C",99,99,3,300,0.1,0.1)
> results2[85,2]<-MEANL
> results2[85,3]<-MEANU
> results2[85,4]<-OVERBDL
> results2[85,5]<-OVERBDU
> results2[85,6]<-MEANL.Previous
> results2[85,7]<-MEANU.Previous
> results2[85,8]<-OVERBDL.Previous
> results2[85,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,3,300,0.1,3,2)
[1] NA
```

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```
> results2[86,1]<-paste("C",99,99,3,300,0.1,3)
> results2[86,2]<-MEANL
> results2[86,3]<-MEANU
> results2[86,4]<-OVERBDL
> results2[86,5]<-OVERBDU
> results2[86,6]<-MEANL.Previous
> results2[86,7]<-MEANU.Previous
> results2[86,8]<-OVERBDL.Previous
> results2[86,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,3,300,3,0.1,2)
NULL
> results2[87,1]<-paste("C",99,99,3,300,3,0.1)
> results2[87,2]<-MEANL
> results2[87,3]<-MEANU
> results2[87,4]<-OVERBDL
> results2[87,5]<-OVERBDU
> results2[87,6]<-MEANL.Previous
> results2[87,7]<-MEANU.Previous
> results2[87,8]<-OVERBDL.Previous
> results2[87,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,3,300,3,3,2)
[1] NA
> results2[88,1]<-paste("C",99,99,3,300,3,3)
> results2[88,2]<-MEANL
> results2[88,3]<-MEANU
> results2[88,4]<-OVERBDL
> results2[88,5]<-OVERBDU
> results2[88,6]<-MEANL.Previous
> results2[88,7]<-MEANU.Previous
> results2[88,8]<-OVERBDL.Previous
> results2[88,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,300,2,0.1,0.1,2)
NULL
> results2[89,1]<-paste("C",99,99,300,2,0.1,0.1)
> results2[89,2]<-MEANL
> results2[89,3]<-MEANU
> results2[89,4]<-OVERBDL
> results2[89,5]<-OVERBDU
> results2[89,6]<-MEANL.Previous
> results2[89,7]<-MEANU.Previous
> results2[89,8]<-OVERBDL.Previous
> results2[89,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,300,2,0.1,3,2)
NULL
> results2[90,1]<-paste("C",99,99,300,2,0.1,3)
> results2[90,2]<-MEANL
> results2[90,3]<-MEANU
> results2[90,4]<-OVERBDL
> results2[90,5]<-OVERBDU
> results2[90,6]<-MEANL.Previous
> results2[90,7]<-MEANU.Previous
> results2[90,8]<-OVERBDL.Previous
> results2[90,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,300,2,3,0.1,2)
NULL
> results2[91,1]<-paste("C",99,99,300,2,3,0.1)
> results2[91,2]<-MEANL
> results2[91,3]<-MEANU
> results2[91,4]<-OVERBDL
> results2[91,5]<-OVERBDU
> results2[91,6]<-MEANL.Previous
> results2[91,7]<-MEANU.Previous
> results2[91,8]<-OVERBDL.Previous
> results2[91,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,300,2,3,3,2)
NULL
> results2[92,1]<-paste("C",99,99,300,2,3,3)
> results2[92,2]<-MEANL
```

```
> results2[92,3]<-MEANU
> results2[92,4]<-OVERBDL
> results2[92,5]<-OVERBDU
> results2[92,6]<-MEANL.Previous
> results2[92,7]<-MEANU.Previous
> results2[92,8]<-OVERBDL.Previous
> results2[92,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,300,300,0.1,0.1,2)
NULL
> results2[93,1]<-paste("C",99,99,300,300,0.1,0.1)
> results2[93,2]<-MEANL
> results2[93,3]<-MEANU
> results2[93,4]<-OVERBDL
> results2[93,5]<-OVERBDU
> results2[93,6]<-MEANL.Previous
> results2[93,7]<-MEANU.Previous
> results2[93,8]<-OVERBDL.Previous
> results2[93,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,300,300,0.1,3,2)
NULL
> results2[94,1]<-paste("C",99,99,300,300,0.1,3)
> results2[94,2]<-MEANL
> results2[94,3]<-MEANU
> results2[94,4]<-OVERBDL
> results2[94,5]<-OVERBDU
> results2[94,6]<-MEANL.Previous
> results2[94,7]<-MEANU.Previous
> results2[94,8]<-OVERBDL.Previous
> results2[94,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,300,300,3,0.1,2)
NULL
> results2[95,1]<-paste("C",99,99,300,300,3,0.1)
> results2[95,2]<-MEANL
> results2[95,3]<-MEANU
> results2[95,4]<-OVERBDL
> results2[95,5]<-OVERBDU
> results2[95,6]<-MEANL.Previous
> results2[95,7]<-MEANU.Previous
> results2[95,8]<-OVERBDL.Previous
> results2[95,9]<-OVERBDU.Previous
> P2.CUSP2.CALCUSP2("C",99,99,300,300,3,3,2)
NULL
> results2[96,1]<-paste("C",99,99,300,300,3,3)
> results2[96,2]<-MEANL
> results2[96,3]<-MEANU
> results2[96,4]<-OVERBDL
> results2[96,5]<-OVERBDU
> results2[96,6]<-MEANL.Previous
> results2[96,7]<-MEANU.Previous
> results2[96,8]<-OVERBDL.Previous
> results2[96,9]<-OVERBDU.Previous
> results2
                           [,1]   [,2]    [,3]                  [,4]                 [,5]
[,6]               [,7]
 [1,] "T 50 50 3 2 0.1 0.1"     "85.4" "114.6" "0.56462150635438"     "0.56462150635438"
"85.3"             "114.7"
 [2,] "T 50 50 3 2 0.1 3"       "96.3" "103.7" "0.51399580803684"     "0.514854217783259"
"96.1999999999994" "103.800000000001"
 [3,] "T 50 50 3 2 3 0.1"       "89.8" "110.2" "0.504996815981076"    "0.506491628341892"
"89.6999999999997" "110.3"
 [4,] "T 50 50 3 2 3 3"         "97.1" "102.9" "0.504713589512805"    "0.514022510315365"
"96.9999999999993" "103.000000000001"
 [5,] "T 50 50 3 300 0.1 0.1"   "85.4" "114.6" "0.505431683761824"    "0.505431683761824"
"85.3"             "114.7"
 [6,] "T 50 50 3 300 0.1 3"     "96.3" "103.7" "0.513824752559217"    "0.514685881274735"
"96.1999999999994" "103.800000000001"
 [7,] "T 50 50 3 300 3 0.1"     "89.7" "110.3" "0.509449672269421"    "0.510352093049404"
"89.5999999999997" "110.4"
 [8,] "T 50 50 3 300 3 3"       "97.8" "102.4" "0.516296458645936"    "0.506528092950957"
"97.6999999999993" "102.500000000001"
```

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```
[9,] "T 50 50 300 2 0.1 0.1"   "85.2" "114.8" "0.538428036295315"    "0.538428036295316"
"85.1"              "114.9"
[10,] "T 50 50 300 2 0.1 3"     "89.8" "110.2" "0.5007977339946"      "0.501949604404601"
"89.6999999999997" "110.3"
[11,] "T 50 50 300 2 3 0.1"     "88.3" "111.7" "0.511239166872602"    "0.511239192649018"
"88.1999999999998" "111.8"
[12,] "T 50 50 300 2 3 3"       "91"   "109.2" "0.513819981313658"    "0.500477507292504"
"90.8999999999997" "109.3"
[13,] "T 50 50 300 300 0.1 0.1" "85.3" "114.7" "0.87974252753339"     "0.87974252753339"
"85.2"              "114.8"
[14,] "T 50 50 300 300 0.1 3"   "89.8" "110.2" "0.500516937787979"    "0.501675182671402"
"89.6999999999997" "110.3"
[15,] "T 50 50 300 300 3 0.1"   "89.6" "110.4" "0.521609960944485"    "0.522303384834506"
"89.4999999999998" "110.5"
[16,] "T 50 50 300 300 3 3"     "92.1" "108.2" "0.517331573554672"    "0.515211522265245"
"91.9999999999996" "108.3"
[17,] "T 50 99 3 2 0.1 0.1"     "85.6" "114.4" "0.994055161799324"    "0.994055161799324"
"85.5"              "114.5"
[18,] "T 50 99 3 2 0.1 3"       "NA"   "NA"    "0.990546836390985"    "0.990634942337403"
"101.399999999999" "98.6000000000009"
[19,] "T 50 99 3 2 3 0.1"       "93.2" "106.8" "0.991325700954039"    "0.991325700954039"
"93.0999999999995" "106.9"
[20,] "T 50 99 3 2 3 3"         "NA"   "NA"    "0.000109565527484756" "NA"
"93.0999999999995" "106.9"
[21,] "T 50 99 3 300 0.1 0.1"   "85.7" "114.3" "0.999360781585716"    "0.999360781585716"
"85.6"              "114.4"
[22,] "T 50 99 3 300 0.1 3"     "NA"   "NA"    "0.990532408608654"    "0.990620836483216"
"101.399999999999" "98.6000000000009"
[23,] "T 50 99 3 300 3 0.1"     "93"   "107"   "0.991349916382947"    "0.991349916382945"
"92.8999999999996" "107.1"
[24,] "T 50 99 3 300 3 3"       "NA"   "NA"    "0"                    "NA"
"92.8999999999996" "107.1"
[25,] "T 50 99 300 2 0.1 0.1"   "85.4" "114.6" "0.999731211332168"    "0.999731211332167"
"85.3"              "114.7"
[26,] "T 50 99 300 2 0.1 3"     "93.1" "106.9" "0.99008044625714"     "0.990080446257137"
"92.9999999999996" "107"
[27,] "T 50 99 300 2 3 0.1"     "90.7" "109.3" "0.992201260614518"    "0.992201260614521"
"90.5999999999997" "109.4"
[28,] "T 50 99 300 2 3 3"       "94.9" "105.1" "0.991202507337507"    "0.99120250734586"
"94.7999999999994" "105.200000000001"
[29,] "T 50 99 300 300 0.1 0.1" "85.4" "114.6" "0.9964240118418"      "0.996424011841798"
"85.3"              "114.7"
[30,] "T 50 99 300 300 0.1 3"   "93.1" "106.9" "0.990043324645"       "0.990043324644999"
"92.9999999999996" "107"
[31,] "T 50 99 300 300 3 0.1"   "92.8" "107.2" "0.991210375385836"    "0.991210375385836"
"92.6999999999996" "107.3"
[32,] "T 50 99 300 300 3 3"     "96.3" "103.7" "0.990830522335295"    "0.990830590700694"
"96.1999999999994" "103.800000000001"
[33,] "T 99 99 3 2 0.1 0.1"     "91"   "109"   "0.992380169398847"    "0.992380169398848"
"90.8999999999997" "109.1"
[34,] "T 99 99 3 2 0.1 3"       "NA"   "NA"    "0"                    "NA"
"90.8999999999997" "109.1"
[35,] "T 99 99 3 2 3 0.1"       "NA"   "NA"    "0"                    "NA"
"90.8999999999997" "109.1"
[36,] "T 99 99 3 2 3 3"         "NA"   "NA"    "0"                    "NA"
"90.8999999999997" "109.1"
[37,] "T 99 99 3 300 0.1 0.1"   "91"   "109"   "0.992533223314"       "0.992533223313999"
"90.8999999999997" "109.1"
[38,] "T 99 99 3 300 0.1 3"     "NA"   "NA"    "0"                    "NA"
"90.8999999999997" "109.1"
[39,] "T 99 99 3 300 3 0.1"     "96"   "104"   "0.991006429247774"    "0.991006429247777"
"95.8999999999994" "104.100000000001"
[40,] "T 99 99 3 300 3 3"       "NA"   "NA"    "0"                    "NA"
"95.8999999999994" "104.100000000001"
[41,] "T 99 99 300 2 0.1 0.1"   "85.4" "114.6" "0.998189486204154"    "0.998189486204154"
"85.3"              "114.7"
[42,] "T 99 99 300 2 0.1 3"     "94.2" "105.8" "0.99051074224357"     "0.990510742243573"
"94.0999999999995" "105.900000000001"
```

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```
[43,] "T 99 99 300 2 3 0.1"     "91.2" "108.8" "0.991707611821971"    "0.991707611821972"
"91.0999999999996" "108.9"
[44,] "T 99 99 300 2 3 3"       "95.9" "104.1" "0.990863029599898"    "0.990863030595958"
"95.7999999999994" "104.200000000001"
[45,] "T 99 99 300 300 0.1 0.1" "85.5" "114.5" "0.999819803669308"    "0.99981980366931"
"85.4"             "114.6"
[46,] "T 99 99 300 300 0.1 3"   "94.2" "105.8" "0.990480689544563"    "0.990480689544564"
"94.0999999999995" "105.900000000001"
[47,] "T 99 99 300 300 3 0.1"   "92.8" "107.2" "0.990374016433888"    "0.99037401643389"
"92.6999999999996" "107.3"
[48,] "T 99 99 300 300 3 3"     "97.2" "102.8" "0.990939266760535"    "0.990939997850098"
"97.0999999999993" "102.900000000001"
[49,] "C 50 50 3 2 0.1 0.1"     "85.3" "114.7" "0.561437474921411"    "0.561437474921411"
"85.2"             "114.8"
[50,] "C 50 50 3 2 0.1 3"       "94.1" "106.3" "0.502028859363712"    "0.501358772885192"
"93.9999999999995" "106.4"
[51,] "C 50 50 3 2 3 0.1"       "88.2" "111.8" "0.505799916533872"    "0.507943599949238"
"88.0999999999998" "111.9"
[52,] "C 50 50 3 2 3 3"         "94.8" "105.3" "0.509444660734071"    "0.502196795505565"
"94.6999999999994" "105.400000000001"
[53,] "C 50 50 3 300 0.1 0.1"   "85.3" "114.7" "0.512041746285208"    "0.512041746285208"
"85.2"             "114.8"
[54,] "C 50 50 3 300 0.1 3"     "94.1" "106.3" "0.501865144594123"    "0.501189326234986"
"93.9999999999995" "106.4"
[55,] "C 50 50 3 300 3 0.1"     "88.1" "111.9" "0.500069927967194"    "0.501393581727872"
"87.9999999999998" "112"
[56,] "C 50 50 3 300 3 3"       "95.4" "104.9" "0.523236117015503"    "0.500775062248555"
"95.2999999999994" "105.000000000001"
[57,] "C 50 50 300 2 0.1 0.1"   "85.2" "114.8" "0.89722492724299"     "0.89722492724299"
"85.1"             "114.9"
[58,] "C 50 50 300 2 0.1 3"     "88.3" "111.7" "0.522772271513237"    "0.524405771188038"
"88.1999999999998" "111.8"
[59,] "C 50 50 300 2 3 0.1"     "87.2" "112.8" "0.520675971736506"    "0.520676017554731"
"87.0999999999999" "112.9"
[60,] "C 50 50 300 2 3 3"       "89.1" "111.1" "0.520585224017136"    "0.505748051974037"
"88.9999999999998" "111.2"
[61,] "C 50 50 300 300 0.1 0.1" "85.2" "114.8" "0.783301609898722"    "0.783301609898722"
"85.1"             "114.9"
[62,] "C 50 50 300 300 0.1 3"   "88.3" "111.7" "0.522533111451415"    "0.524175275745528"
"88.1999999999998" "111.8"
[63,] "C 50 50 300 300 3 0.1"   "88"   "112"   "0.509859541735237"    "0.510888515407656"
"87.8999999999998" "112.1"
[64,] "C 50 50 300 300 3 3"     "90.1" "110.5" "0.51910593690907"     "0.506142087074274"
"89.9999999999997" "110.6"
[65,] "C 99 50 3 2 0.1 0.1"     "88.7" "111.3" "0.511836854777752"    "0.511836854777752"
"88.5999999999998" "111.4"
[66,] "C 99 50 3 2 0.1 3"       "NA"   "NA"    "0"                    "NA"
"88.5999999999998" "111.4"
[67,] "C 99 50 3 2 3 0.1"       "NA"   "NA"    "0"                    "NA"
"88.5999999999998" "111.4"
[68,] "C 99 50 3 2 3 3"         "NA"   "NA"    "0"                    "NA"
"88.5999999999998" "111.4"
[69,] "C 99 50 3 300 0.1 0.1"   "88.7" "111.3" "0.513025933261806"    "0.513025933261806"
"88.5999999999998" "111.4"
[70,] "C 99 50 3 300 0.1 3"     "NA"   "NA"    "0"                    "NA"
"88.5999999999998" "111.4"
[71,] "C 99 50 3 300 3 0.1"     "90.7" "109.4" "0.518998052381642"    "0.500886015653503"
"90.5999999999997" "109.5"
[72,] "C 99 50 3 300 3 3"       "NA"   "NA"    "0"                    "NA"
"90.5999999999997" "109.5"
[73,] "C 99 50 300 2 0.1 0.1"   "85.2" "114.8" "0.789236602899516"    "0.789236602899516"
"85.1"             "114.9"
[74,] "C 99 50 300 2 0.1 3"     "88.9" "111.1" "0.506998980781122"    "0.514426799813914"
"88.7999999999998" "111.2"
[75,] "C 99 50 300 2 3 0.1"     "87.4" "112.6" "0.517043099745137"    "0.517044565328165"
"87.2999999999999" "112.7"
[76,] "C 99 50 300 2 3 3"       "89.8" "110.5" "0.50371218483629"     "0.500475609692"
"89.6999999999997" "110.6"
```

Exhibit 2.2 (18 of 20)

```
[77,] "C 99 50 300 300 0.1 0.1" "85.2" "114.8" "0.688229148839159"    "0.688229148839159"
"85.1"             "114.9"
[78,] "C 99 50 300 300 0.1 3"   "88.9" "111.1" "0.506779953492145"    "0.514234221109985"
"88.7999999999998" "111.2"
[79,] "C 99 50 300 300 3 0.1"   "88"   "112"   "0.502172742864012"    "0.503315115675356"
"87.8999999999998" "112.1"
[80,] "C 99 50 300 300 3 3"     "90.9" "109.9" "0.527278436581058"    "0.502717636362595"
"90.7999999999997" "110"
[81,] "C 99 99 3 2 0.1 0.1"     "90"   "110"   "0.991002465204069"    "0.991002465204068"
"89.8999999999997" "110.1"
[82,] "C 99 99 3 2 0.1 3"       "NA"   "NA"    "0"                    "NA"
"89.8999999999997" "110.1"
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Exhibit 2.2 (19 of 20)

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Exhibit 2.3 Checking Independent Results against CUDAL Program Expected Results for Content Uniformity - Sampling Plan 2 (page 1 of 4)

Row within "results2"	Test Input	Independent Results		Independent Results Agree with Expected Result? (Y/N)	Additional Information for					
					Independent Test Results		Results Immediately Prior to Test Convergence			
		Mean (Lower)	Mean (Upper)		Lower Bound for Mean (Lower)	Lower Bound for Mean (Upper)	Mean (Lower)	Mean (Upper)	Lower Bound for Mean (Lower)	Lower Bound for Mean (Upper)
1	T 50 50 3 2 0.1 0.1	85.4	114.6	Y	0.564622	0.564622	85.3	114.7	0.207865	0.207865
2	T 50 50 3 2 0.1 3	96.3	103.7	Y	0.513996	0.514854	96.2	103.8	0.492556	0.493445
3	T 50 50 3 2 3 0.1	89.8	110.2	Y	0.504997	0.506492	89.7	110.3	0.482603	0.484132
4	T 50 50 3 2 3 3	97.1	102.9	Y	0.504714	0.514023	97.0	103.0	0.485020	0.494589
5	T 50 50 3 300 0.1 0.1	85.4	114.6	Y	0.505432	0.505432	85.3	114.7	0.177242	0.177242
6	T 50 50 3 300 0.1 3	96.3	103.7	**N**	0.513825	0.514686	96.2	103.8	0.492385	0.493278
7	T 50 50 3 300 3 0.1	89.7	110.3	**N**	0.509450	0.510352	89.6	110.4	0.486525	0.487450
8	T 50 50 3 300 3 3	97.8	102.4	Y	0.516296	0.506528	97.7	102.5	0.497727	0.488320
9	T 50 50 300 2 0.1 0.1	85.2	114.8	Y	0.538428	0.538428	85.1	114.9	0.077231	0.077231
10	T 50 50 300 2 0.1 3	89.8	110.2	Y	0.500798	0.501950	89.7	110.3	0.478072	0.479252
11	T 50 50 300 2 3 0.1	88.3	111.7	Y	0.511239	0.511239	88.2	111.8	0.479214	0.479214
12	T 50 50 300 2 3 3	91.0	109.2	Y	0.513820	0.500478	90.9	109.3	0.495120	0.481859
13	T 50 50 300 300 0.1 0.1	85.3	114.7	Y	0.879743	0.879743	85.2	114.8	0.399385	0.399385
14	T 50 50 300 300 0.1 3	89.8	110.2	Y	0.500517	0.501675	89.7	110.3	0.477795	0.478981
15	T 50 50 300 300 3 0.1	89.6	110.4	Y	0.521610	0.522303	89.5	110.5	0.498519	0.499230
16	T 50 50 300 300 3 3	92.1	108.2	Y	0.517332	0.515212	92.0	108.3	0.491890	0.499342
17	T 50 99 3 2 0.1 0.1	85.6	114.4	Y	0.994055	0.994055	85.5	114.5	0.911787	0.911787
18	T 50 99 3 2 0.1 3	NA	NA	Y	0.990547	0.990635	101.4	98.6	0.989734	0.989828
19	T 50 99 3 2 3 0.1	93.2	106.8	Y	0.991326	0.991326	93.1	106.9	0.989638	0.989638
20	T 50 99 3 2 3 3	NA	NA	Y	0.000110	NA	93.1	106.9	0.000147	NA
21	T 50 99 3 300 0.1 0.1	85.7	114.3	Y	0.999361	0.999361	85.6	114.4	0.986687	0.986687
22	T 50 99 3 300 0.1 3	NA	NA	Y	0.990532	0.990621	101.4	98.6	0.989718	0.989813
23	T 50 99 3 300 3 0.1	93.0	107.0	Y	0.991350	0.991350	92.9	107.1	0.989620	0.989620
24	T 50 99 3 300 3 3	NA	NA	Y	0.000000	NA	92.9	107.1	0.000000	NA

Note: For details the "Expected Results", please refer to table "PART 2: Content Uniformity Sampling Plan 2, Test Data Set & Results" from the validation protocol forms.

Exhibit 2.3 (page 2 of 4)

Row within "results2"	Test	Independent Results		Independent Results Agree with Expected Result? (Y/N)	Additional Information for					
					Independent Test Results		Results Immediately Prior to Test Convergence			
		Mean (Lower)	Mean (Upper)		Lower Bound for Mean (Lower)	Lower Bound for Mean (Upper)	Mean (Lower)	Mean (Upper)	Lower Bound for Mean (Lower)	Lower Bound for Mean (Upper)
25	T 50 99 300 2 0.1 0.1	85.4	114.6	Y	0.999731	0.999731	85.3	114.7	0.968832	0.968832
26	T 50 99 300 2 0.1 3	93.1	106.9	Y	0.990080	0.990080	93.0	107.0	0.988146	0.988146
27	T 50 99 300 2 3 0.1	90.7	109.3	Y	0.992201	0.992201	90.6	109.4	0.989926	0.989926
28	T 50 99 300 2 3 3	94.9	105.1	Y	0.991203	0.991203	94.8	105.2	0.989799	0.989799
29	T 50 99 300 300 0.1 0.1	85.4	114.6	Y	0.996424	0.996424	85.3	114.7	0.879743	0.879743
30	T 50 99 300 300 0.1 3	93.1	106.9	Y	0.990043	0.990043	93.0	107.0	0.988103	0.988103
31	T 50 99 300 300 3 0.1	92.8	107.2	Y	0.991210	0.991210	92.7	107.3	0.989432	0.989432
32	T 50 99 300 300 3 3	96.3	103.7	Y	0.990831	0.990831	96.2	103.8	0.989574	0.989575
33	T 99 99 3 2 0.1 0.1	91.0	109.0	Y	0.992380	0.992380	90.9	109.1	0.988728	0.988728
34	T 99 99 3 2 0.1 3	NA	NA	Y	0.000000	NA	90.9	109.1	0.000000	NA
35	T 99 99 3 2 3 0.1	NA	NA	Y	0.000000	NA	90.9	109.1	0.000000	NA
36	T 99 99 3 2 3 3	NA	NA	Y	0.000000	NA	90.9	109.1	0.000000	NA
37	T 99 99 3 300 0.1 0.1	91.0	109.0	Y	0.992533	0.992533	90.9	109.1	0.988941	0.988941
38	T 99 99 3 300 0.1 3	NA	NA	Y	0.000000	NA	90.9	109.1	0.000000	NA
39	T 99 99 3 300 3 0.1	96.0	104.0	**N**	0.991006	0.991006	95.9	104.1	0.989400	0.989400
40	T 99 99 3 300 3 3	NA	NA	Y	0.000000	NA	95.9	104.1	0.000000	NA
41	T 99 99 300 2 0.1 0.1	85.4	114.6	Y	0.998189	0.998189	85.3	114.7	0.906230	0.906230
42	T 99 99 300 2 0.1 3	94.2	105.8	Y	0.990511	0.990511	94.1	105.9	0.988819	0.988819
43	T 99 99 300 2 3 0.1	91.2	108.8	Y	0.991708	0.991708	91.1	108.9	0.989523	0.989523
44	T 99 99 300 2 3 3	95.9	104.1	Y	0.990863	0.990863	95.8	104.2	0.989510	0.989510
45	T 99 99 300 300 0.1 0.1	85.5	114.5	Y	0.999820	0.999820	85.4	114.6	0.988552	0.988552
46	T 99 99 300 300 0.1 3	94.2	105.8	Y	0.990481	0.990481	94.1	105.9	0.988784	0.988784
47	T 99 99 300 300 3 0.1	92.8	107.2	Y	0.990374	0.990374	92.7	107.3	0.988452	0.988452
48	T 99 99 300 300 3 3	97.2	102.8	Y	0.990939	0.990940	97.1	102.9	0.989766	0.989767
49	C 50 50 3 2 0.1 0.1	85.3	114.7	Y	0.561437	0.561437	85.2	114.8	0.146829	0.146829
50	C 50 50 3 2 0.1 3	94.1	106.3	Y	0.502029	0.501359	94.0	106.4	0.475208	0.485698

Exhibit 2.3 (page 3 of 4)

Row within "results2"	Test	Independent Results		Independent Results Agree with Expected Result? (Y/N)	Additional Information for					
					Independent Test Results		Results Immediately Prior to Test Convergence			
		Mean (Lower)	Mean (Upper)		Lower Bound for Mean (Lower)	Lower Bound for Mean (Upper)	Mean (Lower)	Mean (Upper)	Lower Bound for Mean (Lower)	Lower Bound for Mean (Upper)
51	C 50 50 3 2 3 0.1	88.2	111.8	Y	0.505800	0.507944	88.1	111.9	0.477798	0.479990
52	C 50 50 3 2 3 3	94.8	105.3	Y	0.509445	0.502197	94.7	105.4	0.484840	0.477904
53	C 50 50 3 300 0.1 0.1	85.3	114.7	Y	0.512042	0.512042	85.2	114.8	0.132192	0.132192
54	C 50 50 3 300 0.1 3	94.1	106.3	Y	0.501865	0.501189	94.0	106.4	0.475046	0.485529
55	C 50 50 3 300 3 0.1	88.1	111.9	Y	0.500070	0.501394	88.0	112.0	0.471349	0.472704
56	C 50 50 3 300 3 3	95.4	104.9	Y	0.523236	0.500775	95.3	105.0	0.499973	0.477930
57	C 50 50 300 2 0.1 0.1	85.2	114.8	Y	0.897225	0.897225	85.1	114.9	0.302650	0.302650
58	C 50 50 300 2 0.1 3	88.3	111.7	Y	0.522772	0.524406	88.2	111.8	0.494487	0.496159
59	C 50 50 300 2 3 0.1	87.2	112.8	Y	0.520676	0.520676	87.1	112.9	0.480687	0.480687
60	C 50 50 300 2 3 3	89.1	111.1	Y	0.520585	0.505748	89.0	111.2	0.497175	0.482479
61	C 50 50 300 300 0.1 0.1	85.2	114.8	Y	0.783302	0.783302	85.1	114.9	0.230829	0.230829
62	C 50 50 300 300 0.1 3	88.3	111.7	Y	0.522533	0.524175	88.2	111.8	0.494254	0.495934
63	C 50 50 300 300 3 0.1	88.0	112.0	Y	0.509860	0.510889	87.9	112.1	0.480831	0.481885
64	C 50 50 300 300 3 3	90.1	110.5	Y	0.519106	0.506142	90.0	110.6	0.499189	0.486021
65	C 99 50 3 2 0.1 0.1	88.7	111.3	Y	0.511837	0.511837	88.6	111.4	0.450336	0.450336
66	C 99 50 3 2 0.1 3	NA	NA	Y	0.000000	NA	88.6	111.4	0.000000	NA
67	C 99 50 3 2 3 0.1	NA	NA	Y	0.000000	NA	88.6	111.4	0.000000	NA
68	C 99 50 3 2 3 3	NA	NA	Y	0.000000	NA	88.6	111.4	0.000000	NA
69	C 99 50 3 300 0.1 0.1	88.7	111.3	Y	0.513026	0.513026	88.6	111.4	0.451445	0.451445
70	C 99 50 3 300 0.1 3	NA	NA	Y	0.000000	NA	88.6	111.4	0.000000	NA
71	C 99 50 3 300 3 0.1	90.7	109.4	Y	0.518998	0.500886	90.6	109.5	0.493050	0.474958
72	C 99 50 3 300 3 3	NA	NA	Y	0.000000	NA	90.6	109.5	0.000000	NA
73	C 99 50 300 2 0.1 0.1	85.2	114.8	Y	0.789237	0.789237	85.1	114.9	0.203103	0.203103
74	C 99 50 300 2 0.1 3	88.9	111.1	Y	0.506999	0.514427	88.8	111.2	0.480909	0.488475
75	C 99 50 300 2 3 0.1	87.4	112.6	Y	0.517043	0.517045	87.3	112.7	0.480351	0.480352
76	C 99 50 300 2 3 3	89.8	110.5	Y	0.503712	0.500476	89.7	110.6	0.481662	0.478734

Exhibit 2.3 (page 4 of 4)

Row within "results2"	Test	Independent Results		Independent Results Agree with Expected Result? (Y/N)	Additional Information for					
					Independent Test Results		Results Immediately Prior to Test Convergence			
		Mean (Lower)	Mean (Upper)		Lower Bound for Mean (Lower)	Lower Bound for Mean (Upper)	Mean (Lower)	Mean (Upper)	Lower Bound for Mean (Lower)	Lower Bound for Mean (Upper)
77	C 99 50 300 300 0.1 0.1	85.2	114.8	Y	0.688229	0.688229	85.1	114.9	0.161738	0.161738
78	C 99 50 300 300 0.1 3	88.9	111.1	Y	0.506780	0.514234	88.8	111.2	0.480694	0.488288
79	C 99 50 300 300 3 0.1	88.0	112.0	Y	0.502173	0.503315	87.9	112.1	0.473253	0.474423
80	C 99 50 300 300 3 3	90.9	109.9	Y	0.527278	0.502718	90.8	110.0	0.496967	0.483655
81	C 99 99 3 2 0.1 0.1	90.0	110.0	Y	0.991002	0.991002	89.9	110.1	0.984539	0.984539
82	C 99 99 3 2 0.1 3	NA	NA	Y	0.000000	NA	89.9	110.1	0.000000	NA
83	C 99 99 3 2 3 0.1	NA	NA	Y	0.000000	NA	89.9	110.1	0.000000	NA
84	C 99 99 3 2 3 3	NA	NA	Y	0.000000	NA	89.9	110.1	0.000000	NA
85	C 99 99 3 300 0.1 0.1	90.0	110.0	Y	0.991187	0.991187	89.9	110.1	0.984828	0.984828
86	C 99 99 3 300 0.1 3	NA	NA	Y	0.000000	NA	89.9	110.1	0.000000	NA
87	C 99 99 3 300 3 0.1	93.7	106.3	Y	0.990410	0.990410	93.6	106.4	0.987926	0.987926
88	C 99 99 3 300 3 3	NA	NA	Y	0.000000	NA	93.6	106.4	0.000000	NA
89	C 99 99 300 2 0.1 0.1	85.3	114.7	Y	0.998323	0.998323	85.2	114.8	0.789237	0.789237
90	C 99 99 300 2 0.1 3	92.0	108.0	Y	0.991693	0.991693	91.9	108.1	0.989501	0.989501
91	C 99 99 300 2 3 0.1	89.6	110.4	Y	0.992081	0.992081	89.5	110.5	0.988972	0.988972
92	C 99 99 300 2 3 3	93.2	106.8	Y	0.990749	0.990749	93.1	106.9	0.988772	0.988772
93	C 99 99 300 300 0.1 0.1	85.4	114.6	Y	0.999979	0.999979	85.3	114.7	0.988199	0.988199
94	C 99 99 300 300 0.1 3	92.0	108.0	Y	0.991665	0.991665	91.9	108.1	0.989466	0.989466
95	C 99 99 300 300 3 0.1	90.8	109.2	Y	0.991065	0.991065	90.7	109.3	0.988432	0.988432
96	C 99 99 300 300 3 3	94.2	105.8	Y	0.991183	0.991187	94.1	105.9	0.989542	0.989546

3. PART 2 / Dissolution - Sampling Plan 1

Exhibit 3.1: SPlus Code for Dissolution - Sampling Plan 1

```
""P2.DISP1.COMPUTE"<-
function(LLU,SIGMA)
{
   F1<-((1-pnorm((5 - LLU)/SIGMA,0,1))^6)
   SN2<-sqrt(12)
   PM2<-(pnorm(SN2*(-LLU)/SIGMA,0,1))
   PB2<-(1-pnorm((-15-LLU)/SIGMA,0,1))
   F2<-((PB2^12)-PM2)
   SN3<-sqrt(24)
   PM3<-(pnorm(SN3*(-LLU)/SIGMA,0,1))
   P2<-(pnorm((-15 - LLU)/SIGMA,0,1)-pnorm((-25-LLU)/SIGMA,0,1))
   P3<-(1-pnorm((-15-LLU)/SIGMA,0,1))
   F3<-((P3^24)+24*P2*(P3^23)+276*P2*P2*(P3^22)-PM3)
   OVERBD<<-max(F1, F2, F3)
}

"P2.DISP1.CALDISP1"<-
function(CILEVEL,LBOUND, Q,NUMBER,MEAN,Decimals)
{
   LIM<-(100- Q)
   N<-NUMBER
   CV<<-NA
   Z<-qnorm(sqrt(CILEVEL/100),0,1)
   CHI<-qchisq(1-sqrt(CILEVEL/100),N-1)
   STARTSD<-0.002
   MEANADJ<-(MEAN-Q)
   SAMPSD<-STARTSD
   OVERBD<<-NA
   OVERBD.Previous<<-NA
   while (SAMPSD<=60.0)
        {
        SIGMA<-(sqrt((N-1)*(SAMPSD*SAMPSD)/CHI))
        LLU<-(MEANADJ-Z*SIGMA/sqrt(N))
        SAMPSD.After<<-SAMPSD
        OVERBD.Previous<<-OVERBD
        P2.DISP1.COMPUTE(LLU,SIGMA)
        if ((OVERBD<(LBOUND/100))&&(SAMPSD<=0.00201))
               {
               CV<<-0
               SAMPLSD<-65.0
               }
        else
               {
               if (OVERBD<(LBOUND/100))
                      {
                      SAMPSD<-(SAMPSD-0.001)
                      STARTSD<-SAMPSD
                      CV<<-((100 * SAMPSD)/MEAN)
                      SAMPSD<-65.0
                      }
               }
        SAMPSD<-SAMPSD+0.001
        }
   if(is.na(OVERBD.Previous)==T) {OVERBD.Previous<<-OVERBD}
   SAMPSD<<-(CV*MEAN/100)
   CV<<-round(CV,Decimals)
}
```

Exhibit 3.2: Test Output for Dissolution - Sampling Plan 1 (page 1 of 5)

```
> rm(results3)
> results3<- structure(.Data=rep(NA,192),.Dim=c(32,6))
> P2.DISP1.CALDISP1(50,50,40,3,40.2,2)
[1] 0.93
> results3[1,1]<-paste(50,50,40,3,40.2)
> results3[1,2]<-CV
> results3[1,3]<-SAMPSD
> results3[1,4]<-OVERBD.Previous
> results3[1,5]<-SAMPSD.After
> results3[1,6]<-OVERBD
> P2.DISP1.CALDISP1(50,50,40,3,100,2)
[1] 23.2
> results3[2,1]<-paste(50,50,40,3,100)
> results3[2,2]<-CV
> results3[2,3]<-SAMPSD
> results3[2,4]<-OVERBD.Previous
> results3[2,5]<-SAMPSD.After
> results3[2,6]<-OVERBD
> P2.DISP1.CALDISP1(50,50,40,1000,40.2,2)
[1] 18.07
> results3[3,1]<-paste(50,50,40,1000,40.2)
> results3[3,2]<-CV
> results3[3,3]<-SAMPSD
> results3[3,4]<-OVERBD.Previous
> results3[3,5]<-SAMPSD.After
> results3[3,6]<-OVERBD
> P2.DISP1.CALDISP1(50,50,40,1000,100,2)
[1] 46.13
> results3[4,1]<-paste(50,50,40,1000,100)
> results3[4,2]<-CV
> results3[4,3]<-SAMPSD
> results3[4,4]<-OVERBD.Previous
> results3[4,5]<-SAMPSD.After
> results3[4,6]<-OVERBD
> P2.DISP1.CALDISP1(50,50,85,3,85.2,2)
[1] 0.44
> results3[5,1]<-paste(50,50,85,3,85.2)
> results3[5,2]<-CV
> results3[5,3]<-SAMPSD
> results3[5,4]<-OVERBD.Previous
> results3[5,5]<-SAMPSD.After
> results3[5,6]<-OVERBD
> P2.DISP1.CALDISP1(50,50,85,3,100,2)
[1] 10.1
> results3[6,1]<-paste(50,50,85,3,100)
> results3[6,2]<-CV
> results3[6,3]<-SAMPSD
> results3[6,4]<-OVERBD.Previous
> results3[6,5]<-SAMPSD.After
> results3[6,6]<-OVERBD
> P2.DISP1.CALDISP1(50,50,85,1000,85.2,2)
[1] 8.53
> results3[7,1]<-paste(50,50,85,1000,85.2)
> results3[7,2]<-CV
> results3[7,3]<-SAMPSD
> results3[7,4]<-OVERBD.Previous
> results3[7,5]<-SAMPSD.After
> results3[7,6]<-OVERBD
> P2.DISP1.CALDISP1(50,50,85,1000,100,2)
[1] 19.83
> results3[8,1]<-paste(50,50,85,1000,100)
> results3[8,2]<-CV
> results3[8,3]<-SAMPSD
> results3[8,4]<-OVERBD.Previous
> results3[8,5]<-SAMPSD.After
> results3[8,6]<-OVERBD
> P2.DISP1.CALDISP1(50,99,40,3,40.2,2)
[1] 0.37
> results3[9,1]<-paste(50,99,40,3,40.2)
> results3[9,2]<-CV
```

Exhibit 3.2 (page 2 of 5)

```
> results3[9,3]<-SAMPSD
> results3[9,4]<-OVERBD.Previous
> results3[9,5]<-SAMPSD.After
> results3[9,6]<-OVERBD
> P2.DISP1.CALDISP1(50,99,40,3,100,2)
[1] 13.69
> results3[10,1]<-paste(50,99,40,3,100)
> results3[10,2]<-CV
> results3[10,3]<-SAMPSD
> results3[10,4]<-OVERBD.Previous
> results3[10,5]<-SAMPSD.After
> results3[10,6]<-OVERBD
> P2.DISP1.CALDISP1(50,99,40,1000,40.2,2)
[1] 1
> results3[11,1]<-paste(50,99,40,1000,40.2)
> results3[11,2]<-CV
> results3[11,3]<-SAMPSD
> results3[11,4]<-OVERBD.Previous
> results3[11,5]<-SAMPSD.After
> results3[11,6]<-OVERBD
> P2.DISP1.CALDISP1(50,99,40,1000,100,2)
[1] 25
> results3[12,1]<-paste(50,99,40,1000,100)
> results3[12,2]<-CV
> results3[12,3]<-SAMPSD
> results3[12,4]<-OVERBD.Previous
> results3[12,5]<-SAMPSD.After
> results3[12,6]<-OVERBD
> P2.DISP1.CALDISP1(50,99,85,3,85.2,2)
[1] 0.17
> results3[13,1]<-paste(50,99,85,3,85.2)
> results3[13,2]<-CV
> results3[13,3]<-SAMPSD
> results3[13,4]<-OVERBD.Previous
> results3[13,5]<-SAMPSD.After
> results3[13,6]<-OVERBD
> P2.DISP1.CALDISP1(50,99,85,3,100,2)
[1] 6.41
> results3[14,1]<-paste(50,99,85,3,100)
> results3[14,2]<-CV
> results3[14,3]<-SAMPSD
> results3[14,4]<-OVERBD.Previous
> results3[14,5]<-SAMPSD.After
> results3[14,6]<-OVERBD
> P2.DISP1.CALDISP1(50,99,85,1000,85.2,2)
[1] 0.47
> results3[15,1]<-paste(50,99,85,1000,85.2)
> results3[15,2]<-CV
> results3[15,3]<-SAMPSD
> results3[15,4]<-OVERBD.Previous
> results3[15,5]<-SAMPSD.After
> results3[15,6]<-OVERBD
> P2.DISP1.CALDISP1(50,99,85,1000,100,2)
[1] 11.73
> results3[16,1]<-paste(50,99,85,1000,100)
> results3[16,2]<-CV
> results3[16,3]<-SAMPSD
> results3[16,4]<-OVERBD.Previous
> results3[16,5]<-SAMPSD.After
> results3[16,6]<-OVERBD
> P2.DISP1.CALDISP1(99,50,40,3,40.2,2)
[1] 0.02
> results3[17,1]<-paste(99,50,40,3,40.2)
> results3[17,2]<-CV
> results3[17,3]<-SAMPSD
> results3[17,4]<-OVERBD.Previous
> results3[17,5]<-SAMPSD.After
> results3[17,6]<-OVERBD
> P2.DISP1.CALDISP1(99,50,40,3,100,2)
[1] 1.76
```

Exhibit 3.2 (page 3 of 5)

```
> results3[18,1]<-paste(99,50,40,3,100)
> results3[18,2]<-CV
> results3[18,3]<-SAMPSD
> results3[18,4]<-OVERBD.Previous
> results3[18,5]<-SAMPSD.After
> results3[18,6]<-OVERBD
> P2.DISP1.CALDISP1(99,50,40,1000,40.2,2)
[1] 5.76
> results3[19,1]<-paste(99,50,40,1000,40.2)
> results3[19,2]<-CV
> results3[19,3]<-SAMPSD
> results3[19,4]<-OVERBD.Previous
> results3[19,5]<-SAMPSD.After
> results3[19,6]<-OVERBD
> P2.DISP1.CALDISP1(99,50,40,1000,100,2)
[1] 42.34
> results3[20,1]<-paste(99,50,40,1000,100)
> results3[20,2]<-CV
> results3[20,3]<-SAMPSD
> results3[20,4]<-OVERBD.Previous
> results3[20,5]<-SAMPSD.After
> results3[20,6]<-OVERBD
> P2.DISP1.CALDISP1(99,50,85,3,85.2,2)
[1] 0.01
> results3[21,1]<-paste(99,50,85,3,85.2)
> results3[21,2]<-CV
> results3[21,3]<-SAMPSD
> results3[21,4]<-OVERBD.Previous
> results3[21,5]<-SAMPSD.After
> results3[21,6]<-OVERBD
> P2.DISP1.CALDISP1(99,50,85,3,100,2)
[1] 0.68
> results3[22,1]<-paste(99,50,85,3,100)
> results3[22,2]<-CV
> results3[22,3]<-SAMPSD
> results3[22,4]<-OVERBD.Previous
> results3[22,5]<-SAMPSD.After
> results3[22,6]<-OVERBD
> P2.DISP1.CALDISP1(99,50,85,1000,85.2,2)
[1] 2.72
> results3[23,1]<-paste(99,50,85,1000,85.2)
> results3[23,2]<-CV
> results3[23,3]<-SAMPSD
> results3[23,4]<-OVERBD.Previous
> results3[23,5]<-SAMPSD.After
> results3[23,6]<-OVERBD
> P2.DISP1.CALDISP1(99,50,85,1000,100,2)
[1] 18.27
> results3[24,1]<-paste(99,50,85,1000,100)
> results3[24,2]<-CV
> results3[24,3]<-SAMPSD
> results3[24,4]<-OVERBD.Previous
> results3[24,5]<-SAMPSD.After
> results3[24,6]<-OVERBD
> P2.DISP1.CALDISP1(99,99,40,3,40.2,2)
[1] 0.02
> results3[25,1]<-paste(99,99,40,3,40.2)
> results3[25,2]<-CV
> results3[25,3]<-SAMPSD
> results3[25,4]<-OVERBD.Previous
> results3[25,5]<-SAMPSD.After
> results3[25,6]<-OVERBD
> P2.DISP1.CALDISP1(99,99,40,3,100,2)
[1] 1.25
> results3[26,1]<-paste(99,99,40,3,100)
> results3[26,2]<-CV
> results3[26,3]<-SAMPSD
> results3[26,4]<-OVERBD.Previous
> results3[26,5]<-SAMPSD.After
> results3[26,6]<-OVERBD
```

Exhibit 3.2 (page 4 of 5)

```
> P2.DISP1.CALDISP1(99,99,40,1000,40.2,2)
[1] 0.84
> results3[27,1]<-paste(99,99,40,1000,40.2)
> results3[27,2]<-CV
> results3[27,3]<-SAMPSD
> results3[27,4]<-OVERBD.Previous
> results3[27,5]<-SAMPSD.After
> results3[27,6]<-OVERBD
> P2.DISP1.CALDISP1(99,99,40,1000,100,2)
[1] 23.42
> results3[28,1]<-paste(99,99,40,1000,100)
> results3[28,2]<-CV
> results3[28,3]<-SAMPSD
> results3[28,4]<-OVERBD.Previous
> results3[28,5]<-SAMPSD.After
> results3[28,6]<-OVERBD
> P2.DISP1.CALDISP1(99,99,85,3,85.2,2)
[1] 0.01
> results3[29,1]<-paste(99,99,85,3,85.2)
> results3[29,2]<-CV
> results3[29,3]<-SAMPSD
> results3[29,4]<-OVERBD.Previous
> results3[29,5]<-SAMPSD.After
> results3[29,6]<-OVERBD
> P2.DISP1.CALDISP1(99,99,85,3,100,2)
[1] 0.54
> results3[30,1]<-paste(99,99,85,3,100)
> results3[30,2]<-CV
> results3[30,3]<-SAMPSD
> results3[30,4]<-OVERBD.Previous
> results3[30,5]<-SAMPSD.After
> results3[30,6]<-OVERBD
> P2.DISP1.CALDISP1(99,99,85,1000,85.2,2)
[1] 0.4
> results3[31,1]<-paste(99,99,85,1000,85.2)
> results3[31,2]<-CV
> results3[31,3]<-SAMPSD
> results3[31,4]<-OVERBD.Previous
> results3[31,5]<-SAMPSD.After
> results3[31,6]<-OVERBD
> P2.DISP1.CALDISP1(99,99,85,1000,100,2)
[1] 10.98
> results3[32,1]<-paste(99,99,85,1000,100)
> results3[32,2]<-CV
> results3[32,3]<-SAMPSD
> results3[32,4]<-OVERBD.Previous
> results3[32,5]<-SAMPSD.After
> results3[32,6]<-OVERBD
> results3
                      [,1]    [,2]               [,3]                [,4]
[,5]                [,6]
 [1,] "50 50 40 3 40.2"    "0.93"  "0.374"            "0.500365966840725" "0.375"
"0.499098597976558"
 [2,] "50 50 40 3 100"     "23.2"  "23.2040000000054" "0.500007353168303"
"23.2050000000054" "0.4999484182768"
 [3,] "50 50 40 1000 40.2" "18.07" "7.26500000000076" "0.500015347591504"
"7.26600000000076" "0.499973788748718"
 [4,] "50 50 40 1000 100"  "46.13" "46.1329999999832" "0.500012659572416"
"46.1339999999832" "0.499987652707108"
 [5,] "50 50 85 3 85.2"    "0.44"  "0.374"            "0.500365966840725" "0.375"
"0.499098597976558"
 [6,] "50 50 85 3 100"     "10.1"  "10.1039999999998" "0.500039862572333"
"10.1049999999998" "0.499842111112609"
 [7,] "50 50 85 1000 85.2" "8.53"  "7.26500000000076" "0.500015347591504"
"7.26600000000076" "0.499973788748718"
 [8,] "50 50 85 1000 100"  "19.83" "19.8330000000013" "0.500007052720537"
"19.8340000000013" "0.499923819001427"
 [9,] "50 99 40 3 40.2"    "0.37"  "0.149"            "0.99009311088937"  "0.15"
"0.989390014951551"
```

<u>Exhibit 3.2</u> (page 5 of 5)

```
[10,] "50 99 40 3 100"     "13.69" "13.6909999999978" "0.990001182397835"
"13.6919999999978" "0.989991606936731"
[11,] "50 99 40 1000 40.2" "1"     "0.401"            "0.990054990062765" "0.402"
"0.989894673026004"
[12,] "50 99 40 1000 100"  "25"    "25.0000000000076" "0.990001122414907"
"25.0010000000076" "0.989996307242131"
[13,] "50 99 85 3 85.2"    "0.17"  "0.149"            "0.99009311088937"  "0.15"
"0.989390014951551"
[14,] "50 99 85 3 100"     "6.41"  "6.41200000000048" "0.990012134259526"
"6.41300000000048" "0.989990779603925"
[15,] "50 99 85 1000 85.2" "0.47"  "0.401"            "0.990054990062765" "0.402"
"0.989894673026004"
[16,] "50 99 85 1000 100"  "11.73" "11.7319999999989" "0.990000436842526"
"11.7329999999989" "0.989989906229994"
[17,] "99 50 40 3 40.2"    "0.02"  "0.009"            "0.667951164882794" "0.01"
"0.405696565573393"
[18,] "99 50 40 3 100"     "1.76"  "1.75699999999992" "0.500995639382774"
"1.75799999999992" "0.499342659427331"
[19,] "99 50 40 1000 40.2" "5.76"  "2.31499999999986" "0.500017630408727"
"2.31599999999986" "0.499963866603491"
[20,] "99 50 40 1000 100"  "42.34" "42.342999999992"  "0.500025375769374"
"42.343999999992"  "0.499997040422905"
[21,] "99 50 85 3 85.2"    "0.01"  "0.009"            "0.667951164882794" "0.01"
"0.405696565573393"
[22,] "99 50 85 3 100"     "0.68"  "0.676"            "0.5001797733302"   "0.677"
"0.49294883826594"
[23,] "99 50 85 1000 85.2" "2.72"  "2.31499999999986" "0.500017630408727"
"2.31599999999986" "0.499963866603491"
[24,] "99 50 85 1000 100"  "18.27" "18.2719999999993" "0.500075442124668"
"18.2729999999994" "0.499981403647833"
[25,] "99 99 40 3 40.2"    "0.02"  "0.007"            "0.995845158999973" "0.008"
"0.919083299709468"
[26,] "99 99 40 3 100"     "1.25"  "1.24799999999997" "0.990022610947984"
"1.24899999999997" "0.989883062136429"
[27,] "99 99 40 1000 40.2" "0.84"  "0.338"            "0.990191132387766" "0.339"
"0.98997789693442"
[28,] "99 99 40 1000 100"  "23.42" "23.4160000000056" "0.99000210518347"
"23.4170000000056" "0.989996866100532"
[29,] "99 99 85 3 85.2"    "0.01"  "0.007"            "0.995845158999973" "0.008"
"0.919083299709468"
[30,] "99 99 85 3 100"     "0.54"  "0.536"            "0.990359323485987" "0.537"
"0.989879527798917"
[31,] "99 99 85 1000 85.2" "0.4"   "0.338"            "0.990191132387766" "0.339"
"0.98997789693442"
[32,] "99 99 85 1000 100"  "10.98" "10.9839999999994" "0.990011478761959"
"10.9849999999994" "0.989999987936137"
```

Exhibit 3.3 Checking Independent Results against CUDAL Program Expected Results for Dissolution - Sampling Plan 1

Row within "results3"	Test	CV	Independent Results Agree with Program Result? (Y/N)	Additional Information for			
				Independent Test Results		Results Immediately Prior to Test Convergence	
				Standard Deviation	Lower Bound	Standard Deviation	Lower Bound
1	50 50 40 3 40.2	0.93	Y	0.374	0.500366	0.375	0.499099
2	50 50 40 3 100	23.20	Y	23.204	0.500007	23.205	0.499948
3	50 50 40 1000 40.2	18.07	Y	7.265	0.500015	7.266	0.499974
4	50 50 40 1000 100	46.13	Y	46.133	0.500013	46.134	0.499988
5	50 50 85 3 85.2	0.44	Y	0.374	0.500366	0.375	0.499099
6	50 50 85 3 100	10.10	Y	10.104	0.500040	10.105	0.499842
7	50 50 85 1000 85.2	8.53	Y	7.265	0.500015	7.266	0.499974
8	50 50 85 1000 100	19.83	Y	19.833	0.500007	19.834	0.499924
9	50 99 40 3 40.2	0.37	Y	0.149	0.990093	0.150	0.989390
10	50 99 40 3 100	13.69	Y	13.691	0.990001	13.692	0.989992
11	50 99 40 1000 40.2	1.00	Y	0.401	0.990055	0.402	0.989895
12	50 99 40 1000 100	25.00	Y	25.000	0.990001	25.001	0.989996
13	50 99 85 3 85.2	0.17	Y	0.149	0.990093	0.150	0.989390
14	50 99 85 3 100	6.41	Y	6.412	0.990012	6.413	0.989991
15	50 99 85 1000 85.2	0.47	Y	0.401	0.990055	0.402	0.989895
16	50 99 85 1000 100	11.73	Y	11.732	0.990000	11.733	0.989990
17	99 50 40 3 40.2	0.02	Y	0.009	0.667951	0.010	0.405697
18	99 50 40 3 100	1.76	Y	1.757	0.500996	1.758	0.499343
19	99 50 40 1000 40.2	5.76	Y	2.315	0.500018	2.316	0.499964
20	99 50 40 1000 100	42.34	Y	42.343	0.500025	42.344	0.499997
21	99 50 85 3 85.2	0.01	Y	0.009	0.667951	0.010	0.405697
22	99 50 85 3 100	0.68	Y	0.676	0.500180	0.677	0.492949
23	99 50 85 1000 85.2	2.72	Y	2.315	0.500018	2.316	0.499964
24	99 50 85 1000 100	18.27	Y	18.272	0.500075	18.273	0.499981
25	99 99 40 3 40.2	0.02	Y	0.007	0.995845	0.008	0.919083
26	99 99 40 3 100	1.25	Y	1.248	0.990023	1.249	0.989883
27	99 99 40 1000 40.2	0.84	Y	0.338	0.990191	0.339	0.989978
28	99 99 40 1000 100	23.42	Y	23.416	0.990002	23.417	0.989997
29	99 99 85 3 85.2	0.01	Y	0.007	0.995845	0.008	0.919083
30	99 99 85 3 100	0.54	Y	0.536	0.990359	0.537	0.989880
31	99 99 85 1000 85.2	0.40	Y	0.338	0.990191	0.339	0.989978
32	99 99 85 1000 100	10.98	Y	10.984	0.990011	10.985	0.990000

4. PART 2 / Dissolution - Sampling Plan 2

Exhibit 4.1: SPlus Code for Dissolution - Sampling Plan 2 (page 1 of 2)

```
"P2.DISP2.COMPUTE"<-
function(LLU,SIGMA)
{
   F1<-((1 - pnorm((5 - LLU)/SIGMA,0,1))^ 6)
   SN2<-sqrt(12)
   PM2<-(pnorm(SN2*(-LLU)/SIGMA,0,1))
   PB2<-(1 - pnorm((-LLU - 15) / SIGMA,0,1))
   F2<-(PB2^12-PM2)
   SN3<-sqrt(24)
   PM3<-(pnorm(SN3*(-LLU)/ SIGMA,0,1))
   P2<-(pnorm((-LLU -15)/SIGMA,0,1)-pnorm((-LLU-25)/SIGMA,0,1))
   P3<-(1-pnorm((-LLU - 15) / SIGMA,0,1))
   F3<-((P3^24)+(24*P2*P3^23)+(276*P2*P2*P3^22)-PM3)
   OVERBD<<-max(F1, F2, F3)
}

"P2.DISP2.CALDISP2"<-
function(CILEVEL,LBOUND,Q,LOC,NUM,DSE,DSM,SE,SM,Decimals)
{
   MEAN<<-NA
   MEAN.Previous<<-NA
   DM<-0.10
   Q<-Q
   LIM<-(100-Q)
   NN<-NUM
   L<-LOC
   N<-NN*L
   Z<-qnorm(sqrt(CILEVEL/100),0,1)
   CHIERR<-(qchisq(1-sqrt(CILEVEL/100),L*(NN - 1)))
   CHILOC<-(qchisq(1-sqrt(CILEVEL/100),L-1))
   NEXTM<-0.2
   MEANL<-NEXTM
   SE2<-(SE * SE)
   H2<-(L*(NN - 1)/CHIERR - 1)
   SEC<-(((1 -(1/NN))*H2*SE2)^2)
   OVERBD.Previous<<-NA
   OVERBD<<-NA
   if (is.na(MEANL)==F)
        {
        SL2<-(SM * SM * NN)
        SL2UB<- ((L - 1)*SL2/CHILOC)
        H1<-((L - 1)/CHILOC-1)
        FIRST<-(((1 / NN)*H1*SL2)^2)
        PTEST<-((1/NN)*SL2+(1-1/NN)*SE2)
         VAR<-(PTEST+sqrt(FIRST+SEC))
        MVAR<-SL2UB
        SIGMA<-sqrt(VAR)
        MEANADJ<-MEANL
        while (MEANADJ<=LIM)
               {
               LLU<-(MEANADJ-Z*sqrt(MVAR/N))
               OVERBD.Previous<<-OVERBD
               P2.DISP2.COMPUTE(LLU,SIGMA)
               if (OVERBD>(LBOUND/100))
                      {
                      MEAN.Previous<<-(max(MEANL,MEANADJ-DM))+Q
                      MEANL<-MEANADJ
                      MEAN<<-(MEANL+Q)
                      MEANADJ<-(LIM+DM)
                      }
               MEANADJ<-(MEANADJ+DM)
               }
        if (OVERBD<=(LBOUND/100))
               {
               MEANL<-NA
               if (SE==DSE){MEAN<<-(MEANL+Q)}
```

Exhibit 4.1 (page 2 of 2)

```
               }
        }
  if(is.na(OVERBD.Previous)==T) {OVERBD.Previous<<-OVERBD}
  if(is.na(MEAN.Previous)==T) {MEAN.Previous<<-MEAN}
  MEAN<<-round(MEAN, Decimals)
}
```

Exhibit 4.2: Test Output for Dissolution - Sampling Plan 2 (page 1 of 10)

```
 > rm(results4)
> results4<- structure(.Data=rep(NA,360),.Dim=c(72,5))
> P2.DISP2.CALDISP2(50,50,40,3,2,0.1,5,0.1,5,2)
[1] 43.1
> results4[1,1]<-paste(50,50,40,3,2,0.1,5,0.1,5)
> results4[1,2]<-MEAN
> results4[1,3]<-OVERBD
> results4[1,4]<-MEAN.Previous
> results4[1,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,3,2,0.1,5,0.1,20,2)
[1] 89.7
> results4[2,1]<-paste(50,50,40,3,2,0.1,5,0.1,20)
> results4[2,2]<-MEAN
> results4[2,3]<-OVERBD
> results4[2,4]<-MEAN.Previous
> results4[2,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,3,2,0.1,5,5,5,2)
[1] 43.4
> results4[3,1]<-paste(50,50,40,3,2,0.1,5,5,5)
> results4[3,2]<-MEAN
> results4[3,3]<-OVERBD
> results4[3,4]<-MEAN.Previous
> results4[3,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,3,2,0.1,5,5,20,2)
[1] 90
> results4[4,1]<-paste(50,50,40,3,2,0.1,5,5,20)
> results4[4,2]<-MEAN
> results4[4,3]<-OVERBD
> results4[4,4]<-MEAN.Previous
> results4[4,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,3,300,5,0.1,5,0.1,2)
[1] 40.2
> results4[5,1]<-paste(50,50,40,3,300,5,0.1,5,0.1)
> results4[5,2]<-MEAN
> results4[5,3]<-OVERBD
> results4[5,4]<-MEAN.Previous
> results4[5,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,3,300,5,0.1,5,5,2)
[1] 43.7
> results4[6,1]<-paste(50,50,40,3,300,5,0.1,5,5)
> results4[6,2]<-MEAN
> results4[6,3]<-OVERBD
> results4[6,4]<-MEAN.Previous
> results4[6,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,3,300,5,0.1,20,0.1,2)
[1] 55
> results4[7,1]<-paste(50,50,40,3,300,5,0.1,20,0.1)
> results4[7,2]<-MEAN
> results4[7,3]<-OVERBD
> results4[7,4]<-MEAN.Previous
> results4[7,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,3,300,5,0.1,20,5,2)
[1] 60.3
> results4[8,1]<-paste(50,50,40,3,300,5,0.1,20,5)
> results4[8,2]<-MEAN
> results4[8,3]<-OVERBD
> results4[8,4]<-MEAN.Previous
> results4[8,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,300,2,5,5,5,5,2)
[1] 40.2
```

Exhibit 4.2 (page 2 of 10)

```
> results4[9,1]<-paste(50,50,40,300,2,5,5,5,5)
> results4[9,2]<-MEAN
> results4[9,3]<-OVERBD
> results4[9,4]<-MEAN.Previous
> results4[9,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,300,2,5,5,5,20,2)
[1] 56.6
> results4[10,1]<-paste(50,50,40,300,2,5,5,5,20)
> results4[10,2]<-MEAN
> results4[10,3]<-OVERBD
> results4[10,4]<-MEAN.Previous
> results4[10,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,300,2,5,5,20,5,2)
[1] 46.9
> results4[11,1]<-paste(50,50,40,300,2,5,5,20,5)
> results4[11,2]<-MEAN
> results4[11,3]<-OVERBD
> results4[11,4]<-MEAN.Previous
> results4[11,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,300,2,5,5,20,20,2)
[1] 64.1
> results4[12,1]<-paste(50,50,40,300,2,5,5,20,20)
> results4[12,2]<-MEAN
> results4[12,3]<-OVERBD
> results4[12,4]<-MEAN.Previous
> results4[12,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,300,300,5,5,5,5,2)
[1] 40.3
> results4[13,1]<-paste(50,50,40,300,300,5,5,5,5)
> results4[13,2]<-MEAN
> results4[13,3]<-OVERBD
> results4[13,4]<-MEAN.Previous
> results4[13,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,300,300,5,5,5,20,2)
[1] 57.1
> results4[14,1]<-paste(50,50,40,300,300,5,5,5,20)
> results4[14,2]<-MEAN
> results4[14,3]<-OVERBD
> results4[14,4]<-MEAN.Previous
> results4[14,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,300,300,5,5,20,5,2)
[1] 55.8
> results4[15,1]<-paste(50,50,40,300,300,5,5,20,5)
> results4[15,2]<-MEAN
> results4[15,3]<-OVERBD
> results4[15,4]<-MEAN.Previous
> results4[15,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,40,300,300,5,5,20,20,2)
[1] 70.8
> results4[16,1]<-paste(50,50,40,300,300,5,5,20,20)
> results4[16,2]<-MEAN
> results4[16,3]<-OVERBD
> results4[16,4]<-MEAN.Previous
> results4[16,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,85,3,2,0.1,0.1,0.1,0.1,2)
[1] 85.2
> results4[17,1]<-paste(50,50,85,3,2,0.1,0.1,0.1,0.1)
> results4[17,2]<-MEAN
> results4[17,3]<-OVERBD
> results4[17,4]<-MEAN.Previous
> results4[17,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,85,3,2,0.1,0.1,0.1,5,2)
[1] 88.1
> results4[18,1]<-paste(50,50,85,3,2,0.1,0.1,0.1,5)
> results4[18,2]<-MEAN
> results4[18,3]<-OVERBD
> results4[18,4]<-MEAN.Previous
> results4[18,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,85,3,2,0.1,0.1,5,0.1,2)
[1] 85.2
```

Exhibit 4.2 (page 3 of 10)

```
> results4[19,1]<-paste(50,50,85,3,2,0.1,0.1,5,0.1)
> results4[19,2]<-MEAN
> results4[19,3]<-OVERBD
> results4[19,4]<-MEAN.Previous
> results4[19,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,85,3,2,0.1,0.1,5,5,2)
[1] 88.4
> results4[20,1]<-paste(50,50,85,3,2,0.1,0.1,5,5)
> results4[20,2]<-MEAN
> results4[20,3]<-OVERBD
> results4[20,4]<-MEAN.Previous
> results4[20,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,85,300,300,5,0.1,5,0.1,2)
[1] 85.2
> results4[21,1]<-paste(50,50,85,300,300,5,0.1,5,0.1)
> results4[21,2]<-MEAN
> results4[21,3]<-OVERBD
> results4[21,4]<-MEAN.Previous
> results4[21,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,85,300,300,5,0.1,5,5,2)
[1] 85.3
> results4[22,1]<-paste(50,50,85,300,300,5,0.1,5,5)
> results4[22,2]<-MEAN
> results4[22,3]<-OVERBD
> results4[22,4]<-MEAN.Previous
> results4[22,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,85,300,300,5,0.1,10,0.1,2)
[1] 86.1
> results4[23,1]<-paste(50,50,85,300,300,5,0.1,10,0.1)
> results4[23,2]<-MEAN
> results4[23,3]<-OVERBD
> results4[23,4]<-MEAN.Previous
> results4[23,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,50,85,300,300,5,0.1,10,5,2)
[1] 87.2
> results4[24,1]<-paste(50,50,85,300,300,5,0.1,10,5)
> results4[24,2]<-MEAN
> results4[24,3]<-OVERBD
> results4[24,4]<-MEAN.Previous
> results4[24,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,40,3,2,5,5,5,5,2)
[1] 49.4
> results4[25,1]<-paste(50,99,40,3,2,5,5,5,5)
> results4[25,2]<-MEAN
> results4[25,3]<-OVERBD
> results4[25,4]<-MEAN.Previous
> results4[25,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,40,3,2,5,5,5,20,2)
[1] NA
> results4[26,1]<-paste(50,99,40,3,2,5,5,5,20)
> results4[26,2]<-MEAN
> results4[26,3]<-OVERBD
> results4[26,4]<-MEAN.Previous
> results4[26,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,40,3,2,5,5,20,5,2)
[1] 89.4
> results4[27,1]<-paste(50,99,40,3,2,5,5,20,5)
> results4[27,2]<-MEAN
> results4[27,3]<-OVERBD
> results4[27,4]<-MEAN.Previous
> results4[27,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,40,3,2,5,5,20,20,2)
[1] NA
> results4[28,1]<-paste(50,99,40,3,2,5,5,20,20)
> results4[28,2]<-MEAN
> results4[28,3]<-OVERBD
> results4[28,4]<-MEAN.Previous
> results4[28,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,40,300,300,5,5,5,5,2)
[1] 43.7
```

Exhibit 4.2 (page 4 of 10)

```
> results4[29,1]<-paste(50,99,40,300,300,5,5,5,5)
> results4[29,2]<-MEAN
> results4[29,3]<-OVERBD
> results4[29,4]<-MEAN.Previous
> results4[29,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,40,300,300,5,5,5,20,2)
[1] 86.1
> results4[30,1]<-paste(50,99,40,300,300,5,5,5,20)
> results4[30,2]<-MEAN
> results4[30,3]<-OVERBD
> results4[30,4]<-MEAN.Previous
> results4[30,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,40,300,300,5,5,20,5,2)
[1] 84.1
> results4[31,1]<-paste(50,99,40,300,300,5,5,20,5)
> results4[31,2]<-MEAN
> results4[31,3]<-OVERBD
> results4[31,4]<-MEAN.Previous
> results4[31,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,40,300,300,5,5,20,20,2)
[1] NA
> results4[32,1]<-paste(50,99,40,300,300,5,5,20,20)
> results4[32,2]<-MEAN
> results4[32,3]<-OVERBD
> results4[32,4]<-MEAN.Previous
> results4[32,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,85,3,2,0.25,0.25,0.25,0.25,2)
[1] 85.4
> results4[33,1]<-paste(50,99,85,3,2,0.25,0.25,0.25,0.25)
> results4[33,2]<-MEAN
> results4[33,3]<-OVERBD
> results4[33,4]<-MEAN.Previous
> results4[33,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,85,3,2,0.25,0.25,0.25,5,2)
[1] 92.5
> results4[34,1]<-paste(50,99,85,3,2,0.25,0.25,0.25,5)
> results4[34,2]<-MEAN
> results4[34,3]<-OVERBD
> results4[34,4]<-MEAN.Previous
> results4[34,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,85,3,2,0.25,0.25,5,0.25,2)
[1] 87.7
> results4[35,1]<-paste(50,99,85,3,2,0.25,0.25,5,0.25)
> results4[35,2]<-MEAN
> results4[35,3]<-OVERBD
> results4[35,4]<-MEAN.Previous
> results4[35,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(50,99,85,3,2,0.25,0.25,5,5,2)
[1] 94.4
> results4[36,1]<-paste(50,99,85,3,2,0.25,0.25,5,5)
> results4[36,2]<-MEAN
> results4[36,3]<-OVERBD
> results4[36,4]<-MEAN.Previous
> results4[36,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,40,3,2,0.25,0.25,0.25,0.25,2)
[1] 45.3
> results4[37,1]<-paste(99,50,40,3,2,0.25,0.25,0.25,0.25)
> results4[37,2]<-MEAN
> results4[37,3]<-OVERBD
> results4[37,4]<-MEAN.Previous
> results4[37,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,40,3,2,0.25,0.25,0.25,5,2)
[1] NA
> results4[38,1]<-paste(99,50,40,3,2,0.25,0.25,0.25,5)
> results4[38,2]<-MEAN
> results4[38,3]<-OVERBD
> results4[38,4]<-MEAN.Previous
> results4[38,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,40,3,2,0.25,0.25,5,0.25,2)
[1] 64.9
```

Exhibit 4.2 (page 5 of 10)

```
> results4[39,1]<-paste(99,50,40,3,2,0.25,0.25,5,0.25)
> results4[39,2]<-MEAN
> results4[39,3]<-OVERBD
> results4[39,4]<-MEAN.Previous
> results4[39,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,40,3,2,0.25,0.25,5,5,2)
[1] NA
> results4[40,1]<-paste(99,50,40,3,2,0.25,0.25,5,5)
> results4[40,2]<-MEAN
> results4[40,3]<-OVERBD
> results4[40,4]<-MEAN.Previous
> results4[40,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,40,300,300,5,5,5,5,2)
[1] 41
> results4[41,1]<-paste(99,50,40,300,300,5,5,5,5)
> results4[41,2]<-MEAN
> results4[41,3]<-OVERBD
> results4[41,4]<-MEAN.Previous
> results4[41,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,40,300,300,5,5,5,20,2)
[1] 63
> results4[42,1]<-paste(99,50,40,300,300,5,5,5,20)
> results4[42,2]<-MEAN
> results4[42,3]<-OVERBD
> results4[42,4]<-MEAN.Previous
> results4[42,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,40,300,300,5,5,20,5,2)
[1] 56.8
> results4[43,1]<-paste(99,50,40,300,300,5,5,20,5)
> results4[43,2]<-MEAN
> results4[43,3]<-OVERBD
> results4[43,4]<-MEAN.Previous
> results4[43,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,40,300,300,5,5,20,20,2)
[1] 76
> results4[44,1]<-paste(99,50,40,300,300,5,5,20,20)
> results4[44,2]<-MEAN
> results4[44,3]<-OVERBD
> results4[44,4]<-MEAN.Previous
> results4[44,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,85,3,2,0.25,0.25,0.25,0.25,2)
[1] 90.3
> results4[45,1]<-paste(99,50,85,3,2,0.25,0.25,0.25,0.25)
> results4[45,2]<-MEAN
> results4[45,3]<-OVERBD
> results4[45,4]<-MEAN.Previous
> results4[45,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,85,3,2,0.25,0.25,0.25,5,2)
[1] NA
> results4[46,1]<-paste(99,50,85,3,2,0.25,0.25,0.25,5)
> results4[46,2]<-MEAN
> results4[46,3]<-OVERBD
> results4[46,4]<-MEAN.Previous
> results4[46,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,85,3,2,0.25,0.25,5,0.25,2)
[1] NA
> results4[47,1]<-paste(99,50,85,3,2,0.25,0.25,5,0.25)
> results4[47,2]<-MEAN
> results4[47,3]<-OVERBD
> results4[47,4]<-MEAN.Previous
> results4[47,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,50,85,3,2,0.25,0.25,5,5,2)
[1] NA
> results4[48,1]<-paste(99,50,85,3,2,0.25,0.25,5,5)
> results4[48,2]<-MEAN
> results4[48,3]<-OVERBD
> results4[48,4]<-MEAN.Previous
> results4[48,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,3,2,0.25,0.25,0.25,0.25,2)
[1] 47
```

Exhibit 4.2 (page 6 of 10)

```
> results4[49,1]<-paste(99,99,40,3,2,0.25,0.25,0.25,0.25)
> results4[49,2]<-MEAN
> results4[49,3]<-OVERBD
> results4[49,4]<-MEAN.Previous
> results4[49,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,3,2,0.25,0.25,0.25,5,2)
[1] NA
> results4[50,1]<-paste(99,99,40,3,2,0.25,0.25,0.25,5)
> results4[50,2]<-MEAN
> results4[50,3]<-OVERBD
> results4[50,4]<-MEAN.Previous
> results4[50,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,3,2,0.25,0.25,5,0.25,2)
[1] 96.6
> results4[51,1]<-paste(99,99,40,3,2,0.25,0.25,5,0.25)
> results4[51,2]<-MEAN
> results4[51,3]<-OVERBD
> results4[51,4]<-MEAN.Previous
> results4[51,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,3,2,0.25,0.25,5,5,2)
[1] NA
> results4[52,1]<-paste(99,99,40,3,2,0.25,0.25,5,5)
> results4[52,2]<-MEAN
> results4[52,3]<-OVERBD
> results4[52,4]<-MEAN.Previous
> results4[52,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,3,300,5,0.1,5,0.1,2)
[1] 44.7
> results4[53,1]<-paste(99,99,40,3,300,5,0.1,5,0.1)
> results4[53,2]<-MEAN
> results4[53,3]<-OVERBD
> results4[53,4]<-MEAN.Previous
> results4[53,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,3,300,5,0.1,5,5,2)
[1] NA
> results4[54,1]<-paste(99,99,40,3,300,5,0.1,5,5)
> results4[54,2]<-MEAN
> results4[54,3]<-OVERBD
> results4[54,4]<-MEAN.Previous
> results4[54,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,3,300,5,0.1,20,0.1,2)
[1] 88.1
> results4[55,1]<-paste(99,99,40,3,300,5,0.1,20,0.1)
> results4[55,2]<-MEAN
> results4[55,3]<-OVERBD
> results4[55,4]<-MEAN.Previous
> results4[55,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,3,300,5,0.1,20,5,2)
[1] NA
> results4[56,1]<-paste(99,99,40,3,300,5,0.1,20,5)
> results4[56,2]<-MEAN
> results4[56,3]<-OVERBD
> results4[56,4]<-MEAN.Previous
> results4[56,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,300,2,5,5,5,5,2)
[1] 44.1
> results4[57,1]<-paste(99,99,40,300,2,5,5,5,5)
> results4[57,2]<-MEAN
> results4[57,3]<-OVERBD
> results4[57,4]<-MEAN.Previous
> results4[57,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,300,2,5,5,5,20,2)
[1] 93.9
> results4[58,1]<-paste(99,99,40,300,2,5,5,5,20)
> results4[58,2]<-MEAN
> results4[58,3]<-OVERBD
> results4[58,4]<-MEAN.Previous
> results4[58,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,300,2,5,5,20,5,2)
[1] 71.3
```

Exhibit 4.2 (page 7 of 10)

```
> results4[59,1]<-paste(99,99,40,300,2,5,5,20,5)
> results4[59,2]<-MEAN
> results4[59,3]<-OVERBD
> results4[59,4]<-MEAN.Previous
> results4[59,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,300,2,5,5,20,20,2)
[1] NA
> results4[60,1]<-paste(99,99,40,300,2,5,5,20,20)
> results4[60,2]<-MEAN
> results4[60,3]<-OVERBD
> results4[60,4]<-MEAN.Previous
> results4[60,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,300,300,5,5,5,5,2)
[1] 44.6
> results4[61,1]<-paste(99,99,40,300,300,5,5,5,5)
> results4[61,2]<-MEAN
> results4[61,3]<-OVERBD
> results4[61,4]<-MEAN.Previous
> results4[61,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,300,300,5,5,5,20,2)
[1] 94.8
> results4[62,1]<-paste(99,99,40,300,300,5,5,5,20)
> results4[62,2]<-MEAN
> results4[62,3]<-OVERBD
> results4[62,4]<-MEAN.Previous
> results4[62,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,300,300,5,5,20,5,2)
[1] 85.3
> results4[63,1]<-paste(99,99,40,300,300,5,5,20,5)
> results4[63,2]<-MEAN
> results4[63,3]<-OVERBD
> results4[63,4]<-MEAN.Previous
> results4[63,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,40,300,300,5,5,20,20,2)
[1] NA
> results4[64,1]<-paste(99,99,40,300,300,5,5,20,20)
> results4[64,2]<-MEAN
> results4[64,3]<-OVERBD
> results4[64,4]<-MEAN.Previous
> results4[64,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,85,3,2,0.25,0.25,0.25,0.25,2)
[1] 92
> results4[65,1]<-paste(99,99,85,3,2,0.25,0.25,0.25,0.25)
> results4[65,2]<-MEAN
> results4[65,3]<-OVERBD
> results4[65,4]<-MEAN.Previous
> results4[65,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,85,3,2,0.25,0.25,0.25,5,2)
[1] NA
> results4[66,1]<-paste(99,99,85,3,2,0.25,0.25,0.25,5)
> results4[66,2]<-MEAN
> results4[66,3]<-OVERBD
> results4[66,4]<-MEAN.Previous
> results4[66,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,85,3,2,0.25,0.25,5,0.25,2)
[1] NA
> results4[67,1]<-paste(99,99,85,3,2,0.25,0.25,5,0.25)
> results4[67,2]<-MEAN
> results4[67,3]<-OVERBD
> results4[67,4]<-MEAN.Previous
> results4[67,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,85,3,2,0.25,0.25,5,5,2)
[1] NA
> results4[68,1]<-paste(99,99,85,3,2,0.25,0.25,5,5)
> results4[68,2]<-MEAN
> results4[68,3]<-OVERBD
> results4[68,4]<-MEAN.Previous
> results4[68,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,85,300,300,0.1,5,0.1,5,2)
[1] 88.5
```

Exhibit 4.2 (page 8 of 10)

```
> results4[69,1]<-paste(99,99,85,300,300,0.1,5,0.1,5)
> results4[69,2]<-MEAN
> results4[69,3]<-OVERBD
> results4[69,4]<-MEAN.Previous
> results4[69,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,85,300,300,0.1,5,0.1,10,2)
[1] 99.2
> results4[70,1]<-paste(99,99,85,300,300,0.1,5,0.1,10)
> results4[70,2]<-MEAN
> results4[70,3]<-OVERBD
> results4[70,4]<-MEAN.Previous
> results4[70,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,85,300,300,0.1,5,5,5,2)
[1] 89.6
> results4[71,1]<-paste(99,99,85,300,300,0.1,5,5,5)
> results4[71,2]<-MEAN
> results4[71,3]<-OVERBD
> results4[71,4]<-MEAN.Previous
> results4[71,5]<-OVERBD.Previous
> P2.DISP2.CALDISP2(99,99,85,300,300,0.1,5,5,10,2)
[1] NA
> results4[72,1]<-paste(99,99,85,300,300,0.1,5,5,10)
> results4[72,2]<-MEAN
> results4[72,3]<-OVERBD
> results4[72,4]<-MEAN.Previous
> results4[72,5]<-OVERBD.Previous
> results4
                                     [,1]   [,2]                  [,3]               [,4]
[,5]
 [1,] "50 50 40 3 2 0.1 5 0.1 5"          "43.1" "0.521917366620824"    "43"
"0.4954503170707"
 [2,] "50 50 40 3 2 0.1 5 0.1 20"         "89.7" "0.501168048082236"    "89.6000000000004"
"0.499051610399906"
 [3,] "50 50 40 3 2 0.1 5 5 5"            "43.4" "0.505866489864713"    "43.3"
"0.480218607247889"
 [4,] "50 50 40 3 2 0.1 5 5 20"           "90"   "0.501279021653803"    "89.9000000000004"
"0.499174216606745"
 [5,] "50 50 40 3 300 5 0.1 5 0.1"        "40.2" "0.556409808392212"    "40.2"
"0.556409808392212"
 [6,] "50 50 40 3 300 5 0.1 5 5"          "43.7" "0.505385142748007"    "43.6"
"0.480912349493794"
 [7,] "50 50 40 3 300 5 0.1 20 0.1"       "55"   "0.50122846577026"     "54.9"
"0.496670246833587"
 [8,] "50 50 40 3 300 5 0.1 20 5"         "60.3" "0.501955140808095"    "60.2"
"0.497796799088215"
 [9,] "50 50 40 300 2 5 5 5 5"            "40.2" "0.510622682434819"    "40.2"
"0.510622682434819"
[10,] "50 50 40 300 2 5 5 5 20"           "56.6" "0.502868766661276"    "56.5"
"0.498470565319917"
[11,] "50 50 40 300 2 5 5 20 5"           "46.9" "0.505286190294404"    "46.8"
"0.497555358171469"
[12,] "50 50 40 300 2 5 5 20 20"          "64.1" "0.502237898542166"    "64.0000000000001"
"0.498726074744471"
[13,] "50 50 40 300 300 5 5 5 5"          "40.3" "0.525213647086248"    "40.2"
"0.496923050261235"
[14,] "50 50 40 300 300 5 5 5 20"         "57.1" "0.501579685803862"    "57"
"0.49725740921988"
[15,] "50 50 40 300 300 5 5 20 5"         "55.8" "0.50138885835087"     "55.7"
"0.496942782545909"
[16,] "50 50 40 300 300 5 5 20 20"        "70.8" "0.500262061176276"    "70.7000000000002"
"0.497270726388496"
[17,] "50 50 85 3 2 0.1 0.1 0.1 0.1"      "85.2" "0.999941757476179"    "85.2"
"0.999941757476179"
[18,] "50 50 85 3 2 0.1 0.1 0.1 5"        "88.1" "0.521917366620824"    "88"
"0.4954503170707"
[19,] "50 50 85 3 2 0.1 0.1 5 0.1"        "85.2" "0.554999287135246"    "85.2"
"0.554999287135246"
[20,] "50 50 85 3 2 0.1 0.1 5 5"          "88.4" "0.505866489864713"    "88.3"
"0.480218607247889"
```

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```
[21,] "50 50 85 300 300 5 0.1 5 0.1"      "85.2" "0.576447931484173"    "85.2"
"0.576447931484173"
[22,] "50 50 85 300 300 5 0.1 5 5"        "85.3" "0.525213647086248"    "85.2"
"0.496923050261235"
[23,] "50 50 85 300 300 5 0.1 10 0.1"     "86.1" "0.500371315932726"    "86"
"0.476158747118056"
[24,] "50 50 85 300 300 5 0.1 10 5"       "87.2" "0.511521614470746"    "87.1"
"0.491735489206301"
[25,] "50 99 40 3 2 5 5 5 5"              "49.4" "0.990419074166697"    "49.3"
"0.989935946000513"
[26,] "50 99 40 3 2 5 5 5 20"             "NA"   "0.693321097291961"    "NA"
"0.69155180230849"
[27,] "50 99 40 3 2 5 5 20 5"             "89.4" "0.990089379784503"    "89.3000000000004"
"0.989922241134375"
[28,] "50 99 40 3 2 5 5 20 20"            "NA"   "0.594331140681644"    "NA"
"0.592522562842422"
[29,] "50 99 40 300 300 5 5 5 5"          "43.7" "0.991352756141351"    "43.6"
"0.989708707708332"
[30,] "50 99 40 300 300 5 5 5 20"         "86.1" "0.990085309025924"    "86.0000000000004"
"0.989915046700981"
[31,] "50 99 40 300 300 5 5 20 5"         "84.1" "0.990093065877836"    "84.0000000000004"
"0.98991910869414"
[32,] "50 99 40 300 300 5 5 20 20"        "NA"   "0.962009758210934"    "NA"
"0.961585210700893"
[33,] "50 99 85 3 2 0.25 0.25 0.25 0.25" "85.4" "0.997458168270178"    "85.3"
"0.959937400469455"
[34,] "50 99 85 3 2 0.25 0.25 0.25 5"    "92.5" "0.990456260273004"    "92.4"
"0.989557797654275"
[35,] "50 99 85 3 2 0.25 0.25 5 0.25"    "87.7" "0.992251566109119"    "87.6"
"0.989997156236511"
[36,] "50 99 85 3 2 0.25 0.25 5 5"       "94.4" "0.990419074166697"    "94.3"
"0.989935946000513"
[37,] "99 50 40 3 2 0.25 0.25 0.25 0.25" "45.3" "0.531467124472054"    "45.2"
"0.483100034269982"
[38,] "99 50 40 3 2 0.25 0.25 0.25 5"    "NA"   "0.000188161024983625" "NA"
"0.000186095864091663"
[39,] "99 50 40 3 2 0.25 0.25 5 0.25"    "64.9" "0.501898654711612"    "64.8000000000001"
"0.49799360410633"
[40,] "99 50 40 3 2 0.25 0.25 5 5"       "NA"   "0.000192202086921468" "NA"
"0.00019010403194562"
[41,] "99 50 40 300 300 5 5 5 5"          "41"   "0.521554434444288"    "40.9"
"0.493915256685188"
[42,] "99 50 40 300 300 5 5 5 20"         "63"   "0.500450545772971"    "62.9"
"0.496549211799517"
[43,] "99 50 40 300 300 5 5 20 5"         "56.8" "0.504040964487511"    "56.7"
"0.499644014309088"
[44,] "99 50 40 300 300 5 5 20 20"        "76"   "0.502311246487348"    "75.9000000000002"
"0.499910216453025"
[45,] "99 50 85 3 2 0.25 0.25 0.25 0.25" "90.3" "0.531467124472054"    "90.2"
"0.483100034269982"
[46,] "99 50 85 3 2 0.25 0.25 0.25 5"    "NA"   "5.0824406665112e-007" "NA"
"5.0048551046325e-007"
[47,] "99 50 85 3 2 0.25 0.25 5 0.25"    "NA"   "0.123838355823629"    "NA"
"0.12018686198714"
[48,] "99 50 85 3 2 0.25 0.25 5 5"       "NA"   "5.3763675901205e-007" "NA"
"5.2948042936295e-007"
[49,] "99 99 40 3 2 0.25 0.25 0.25 0.25" "47"   "0.992478635143386"    "46.9"
"0.989075214309052"
[50,] "99 99 40 3 2 0.25 0.25 0.25 5"    "NA"   "0.000188161024983625" "NA"
"0.000186095864091663"
[51,] "99 99 40 3 2 0.25 0.25 5 0.25"    "96.6" "0.990042188703622"    "96.5000000000005"
"0.989884690946538"
[52,] "99 99 40 3 2 0.25 0.25 5 5"       "NA"   "0.000192202086921468" "NA"
"0.00019010403194562"
[53,] "99 99 40 3 300 5 0.1 5 0.1"       "44.7" "0.991259101253905"    "44.6"
"0.988847177982747"
[54,] "99 99 40 3 300 5 0.1 5 5"         "NA"   "0.000190761488862101" "NA"
"0.000188675133672948"
```

Exhibit 4.2 (page 10 of 10)

```
[55,] "99 99 40 3 300 5 0.1 20 0.1"       "88.1" "0.990009292166395"    "88.0000000000004"
"0.989839276281607"
[56,] "99 99 40 3 300 5 0.1 20 5"         "NA"   "0.000231402263730339" "NA"
"0.000228996359014795"
[57,] "99 99 40 300 2 5 5 5 5"            "44.1" "0.991575075037375"    "44"
"0.989767445671603"
[58,] "99 99 40 300 2 5 5 5 20"           "93.9" "0.990074392733731"    "93.8000000000005"
"0.989915686586401"
[59,] "99 99 40 300 2 5 5 20 5"           "71.3" "0.990205483765178"    "71.2000000000002"
"0.989990041212723"
[60,] "99 99 40 300 2 5 5 20 20"          "NA"   "0.973812860263074"    "NA"
"0.973486486164264"
[61,] "99 99 40 300 300 5 5 5 5"          "44.6" "0.991291976095512"    "44.5"
"0.989810270533165"
[62,] "99 99 40 300 300 5 5 5 20"         "94.8" "0.990061232632134"    "94.7000000000005"
"0.989904243059879"
[63,] "99 99 40 300 300 5 5 20 5"         "85.3" "0.99013317139568"     "85.2000000000004"
"0.989961153266137"
[64,] "99 99 40 300 300 5 5 20 20"        "NA"   "0.924947210038662"    "NA"
"0.924210222822161"
[65,] "99 99 85 3 2 0.25 0.25 0.25 0.25" "92"   "0.992478635143386"    "91.9"
"0.989075214309052"
[66,] "99 99 85 3 2 0.25 0.25 0.25 5"    "NA"   "5.0824406665112e-007" "NA"
"5.0048551046325e-007"
[67,] "99 99 85 3 2 0.25 0.25 5 0.25"    "NA"   "0.123838355823629"    "NA"
"0.12018686198714"
[68,] "99 99 85 3 2 0.25 0.25 5 5"       "NA"   "5.3763675901205e-007" "NA"
"5.2948042936295e-007"
[69,] "99 99 85 300 300 0.1 5 0.1 5"     "88.5" "0.990408338758731"    "88.4"
"0.987909965239981"
[70,] "99 99 85 300 300 0.1 5 0.1 10"    "99.2" "0.990259281302219"    "99.1"
"0.989920427978619"
[71,] "99 99 85 300 300 0.1 5 5 5"       "89.6" "0.991291976095512"    "89.5"
"0.989810270533165"
[72,] "99 99 85 300 300 0.1 5 5 10"      "NA"   "0.978124061098312"    "NA"
"0.977465146999025"
```

Exhibit 4.3 Checking Independent Results against CUDAL Program Expected Results for Dissolution - Sampling Plan 2 (page 1 of 3)

Row within "results4"	Test	Independent Results for Mean	Independent Results Agree with Expected Results? (Y/N)	Additional Information for		
				Independent Lower Bound Results for Mean	Results Immediately Prior to Test Convergence: Mean	Results Immediately Prior to Test Convergence: Lower Bound for Mean
1	50 50 40 3 2 0.1 5 0.1 5	43.10	Y	0.521917	43.0	0.495450
2	50 50 40 3 2 0.1 5 0.1 20	89.70	Y	0.501168	89.6	0.499052
3	50 50 40 3 2 0.1 5 5 5	43.40	**N**	0.505866	43.3	0.480219
4	50 50 40 3 2 0.1 5 5 20	90.00	Y	0.501279	89.9	0.499174
5	50 50 40 3 300 5 0.1 5 0.1	40.20	Y	0.556410	40.2	0.556410
6	50 50 40 3 300 5 0.1 5 5	43.70	Y	0.505385	43.6	0.480912
7	50 50 40 3 300 5 0.1 20 0.1	55.00	Y	0.501228	54.9	0.496670
8	50 50 40 3 300 5 0.1 20 5	60.30	Y	0.501955	60.2	0.497797
9	50 50 40 300 2 5 5 5 5	40.20	Y	0.510623	40.2	0.510623
10	50 50 40 300 2 5 5 5 20	56.60	Y	0.502869	56.5	0.498471
11	50 50 40 300 2 5 5 20 5	46.90	Y	0.505286	46.8	0.497555
12	50 50 40 300 2 5 5 20 20	64.10	Y	0.502238	64.0	0.498726
13	50 50 40 300 300 5 5 5 5	40.30	Y	0.525214	40.2	0.496923

Exhibit 4.3 (page 2 of 3)

Row within "results4"	Test	Independent Results for Mean	Independent Results Agree with Expected Results? (Y/N)	Additional Information for		
				Independent Lower Bound Results for Mean	Results Immediately Prior to Test Convergence	
					Mean	Lower Bound for Mean
14	50 50 40 300 300 5 5 5 20	57.10	Y	0.501580	57.0	0.497257
15	50 50 40 300 300 5 5 20 5	55.80	Y	0.501389	55.7	0.496943
16	50 50 40 300 300 5 5 20 20	70.80	Y	0.500262	70.7	0.497271
17	50 50 85 3 2 0.1 0.1 0.1 0.1	85.20	Y	0.999942	85.2	0.999942
18	50 50 85 3 2 0.1 0.1 0.1 5	88.10	Y	0.521917	88.0	0.495450
19	50 50 85 3 2 0.1 0.1 5 0.1	85.20	Y	0.554999	85.2	0.554999
20	50 50 85 3 2 0.1 0.1 5 5	88.40	Y	0.505866	88.3	0.480219
21	50 50 85 300 300 5 0.1 5 0.1	85.20	Y	0.576448	85.2	0.576448
22	50 50 85 300 300 5 0.1 5 5	85.30	Y	0.525214	85.2	0.496923
23	50 50 85 300 300 5 0.1 10 0.1	86.10	Y	0.500371	86.0	0.476159
24	50 50 85 300 300 5 0.1 10 5	87.20	Y	0.511522	87.1	0.491735
25	50 99 40 3 2 5 5 5 5	49.40	Y	0.990419	49.3	0.989936
26	50 99 40 3 2 5 5 5 20	NA	Y	0.693321	NA	0.691552
27	50 99 40 3 2 5 5 20 5	89.40	Y	0.990089	89.3	0.989922
28	50 99 40 3 2 5 5 20 20	NA	Y	0.594331	NA	0.592523
29	50 99 40 300 300 5 5 5 5	43.70	Y	0.991353	43.6	0.989709
30	50 99 40 300 300 5 5 5 20	86.10	Y	0.990085	86.0	0.989915
31	50 99 40 300 300 5 5 20 5	84.10	Y	0.990093	84.0	0.989919
32	50 99 40 300 300 5 5 20 20	NA	Y	0.962010	NA	0.961585
33	50 99 85 3 2 0.25 0.25 0.25 0.25	85.40	Y	0.997458	85.3	0.959937
34	50 99 85 3 2 0.25 0.25 0.25 5	92.50	Y	0.990456	92.4	0.989558
35	50 99 85 3 2 0.25 0.25 5 0.25	87.70	Y	0.992252	87.6	0.989997
36	50 99 85 3 2 0.25 0.25 5 5	94.40	Y	0.990419	94.3	0.989936
37	99 50 40 3 2 0.25 0.25 0.25 0.25	45.30	Y	0.531467	45.2	0.483100
38	99 50 40 3 2 0.25 0.25 0.25 5	NA	Y	0.000188	NA	0.000186
39	99 50 40 3 2 0.25 0.25 5 0.25	64.90	Y	0.501899	64.8	0.497994
40	99 50 40 3 2 0.25 0.25 5 5	NA	Y	0.000192	NA	0.000190
41	99 50 40 300 300 5 5 5 5	41.00	Y	0.521554	40.9	0.493915
42	99 50 40 300 300 5 5 5 20	63.00	Y	0.500451	62.9	0.496549
43	99 50 40 300 300 5 5 20 5	56.80	Y	0.504041	56.7	0.499644
44	99 50 40 300 300 5 5 20 20	76.00	Y	0.502311	75.9	0.499910
45	99 50 85 3 2 0.25 0.25 0.25 0.25	90.30	Y	0.531467	90.2	0.483100
46	99 50 85 3 2 0.25 0.25 0.25 5	NA	Y	0.000001	NA	0.000001
47	99 50 85 3 2 0.25 0.25 5 0.25	NA	Y	0.123838	NA	0.120187
48	99 50 85 3 2 0.25 0.25 5 5	NA	Y	0.000001	NA	0.000001
49	99 99 40 3 2 0.25 0.25 0.25 0.25	47.00	Y	0.992479	46.9	0.989075
50	99 99 40 3 2 0.25 0.25 0.25 5	NA	Y	0.000188	NA	0.000186
51	99 99 40 3 2 0.25 0.25 5 0.25	96.60	Y	0.990042	96.5	0.989885
52	99 99 40 3 2 0.25 0.25 5 5	NA	Y	0.000192	NA	0.000190
53	99 99 40 3 300 5 0.1 5 0.1	44.70	Y	0.991259	44.6	0.988847
54	99 99 40 3 300 5 0.1 5 5	NA	Y	0.000191	NA	0.000189
55	99 99 40 3 300 5 0.1 20 0.1	88.10	Y	0.990009	88.0	0.989839

Exhibit 4.3 (page 3 of 3)

Row within "results4"	Test	Independent Results for Mean	Independent Results Agree with Expected Results? (Y/N)	Additional Information for		
				Independent Lower Bound Results for Mean	Results Immediately Prior to Test Convergence	
					Mean	Lower Bound for Mean
56	99 99 40 3 300 5 0.1 20 5	NA	Y	0.000231	NA	0.000229
57	99 99 40 300 2 5 5 5 5	44.10	Y	0.991575	44.0	0.989767
58	99 99 40 300 2 5 5 5 20	93.90	Y	0.990074	93.8	0.989916
59	99 99 40 300 2 5 5 20 5	71.30	Y	0.990205	71.2	0.989990
60	99 99 40 300 2 5 5 20 20	NA	Y	0.973813	NA	0.973486
61	99 99 40 300 300 5 5 5 5	44.60	Y	0.991292	44.5	0.989810
62	99 99 40 300 300 5 5 5 20	94.80	Y	0.990061	94.7	0.989904
63	99 99 40 300 300 5 5 20 5	85.30	Y	0.990133	85.2	0.989961
64	99 99 40 300 300 5 5 20 20	NA	Y	0.924947	NA	0.924210
65	99 99 85 3 2 0.25 0.25 0.25 0.25	92.00	Y	0.992479	91.9	0.989075
66	99 99 85 3 2 0.25 0.25 0.25 5	NA	Y	0.000001	NA	0.000001
67	99 99 85 3 2 0.25 0.25 5 0.25	NA	Y	0.123838	NA	0.120187
68	99 99 85 3 2 0.25 0.25 5 5	NA	Y	0.000001	NA	0.000001
69	99 99 85 300 300 0.1 5 0.1 5	88.50	Y	0.990408	88.4	0.987910
70	99 99 85 300 300 0.1 5 0.1 10	99.20	Y	0.990259	99.1	0.989920
71	99 99 85 300 300 0.1 5 5 5	89.60	Y	0.991292	89.5	0.989810
72	99 99 85 300 300 0.1 5 5 10	NA	Y	0.978124	NA	0.977465

5. PART 4 / Content Uniformity - Sampling Plan 1

Exhibit 5.1: SPlus Code for Content Uniformity - Sampling Plan 1

```
Code used in part 2:
-------------------
"P2.CUSP1.c1calc"<-
function(SIGMA,LLU,ULU,TYPE)
{
   C2<-0.078
   K<-(1+30*LLU*LLU/(SIGMA*SIGMA))
   V<-((K^2)/(1+(2*30*(LLU^2)/(SIGMA^2))))
   PCV2<-(1-pf(30/(K*C2^2),V, 29,ncp=0))
   P1L<-pnorm((100-LLU)/SIGMA,0,1)-pnorm((85-LLU)/SIGMA,0,1)
   P1U<-pnorm((115-LLU)/SIGMA,0,1)-pnorm((100-LLU)/SIGMA,0,1)
   P1 <-P1L+P1U
   P2L<-pnorm((85-LLU)/SIGMA,0,1)-pnorm((75-LLU)/SIGMA,0,1)
   P2U<-pnorm((125-LLU)/SIGMA,0,1)-pnorm((115-LLU)/SIGMA,0,1)
   P2<-P2L+P2U
   if (TYPE=="T") (PCTTAB2<-(P1^30+30*(P1^29)*P2))
   if (TYPE=="C") (PCTTAB2<-(P1^27*(P1*P1*P1+30*P1*P1*P2+435*P1*P2*P2+4060*P2*P2*P2)))
   LPROB2<<-max(PCV2+PCTTAB2-1,0)
   C1<-0.060
   K<-(1 +10*LLU*LLU/(SIGMA*SIGMA))
   V<-(K*K/(1+2*10*LLU*LLU/(SIGMA*SIGMA)))
   PCV1<-(1-pf(10/(K*C1^2),V,9,ncp=0))
   if ((TYPE)=="T") (PCTTAB1<-P1^10)
   if ((TYPE)=="C") (PCTTAB1<-(P1^9)*(P1+10*P2))
   LPROB1<<-max(PCV1+PCTTAB1-1,0)
   OVERLBD<<-max(LPROB1,LPROB2)
   C2<-0.078
   K<-1+30*ULU*ULU/(SIGMA*SIGMA)
   V<-K*K/(1+2*30*ULU*ULU/(SIGMA*SIGMA))
   PCV2<-(1-pf(30/(K*C2*C2),V,29,ncp=0))
   P1L<-pnorm((100-ULU)/SIGMA,0,1)-pnorm((85-ULU)/SIGMA,0,1)
   P1U<-pnorm((115-ULU)/SIGMA,0,1)-pnorm((100-ULU)/SIGMA,0,1)
   P1<-P1L+P1U
   P2L<-pnorm((85-ULU)/SIGMA,0,1)-pnorm((75-ULU)/SIGMA,0,1)
   P2U<-pnorm((125-ULU)/SIGMA,0,1)-pnorm((115-ULU)/SIGMA,0,1)
   P2<-P2L+P2U
   if ((TYPE)=="T") (PCTTAB2<-(P1^30+30*(P1^29)*P2))
   if ((TYPE)=="C") (PCTTAB2<-(P1^27*(P1*P1*P1+30*P1*P1*P2+435*P1*P2*P2+4060*P2*P2*P2)))
   LPROB2<<-max(PCV2+PCTTAB2-1,0)
   C1<-0.060
   K<-1+10*ULU*ULU/(SIGMA*SIGMA)
   V<-K*K/(1+2*10*ULU*ULU/(SIGMA*SIGMA))
   PCV1<-(1-pf(10/(K*C1*C1),V,9,ncp=0))
   if ((TYPE)=="T") (PCTTAB1<-P1^10)
   if ((TYPE)=="C") (PCTTAB1<-P1^9*(P1+10*P2))
   LPROB1<<-max(PCV1+PCTTAB1-1,0)
   OVERUBD<<-max(LPROB1,LPROB2)
   OVERBD<<-min(OVERLBD,OVERUBD)
}
New Code for part 4:
--------------------
"P4.CUSP1.CALCUSP1"<-
function(TYPE,CILEVEL,NUMBER,MEAN,CV,Decimals)
{
        N<-NUMBER
        Z<- qnorm((1+sqrt(CILEVEL/100))/2,0,1)
        CHI <-qchisq(1-sqrt(CILEVEL/100),N-1)
        UPPER_IND<-0
        SAMPSD<-(CV*MEAN/100)
        SIGMA<- sqrt((N - 1) * SAMPSD * SAMPSD / CHI)
        LLU<- MEAN - Z *SIGMA / sqrt(N)
        ULU<- MEAN + Z * SIGMA / sqrt(N)
        P2.CUSP1.c1calc(SIGMA,LLU,ULU,TYPE)
        LBOUND<<-round(OVERBD,Decimals)
}
```

Exhibit 5.2: Test Output for Content Uniformity - Sampling Plan 1

```
> rm(results5)
> results5<- structure(.Data=rep(NA,8),.Dim=c(4,2))
> P4.CUSP1.CALCUSP1("C",50,2000,110,2.65,5)
[1] 0.95017
> results5[1,1]<-paste("C",50,2000,110,2.65)
> results5[1,2]<-LBOUND
> P4.CUSP1.CALCUSP1("T",99,5,86,0.10,5)
[1] 0.42512
> results5[2,1]<-paste("T",99,5,86,0.10)
> results5[2,2]<-LBOUND
> P4.CUSP1.CALCUSP1("C",83.2,48,94.42,4.919,5)
[1] 0.84227
> results5[3,1]<-paste("C",83.2,48,94.42,4.919)
> results5[3,2]<-LBOUND
> P4.CUSP1.CALCUSP1("T",57.4,15,110.83,1.714,5)
[1] 0.5416
> results5[4,1]<-paste("T",57.4,15,110.83,1.714)
> results5[4,2]<-LBOUND
> results5
                         [,1]      [,2]
[1,] "C 50 2000 110 2.65"     "0.95017"
[2,] "T 99 5 86 0.1"          "0.42512"
[3,] "C 83.2 48 94.42 4.919"  "0.84227"
[4,] "T 57.4 15 110.83 1.714" "0.5416"
```

Exhibit 5.3 Checking Independent Results against CUDAL Program Expected Results for Content Uniformity - Sampling Plan 1

Row within "results5"	Test	Independent Results for Lower Bound	Independent Results Agree with Expected Results? (Y/N)
1	C 50 2000 110 2.65	0.95017	Y
2	T 99 5 86 0.1	0.42512	Y
3	C 83.2 48 94.42 4.919	0.84227	Y
4	T 57.4 15 110.83 1.714	0.54160	Y

6. PART 4 / Content Uniformity - Sampling Plan 2

Exhibit 6.1: SPlus Code for Content Uniformity - Sampling Plan 2 (page 1 of 2)

```
Code used in part 2:
-------------------

"P2.CUSP2.cullu"<-
function(MEAN,Z,MVAR,N,SIGMA,TYPE)
{
   LLU<-(MEAN-(Z*sqrt(MVAR/N)))
   C2<-0.078
   K<-(1+((30*LLU*LLU)/(SIGMA*SIGMA)))
   V<-((K*K)/(1+((2*30*LLU*LLU)/(SIGMA*SIGMA))))
   PCV2<-(1-pf(30/(K*C2*C2), V, 29, ncp=0))
   P1L<-(pnorm((100-LLU)/SIGMA,0,1)-pnorm((85-LLU)/SIGMA,0,1))
   P1U<-(pnorm((115-LLU)/SIGMA,0,1)-pnorm((100-LLU)/SIGMA,0,1))
   P1<-(P1L+P1U)
   P2L<-(pnorm((85-LLU)/SIGMA,0,1)-pnorm((75-LLU)/SIGMA,0,1))
   P2U<-(pnorm((125-LLU)/SIGMA,0,1)-pnorm((115-LLU)/SIGMA,0,1))
   P2<-(P2L+P2U)
   if (TYPE=="T") {PCTTAB2<-((P1^30)+30*(P1^29)*P2)}
   if (TYPE=="C") {PCTTAB2<-((P1^27)*(P1*P1*P1+30*P1*P1*P2+435*P1*P2*P2+4060*P2*P2*P2))}
   TPROBL2<-max(PCV2+PCTTAB2-1,0)
   C1<-0.060
   K<-(1+((10*LLU*LLU)/(SIGMA*SIGMA)))
   V<-((K*K)/(1+((2*10*LLU*LLU)/(SIGMA*SIGMA))))
   PCV1<-(1-pf(10/(K*C1*C1),V,9,ncp=0))
   if (TYPE=="T") {PCTTAB1<-(P1^10)}
   if (TYPE=="C") {PCTTAB1<-((P1^9)*(P1+10*P2))}
   LPROB1<-max(PCV1+PCTTAB1-1,0)
   OVERBDL<<-max(TPROBL2,LPROB1)
}

"P2.CUSP2.cuulu"<-
function(MEAN,Z,MVAR,N,SIGMA,TYPE)
{
   ULU<-(MEAN+(Z*sqrt(MVAR/N)))
   C2<-0.078
   K<-(1+((30*ULU*ULU)/(SIGMA*SIGMA)))
   V<-((K*K)/(1+((2*30*ULU*ULU)/(SIGMA*SIGMA))))
   PCV2<-(1-pf(30/(K*C2*C2),V,29,ncp=0))
   P1L<-(pnorm((100-ULU)/SIGMA,0,1)-pnorm((85-ULU)/SIGMA,0,1))
   P1U<-(pnorm((115-ULU)/SIGMA,0,1)-pnorm((100-ULU)/SIGMA,0,1))
   P1<-(P1L+P1U)
   P2L<-(pnorm((85-ULU)/SIGMA,0,1)-pnorm((75-ULU)/SIGMA,0,1))
   P2U<-(pnorm((125-ULU)/SIGMA,0,1)-pnorm((115-ULU)/SIGMA,0,1))
   P2<-(P2L+P2U)
   if (TYPE=="T") {PCTTAB2<-((P1^30)+30*(P1^29)*P2)}
   if (TYPE=="C") {PCTTAB2<-((P1^27)*(P1*P1*P1+30*P1*P1*P2+435*P1*P2*P2+4060*P2*P2*P2))}
   TPROBL2<-max(PCV2+PCTTAB2-1,0)
   C1<-0.060
   K<-(1+((10*ULU*ULU)/(SIGMA*SIGMA)))
   V<-((K*K)/(1+((2*10*ULU*ULU)/(SIGMA*SIGMA))))
   PCV1<-(1-pf(10/(K*C1*C1),V,9,ncp=0))
   if(TYPE=="T") {PCTTAB1<-(P1^10)}
   if(TYPE=="C") {PCTTAB1<-(P1^9*(P1+10*P2))}
   LPROB1<-max(PCV1+PCTTAB1-1,0)
   OVERBDU<<-max(TPROBL2, LPROB1)
}

New Code for part 4:
--------------------

"P4.CUSP2.CALCUSP2"<-
function(TYPE,CILEVEL,LOC,NUM,SE,SM,MEAN,Decimals)
{
   Z<-qnorm((1+sqrt(CILEVEL/100))/2,0,1)
   NN<-NUM
   L<-LOC
```

Exhibit 6.1 (page 2 of 2)

```
   N<-NN*L
   CHIERR<-qchisq(1-sqrt(CILEVEL/100),L*(NN-1))
   CHILOC<-qchisq(1-sqrt(CILEVEL/100),L-1)
   SEBOUND<-9.2
   SMLIM<-9.2
   SE2<-SE*SE
   H2<-(L*(NN-1)/CHIERR-1)
   SEC<-(((1-1/NN)*H2*SE2)^2)
   SL2<-(SM*SM*NN)
   SL2UB<-((L-1)*SL2/CHILOC)
   H1<-((L-1)/CHILOC-1)
   FIRST<-(((1/NN)*H1*SL2)^2)
   PTEST<-((1/NN)*SL2+(1-1/NN)*SE2)
   VAR<-(PTEST+sqrt(FIRST+SEC))
   MVAR<-SL2UB
   SIGMA<-sqrt(VAR)
   P2.CUSP2.cullu(MEAN,Z,MVAR,N,SIGMA,TYPE)
   P2.CUSP2.cuulu(MEAN,Z,MVAR,N,SIGMA,TYPE)
   LBOUND<<-round(min(OVERBDL,OVERBDU),Decimals)
}
```

Exhibit 6.2: Test Output for Content Uniformity - Sampling Plan 2

```
> rm(results6)
> results6<- structure(.Data=rep(NA,8),.Dim=c(4,2))
> P4.CUSP2.CALCUSP2("C",50,300,300,4,4.8,103.10,5)
[1] 0.95164
> results6[1,1]<-paste("C",50,300,300,4,4.8,103.10)
> results6[1,2]<-LBOUND
> P4.CUSP2.CALCUSP2("T",99,3,2,0.1,0.1,90.50,5)
[1] 0.95271
> results6[2,1]<-paste("T",99,3,2,0.1,0.1,90.50)
> results6[2,2]<-LBOUND
> P4.CUSP2.CALCUSP2("C",55.3,15,4,4.216,3.461,92.52,5)
[1] 0.45013
> results6[3,1]<-paste("C",55.3,15,4,4.216,3.461,92.52)
> results6[3,2]<-LBOUND
> P4.CUSP2.CALCUSP2("T",88.8,30,2,1.842,1.016,111.21,5)
[1] 0.62909
> results6[4,1]<-paste("T",88.8,30,2,1.842,1.016,111.21)
> results6[4,2]<-LBOUND
> results6
                                 [,1]      [,2]
[1,] "C 50 300 300 4 4.8 103.1"       "0.95164"
[2,] "T 99 3 2 0.1 0.1 90.5"          "0.95271"
[3,] "C 55.3 15 4 4.216 3.461 92.52"  "0.45013"
[4,] "T 88.8 30 2 1.842 1.016 111.21" "0.62909"
```

Exhibit 6.3 Checking Independent Results against CUDAL Program Expected Results for Content Uniformity - Sampling Plan 2

Row within "results6"	Test	Independent Results for Lower Bound	Independent Results Agree with Expected Results? (Y/N)
1	C 50 300 300 4 4.8 103.1	0.95164	Y
2	T 99 3 2 0.1 0.1 90.5	0.95271	Y
3	C 55.3 15 4 4.216 3.461 92.52	0.45013	Y
4	T 88.8 30 2 1.842 1.016 111.21	0.62909	Y

7. PART 4 / Dissolution - Sampling Plan 1

Exhibit 7.1: SPlus Code for Dissolution - Sampling Plan 1

```
Code use in part 2:
-------------------
"P2.DISP1.COMPUTE"<-
function(LLU,SIGMA)
{
   F1<-((1-pnorm((5 - LLU)/SIGMA,0,1))^6)
   SN2<-sqrt(12)
   PM2<-(pnorm(SN2*(-LLU)/SIGMA,0,1))
   PB2<-(1-pnorm((-15-LLU)/SIGMA,0,1))
   F2<-((PB2^12)-PM2)
   SN3<-sqrt(24)
   PM3<-(pnorm(SN3*(-LLU)/SIGMA,0,1))
   P2<-(pnorm((-15 - LLU)/SIGMA,0,1)-pnorm((-25-LLU)/SIGMA,0,1))
   P3<-(1-pnorm((-15-LLU)/SIGMA,0,1))
   F3<-((P3^24)+24*P2*(P3^23)+276*P2*P2*(P3^22)-PM3)
   OVERBD<<-max(F1, F2, F3)
}

New Code for part 4:
--------------------
"P4.DISP1.CALDISP1"<-
function(Q,CILEVEL,NUMBER,MEAN,CV,Decimals)
{
   N<-NUMBER
   Z<-qnorm(sqrt(CILEVEL/100),0,1)
   CHI<-qchisq(1-sqrt(CILEVEL/100),N-1)
   MEANADJ<-(MEAN-Q)
   SAMPSD<-(CV*MEAN/100)
   SIGMA<-(sqrt((N-1)*(SAMPSD*SAMPSD)/CHI))
   LLU<-(MEANADJ-Z*SIGMA/sqrt(N))
   P2.DISP1.COMPUTE(LLU,SIGMA)
   LBOUND<<-round(OVERBD,Decimals)
}
```

Exhibit 7.2: Test Output for Dissolution - Sampling Plan 1

```
> rm(results7)
> results7<- structure(.Data=rep(NA,6),.Dim=c(3,2))
> P4.DISP1.CALDISP1(40,99,1000,41,5.51,5)
[1] 0.95004
> results7[1,1]<-paste(40,99,1000,41,5.51)
> results7[1,2]<-LBOUND
> P4.DISP1.CALDISP1(85,50,3,100,7.32,5)
[1] 0.95018
> results7[2,1]<-paste(85,50,3,100,7.32)
> results7[2,2]<-LBOUND
> P4.DISP1.CALDISP1(75.4,58.4,12,77.63,6.432,5)
[1] 0.78157
> results7[3,1]<-paste(5.4,58.4,12,77.63,6.432)
> results7[3,2]<-LBOUND
> results7
                          [,1]      [,2]
[1,] "40 99 1000 41 5.51"      "0.95004"
[2,] "85 50 3 100 7.32"        "0.95018"
[3,] "5.4 58.4 12 77.63 6.432" "0.78157"
```

Exhibit 7.3 Checking Independent Results against CUDAL Program Expected Results for Dissolution - Sampling Plan 1

Row within “results7”	Test	Independent Results for Lower Bound	Independent Results Agree with Expected Results? (Y/N)
1	40 99 1000 41 5.51	0.95004	Y
2	85 50 3 100 7.32	0.95018	Y
3	5.4 58.4 12 77.63 6.432	0.78157	Y

8. PART 4 / Dissolution - Sampling Plan 2

Exhibit 8.1: SPlus Code for Dissolution - Sampling Plan 2

```
Code use in part 2:
-------------------

"P2.DISP2.COMPUTE"<-
function(LLU,SIGMA)
{
   F1<-((1 - pnorm((5 - LLU)/SIGMA,0,1))^ 6)
   SN2<-sqrt(12)
   PM2<-(pnorm(SN2*(-LLU)/SIGMA,0,1))
   PB2<-(1 - pnorm((-LLU - 15) / SIGMA,0,1))
   F2<-(PB2^12-PM2)
   SN3<-sqrt(24)
   PM3<-(pnorm(SN3*(-LLU)/ SIGMA,0,1))
   P2<-(pnorm((-LLU -15)/SIGMA,0,1)-pnorm((-LLU-25)/SIGMA,0,1))
   P3<-(1-pnorm((-LLU - 15) / SIGMA,0,1))
   F3<-((P3^24)+(24*P2*P3^23)+(276*P2*P2*P3^22)-PM3)
   OVERBD<<-max(F1, F2, F3)
}

New Code for part 4:
--------------------
"P4.DISP2.CALDISP2"<-
function(Q,CILEVEL,LOC,NUM,SE,SM,MEAN,Decimals)
{
   Q<-Q
   NN<-NUM
   L<-LOC
   N<-NN*L
   Z<-qnorm(sqrt(CILEVEL/100),0,1)
   MEANADJ<-(MEAN-Q)
   CHIERR<-(qchisq(1-sqrt(CILEVEL/100),L*(NN - 1)))
   CHILOC<-(qchisq(1-sqrt(CILEVEL/100),L-1))
   SE2<-(SE * SE)
   H2<-(L*(NN - 1)/CHIERR - 1)
   SEC<-(((1 -(1/NN))*H2*SE2)^2)
   SL2<-(SM * SM * NN)
   SL2UB<- ((L - 1)*SL2/CHILOC)
   H1<-((L - 1)/CHILOC-1)
   FIRST<-(((1 / NN)*H1*SL2)^2)
   PTEST<-((1/NN)*SL2+(1-1/NN)*SE2)
   VAR<-(PTEST+sqrt(FIRST+SEC))
   MVAR<-SL2UB
   SIGMA<-sqrt(VAR)
   LLU<-(MEANADJ-Z*sqrt(MVAR/N))
   P2.DISP2.COMPUTE(LLU,SIGMA)
   LBOUND<<-round(OVERBD,Decimals)
}
```

Exhibit 8.2: Test Output for Dissolution - Sampling Plan 2

```
> rm(results8)
> results8<- structure(.Data=rep(NA,6),.Dim=c(3,2))
> P4.DISP2.CALDISP2(40,50,3,300,1,1,41.2,5)
[1] 0.95102
> results8[1,1]<-paste(40,50,3,300,1,1,41.2)
> results8[1,2]<-LBOUND
> P4.DISP2.CALDISP2(85,99,300,2,10.75,9.25,99.2,5)
[1] 0.95105
> results8[2,1]<-paste(85,99,300,2,10.75,9.25,99.2)
> results8[2,2]<-LBOUND
> P4.DISP2.CALDISP2(55.7,67.4,15,3,6.251,5.752,59.11,5)
[1] 0.77095
> results8[3,1]<-paste(55.7,67.4,15,3,6.251,5.752,59.11)
> results8[3,2]<-LBOUND
> results8
                                   [,1]      [,2]
[1,] "40 50 3 300 1 1 41.2"             "0.95102"
[2,] "85 99 300 2 10.75 9.25 99.2"      "0.95105"
[3,] "55.7 67.4 15 3 6.251 5.752 59.11" "0.77095"
```

Exhibit 8.3 Checking Independent Results against CUDAL Program Expected Results for Dissolution - Sampling Plan 2

Row within "results8"	Test	Independent Results for Lower Bound	Independent Results Agree with Expected Results? (Y/N)
1	40 50 3 300 1 1 41.2	0.95102	**N**
2	85 99 300 2 10.75 9.25 99.2	0.95105	**N**
3	55.7 67.4 15 3 6.251 5.752 59.11	0.77095	Y

Integration check for Bergum CUSP1 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Capsules, 50%CI, 50% lower bound.

Acceptance limit table exported from SAS as "ONE2.xls" and then imported into MathCad.

Test Mean and CV

$Mean := 93$

$CV := 6.8$

$Sigma := Mean \cdot \frac{CV}{100}$ $\quad Sigma = 6.324$

Acceptance Limit Table

data := C:\..\One2.xls

$X := data^{\langle 0 \rangle}$

$STD := data^{\langle 1 \rangle}$

$N := \left(data^{\langle 2 \rangle}\right)_1$ $\quad N = 2000$

$i := 0 .. 298$ $\quad X_0 = 85.1$

$X_{298} = 114.9$

$$cumNorm_i := cnorm\left[\frac{\left[\left(X_i - Mean\right)\cdot\sqrt{N}\right]}{Sigma}\right]$$

calculation of cumulative normal scaled deviations by table row using MathCAD's "cnorm" operator

$i := 1 .. 298$

$PMean_i := cumNorm_i - cumNorm_{i-1}$ $\quad df := N - 1$

probability of mean by table row

$$scaledSTD_i := \left[\frac{\left[df \cdot \left[\frac{\left(STD_i + STD_{i-1}\right)}{2}\right]^2\right]}{Sigma^2}\right]$$

calculation of scaled STD by table row

$$PSTD_i := pchisq\left[scaledSTD_i, \left(data^{\langle 2 \rangle}\right)_i - 1\right]$$

probability of std. dev. by table using MathCad's "pchisq" operator

$PT_i := PMean_i \cdot PSTD_i$

joint probabilities by table row

$PTRAP := \sum PT$

sum of joint probabilities using the vector sum operator

$PTRAP = 0.08688$

Integrated passing probability

Integration check for Bergum CUSP1 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Capsules, 50%CI, 50% lower bound.

Acceptance limit table exported from SAS as "ONE2.xls" and then imported into MathCad.

Test Mean and CV

$Mean := 95$

$CV := 7.0$

$Sigma := Mean \cdot \frac{CV}{100}$ $\quad Sigma = 6.65$

Acceptance Limit Table

$data :=$ C:\..\One2.xls

$X := data^{\langle 0 \rangle}$

$STD := data^{\langle 1 \rangle}$

$N := \left(data^{\langle 2 \rangle}\right)_1$ $\quad N = 2000$

$i := 0..298$ $\quad X_0 = 85.1$

$X_{298} = 114.9$

$cumNorm_i := cnorm\left[\frac{\left[(X_i - Mean)\cdot\sqrt{N}\right]}{Sigma}\right]$

calculation of cumulative normal scaled deviations by table row using MathCAD's "cnorm" operator

$i := 1..298$

$PMean_i := cumNorm_i - cumNorm_{i-1}$ $\quad df := N - 1$

probability of mean by table row

$scaledSTD_i := \left[\frac{\left[df \cdot \left[\frac{(STD_i + STD_{i-1})}{2}\right]^2\right]}{Sigma^2}\right]$

calculation of scaled STD by table row

$PSTD_i := pchisq\left[scaledSTD_i, \left(data^{\langle 2 \rangle}\right)_i - 1\right]$

probability of std. dev. by table using MathCad's "pchisq" operator

$PT_i := PMean_i \cdot PSTD_i$

joint probabilities by table row

$PTRAP := \sum PT$

sum of joint probabilities using the vector sum operator

$PTRAP = 0.93923$

Integrated passing probability

Integration check for Bergum CUSP1 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Tablets, 99% CI, 99% lower bound.

Acceptance limit table exported from SAS as "ONE1.xls" and then imported into MathCad.

Test Mean and CV

$\text{Mean} := 98.5$

$\text{CV} := 1$

$\text{Sigma} := \text{Mean} \cdot \frac{\text{CV}}{100}$ $\quad$ $\text{Sigma} = 0.985$

Acceptance Limit Table

$\text{data} :=$ C:\..\One1.xls

$X := \text{data}^{\langle 0 \rangle}$

$\text{STD} := \text{data}^{\langle 1 \rangle}$

$N := \left(\text{data}^{\langle 2 \rangle}\right)_1$ $\quad$ $N = 5$

$i := 0 .. 298$ $\quad$ $X_0 = 85.1$

$X_{298} = 114.9$

$$\text{cumNorm}_i := \text{cnorm}\left[\frac{\left[\left(X_i - \text{Mean}\right) \cdot \sqrt{N}\right]}{\text{Sigma}}\right]$$

calculation of cumulative normal scaled deviations by table row using MathCAD's "cnorm" operator

$i := 1 .. 298$

$\text{PMean}_i := \text{cumNorm}_i - \text{cumNorm}_{i-1}$ $\quad$ $\text{df} := N - 1$

probability of mean by table row

$$\text{scaledSTD}_i := \left[\frac{\left[\text{df} \cdot \left[\frac{\left(\text{STD}_i + \text{STD}_{i-1}\right)}{2}\right]^2\right]}{\text{Sigma}^2}\right]$$

calculation of scaled STD by table row

$$\text{PSTD}_i := \text{pchisq}\left[\text{scaledSTD}_i, \left(\text{data}^{\langle 2 \rangle}\right)_i - 1\right]$$

probability of std. dev. by table using MathCad's "pchisq" operator

$\text{PT}_i := \text{PMean}_i \cdot \text{PSTD}_i$

joint probabilities by table row

$\text{PTRAP} := \sum \text{PT}$

sum of joint probabilities using the vector sum operator

$\text{PTRAP} = 0.3825$

Integrated passing probability

Integration check for Bergum CUSP1 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Tablets, 99% CI, 99% lower bound.

Acceptance limit table exported from SAS as "ONE1.xls" and then imported into MathCad.

Test Mean and CV

$Mean := 100$

$CV := 0.5$

$Sigma := Mean \cdot \frac{CV}{100}$ $\quad Sigma = 0.5$

Acceptance Limit Table

$data :=$ C:\..\One1.xls

$X := data^{\langle 0 \rangle}$

$STD := data^{\langle 1 \rangle}$

$N := \left(data^{\langle 2 \rangle}\right)_1$ $\quad N = 5$

$i := 0 .. 298$ $\quad X_0 = 85.1$

$X_{298} = 114.9$

$$cumNorm_i := cnorm\left[\frac{\left[\left(X_i - Mean\right) \cdot \sqrt{N}\right]}{Sigma}\right]$$

calculation of cumulative normal scaled deviations by table row using MathCAD's "cnorm" operator

$i := 1 .. 298$

$PMean_i := cumNorm_i - cumNorm_{i-1}$ $\quad df := N - 1$

probability of mean by table row

$$scaledSTD_i := \left[\frac{\left[df \cdot \left[\frac{\left(STD_i + STD_{i-1}\right)}{2}\right]^2\right]}{Sigma^2}\right]$$

calculation of scaled STD by table row

$$PSTD_i := pchisq\left[scaledSTD_i, \left(data^{\langle 2 \rangle}\right)_i - 1\right]$$

probability of std. dev. by table using MathCad's "pchisq" operator

$PT_i := PMean_i \cdot PSTD_i$

joint probabilities by table row

$PTRAP := \sum PT$

sum of joint probabilities using the vector sum operator

$PTRAP = 0.98529$

Integrated passing probability

Integration check for Bergum CUSP2 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Capsules, 99% CI, 99% lower bound, 300 locations, 300 tablets per location

Acceptance limit table exported from SAS as "TABC2.xls" and then imported into MathCad.

Test Mean and CV

$U := 97.5$

$SIGSE := 3.5$

$SIGSM := 3.5$

Acceptance Limit Table

$data :=$ C:\..\TABC2.xls

$MeanL := data^{\langle 5 \rangle}$

$MeanU := data^{\langle 6 \rangle}$

$SE := data^{\langle 4 \rangle}$

$SM := data^{\langle 7 \rangle}$

$NN := data^{\langle 1 \rangle}$

$N := data^{\langle 3 \rangle}$

$L := data^{\langle 2 \rangle}$

$D := data^{\langle 0 \rangle}$

$SIGSM2 := SIGSM^2$

$EXPSE2 := SIGSE^2$

$i := 0..2501$

$EXPSM2_i := EXPSE2 + (NN_i \cdot SIGSM2)$

calculation of PMean by table row

$$PMean_i := cnorm\left[(MeanU_i - U)\cdot\sqrt{\frac{N_i}{EXPSM2_i}}\right] - cnorm\left[(MeanL_i - U)\cdot\sqrt{\frac{N_i}{EXPSM2_i}}\right]$$

calculation of PSE by table row

$$PSE_i := pchisq\left[\left[\frac{L_i\cdot(NN_i - 1)\cdot(SE_i)^2}{EXPSE2}\right],\left[L_i\cdot(NN_i - 1)\right]\right] - pchisq\left[\left[\frac{L_i\cdot(NN_i - 1)\cdot(SE_i - D_i)^2}{EXPSE2}\right],\left[L_i\cdot(NN_i - 1)\right]\right]$$

calculation of PSM by table row

$$PSM_i := pchisq\left[\left[\frac{NN_i\cdot(L_i - 1)\cdot(SM_i)^2}{EXPSM2_i}\right],(L_i - 1)\right] - pchisq\left[\left[\frac{NN_i\cdot(L_i - 1)\cdot(SM_i - D_i)^2}{EXPSM2_i}\right],(L_i - 1)\right]$$

$P_i := PMean_i \cdot PSE_i \cdot PSM_i$

joint passing probabilities by table row

$PSUM := \sum P$ sum of joint probabilities using the vector sum operator

$PSUM = 0.992$ Integrated passing probability

Integration check for Bergum CUSP2 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Capsules, 99% CI, 99% lower bound, 300 locations, 300 tablets per location

Acceptance limit table exported from SAS as "TABC2.xls" and then imported into MathCad.

Test Mean and CV

$U := 97.5$

$SIGSE := 3.5$

$SIGSM := 4.0$

Acceptance Limit Table

data := C:\..\TABC2.xls

$MeanL := data^{\langle 5 \rangle}$

$MeanU := data^{\langle 6 \rangle}$

$SE := data^{\langle 4 \rangle}$

$SM := data^{\langle 7 \rangle}$

$NN := data^{\langle 1 \rangle}$

$N := data^{\langle 3 \rangle}$

$L := data^{\langle 2 \rangle}$

$D := data^{\langle 0 \rangle}$

$SIGSM2 := SIGSM^2$

$EXPSE2 := SIGSE^2$

$i := 0 .. 2501$

$EXPSM2_i := EXPSE2 + (NN_i \cdot SIGSM2)$

calculation of PMean by table row

$$PMean_i := cnorm\left[(MeanU_i - U) \cdot \sqrt{\frac{N_i}{EXPSM2_i}}\right] - cnorm\left[(MeanL_i - U) \cdot \sqrt{\frac{N_i}{EXPSM2_i}}\right]$$

calculation of PSE by table row

$$PSE_i := pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i)^2}{EXPSE2}\right], [L_i \cdot (NN_i - 1)]\right] - pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i - D_i)^2}{EXPSE2}\right], [L_i \cdot (NN_i - 1)]\right]$$

calculation of PSM by table row

$$PSM_i := pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i)^2}{EXPSM2_i}\right], (L_i - 1)\right] - pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i - D_i)^2}{EXPSM2_i}\right], (L_i - 1)\right]$$

$P_i := PMean_i \cdot PSE_i \cdot PSM_i$

joint passing probabilities by table row

$PSUM := \sum P$

sum of joint probabilities using the vector sum operator

$PSUM = 0.24251$

Integrated passing probability

Integration check for Bergum CUSP2 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Tablets, 50% CI, 50% lower bound, 3 locations, 2 tablet per location

Acceptance limit table exported from SAS as "TABC1.xls" and then imported into MathCad.

Test Mean and CV

$U := 100$

$SIGSE := 1$

$SIGSM := 1$

Acceptance Limit Table

data := C:\..\TABC1.xls

$MeanL := data^{\langle 5 \rangle}$

$MeanU := data^{\langle 6 \rangle}$

$SE := data^{\langle 4 \rangle}$

$SM := data^{\langle 7 \rangle}$

$NN := data^{\langle 1 \rangle}$

$N := data^{\langle 3 \rangle}$

$L := data^{\langle 2 \rangle}$

$D := data^{\langle 0 \rangle}$

$SIGSM2 := SIGSM^2$

$EXPSE2 := SIGSE^2$

$i := 0..2258$

$EXPSM2_i := EXPSE2 + (NN_i \cdot SIGSM2)$

calculation of PMean by table row

$$PMean_i := cnorm\left[(MeanU_i - U) \cdot \sqrt{\frac{N_i}{EXPSM2_i}}\right] - cnorm\left[(MeanL_i - U) \cdot \sqrt{\frac{N_i}{EXPSM2_i}}\right]$$

calculation of PSE by table row

$$PSE_i := pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i)^2}{EXPSE2}\right], [L_i \cdot (NN_i - 1)]\right] - pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i - D_i)^2}{EXPSE2}\right], [L_i \cdot (NN_i - 1)]\right]$$

calculation of PSM by table row

$$PSM_i := pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i)^2}{EXPSM2_i}\right], (L_i - 1)\right] - pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i - D_i)^2}{EXPSM2_i}\right], (L_i - 1)\right]$$

$P_i := PMean_i \cdot PSE_i \cdot PSM_i$

joint passing probabilities by table row

$PSUM := \sum P$

sum of joint probabilities using the vector sum operator

$PSUM = 0.99986$

Integrated passing probability

Integration check for Bergum CUSP2 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Tablets, 50% CI, 50% lower bound, 3 locations, 2 tablet per location

Acceptance limit table exported from SAS as "TABC1.xls" and then imported into MathCad.

Test Mean and CV

$U := 100$

$SIGSE := 3$

$SIGSM := 3$

Acceptance Limit Table

data :=

C:\..\TABC1.xls

$MeanL := data^{\langle 5 \rangle}$

$MeanU := data^{\langle 6 \rangle}$

$SE := data^{\langle 4 \rangle}$

$SM := data^{\langle 7 \rangle}$

$NN := data^{\langle 1 \rangle}$

$N := data^{\langle 3 \rangle}$

$L := data^{\langle 2 \rangle}$

$D := data^{\langle 0 \rangle}$

$SIGSM2 := SIGSM^2$

$EXPSE2 := SIGSE^2$

$i := 0..2258$

$EXPSM2_i := EXPSE2 + (NN_i \cdot SIGSM2)$

calculation of PMean by table row

$$PMean_i := cnorm\left[(MeanU_i - U)\cdot\sqrt{\frac{N_i}{EXPSM2_i}}\right] - cnorm\left[(MeanL_i - U)\cdot\sqrt{\frac{N_i}{EXPSM2_i}}\right]$$

calculation of PSE by table row

$$PSE_i := pchisq\left[\left[\frac{L_i\cdot(NN_i - 1)\cdot(SE_i)^2}{EXPSE2}\right],\left[L_i\cdot(NN_i - 1)\right]\right] - pchisq\left[\left[\frac{L_i\cdot(NN_i - 1)\cdot(SE_i - D_i)^2}{EXPSE2}\right],\left[L_i\cdot(NN_i - 1)\right]\right]$$

calculation of PSM by table row

$$PSM_i := pchisq\left[\left[\frac{NN_i\cdot(L_i - 1)\cdot(SM_i)^2}{EXPSM2_i}\right],(L_i - 1)\right] - pchisq\left[\left[\frac{NN_i\cdot(L_i - 1)\cdot(SM_i - D_i)^2}{EXPSM2_i}\right],(L_i - 1)\right]$$

$P_i := PMean_i \cdot PSE_i \cdot PSM_i$

joint passing probabilities by table row

$PSUM := \sum P$ — sum of joint probabilities using the vector sum operator

$PSUM = 0.52631$ — Integrated passing probability

Integration check for Bergum DISP1 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Q = 40, sample size of 3, 99% CI, 99% lower bound.

Acceptance limit table exported from SAS as "DIONE1.xls" and then imported into MathCad.

Test Mean and CV

$U := 98$

$CV := 1$

$Sigma := U \cdot \frac{CV}{100}$ $\quad Sigma = 0.98$

$N := 3$

Acceptance Limit Table

data :=

C:\..\dione X.xls

$CVtab := data^{\langle 0 \rangle}$ $\quad Mtab := data^{\langle 1 \rangle}$

$X := data^{\langle 2 \rangle}$ $\quad STD := data^{\langle 3 \rangle}$

$X_0 = 40.2$ $\quad STD_0 = 0.007$

$X_{298} = 99.8$

$X_{299} = 100$

calculation of probabilities for means and std. devs. by table row

$i := 1 .. 298$

$$PMean_i := cnorm\left[\left(X_i - U\right) \cdot \frac{\sqrt{N}}{Sigma}\right] - cnorm\left[\left(X_{i-1} - U\right) \cdot \frac{\sqrt{N}}{Sigma}\right]$$

$$Aveht_i := \frac{\left(STD_i + STD_{i-1}\right)}{2}$$

$$PSD_i := pchisq\left[\left[\frac{(N-1) \cdot \left(Aveht_i\right)^2}{Sigma^2}\right], N - 1\right]$$

additional calculation of probabilities for means and std. dev. by table row when X > 99.9

$$PMean_{299} := 1 - cnorm\left[\left(X_{298} - U\right) \cdot \frac{\sqrt{N}}{Sigma}\right]$$

$$PSD_{299} := pchisq\left[\left[\frac{(N-1) \cdot \left(STD_{299}\right)^2}{Sigma^2}\right], N - 1\right]$$

$i := 1 .. 299$

$PT_i := PMean_i \cdot PSD_i$ joint probabilities by table row

$PTRAP := \sum PT$ sum of joint probabilities using the vector sum operator

$PTRAP = 0.78665$ Integrated passing probability

Integration check for Bergum DISP1 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Q = 40, sample size of 3, 99% CI, 99% lower bound.

Acceptance limit table exported from SAS as "DIONE1.xls" and then imported into MathCad.

Test Mean and CV

$U := 100$

$CV := 3$

$Sigma := U \cdot \frac{CV}{100}$ $\qquad Sigma = 3$

$N := 3$

Acceptance Limit Table

data := C:\..\dione X.xls

$CVtab := data^{\langle 0 \rangle}$ $\qquad Mtab := data^{\langle 1 \rangle}$

$X := data^{\langle 2 \rangle}$ $\qquad STD := data^{\langle 3 \rangle}$

$X_0 = 40.2$ $\qquad STD_0 = 0.007$

$X_{298} = 99.8$

$X_{299} = 100$

calculation of probabilities for means and std. devs. by table row

$i := 1 .. 298$

$$PMean_i := cnorm\left[(X_i - U) \cdot \frac{\sqrt{N}}{Sigma}\right] - cnorm\left[(X_{i-1} - U) \cdot \frac{\sqrt{N}}{Sigma}\right]$$

$$Aveht_i := \frac{(STD_i + STD_{i-1})}{2}$$

$$PSD_i := pchisq\left[\left[\frac{(N-1) \cdot (Aveht_i)^2}{Sigma^2}\right], N - 1\right]$$

additional calculation of probabilities for means and std. dev. by table row when X > 99.9

$$PMean_{299} := 1 - cnorm\left[(X_{298} - U) \cdot \frac{\sqrt{N}}{Sigma}\right]$$

$$PSD_{299} := pchisq\left[\left[\frac{(N-1) \cdot (STD_{299})^2}{Sigma^2}\right], N - 1\right]$$

$i := 1 .. 299$

$PT_i := PMean_i \cdot PSD_i$ $\qquad$ joint probabilities by table row

$PTRAP := \sum PT$ $\qquad$ sum of joint probabilities using the vector sum operator

$PTRAP = 0.15654$ $\qquad$ Integrated passing probability

Integration check for Bergum DISP1 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Q = 85, sample size of 2000, 50% CI, 50% lower bound.

Acceptance limit table exported from SAS as "DIONE2.xls" and then imported into MathCad.

Test Mean and CV

$U := 85.3$

$CV := 4$

$Sigma := U \cdot \frac{CV}{100}$ $\quad Sigma = 3.412$

$N := 2000$

Acceptance Limit Table

$data :=$ C:\..\DIONE2.xls

$X := data^{\langle 2 \rangle}$

$STD := data^{\langle 3 \rangle}$

$i := 1..73$ $\quad X_0 = 85.2$

$X_{73} = 99.8$

$X_{74} = 100$

calculation of probabilities for means and std. devs. by table row

$$PMean_i := cnorm\left[\left(X_i - U\right)\cdot\frac{\sqrt{N}}{Sigma}\right] - cnorm\left[\left(X_{i-1} - U\right)\cdot\frac{\sqrt{N}}{Sigma}\right]$$

$$Aveht_i := \frac{\left(STD_i + STD_{i-1}\right)}{2}$$

$$PSD_i := pchisq\left[\left[\frac{(N-1)\cdot\left(Aveht_i\right)^2}{Sigma^2}\right], N-1\right]$$

additional calculation of probabilities for means and std. dev. by table row when X > 99.9

$$PMean_{74} := 1 - cnorm\left[\left(X_{73} - U\right)\cdot\frac{\sqrt{N}}{Sigma}\right]$$

$$PSD_{74} := pchisq\left[\left[\frac{(N-1)\cdot\left(STD_{74}\right)^2}{Sigma^2}\right], N-1\right]$$

$i := 1..74$

$PT_i := PMean_i \cdot PSD_i$ $\quad$ joint probabilities by table row

$PTRAP := \sum PT$ $\quad$ sum of joint probabilities using the vector sum operator

$PTRAP = 0.90502$ $\quad$ Integrated passing probability

Integration check for Bergum DISP2 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Q = 40, 50% CI, 50% lower bound, 3 locations, 2 per location

Acceptance limit table exported from SAS as "TABD1.xls" and then imported into MathCad.

Test Mean and CV

$U := 75$

$SIGSE := 6$ $DSE := 0.25$

$SIGSM := 6$ $DSM := 0.25$

Acceptance Limit Table

data :=

C:\..\TABD1.xls

$MeanL := data^{\langle 6 \rangle}$

$SE := data^{\langle 3 \rangle}$

$SM := data^{\langle 4 \rangle}$

$NN := data^{\langle 0 \rangle}$

$N := data^{\langle 2 \rangle}$

$L := data^{\langle 1 \rangle}$

$SIGSM2 := SIGSM^2$

$EXPSE2 := SIGSE^2$

$i := 0 .. 13698$

$EXPSM2_i := EXPSE2 + (NN_i \cdot SIGSM2)$

calculation of PMean by table row

$$PMean_i := 1 - cnorm\left[(MeanL_i - U) \cdot \sqrt{\frac{N_i}{EXPSM2_i}}\right]$$

calculation of PSE by table row

$$PSE_i := pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i)^2}{EXPSE2}\right], \left[L_i \cdot (NN_i - 1)\right]\right] - pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i - DSE)^2}{EXPSE2}\right], \left[L_i \cdot (NN_i - 1)\right]\right]$$

calculation of PSM by table row

$$PSM_i := pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i)^2}{EXPSM2_i}\right], (L_i - 1)\right] - pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i - DSM)^2}{EXPSM2_i}\right], (L_i - 1)\right]$$

$P_i := PMean_i \cdot PSE_i \cdot PSM_i$ joint passing probabilities by table row

$PSUM := \sum P$ sum of joint probabilities using the vector sum operator

$PSUM = 0.98481$ Integrated passing probability

Integration check for Bergum DISP2 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Q = 40, 50% CI, 50% lower bound, 3 locations, 2 per location

Acceptance limit table exported from SAS as "TABD1.xls" and then imported into MathCad.

Test Mean and CV

$U := 75$

$SIGSE := 10 \qquad DSE := 0.25$

$SIGSM := 10 \qquad DSM := 0.25$

Acceptance Limit Table

data := C:\..\TABD1.xls

$MeanL := data^{\langle 6 \rangle}$

$SE := data^{\langle 3 \rangle}$

$SM := data^{\langle 4 \rangle}$

$NN := data^{\langle 0 \rangle}$

$N := data^{\langle 2 \rangle}$

$L := data^{\langle 1 \rangle}$

$SIGSM2 := SIGSM^2$

$EXPSE2 := SIGSE^2$

$i := 0 .. 13698$

$EXPSM2_i := EXPSE2 + (NN_i \cdot SIGSM2)$

calculation of PMean by table row

$$PMean_i := 1 - cnorm\left[(MeanL_i - U) \cdot \sqrt{\frac{N_i}{EXPSM2_i}}\right]$$

calculation of PSE by table row

$$PSE_i := pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i)^2}{EXPSE2}\right], [L_i \cdot (NN_i - 1)]\right] - pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i - DSE)^2}{EXPSE2}\right], [L_i \cdot (NN_i - 1)]\right]$$

calculation of PSM by table row

$$PSM_i := pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i)^2}{EXPSM2_i}\right], (L_i - 1)\right] - pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i - DSM)^2}{EXPSM2_i}\right], (L_i - 1)\right]$$

$P_i := PMean_i \cdot PSE_i \cdot PSM_i$ — joint passing probabilities by table row

$PSUM := \sum P$ — sum of joint probabilities using the vector sum operator

$PSUM = 0.765$ — Integrated passing probability

Integration check for Bergum DISP2 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Q = 85, 99% CI, 99% lower bound, 300 locations, 300 per location

Acceptance limit table exported from SAS as "TABD2.xls" and then imported into MathCad.

Test Mean and CV

$U := 87$

$SIGSE := 2$ $DSE := 0.25$

$SIGSM := 2$ $DSM := 0.25$

$SIGSM2 := SIGSM^2$

$EXPSE2 := SIGSE^2$

$i := 0..1511$

$EXPSM2_i := EXPSE2 + (NN_i \cdot SIGSM2)$

Acceptance Limit Table

data :=

C:\..\TABD2.xls

$MeanL := data^{\langle 6 \rangle}$

$SE := data^{\langle 3 \rangle}$

$SM := data^{\langle 4 \rangle}$

$NN := data^{\langle 0 \rangle}$

$N := data^{\langle 2 \rangle}$

$L := data^{\langle 1 \rangle}$

calculation of PMean by table row

$$PMean_i := 1 - cnorm\left[(MeanL_i - U) \cdot \sqrt{\frac{N_i}{EXPSM2_i}}\right]$$

calculation of PSE by table row

$$PSE_i := pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i)^2}{EXPSE2}\right], \left[L_i \cdot (NN_i - 1)\right]\right] - pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i - DSE)^2}{EXPSE2}\right], \left[L_i \cdot (NN_i - 1)\right]\right]$$

calculation of PSM by table row

$$PSM_i := pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i)^2}{EXPSM2_i}\right], (L_i - 1)\right] - pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i - DSM)^2}{EXPSM2_i}\right], (L_i - 1)\right]$$

$P_i := PMean_i \cdot PSE_i \cdot PSM_i$ joint passing probabilities by table row

$PSUM := \sum P$ sum of joint probabilities using the vector sum operator

$PSUM = 0.76594$ Integrated passing probability

Integration check for Bergum DISP2 Validation

Calculations based on acceptance limit table generated from the CuDAL validation run for

Q = 85, 99% CI, 99% lower bound, 300 locations, 300 per location

Acceptance limit table exported from SAS as "TABD2.xls" and then imported into MathCad.

Test Mean and CV

$U := 87$

$SIGSE := 3 \quad DSE := 0.25$

$SIGSM := 2 \quad DSM := 0.25$

$SIGSM2 := SIGSM^2$

$EXPSE2 := SIGSE^2$

$i := 0..1511$

$EXPSM2_i := EXPSE2 + (NN_i \cdot SIGSM2)$

Acceptance Limit Table

data :=

C:\..\TABD2.xls

$MeanL := data^{\langle 6 \rangle}$

$SE := data^{\langle 3 \rangle}$

$SM := data^{\langle 4 \rangle}$

$NN := data^{\langle 0 \rangle}$

$N := data^{\langle 2 \rangle}$

$L := data^{\langle 1 \rangle}$

calculation of PMean by table row

$$PMean_i := 1 - cnorm\left[(MeanL_i - U) \cdot \sqrt{\frac{N_i}{EXPSM2_i}}\right]$$

calculation of PSE by table row

$$PSE_i := pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i)^2}{EXPSE2}\right], [L_i \cdot (NN_i - 1)]\right] - pchisq\left[\left[\frac{L_i \cdot (NN_i - 1) \cdot (SE_i - DSE)^2}{EXPSE2}\right], [L_i \cdot (NN_i - 1)]\right]$$

calculation of PSM by table row

$$PSM_i := pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i)^2}{EXPSM2_i}\right], (L_i - 1)\right] - pchisq\left[\left[\frac{NN_i \cdot (L_i - 1) \cdot (SM_i - DSM)^2}{EXPSM2_i}\right], (L_i - 1)\right]$$

$P_i := PMean_i \cdot PSE_i \cdot PSM_i$ — joint passing probabilities by table row

$PSUM := \sum P$ — sum of joint probabilities using the vector sum operator

$PSUM = 0.01274$ — Integrated passing probability

CURRICULUM VITA'S

Douglas S. Lee, Ph.D.

Pfizer Central Research
Mathematical & Statistical Sciences
Eastern Point Road, MS8118A-3046
Groton, CT 06340
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45 Hedge Avenue
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douglas.s.lee@mindspring.com

Professional, results-oriented statistical consultant able to rapidly and accurately assess complex pharmaceutical development problems and find innovative and creative solutions. Works collaboratively with analytical chemists, pharmaceutical scientists, technicians, and programmers to solve stability, analytical, and method optimization problems. Strong teaching, consulting, management and small team negotiating skills. Demonstrated team-builder and leader known for professional integrity.,. Thoughtful, common sense approach to problem-solving with an eye to practical applications, client needs, budget, and time constraints.

Technical Skills Summary

Statistics and Experimental Design: General linear modeling and ANOVA with multiple comparisons for point and interval hypotheses, hierarchical mixed model analysis, experimental design (classical, Taguchi, and RSM), statistical process control, multivariate analysis of variance, principal components analysis, clustering, factor analysis, multi-dimensional scaling, discriminant analysis, and non-parametric statistics.

Statistical and Mathematical Software: SAS (STAT, QC, ANALYST, INSIGHT), S-Plus, Statgraphics, JMP, Statistica, Systat, Design-Expert, NQuery, Biom, Macsyma, MathCad.

Technical Graphics Software: AXUM, Visio, Statgraphics

General Office Software: Excel, Word, Powerpoint, Access, WordPerfect, Quattro Pro

Employment History

Pfizer Central Research, Groton, CT 1998 – present

Statistical Consultant, Associate Director – Mathematical & Statistical Sciences

Statistical consultant for Developmental Research. Experimental design and analysis for inhaled insulin development, process scale-up, and dose uniformity. NDA and market stability analyses with adjustments for changes in analytical methods and other study changes as required. HPLC assay optimization for ruggedness and robustness, trouble-shooting dissolution methods, experimental designs for equivalence testing and method transfer, develop and teach service courses for analytical chemists (logic of hypothesis testing, basic statistics, experimental design).

DSL Associates Inc., Norwich, CT 1996 – 1998

Statistical Consultant, President

Established a successful private practice in statistical analysis and experimental design for academic, physical therapy, pharmaceutical, and engineering clients.

National Undersea Research Center, University of Connecticut, Storrs, CT 1989 - 1996

Freshwater Program Director

Conducted annual solicitation, review, and coordination of research on factors controlling contaminant and excess nutrient cycling in large lakes and trophic transfer of contaminants. Planned, coordinated, and supervised at-sea operations for research submersibles and remotely operated vehicles in the U.S., Canada, Israel, Russia, Uganda, and Burundi. Specified, designed, and developed advanced underwater sampling systems. Co-managed $2.5 million annual budget.

Department of Marine Sciences, University of Connecticut, Storrs, CT 1989-1997

Adjunct Assistant Professor of Marine Sciences

Established and administered environmental assessment projects in the Great Lakes and Long Island Sound for NOAA and Connecticut Dept. of Environmental Protection clients. Statistical and experimental design consultant for faculty and students.

Education

1.7 CEUs, Advanced Multivariate Analysis, Inst. Professional Education 1999
1.7 CEUs, Analysis of Messy Data – Mixed Models, Inst. Professional Education 1998
1.7 CEUs, Analysis of Messy Data – Fixed Effects, Unbalanced Designs, Inst. Professional Education 1997
3.0 CEUs, Advanced Concurrent Engineering Project Mgt., University of Rhode Island 1996
Ph.D., Zoology, Michigan State University 1989
M.S., Fisheries Science/Ecology, Oregon State University 1983
B.S., Fisheries Science/Management, Oregon State University 1980

Awards and Honors

Pfizer Central Research Achievement Award 2000

Pfizer Best Practices and Leadership Teams

Dissolution Method Development
HPLC Ruggedness and Robustness
Developmental Research Leadership Team for Inhaled Insulin

Selected Pharmaceutical Posters/Presentations/Publications

2000

Lee Douglas S. Modeling of fill weight/formulation/product performance for alternative 1.0 and 3.0 mg package strengths for inhaled insulin. January 2000 Special Meeting, Inhale Therapeutics.

D'Ambrosio, Lee, Richard Hutchins, and Douglas Lee. Interval hypothesis tests: the statistical method of choice to test equivalency of interlaboratory data. Pittcon 2000.

1999

Lee, Douglas S. Statistical comparison of dissolution profiles: Testing for equivalence. June 1999 MSS Poster Session.

Bartkowski, R., D. Lee., N. Peckham, and L. Margulis. Quantitative electrophoresis: Using ANCOVA for standard curve calibration of SDS-Page Gels.

Peckham, N, R. Kitchell, R. Bartkowski, D. Lee, and L. Margulis. Development of quantitative SDS-Page for proteins.

Lee, Douglas S. and White, Steve. 1.0 mg clinical dose uniformity and probability of passing FDA guidance specifications. September 1999 Special Meeting, Inhale Therapeutics.

Lee Douglas S. 3.0 mg clinical dose uniformity simulation. November 1999 Technical Meetings, Inhale Therapeutics.

1998

Lada, Mark A., Glenna Walters, Laurie St. Pierre, James Curley, Douglas Lee, and Lisa Alimo. Investigation of propyl paraben preservative loss from zyrtec syrup stored in polypropylene bottles.

Oat, David A., Douglas Lee, Joseph Mongillo, Robert Timpano, and Henry Yorzinski. Current best practice guideline for an extraction solvent screen applied to solid drug product formulations.

Dumont, Monica L., Mimi Kuzniar, and Douglas Lee. Dissolution Dilemma - Optimization of CP-358,774-1 dissolution performance using experimental design principles.

Mongillo, Joseph A., Douglas Lee, John Goras, William Sokol, and Angie Hausberger. Experimental Design: Robustness of ziprasidone hydrochloride capsule dissolution methodology.

Bye, Cheryl, Shawn Jones, John Larmann, Douglas Lee, and A.. O'Farrell. Experimental design approach to method ruggedness evaluation.

1997

Lee, Douglas S., Joseph Mongillo, John Goras, William Sokol, and Angie Hausberger. Analytical method ruggedness and trouble-shooting: Application of a fractional factorial design to a dissolution assay.

Helen N. Strickland

Professional experience

1996 – Present GlaxoSmithKline Zebulon, NC

Statistical Consultant

Serve as an independent authority on complex statistical product quality issues, which includes identifying relevant product and process problems. Provide advice on data collection and support for data analyses, provide written and/or verbal interpretation and presentation of the results of statistical analyses, and recommend appropriate course of action to management. Improve the experimental methodology and the statistical operations of the Technical Operations division by providing the scientific and statistical rationale/justification for product and process investigations, validations, experiments and improvements. Consult with various levels of management and technical staff to clarify the objectives of product, process and laboratory investigations, process improvement initiatives, process validation initiatives, analytical method validations and analytical method transfers.

1993 – 1996 Glaxo Zebulon, NC

Statistician

Performed statistical analysis to support routine objectives and process improvement initiatives of manufacturing, packaging, product transfers, new product development, quality assurance and regulatory affairs. Performed statistical analysis for establishing product specifications, product sampling plans, analytical and in-process trend analyses, annual reports, product transfer evaluations, analytical methods transfer, product failure and out-of-specification investigations. Perform statistical analysis to support post-approval regulatory submissions (PAS, CBE, general correspondences, annual stability reports, etc.).

1992 – 1993 Glaxo Zebulon, NC

Assistant Chemist, QA Analytical Services.

Conducted routine and non-routine analytical tests while adhering to cGMP and established policies. Interpreted validity of own test data and performed data summarization. Maintained appropriate documentation.

1991 – 1992 Kabi Pharmacia Clayton, NC

Assistant Chemist, QA

Conducted routine and non-routine analytical tests while adhering to cGMP and established policies on finished product testing and USP Water testing.

1984 – 1991 Novo-Nordisk Biochemical Ind Franklinton, NC

Chemical Analyst to Senior Analyst, Quality Control

Conducted and coordinated special projects, validated and implemented new analytical test methods. Performed chemical, enzyme and microbiological testing. Collected, collated and performed statistical analysis on data.

Educational experience

December, 1996 North Carolina State University Raleigh, NC

Master of Statistics

May, 1984 North Carolina State University Raleigh, NC

Bachelor of Science in Chemistry

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2110 E. Galbraith St.
Cincinnati, Ohio 45215
(513) 948-7161 (voice)
(513) 948-6927 (fax)
jerry.planchard@aventis.com

Professional Experience

Aventis Pharmaceuticals, Inc. (and predecessor companies)

1992 - Present Senior Consultant, Operations Dept., Cincinnati, OH

Primary technical resource for statistical quality control activities in Cincinnati Operations. This activity involves the application of statistical process control, experimental design, and general statistical theory to continuous improvement, process validation, and new product introduction.

1992 Department Head, Physical and Analytical Chemistry, Kansas City, MO

Responsible for all preformulation, analytical spectroscopy, and GLP coordination of US development compounds. Supervised a department of 15 scientists.

1989 - 1992 Research Scientist, Pharmacy Research Dept., Cincinnati, OH

Responsible for the preformulation characterization and stability program of all new clinical canidates. Supervised a group of 6 scientists

1979 - 1988 Research Associate, Chemical Development Dept., Cincinnati, OH

Responsible for the GMP pilot unit facility and supervision of four chemists and two technicians. Primary mission was the scale-up of organic synthesis to provide 1 - 100 kg quantities of drug substance for toxicology and clinical studies. Responsible for all aspects of the operation including reactive chemicals review and environmental assessment. Also responsible for incorporating synthesis procedures into IND and NDA applications.

1975 - 1979 Senior Scientist, Chemical Development Dept., Cincinnati, OH

Responsibilities included design of a bulk drug substance manufacturing plant, optimization of synthesis routes and methods, and manufacturing cost assessments of drug candidates.

<u>Louisiana State University, Baton Rouge, LA</u>

1967 - 1975 Associate Professor, Chemical Engineering Dept.

Research interests included computer process control, process optimization, and mass transfer.

Other Professional Activities

1994 - 1996 Adjunct Instructor - University of Cincinnati, Cincinnati, OH

Course -- Experimental Design in the Chemical Industry

Computer Releated Experience

- Taught Fortran programming for 7 years while at Louisiana State University
- Extensive programming experience in 4 computer languages including Fortran, C, SAS, and Basic
- Contract programmer for the Air Force, 1968 - 1971 - developed simulation models of air to ground missle systems
- SAS user since 1992.

Education

1959 B.S. in Chemical Engineering, Tulane University, New Orleans, LA

1967 Ph.D. in Chemical Engineering, Tulane University, New Orleans, LA

Recent Short Courses

1995 Analysis of Messy Data, The Institute of Professional Education, Arlington, VA
1996 Linear and Non-linear Regression, The Institute of Professional Eduction, Arlington, VA.
1997 Applied Multivariate Methods, The Institute of Professional Education, Arlington, VA
1998 Macro Programming, SAS Institute, Cincinnati, OH
1999 Principles of Regression Analysis, SAS Institute, Denver, CO
2000 Advanced General Linear Models with an Emphasis on Mixed Models, SAS Institute, Cary, NC

Professional Organizations and Associations

American Institute of Chemical Engineers
Statistical Working Group of PhRMA
Blend Uniformity Working Group of the Pharmaceutical Quality Research Initiative (PQRI)

Jerome A. Planchard **(513) 948 - 7161 (day)**
3528 Sherbrooke Dr. **(513) 733-9424 (evening)**
Cincinnati, Ohio 45241

Recent Publications and Presentations

‘‘Blend Uniformity Validation and the Effect of Thief Sampling Error’’, a series of presentations made at conferences sponsored by the Institute for International Research in Orlando, FL (12/97), Tampa, FL (3/98), Princeton, NJ (5/98), London, UK (7/98), Princeton, NJ (4/99), and Philadelphia, PA (3/00).

‘‘Blend Uniformity Analysis: Validation and In-Process Testing” , Co-author, PDA Technical Report No. 25, PDA Journal of Pharmaceutical Science and Technology Supplement, Volume 51, number S1, November-December, 1997

‘‘Acceptance Criteria in Unit Dose Sampling’’, co-authored with D. Gonzales and J. Hofer, PDA Annual Meeting, Philadelphia, PA, November, 1996.

Panel Member, Blend Uniformity Session - Joint FDA/Industry Training and Educational Meeting, August 20 - 21, 1996, Kansas City, MO

Panel Member, Forum on Blend Analysis, Sponsored by PDA, January 29, 1996, Rockville, MD

‘‘Blend Uniformity and Unit Dose Sampling’’, co-authored with J. Berman, Drug Development and Industrial Pharmacy, 21(11), 1257 - 1283 (1995)

Laura B. Foust

Assistant Senior Statistician
Quality Control Technical Excellence

Eli Lilly and Company
Lilly Corporate Center
Indianapolis, IN 46285

ph 317.276.3007 fax 317.276.4669
e-mail FOUST_LAURA_B@LILLY.COM

Years of service: 10 Position effective: 4/95 Revised: 4/00

Education

Bachelor, Mathematics, University of Akron
Masters, Statistics, Purdue University

Languages

English/Native Language

Work Experience

Assistant Senior Statistician, Eli Lilly and Company- QC Technical Excellence	4/95-present
Statistician, Eli Lilly and Company- Indianapolis Pharma Mfg (Stat and Math services)	6/90-4/95
Graduate Student Instructor, Statistical Consultant, Purdue University	8/88-5/90
Tutor, Akron University	8/84-5/88
Teller (summers), Bank One, Ohio	5/84-8/87

Knowledge/Skills/Abilities/Strengths

Laura:

- Provides technical mentoring to operators, lab technicians, Quality Control and Technical Service scientists, and management. She is also a technical mentor to scientists in International. Technical Services, Purchased Materials Quality Control, and the Global Analytical Support Labs at Eli Lilly and Co.
- Has led recruiting efforts to replace 5 statisticians in her component and has provided assistance to two other components in their recruiting efforts. Laura currently assists new manufacturing statisticians with their career development and is Team leader for the Tech Excellence Statistical Support team.
- Has a broad understanding of the manufacturing operations in solid oral dosage form manufacturing plants and animal health parenteral products. She has 10 years experience in providing statistical consulting, study design, and analysis for production and laboratory issues in US, Puerto Rico, and various European and South American pharmaceutical and API manufacturing sites (e.g., Italy, Brazil).
- Is system owner of an internal computer application to perform acceptance limits calculations (base code is written in SAS), and has validated spreadsheet-based programs for internal use at Eli Lilly and Co.
- Has been a member of two Lilly CM&C teams (supporting NDA submissions) and has provided written contributions to many NDA supplements for Eli Lilly & Company.
- Has experience dealing with various regulatory and/or statistical issues involving site transfers (Italy, Mexico), product scale-up, site certification (Brazil), third-party manufacturing contracts, and vendor quality.
- Is author/content expert of many Lilly local, site, and corporate (global) SOPs and associated training courses dealing with SPC, acceptance sampling, defect identification, and acceptance limits. She has received training in both instructor skills and structured writing. Laura is an experienced instructor.
- Has worked closely with statisticians, Lilly regulatory, QA, stability, and other Lilly central support groups to influence issues facing pharmaceutical manufacturing such as blend uniformity and stability issues. Laura is a member of Lilly World-wide Stability committee. She represents her component on the PhRMA Statistics Working group and serves on 2 subgroups. She is also a member of PDA.
- Laura is a member of the American Society for Quality and was on the core organizing team for the 2000 Quality Congress (in Indianapolis). She is a Deacon for her church, conducts church staff performance evals and handles personnel issues as an elected member to the Personnel committee, and is secretary for the CWF.

Mary Ann Gorko
104 Marlbrooke Way
Kennett Square, PA 19348
(610) 925-0887 (home)
(302) 892-8507 (work)

Work Experience:

July 1998 to present - DuPont Pharmaceuticals - Project Statistician
February 1996 to June 1998 - DuPont Merck Pharmaceuticals - Project Statistician
October 1991 to February 1996 - DuPont Merck Pharmaceuticals - Statistician
Biometrics
Wilmington, DE

Consultant for all phases of non-clinical statistics including Discovery, Safety Assessment, Pharmacy Research, and Analytical Research. Design and analyze experiments for formulation optimization. Analyze stability data for submittal to FDA. Project team member for drug dependent antibody assay. Review and analyze Safety Assessment studies. Make presentations on statistical techniques to various departments.

Extensive use of SAS programming in both a mainframe and PC environment. Strong background in graphics procedures, data manipulations and data analysis procedures.

Received several awards for prompt and excellent work such as helping out with analyses beyond job responsibilities, leading the effort to establish a user friendly program for safety assessment to enable them to update their own reference ranges and rapid turn around of data analyses.

January 1989 to September 1991 - DuPont - Contract Statistician
Quality Management and Technology Center
Wilmington, DE

Consulted in many areas including environmental and fibers. Supported other statisticians in analyzing test data for agricultural products. Validated many statistical programs. Received a silver award for contributions to an environmental project. Involved in design of experiments for process improvements and quality investigations.

Extensive use of SAS and MINITAB programming languages.

October 1984 to August 1988 - Wyeth Ayerst Laboratories – Nonclinical Statistician
Statistical Services
Rouses Point, NY

Supported Pharmacy and Analytical Research and Quality Control. Responsible for monitoring control chart system. Analyzed stability data and assay validation data. Analyzed data from formulation optimization studies.

Extensive use of SAS programming language.

Education:

MS Statistics, December 1984, Miami University, Oxford, OH
MS Mathematics, August 1984, Miami University, Oxford, OH
BA Mathematics and Statistics, August 1982, Miami University, Oxford, OH

Publications:

S.I.F. Badawy, M.M. Menning, M.A. Gorko, D.L. Gilbert, Effect of process parameters on compressability of granulation manufactures in a high-shear mixer. Int. J. Pharm, 198:51-61 (2000)

B.J. Mueller, S.A. Guessford, T.T. Chen, R.M. Karczmarcyk, M.A. Schreiber, J.W. Ycas, M.A. Gorko, A.J. Repta, Effect of inline filtration on ViaSpan Cold-Storage Solution. American Journal of Health-System Pharmacy, 55:266-271 (1998)

E.M. Sullivan, M.A. Gorko, R.C. Stellon, G.C. Chao, A Statistically-Based process for Auditing Clinical Data Listings. Drug Information Journal, 31:647-653 (1997).

P.J. Gillies, J.T. Billheimer, V.A. Blackston, D.A. Cromley, G.D. Figuly, R.T. Fischer, S.J. Germain, H.E. Godonis, M.A. Gorko, L.C. Grimminger, S.J. Harvey, J.H. Jensen, C.J. Kieras, S.D. Royce, H.C. Pautler, E.J. Shimshick, R.C. Stevenson, J.W. Hainer, DMP504, a Novel Hydrogel Bile Acid Sequestrant: II. Lipid-Lowering Pharmacology in the Hamster. Drug Development Research 41:65-75 (1997).

D.L. Burcham, B.A. Aungst, M. Hussain, M.A. Gorko, C.Y. Quon, S.M. Huang, The Effect of Absorption Enhancers on the Oral Absorption of the GP IIB/IIIA Receptor Antagonist, DMP728, in Rats and Dogs. Pharmaceutical Research, 12(12):2065-2070 (1995).

Professional Activities:

American Statistical Association – Delaware Chapter
President - 1998/1999, Vice President – 1997/1998, Treasurer – 1996/1997
Nominating Committee – 1995, Membership Chair - 1993/1994
Conference Committee 1991, 1993, and 1999

Toastmasters International
Vice President of Public Relations - 1996/1997

Member of PhRMA Statistics Technical Working Group - 1996 to present

Merlin L. Utter

Home Address
16 Cottage Place
Hillsdale, New Jersey 07642
(201) 664-1762

Work Address
Wyeth Ayerst Laboratories
Pearl River, NY 10965
(845) 732-2962

EMPLOYMENT

1984 - Present **Wyeth-Ayerst Pharmaceuticals**

Group Leader, Statistics, Quality Assuramce, Wyeth-Ayerst Oct 2000 - Present
Manage group of 2 full time statisticians and 2 part-time consultants performing functions discussed below.

Statistical Consultant, Quality Assurance, Wyeth-Ayerst 1994 – Oct. 2000
Provided statistical support to the Quality Assurance, and Manufacturing functions of Wyeth-Ayerst Pharmaceuticals. Activities included the design and analysis of validation data, the setting of release limits from stability data, statistical support for batch release and product contamination decisions, investigations of laboratory/manufacturing problems , response to regulatory issues, and support for the implementation of statistical process control within the plant.

Statistical Consultant, Quality Management, Std Prods Factory, Lederle 1994
Provided statistical support similar to the above but to the Quality Assurance, and Manufacturing functions within the Standard Products focused factory of Lederle Laboratories.

Statistical Consultant, Quality Management 1984 - 1994
Provided statistical support similar to the above, but as part of a group that serviced the entire Lederle Division. Hired two statisticians and managed group for the last two years.

1974-1983 **The Procter and Gamble Company**

Biometrician, Beauty Care Division 1981 - 1983
Provided a leadership role in the design and execution of hair and skin clinical studies. Responsibilities included helping the project teams plan both their current and long-term clinical needs as well as design, analyze and interpret test results for all clinical studies. Managed three people in this role.

Statistical Consultant , Toilet Goods Division 1980 - 1981
Responsible for providing statistical consulting in the areas of Process and Product Development, Products Research, and Regulatory. Provided statistical support in such areas as claim substantiation, design and analysis of data for both laboratory and consumer testing, and design of experiments for process optimization.

Internal Corporate Consultant 1974 - 1980
Consulted with both on-site and remote locations in the areas of Manufacturing and Product Development, specializing in the solving of a wide assortment of quality control/quality assurance problems as well as cost savings opportunities. Also consulted in the areas of R&D, Engineering, General Advertising, Sales and Marketing.

EDUCATION

Rensselaer Polytechnic Institute; Troy, New York

1974 Ph. D. - Statistics and Operations Research
NSF Fellowship, GPA=4.0/4.0

Dissertation: Robustness of Experimental Designs and Various Optimality Criteria

1971 M. S. - Statistics and Operations Research
Full-time teaching assistant, NSF Research Summer Grant, GPA=3.8/4.0

1969 B. S. - Mathematics
Dean's List, Cum Laude, GPA=3.5/4.0

PUBLICATIONS

Chapter on Process Validation, (with J. Bergum), Encyclopedia of Biopharmaceutical Statistics, 422-439, Shein-Chun Chow ed., Marcel Dekker (2000).

"An Evaluation of the Pooled Dissolution Test Acceptance Sampling Procedure for Pooled Samples", (with R. Wojcik and A. Zimmermann), Pharm Forum, 1995 (21,4), 1169-1175

"Cyclical Job Sequencing on Multiple Sets of Identical Machines,"(with H. Stern and E. Rodriguez), Naval Research Logistics Quarterly, 1977, 24 (1), 137-151.

PRESENTATIONS

Organizer/moderator/speaker for session on Process Validation, Muncie Statistical Meetings, May 1990

PROFESSIONAL AFFILIATIONS

American Statistical Association
American Society For Quality Control
PhRMA QC Statistics Committee

Plinio A. De los Santos, Jr.
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OBJECTIVE:
To obtain a position involving the use of applied statistics and operations research methods.

EDUCATION:

- ***Rensselaer Polytechnic Institute- Troy, N.Y.***
  Ph.D., Decision Sciences & Engineering Systems
  Completion date: 12/98. GPA: 3.92.
  Doctoral Thesis: "Statistical Methods for Estimating and Characterizing Social Welfare Recipient Payments."

- ***Rensselaer Polytechnic Institute - Troy, N.Y.***
  Master of Science in Industrial and Management Engineering
  Applied Probability, Statistics and Quality Control concentration.
  Completion date: 05/96. GPA: 3.90.

- ***University of Puerto Rico - Rio Piedras Campus, P.R.***
  Master of Business Administration.
  Completion date: 12/92. GPA: 3.87.

- ***Technological Institute of Santo Domingo - Dominican Republic***
  Bachelor of Science in Industrial Engineering (Summa Cum Laude)
  Completion date: 10/86. GPA: 3.84.

JOB EXPERIENCE:

- ***Principal Quality Engineer, MicroStrategy Inc.***, Vienna, VA (03/99 to present)
  QE Lead for I-Benchmark function. Performs simulation-based scalability and reliability testing of e-business and OLAP software applications. Develops modeling algorithms to estimate machine requeriments under clustered enviroments. These tasks require exposure to web-application stress tools (like WAST), multiple RDBMS (such as Oracle, SQL Server and MS Access) and machine clustering solutions (like Cisco's LocalDirector).

- ***Research Assistant, Rensselaer Statistical Consulting Center***, Troy, N.Y. (01/96 to 12/98)
  Developed and applied statistical methods in public administration and medical research projects. These projects required the development of new techniques for multi-period sampling, nonparametric imputation of missing data and survival analysis of social welfare data. Also, the evaluation of such new techniques required the development of simulation experiments with large data sets.

- ***Schein Pharmaceutical Inc.***, Carmel N.Y. (Summer/95)
  Performed re-organization analysis for the drug-stability department. This project required the formulation and solution of an integer programming "Knapsack" problem for approaching resource allocation issues. Also, it required the evaluation of the sampling and regression approaches employed in the analysis of drug-stability data.

- ***Pharmaceutical Technologist, Warner Lambert Inc.***, Fajardo, P.R. (05/93 to 06/94)
  Performed data analysis of process and product validation projects, involving the application of the following statistical techniques: analysis of variance, multiple regression analysis, design of experiments, SPC and acceptance sampling. Also, performed project management of GMP compliance projects and product reformulation bio-studies.

COMPUTER SKILLS:

Application Area	***Programs***
General purpose programming	FORTRAN
RDBMS (SQL)	MS Access, Oracle and SQL Server
Statistics	SAS, Splus, Minitab, Statgraphics
Simulation modeling	Siman, Arena
Mathematical programming	Lingo, Ampl
Project management	MS Project, Time Line
Web Pages	HTML, ASP, XML
Software Testing Automation	SQA Robot, WAST

Note: Also familiarity with Windows 95, 98 and NT, and UNIX operating systems.

LANGUAGES: Spanish and English.

CITIZENSHIP STATUS: US Citizen.