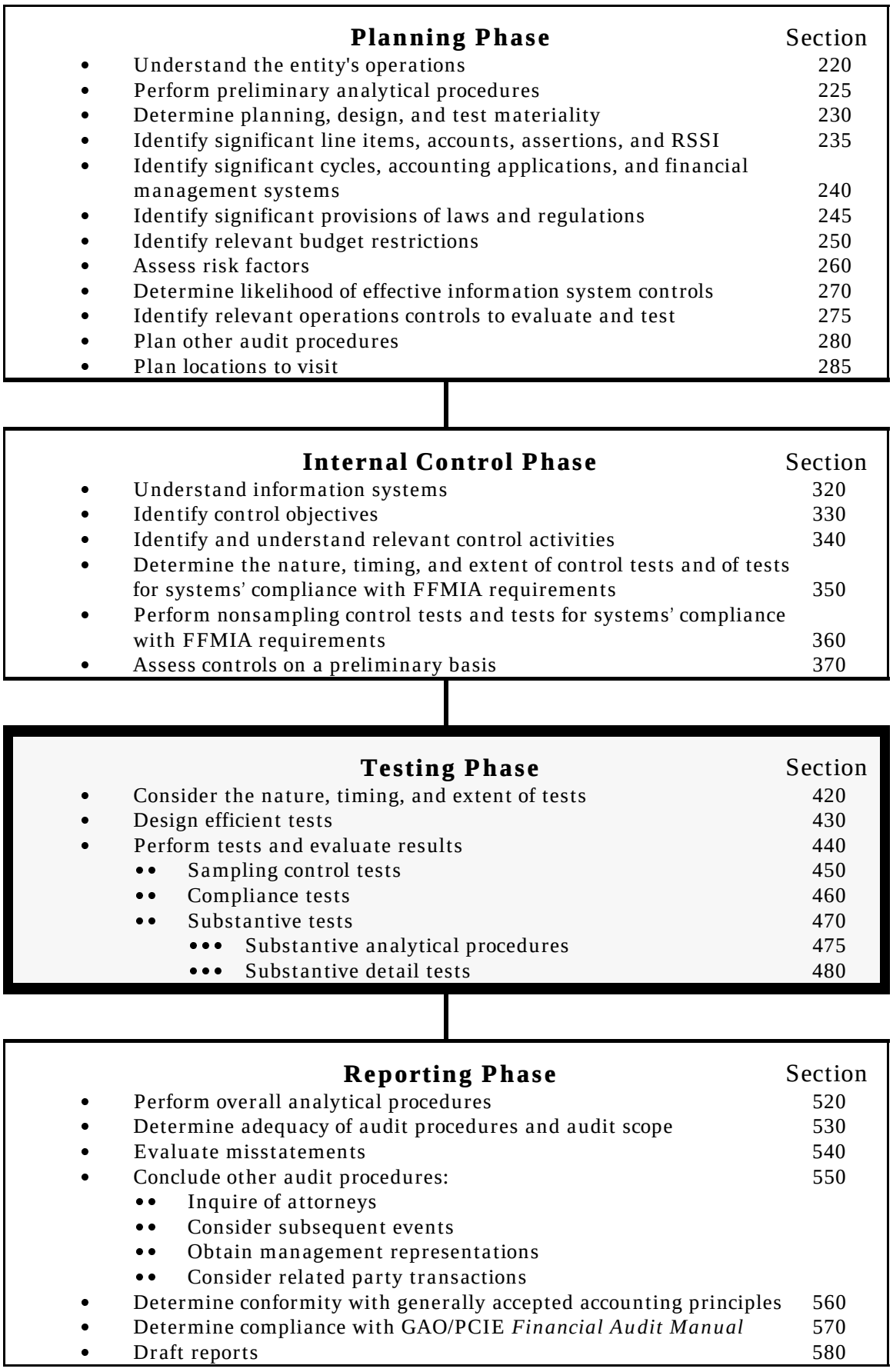
SECTION 400

Testing Phase

Figure 400.1: Methodology Overview



410 - OVERVIEW

.01 During the testing phase, the auditor gathers evidence to report on the financial statements, internal control, whether the entity's systems are in substantial compliance with the three requirements of FFMIA, and the entity's compliance with significant provisions of laws and regulations. (See figure 400.1.) The following types of tests are performed in the testing phase:

- **Sampling control tests** may be performed to obtain evidence about the achievement of specific control objectives. If the auditor obtains sufficient evidence regarding control objectives through the use of nonsampling control tests (such as observation, inquiry, and walkthroughs including inspection of documents), sampling control tests are not necessary, as discussed in section 350. Further guidance on sampling control tests begins in section 450.

- **Compliance tests** are performed to obtain evidence about compliance with significant provisions of laws and regulations. Further guidance on compliance tests is in section 460.

- **Substantive tests** are performed to obtain evidence that provides reasonable assurance about whether the financial statements and related assertions are free of material misstatement. Further guidance on substantive tests is in section 470.

.02 Sampling is often used in these tests. Sampling requires the exercise of professional judgment as well as knowledge of statistical sampling methods. The following sections provide a framework for applying sampling to financial audit situations, but are not meant to be a comprehensive discussion. Additional background and guidance on sampling is provided in the Audit Guide *Audit Sampling* (2001 issue),[1] published in 1999 by the American Institute of Certified Public Accountants and in *Using Statistical Sampling* published by GAO (accession number 129810). The auditor should consider whether he or she needs to consult with the Statistician for assistance in designing and evaluating samples. The auditor should consider the costs and benefits in determining which type of sampling to use.

[1] The FAM generally uses the same terminology as the Audit Guide.

.03 During this phase, the auditor performs the following activities for each type of test:

- Consider the nature, timing, and extent of tests
- Design efficient tests
- Perform tests
- Evaluate results

Each of these processes is discussed below.

420 - CONSIDER THE NATURE, TIMING, AND EXTENT OF TESTS

CONSIDER THE NATURE OF TESTS

.01 The auditor determines the testing methods that will best achieve the audit objectives for sampling control tests, compliance tests, and substantive tests. Testing methods generally can be classified as either analytical procedures or detail tests. Analytical procedures involve the comparison of the recorded test amount with the auditor's expectation of the recorded amount and the investigation of any significant differences between these amounts. Detail tests can be classified in two general categories: sampling and nonsampling. Sampling methods involve the selection of individual items from a population with the objective of reaching a conclusion on all the items in the population (including those not selected for testing). Nonsampling methods involve selections to reach a conclusion only on the items tested. Nonsampling requires the auditor to assess the risk of misstatement in the items not tested.

.02 The testing method selected by the auditor is a matter of the auditor's judgment, considering the objectives of the test, the nature of the population, the results of procedures performed during the planning and internal control phases (including combined risk assessment and test materiality), and possible efficiencies. For tests that involve sampling, efficiencies can be achieved by using a common sample for each test. These potential efficiencies are discussed further in section 430.

CONSIDER THE TIMING OF TESTS

.03 As discussed in section 295 D, the auditor may choose to conduct tests before or after the balance sheet date (interim testing) or to conduct all tests as of the balance sheet date. Section 495 C provides guidance on interim testing, tests of the period between the interim date and the balance sheet date (the rollforward period), and related documentation.

CONSIDER THE EXTENT OF TESTS

.04 For each type of test, the auditor determines, based on judgment, the extent of tests to be performed. Generally, the extent of sampling control tests is a function of the auditor's preliminary assessment of the effectiveness of

controls and the number of control deviations expected. The extent of compliance tests is a function of the effectiveness of compliance controls. The extent of substantive tests is a function of combined risk and test materiality.

430 - DESIGN EFFICIENT TESTS

.01 After considering the general nature, timing, and extent of the tests to be performed, the auditor should design specific tests. The auditor should coordinate similar tests to maximize efficiency. For tests that involve sampling, efficiencies can be realized by performing numerous tests on a common sample (multipurpose testing).[1] The auditor generally should minimize the number of separate sampling applications performed on the same population by attempting to effectively achieve as many objectives as possible using the items selected for testing.

.02 As discussed in section 480, there are several methods of selecting items for testing. When determining the selection method to use during a multipurpose test, the auditor generally should use the method considered most appropriate for substantive detail tests in the particular situation. Use of this selection method is usually the most efficient because sampling control and compliance tests generally can be based on any type of sample.

.03 For example, the auditor might use a sample of property additions to (1) substantively test the amount of additions and (2) test financial reporting controls over property acquisition. If a substantive test would require 135 sample items and if the test of financial reporting controls would require 45 sample items, the auditor should select 135 items in the sample but test controls relating only to 45. The 45 items for control testing should be selected randomly or systematically (with a random start) from the 135 sample items. For example, beginning from a random start, every third item selected for substantive testing should be tested for controls. If appropriate, the auditor may test controls relating to all sample items to provide additional assurance concerning controls.

[1] Many factors influence efficiency in addition to number of sampling applications, such as sample size, number of locations it is necessary to visit to achieve audit objectives, nature of the audit procedures, extent of review required, whether rework can be avoided by designing easy-to-follow procedures.

[This page intentionally left blank.]

440 - PERFORM TESTS AND EVALUATE RESULTS

.01 The auditor should perform the planned tests and should evaluate the results of each type of test separately, without respect to whether the items were chosen as part of a multipurpose test. Guidance on performing and evaluating the results is presented for each type of test in the following sections

- Section 450 - Sampling control tests,
- Section 460 - Compliance tests, and
- Section 470 - Substantive tests.

.02 Sometimes, tests performed with the expectation of obtaining certain results give other results. When this happens, the auditor may wish to expand a sample to test additional items. Unless planned for in advance, this generally cannot be done simply, as discussed in paragraphs 450.17, 460.02, and 480.28; the auditor should consult with the Statistician in such cases.

.03 The auditor should keep in mind that the consideration of the risk of material misstatement due to fraud (discussed in section 260 for planning) is a cumulative process that should be ongoing throughout the audit. During testing, the auditor may become aware of additional fraud risk factors or other conditions that may affect the auditor's consideration of fraud risk factors identified during planning, such as discrepancies in the accounting records, conflicting or missing evidential matter, or problematic or unusual relationships between the auditor and the entity being audited. The auditor should consider whether fraud risk factors or other conditions identified require additional or different audit procedures. (See section 540.)

.04 For CFO Act agencies and components listed in OMB audit guidance the auditor is required to report on the substantial compliance of their financial management systems with the requirements of FFMIA. The auditor should conclude on substantial compliance at the completion of the audit work based on work done in the internal control and testing phases, as discussed in section 540.

[This page intentionally left blank.]

450 - SAMPLING CONTROL TESTS

.01 Controls that leave documentary evidence of their existence and application may be tested by inspecting this evidence. If sufficient evidence cannot be obtained through walkthroughs in combination with other observation and inquiry tests, the auditor generally should obtain more evidence by inspecting individual items selected using sampling procedures. The auditor may use multipurpose testing to use the same sample to test controls and/or compliance and/or balances (substantive test). This is usually more efficient. Alternatively, the auditor may design a sample to test controls alone. In this case, the auditor generally should use random attribute sampling (described beginning in paragraph 450.05) to select items for sampling control tests.

.02 When planning sampling control tests, the auditor should determine (1) the objectives of the test (including what constitutes a deviation), (2) the population (including sampling unit and frame), (3) the method of selecting the sample, and (4) the sample design and resulting sample size. The auditor should document the sampling plan in the workpapers. See section 495 E for example workpapers for documenting samples.

OBJECTIVES OF THE TEST

.03 The auditor should clearly indicate the objectives of the specific control test. In designing samples for control tests, the auditor ordinarily should plan to evaluate operating effectiveness in terms of the rate of deviations in units or dollars from prescribed controls. This involves defining (1) the specific control to be tested and (2) the deviation conditions. The auditor should define control deviations in terms of control activities not followed. For example, the auditor might define a deviation in cash disbursements as "invoice not approved and initialed by authorized individual."

POPULATION

.04 In defining the population, the auditor should identify the whole set of items on which the auditor needs to reach a conclusion and from which the sample should be drawn. This includes (1) describing the population, (2) determining the source document or the transaction documents to be tested, and (3) defining the period covered by the test. When multiple locations are involved, the auditor may consider all or several locations as one population for sampling if the controls at each location are components of

one overall control system. Before combining locations into one population, the auditor should consider such factors as (1) the extent of uniformity of the controls and their applications at each location, (2) whether significant changes can be made to the controls or their application at the local level, (3) the amount and nature of centralized oversight or control over local operations, and (4) whether there could be a need for separate conclusions for each location. If the auditor concludes that the locations should be separate populations, he or she should select separate samples at each location; he or she should evaluate the results of each sample separately.

METHOD OF SELECTION

.05 The auditor should select a sample that he or she expects to be representative of the population. For tests of controls, attribute sampling achieves this objective. Attribute sampling requires random selection of sample items without considering the transactions' dollar amount or other special characteristics. IDEA or other software may be used to make random selections.

SAMPLE SIZE

.06 In designing attribute samples for which inspection is the principal source of evidence of control effectiveness, the auditor should determine the objectives of the sample. For financial reporting control tests, the objective is to support the preliminary assessment of control risk as either moderate or low. For compliance and operations control tests, the objective is to support the preliminary assessment of the control as effective. In addition, for financial reporting and compliance control tests, there is an objective of obtaining evidence to support the auditor's report on internal control.

.07 To determine the sample size, the auditor uses judgment to determine three factors: the confidence level, the tolerable rate (maximum rate of deviations from the prescribed control that the auditor is willing to accept without altering the preliminary assessment of control effectiveness), and the expected population deviation rate (expected error rate). Once the auditor determines these factors, he or she may use software (such as IDEA) or tables to determine sample size and to determine how many deviations the auditor may find without having to change the control risk assessment. GAO uses Tables I and II. Table I on the following page may be used to determine the sample sizes necessary to support these preliminary

assessments of controls and to conclude on the effectiveness of the controls. Tables I and II are used to evaluate the test results. The AICPA has other examples in its guidance, and the GAO factors are within the range of the AICPA examples. If an auditor chooses to use factors other than Tables I and II, he or she should consult with the Statistician.

.08 Tables I and II are based on a 90 percent confidence level. (This confidence level used at GAO is generally appropriate because the auditor obtains additional satisfaction regarding controls through other tests such as substantive tests, inquiry, observation, and walkthroughs.)

.09 Tables I and II are each based on different tolerable rates. Table I is based on a tolerable rate of 5 percent, and Table II is based on a tolerable rate of 10 percent. Each table shows various sample sizes and the maximum number of deviations that may be detected in each sample to rely on the controls at the determined control risk level. (See paragraphs 450.13-.15 for a discussion of the evaluation of test results.)[1]

[1] Tables I and II assume a large population (generally over 5,000 items). If the population is small, the auditor may ask the Statistician to calculate a reduced sample size and to evaluate the results. Generally, the effect is small unless the sample size per the table is more than 10 percent of the population.

Figure 450.1: Sample Sizes and Acceptable Numbers of Deviations
(90% Confidence Level)

TABLE I
(Tolerable rate of 5%)

(Use for determining sample sizes in all cases)

Sample Size	Acceptable Number of Deviations
45	0
78	1
105	2
132	3
158	4
209	6

TABLE II
(Tolerable rate of 10%)

(Use for evaluating sample results only if preliminary assessment of financial reporting control risk is low and deviations exceed Table I)

Sample Size	Acceptable Number of Deviations
45	1
78	4
105	6
132	8
158	10
209	14

.10 For financial reporting controls, if the preliminary assessment of control risk is low or moderate, Table I may be used to determine sample size. OMB audit guidance requires the auditor to perform sufficient control tests to justify a low assessed level of control risk, if controls have been properly designed and placed in operation.

.11 For compliance and operations controls, sample sizes may also be determined using Table I.

.12 The auditor may use the sample size indicated for 0 acceptable deviations (45 items). If no deviations are expected, the sample size will be the most efficient for assessing control effectiveness; if no deviations are found, the sample will be sufficient to support the assessment of control risk. However, the auditor may use a larger sample size if control deviations are expected to occur but not exceed the acceptable number of deviations for the table.

EVALUATING TEST RESULTS

Financial Reporting Controls

.13 To evaluate sample results, the auditor needs the sample size, the number of deviations, and the confidence level. The auditor may use software (such as IDEA) or tables to evaluate results.[2] If the auditor used Table I to determine sample size, and deviations are noted that exceed the acceptable number for the sample size, the auditor should follow the guidance below in deciding how to revise the preliminary assessment of control risk:

- **Low control risk:** If the preliminary assessment of control risk is low and if deviations are noted that exceed the acceptable number for Table I, but not Table II, control risk may be assessed as moderate. For example, if the original sample was 45 items, the auditor may reduce the assessment of control risk to a moderate level if there is not more than 1 deviation. If the auditor finds more than 1 deviation with a sample size of 45 items, the auditor concludes that the controls being tested are not operating effectively and should reassess control risk as high.

- **Moderate control risk:** If the preliminary assessment of control risk is moderate and if control deviations exceed the acceptable number for Table I, the auditor should conclude that control risk is high. The

[2] Using the AICPA guidance, the auditor computes the deviation rate and the upper limit at the desired confidence level (usually the same confidence level used to determine sample size). If the upper limit of deviations is less than the tolerable rate, the results support the control risk assessment. If not, the control risk should be increased in designing substantive tests.

preliminary assessment of control risk is based on the assumption that the controls operate as designed. If the preliminary assessment of control risk is moderate and if control tests indicate that the control is not operating as designed (deviations exceed the acceptable number in Table I), the auditor should conclude that the control is ineffective and revise the control risk assessment to high.

Compliance Controls

.14 If Table I is used to determine sample size and deviations are noted that exceed the acceptable number for the sample sizes shown in Table I, the auditor should conclude that the compliance control is not effective. The auditor also should determine whether any deviations noted ultimately resulted in noncompliance with a budget-related or other law or regulation.

Operations Controls

.15 If Table I is used to determine sample size and deviations are noted that exceed the acceptable number for the sample sizes shown in Table I, the auditor should conclude that the operations control is not effective. The auditor should not place reliance on ineffective operations controls when performing other auditing procedures.

OTHER CONSIDERATIONS

.16 If, during the testing of sample items, the number of deviations exceeds the acceptable number of deviations in Table I or II (as applicable), the auditor concludes that the controls are not operating as designed. However, the auditor should consider whether there are other reasons for continuing to test the remaining sample items. For example, audit team management should determine whether additional information (such as an estimate of the population rate of occurrence) is needed to report control weaknesses as described in paragraphs 580.31-.57. The significance of the weakness will determine how the auditor reports the finding and, therefore, which elements of the finding (condition, cause, criteria, possible effect, and recommendation or suggestion) need to be developed. Or, the auditor may want to include an interval estimate in the report. The auditor should consult with audit team management and the Statistician in deciding whether to complete the testing of the sample.

.17 If an unacceptable number of deviations is noted in the original sample and the auditor believes the use of a larger sample size might result in an acceptable number of deviations, the auditor should consult with the Statistician before selecting additional sample items. The selection and evaluation of additional sample items cannot be based on Tables I or II or on the formulas used by IDEA.

.18 The auditor should consult with the Statistician when projecting the rate of sample control deviations to a population for disclosure in a report. While typically stated as a percentage of transactions, the deviation rate is expressed as a percentage of dollars in the population if sampling control tests are performed on a sample selected using DUS (see paragraphs 480.14-.23).

[This page intentionally left blank.]

460 - COMPLIANCE TESTS

.01 The type of provision of a law or regulation and the assessment of the effectiveness of compliance controls affect the nature and extent of compliance testing. Based on the type of provision (as discussed in paragraph 245.01) the compliance tests discussed below should be performed.

TRANSACTION-BASED PROVISIONS

.02 To test transaction-based provisions, the auditor should use sampling to select specific transactions for testing compliance. The selection of transactions to test may be combined with tests of financial reporting, compliance, or operations controls and/or with substantive tests, as appropriate. If the selection is solely for compliance testing, the auditor generally should use a random attribute sample (see paragraph 450.05). To determine sample size, the auditor needs to make judgments as to confidence level, tolerable rate, and expected population deviation rate. Confidence level should be related to compliance control risk. For example, if the auditor determines compliance controls are effective, he or she may use an 80 percent confidence level; if ineffective, a 95 percent confidence level. Tolerable rate is the rate of transactions not in compliance that could exist in the population without causing the auditor to believe the noncompliance rate is too high. GAO auditors should use 5 percent for this. Since the auditor will assess the impact of all identified noncompliance, many auditors use zero as the expected population deviation rate. Using the above factors yields the following sample sizes:

Compliance Controls	Confidence Level	Minimum Sample Size[1]
Effective	80 percent	32
Not Effective	95 percent	59

[1] Tolerable rate of 5 percent, expected population deviation rate of 0, and a large population (see footnote on page 450-3). If the population is small, the auditor may ask the Statistician to compute a reduced sample size and to evaluate the results.

Since the auditor usually reports compliance on an entitywide basis, the auditor may use these sample sizes on an entitywide basis. Evaluation of test results is discussed in paragraph 460.07. The auditor should test the entire sample, even if instances of noncompliance are detected. If compliance controls were assessed on a preliminary basis as effective and the results of testing indicated that this assessment is not appropriate, in the above example, the auditor should consult with the Statistician to determine the appropriate sample size and selection procedures. The auditor cannot merely choose the other sample size, but may, for example, increase the sample size from 32 to 65 by using sequential sampling and randomly selecting 33 additional items. The Statistician should also evaluate the results when a test is expanded.

QUANTITATIVE-BASED PROVISIONS

.03 Generally, effective compliance controls should provide reasonable assurance that the accumulation/summarization of information is accurate and complete. If the compliance controls do not provide such reasonable assurance, the auditor should test the accumulation of information directly for existence, completeness, and summarization. Such tests may be either samples or nonsampling selections and generally should be designed to detect misstatements that exceed an auditor-determined percentage of the total amount of the summarized information or the amount of the restriction stated in the provision, if any (GAO generally uses 5 percent for this test materiality). (The amount of the restriction is described in paragraph 245.01.) Such tests may be discontinued if significant misstatements are noted that would preclude compliance. The test for compliance is the comparison of the accumulated/ summarized information with any restrictions on the amounts stated in the identified provision.

.04 For example, if provisions of budget-related laws and regulations are considered significant and if related budget and consequently compliance controls are ineffective, the auditor should test the summarized information directly for the following potential misstatements in budget execution information:

- **Validity:** Recorded amounts are not valid. (See section 395 F for validity criteria for obligations, expended authority, and outlays.)

- **Completeness:** Not all amounts are recorded.

- **Cutoff:** Obligations, expended authority, and outlays are not recorded in the proper period.

- **Recording:** Obligations, expended authority, and outlays are not recorded at the proper amount.

- **Classification:** Obligations, expended authority, and outlays are not recorded in the proper account by program and by object, if applicable, including the proper appropriation year if the account has multiple years. (Examples of program and object classifications are provided in section 395 F.)

- **Summarization:** Transactions are not properly summarized to the respective account totals.

.05 An example of audit procedures to test for these misstatements is included in section 495 B.

PROCEDURAL-BASED PROVISIONS

.06 In testing compliance controls relating to a procedural-based provision, the auditor generally would obtain sufficient evidence to conclude whether the entity performed the procedure and therefore complied with the provision. For example, the auditor's tests of compliance controls concerning receipt of information from grantees generally would provide evidence of whether such information was received and therefore whether the entity complied. If compliance control tests do not provide sufficient evidence to determine compliance, the auditor should perform additional procedures, as considered necessary, to obtain such evidence.

EVALUATING TEST RESULTS

.07 For any possible instances of noncompliance noted in connection with the procedures described above or other audit procedures, the auditor should

- discuss such possible instances with OGC and, when appropriate, the Special Investigator Unit and conclude whether noncompliance has occurred and the implications of any noncompliance;

- identify the weakness in compliance controls that allowed the noncompliance to occur, if not previously identified during compliance control testing;

- report the nature of any weakness in compliance controls and consider modification of the report on internal control as appropriate (see paragraphs 580.31-.55);

- consider the implications of any instances of noncompliance on the financial statements; and

- report instances of noncompliance, as appropriate. (See paragraphs 580.67-.75.)

470 - SUBSTANTIVE TESTS - OVERVIEW

.01 In the internal control phase, the auditor preliminarily assesses the level of combined (inherent and control) risk for each significant assertion within each significant line item or account (see section 370). Substantive audit procedures should be applied to all significant assertions in significant financial statement line items and accounts. The auditor's objective during substantive tests is to determine whether the assertions are materially misstated and to form an opinion about whether the financial statements are presented fairly in accordance with GAAP. To determine if significant assertions are misstated, the auditor should consider designing substantive tests to detect each of the potential misstatements in assertions that were developed in the internal control phase (see section 330). In addition, the auditor should consider whether efficiencies can be achieved by using the concepts of directional testing, as discussed in paragraphs 470.14-.16.

.02 Based on the level of expected overall audit assurance determined in the planning phase of the audit (see paragraph 260.04), the auditor should establish the minimum levels of substantive assurance for each level of combined risk. For example, based on the audit risk model in AU 350 and a desired overall audit assurance of 95 percent, GAO considers the following minimum levels of substantive assurance for each level of combined risk to be appropriate:

Low combined risk	63%
Moderate combined risk	86%
High combined risk	95%

Substantive assurance is the auditor's judgment that all of the auditor's substantive tests will detect misstatements that in total exceed materiality. Substantive assurance, which relates to the entire audit and correlates directly with the level of combined risk, is not the same as confidence level, which is for a specific sample. The higher the risk, the more substantive assurance required.

TYPES OF SUBSTANTIVE TESTS

.03 There are two general types of substantive tests: (1) substantive analytical procedures and (2) tests of details. To achieve the required substantive assurance (discussed above) the auditor may use either of these tests or a

combination of the two. The type of test to use and the amount of reliance to place on each type of procedure, within the framework of the audit matrix (discussed in paragraph 470.10), is a matter of the auditor's judgment and should be based on effectiveness and efficiency considerations.

Substantive analytical procedures

.04 Substantive analytical procedures involve the comparison of a recorded amount with the auditor's expectation of that amount and investigation of any significant differences to reach a conclusion on the recorded amount. Analytical procedures involve a study of plausible relationships among both financial and nonfinancial data. A basic premise is that plausible relationships among data may reasonably exist and continue in the absence of errors, fraud, or changes in circumstances. (See AU 329.)

.05 Substantive analytical procedures may be performed at one of three levels for an assertion, as follows:

- **Complete:** The auditor relies solely on analytical procedures for all of the assurance required from substantive procedures. The procedure is so persuasive that the auditor believes that it will detect any aggregate misstatements that exceed test materiality.

- **Partial:** The auditor relies on a combination of analytical procedures and tests of details to obtain an appropriate level of substantive assurance. For partial assurance, the auditor believes that the analytical procedures should detect any aggregate misstatements that exceed test materiality.

- **None:** The auditor does not rely on analytical procedures for substantive assurance. All substantive assurance will be obtained from tests of details. In this situation, supplemental analytical procedures may be performed to increase the auditor's understanding of account balances and transactions, but not to provide any additional substantive assurance. These procedures are similar in scope to those performed on an overall basis at the financial statement level (see section 520).

.06 To determine whether to perform complete or partial substantive analytical procedures, the auditor should consider the effectiveness or persuasiveness and efficiency of such procedures. In so doing, the auditor should consider the factors discussed in detail in section 495 A.

Detail tests

.07 Detail tests are test procedures that are applied to individual items selected for testing and include:

- **Confirming** a balance or transaction or the related terms, such as accounts receivable or accounts payable, by obtaining and evaluating direct communication from a third party.

- **Physically observing**, inspecting, or counting tangible assets, such as inventory or property, plant, and equipment, and applying related procedures.

- **Examining supporting documents** to determine whether a balance is properly stated. For example, the auditor might examine invoices for property and equipment purchases.

- **Recalculating,** or checking mathematical accuracy of entity records by footing or crossfooting or by recomputing amounts and tracing journal postings, subsidiary ledger balances, and other details to corresponding general ledger accounts. For example, the auditor might recalculate unit cost extensions in an inventory list, foot the list (whether prepared manually or by computer), and trace the total to the general ledger amount.

.08 Detail tests are generally used in combination to provide sufficient substantive assurance about an assertion. For example, to test the valuation of accounts receivable, the auditor might confirm balances, recalculate the aging schedule, examine documents supporting the aging and specific delinquent accounts, and discuss collectibility with management. On the other hand, a single detail test procedure might provide substantive assurance about more than one of the five financial statement assertions. For example, a physical observation of inventory might provide evidence about existence, valuation, and presentation and disclosure.

.09 The minimum extent of detail testing to be performed is based on the combined risk assessment and the amount of assurance obtained from substantive analytical procedures, as illustrated in the Audit Matrix (figure 470.1).

DETERMINING MIX OF SUBSTANTIVE TESTS

.10 In determining an appropriate mix of analytical procedures and detail tests, the auditor should consider the following matrix (figure 470.1) which illustrates the integration of such tests for each level of combined risk, when the auditor is using a desired overall audit assurance of 95 percent. GAO auditors should use this audit matrix.

Figure 470.1: Audit Matrix

Assessed combined risk level	Sub-stantive assurance	Sub-stantive assurance from analytical procedures [a]	Minimum substantive assurance from detail tests
Low	63%	Complete	0%
		Partial	50%
		None	63%
Moderate	86%	Complete	0%
		Partial	77%
		None	86%
High	95%	Complete	0%
		Partial	92%
		None	95%

[a] Complete assurance from analytical procedures requires procedures that are extremely effective and persuasive to serve as the sole source of audit evidence for achieving the audit objective. This level of effectiveness or persuasiveness is very difficult to achieve when combined risk is assessed as high. Therefore, complete reliance on analytical procedures for substantive assurance in these situations is rare, particularly for balance sheet accounts.

.11 Additional factors to consider in determining an appropriate mix of analytical procedures and detail tests include the following:

- **The nature and significance of the assertion being tested:** Analytical procedures are generally more likely to be effective for assertions related to net cost statement accounts than for those related to balance sheet accounts. Significant assertions generally require more or higher quality audit evidence that may not be available from analytical procedures.

- **The nature of the combined risk:** Substantive tests should be designed to address the specific type and level of combined risk for each assertion. For example, for certain loss claim liabilities, detail tests might be used to search subsequent claim payments for potential liabilities in testing the completeness assertion, while analytical procedures might be applied to test the related valuation assertion by evaluating the amounts per claim.

- **The availability of different types of evidence:** Using evidence that can be readily obtained may be more efficient. For example, in federal government audits, the availability of budgets and other information may assist in performing analytical procedures.

- **The quality of the respective types of evidence available:** The higher the quality of a type of evidence, the greater the level of assurance the auditor may derive from that type (see paragraph 470.13).

- **The anticipated effectiveness of analytical procedures:** Detail tests should be used if analytical procedures are not expected to be effective.

.12 When determining the types of substantive tests to use, the auditor's goal should be to choose the mix of effective procedures that are considered to be the most efficient in combination with sampling control tests and compliance tests. The auditor should exercise judgment when assessing the effectiveness or persuasiveness of all audit procedures, particularly analytical procedures.

.13 When considering a procedure's relative effectiveness, the auditor is concerned about the expected quality of the evidence. The quality of evidence obtained in a substantive test depends highly on the circumstances under which it is obtained and should be evaluated with professional skepticism. The following are generalizations about evidence:

- Evidence obtained from independent third parties provides a higher level of assurance than that obtained from sources in the entity.

- Evidence obtained directly by the auditor through confirmation, physical examination, vouching, or recalculation provides a higher level of assurance than that obtained indirectly, such as through inquiry.

- Documentary evidence provides a higher level of assurance than oral representations.

- Evidence obtained at or near the balance sheet date concerning an asset or liability balance provides a higher level of assurance than that obtained before or after the balance sheet date, because the audit risk generally increases with the length of the intervening period.

- The lower the control risk associated with an entity's internal control, the higher the assurance concerning the information subject to that internal control.

OTHER EFFICIENCIES

.14 In planning tests, the auditor should consider the relationships between recorded amounts to help in achieving efficiencies. For example, in double-entry accounting, a misstatement in one account affects at least one other (related) account. This relationship gives rise to the opportunity for testing more than one account with a single test. Similarly, the relationship between budgetary and proprietary[1] accounts may provide the opportunity for efficiencies in testing.

.15 In double-entry accounting, a misstatement in one account affects at least one other (related) account. For example, a misstatement of accrued payroll typically results in a misstatement of payroll expense. In this example, a substantive test of accrued payroll should detect misstatements in both accrued payroll and payroll expense. In designing substantive tests, after considering combined risk and developing an understanding of each related account, the auditor should consider the effect of such tests on related accounts. For example, a test of revenue for completeness may provide substantive evidence about the completeness of accounts receivable. In many instances where double-entry accounting is used, it may be efficient to (1) design an overall strategy that tests certain accounts substantively for

[1] The proprietary accounting system supports the accrual basis of accounting.

either existence or completeness (the two assertions most affected by testing related accounts) and (2) rely on such tests to detect misstatements in the related accounts. For example, the auditor might test (1) assets and expenses directly for existence and (2) liabilities, equity, and revenue for completeness, thereby indirectly testing the related accounts for existence or completeness, as applicable. This logic is called a directional testing approach.

.16 In some instances, the auditor may need to supplement a directional testing approach to address specific combined risks. For example, if inherent and control risk factors warrant, the auditor might test both existence and completeness in a test of cutoff as of the balance sheet date. During initial financial statement audits, the auditor generally should test both existence and completeness directly, when those assertions are significant, because the cumulative knowledge about the interaction of accounts may be limited.

.17 The audit assurance that can be obtained from directional testing is diminished in balance-sheet-only audits if related accounts are not also tested and in audits of entities having single-entry accounting systems (since double-entry account interrelationships do not exist). In these instances, the auditor should test both existence and completeness directly when those assertions are significant.

.18 To maximize efficiency, the auditor should combine the testing of budgetary and proprietary accounts where the combination is appropriate. For example, the auditor may combine tests of outlays (on the statement of budgetary resources) with tests of cash disbursements (used to test net costs).

.19 If an entity has budget accounting records but does not maintain separate proprietary accounting records, or the proprietary records are incomplete, the auditor should directly test expended authority produced by the budget system and the items necessary to reconcile the budget to the proprietary accounts.

.20 Also, if (1) relevant budget restrictions relate to significant quantitative-based provisions of laws and regulations and (2) budget controls are not effective, the auditor should test the accumulation of budget amounts (see paragraphs 460.03-.05).

475 - SUBSTANTIVE ANALYTICAL PROCEDURES

.01 This section provides guidance on the application of substantive analytical procedures. Analytical procedures are sometimes referred to as fluctuation analysis, flux analysis, predictive tests, or analytical review. These procedures consist of comparing recorded account balances with the auditor's expectations. The auditor develops an expectation or estimate of what the recorded amount should be based on an analysis and understanding of relationships between the recorded amounts and other data. This estimate is then used to form a conclusion on the recorded amount. A basic premise underlying analytical procedures is that plausible relationships among data may reasonably be expected to continue unless conditions are known that would change the relationship. (For further information, refer to AU 329 or the Audit Guide *Analytical Procedures*.)

.02 Scanning account detail and recomputation are two other audit procedures related to analytical procedures. Scanning consists of searching for unusual items in the detail of account balances. Scanning is an appropriate tool to investigate the cause of a significant fluctuation, but it is not considered a substantive analytical procedure on its own. Unusual items identified through scanning should be investigated to obtain substantive assurance about the unusual items. The auditor may independently compute an estimate of an account balance, which is sometimes referred to as recomputation or an overall test of reasonableness. These recomputations are considered substantive analytical procedures. When making recomputations, the auditor should assess the reliability of the data used and should follow the steps used for performing substantive analytical procedures.

.03 The risk of forming the incorrect conclusion on the account balance tested may be higher for substantive analytical procedures than for detail tests because of the procedures' extensive use of the auditor's judgment. Accordingly, quality control is of critical importance. To help maintain a high level of quality in these procedures, the assessment of the amount of reliance to place on the procedures, the design of the procedures, and the formulation of conclusions on the results of these procedures should be performed or closely supervised and reviewed by experienced audit team personnel.

PERFORMING SUBSTANTIVE ANALYTICAL PROCEDURES

.04 If substantive analytical procedures are used, the auditor should perform steps a. through l. below:

a. Determine the amount of the limit. The limit is the amount of difference between the auditor's expectation and the recorded amount that the auditor will accept without investigation. The determination of the limit is a matter of the auditor's judgment; some guidelines are provided in paragraph 475.05. The guidelines consider the amount of substantive assurance desired from analytical procedures.

b. Identify a plausible, predictable relationship and develop a model to calculate an expectation of the recorded amount. Consider the type of misstatements that could occur and how those misstatements would be detected by the model.

c. Gather data for developing the expectation, and perform appropriate procedures to establish the reliability of the data. The reliability of these base data is subject to the auditor's judgment. The reliability of data is discussed further in section 495 A.

d. Develop the expectation of the recorded amount using the information obtained during the previous steps. The preciseness of the expectation is subject to the auditor's judgment and is discussed further in section 495 A.

e. Compare the expectation with the recorded amount, and note the difference.

f. Obtain explanations for differences that exceed the limit, since such differences are considered significant.

g. Corroborate explanations for significant differences.

h. Determine whether the explanations and corroborating evidence provide sufficient evidence for the desired level of substantive assurance. If unable to obtain a sufficient level of substantive assurance from analytical procedures, perform additional procedures as discussed in

paragraphs 475.12-.17 and consider whether the difference represents a misstatement.

i. Consider whether the assessment of combined risk remains appropriate, particularly in light of any misstatements identified. Revise the assessment of combined risk, if necessary, and consider the effects on the extent of detail tests.

j. Document (on the Summary of Possible Adjustments as discussed in 540.04) the amount of any misstatements detected by substantive analytical procedures and their estimated effects. The limit (the amount of the difference between the recorded amount and the expectation that does not require explanation) is not considered a known or likely misstatement and is not posted to the Summary of Possible Adjustments.

k. Conclude on the fair presentation of the recorded amount.

l. Include documentation of work performed, results, and conclusions in the workpapers. Required documentation is discussed in section 490.

GUIDELINES FOR ESTABLISHING THE LIMIT

.05 As discussed above, the limit is the amount of the difference between the expected and recorded amounts that can be accepted without further investigation. GAO uses the following guidelines in establishing the limit for each level of reliance on analytical procedures for substantive assurance:

- **Complete reliance:** The limit is 20 percent or less of test materiality.
- **Partial reliance:** The limit is 30 percent or less of test materiality.
- **No reliance:** Substantive analytical procedures are not needed.

Auditors using different limits should document the basis for the limit used.

INVESTIGATING SIGNIFICANT DIFFERENCES

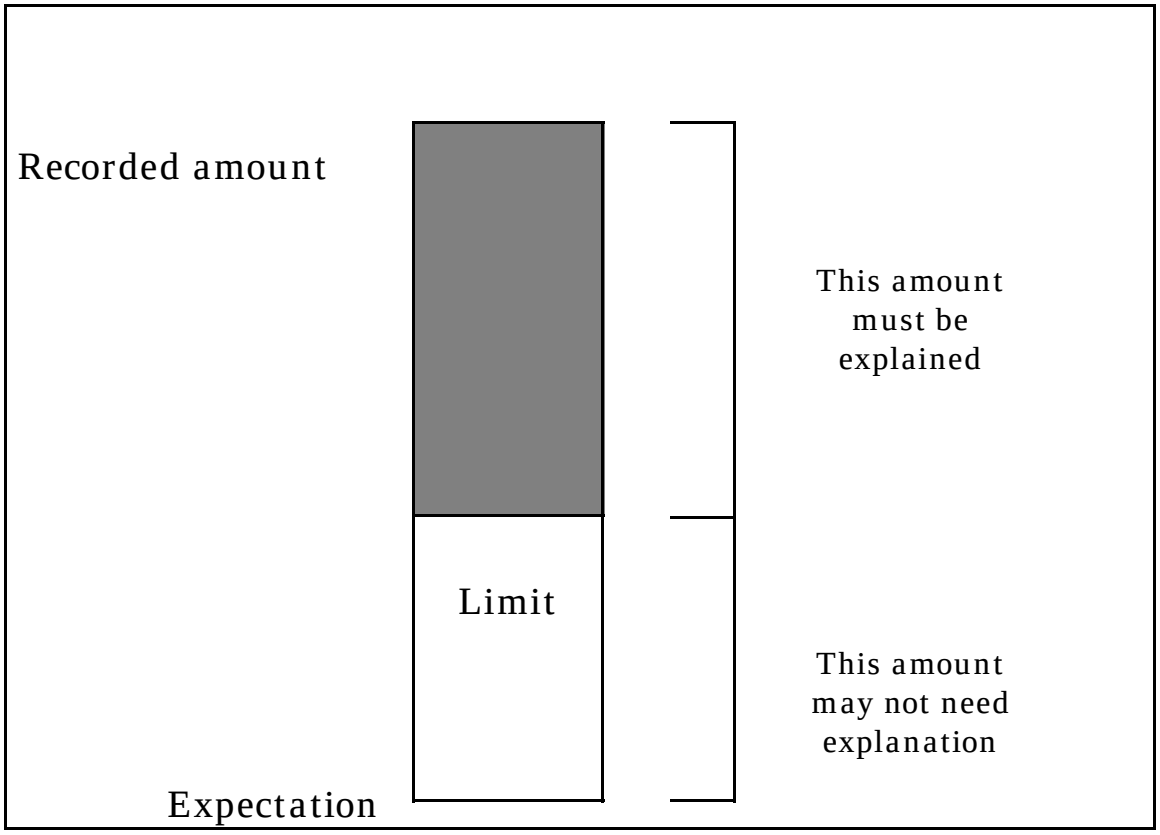
Causes of significant differences

.06 Differences between the expectation and the recorded amount typically relate to either factors not included in the model (such as specific unusual transactions or changes in accounting policies), a lack of preciseness of the model, or misstatements (either errors or fraud).

Amount of Difference to Be Explained

.07 When obtaining explanations, it is usually helpful to review with entity personnel the model and assumptions used to develop the expectation. Entity personnel will then be in a better position to provide the auditor with a relevant explanation. If the amount of the difference exceeds the limit, the auditor generally should try to obtain an explanation for the entire difference between the recorded amount and the expectation. The portion of the difference that exceeds the limit must be explained (see figure 475.1). If the difference does not exceed the limit, an explanation is not required. The auditor should identify and corroborate all significant factors that may cause the expectation to differ from the actual amount, regardless of whether the factors increase or decrease the difference.

Figure 475.1: Amount of Difference Explained When Recorded Amount Exceeds Limit



Corroboration of explanations

.08 The relevance and reliability of corroborating evidence may vary significantly; therefore, the extent of corroboration of explanations is left to the auditor's judgment. Corroboration may consist of examining supporting documentation or corroborating explanations received from accounting department personnel with personnel from the appropriate operating department, who should be knowledgeable about the entity's operations. The explanations for the fluctuations should be quantified and should address the direction and magnitude of the event causing the fluctuation. The auditor should corroborate all explanations received. In determining whether sufficient corroborating evidence has been obtained, the auditor should consider the guidelines for complete and partial assurance discussed in

paragraph 470.05. In evaluating explanations the auditor should consider whether the difference could be caused by error or fraud.

Example of an adequate explanation for a significant fluctuation

.09 Assume that the auditor determined test materiality to be $25 million. Additionally, assume that the auditor has determined, after considering any inherent and control risks, that a substantive analytical procedure should be performed with a limit of $5 million. The auditor estimated interest expense at $80 million by multiplying the average loan balance of $1 billion by the average interest rate of 8 percent. Both of these averages were computed through a simple average of beginning-of-year and end-of-year amounts. The recorded amount of interest expense, $94.5 million, is higher than the estimated amount by $14.5 million and exceeds the limit by $9.5 million.

.10 An explanation from entity personnel that "we borrowed more money this year and interest rates are higher than last year" would not be adequate. This explanation needs to be quantified and corroborated.

.11 An example of an adequate explanation follows:

> Based on a review of correspondence from lenders, interest rates increased during the year and then fell and were computed to average 9 percent based on a monthly average. Additionally, loan statements from lenders indicate that $100 million was borrowed and repaid during the year, and the additional borrowings were outstanding for 6 months. Therefore, the average loan balance was actually $50 million higher and the average interest rate was 1 percent higher than the figures used in the auditor's original estimate.
>
> Therefore, the interest expense in excess of the expectation can be explained as follows (in thousands):

	$1,000,000	X	1%	=	$10,000
+	50,000	X	9%	=	4,500
Total difference explained					$14,500

Course of action in the event of inadequate explanations or corroborating evidence

.12 If an explanation and/or corroborating evidence does not adequately explain the fluctuation sufficient to provide either complete or partial assurance, the auditor must perform additional substantive procedures. These procedures may consist of

- increasing the effectiveness of the substantive analytical procedures by making the expectation more precise in order to obtain the amount of desired assurance,
- performing tests of details and placing no reliance on the substantive analytical procedures that were ineffective, or
- treating the difference as a misstatement.

.13 The auditor should consider the relative efficiency of each of these options. Deciding whether to perform additional substantive procedures is a matter of the auditor's judgment. The additional procedures must provide the auditor with adequate assurance that aggregate misstatements that exceed test materiality have been identified.

.14 To increase the persuasiveness or effectiveness of an analytical procedure, the auditor generally needs to make the expectation more precise. The auditor can do so by

- building a more sophisticated model by identifying more key factors and relationships,
- disaggregating the data (such as using monthly instead of annual data[1]), or
- using more reliable data or obtaining greater confidence in the data's reliability by corroborating the data to a greater extent.

[1] If the data are disaggregated, the limit is still applied on an annual basis.

Measuring the precision of the expectation and the impact of changing each of these factors on the procedure's effectiveness is difficult and is left to the auditor's judgment.

.15 If detail tests are used to test the account balance because adequate explanations cannot be obtained or corroborated, the auditor still must obtain an overall understanding of the current-year financial statements when applying the required overall analytical procedures at the financial statement level. As discussed in section 520, significantly less work is needed to obtain this overall understanding of the financial statements than when using analytical procedures as a substantive test.

.16 Additionally, if analytical procedures originally performed as a substantive test do not provide the required assurance, the auditor may be able to use those procedures to supplement an understanding of the account balances or transactions after obtaining substantive assurance through detail tests.

.17 When the auditor places no reliance on substantive analytical procedures, all substantive assurance is provided by detail tests. In this situation, less rigorous, supplemental analytical procedures may be used to increase the auditor's understanding of the account balances and transactions after performing the detail tests. When using supplemental analytical procedures, the auditor uses judgment to determine which fluctuations require explanations.

480 - SUBSTANTIVE DETAIL TESTS

POPULATION TO BE TESTED

.01 In designing detail tests, the assertion tested affects the choice of the population (an account balance or a portion of an account balance) from which items are selected. For example, the existence assertion deals with whether recorded assets or liabilities exist as of a given date and whether recorded transactions have occurred during a given period. To detail test the existence assertion, the auditor should test the recorded account balance by (1) selecting items from those that compose the account balance and (2) then testing those items to evaluate whether such inclusion in the account balance is proper. For example, to test an expense account for existence, the auditor might select individual expense amounts included in the balance from a detail general ledger and then examine invoices that support the expense amount. It would be inappropriate to select invoices directly and then trace invoice amounts to inclusion in the general ledger balance.

.02 For the existence assertion, the test population should agree with or be reconciled to the recorded amount of the account balance being tested. The auditor should test reconciling items, if any, in an appropriate manner. If this is not done, the conclusion applies only to the test population (the available items), not the recorded population.

.03 Conversely, the completeness assertion deals with whether all transactions and accounts that should be presented in the financial statements are so included. To detail test the completeness assertion, the auditor should select from an independent population of items that should be recorded in the account. The auditor should (1) select items that should be recorded from a source that is likely to contain all the items that should be recorded and (2) determine whether they are included in the recorded balance. For example, to test completeness of recorded revenue, the auditor might select shipments from a shipping log (which is believed to be reasonably complete), trace them to recorded revenue amounts, and then test the summarization of those amounts to inclusion in the general ledger revenue balance. To test completeness of recorded accounts payable, the auditor might select from payments made subsequent to year-end plus invoices on hand but not yet paid and trace those in which the receipt of goods or services occurred before year-end to inclusion in year-end accounts payable (those where the receipt

occurred after year-end should be tested for exclusion from accounts payable).

SELECTION METHODS FOR DETAIL TESTS

.04 Detail tests may be applied to any of the following:

- all items composing the population;
- a nonrepresentative selection (nonsampling selection) of items; and
- a representative selection (sample) of items composing the population.

Flowchart 1 (section 495 E) illustrates the process of deciding the selection method.

.05 Detail testing of **all items composing the population** is generally most appropriate for populations consisting of a small number of large items. For example, several large accounts receivable or investments might compose an entire balance.

.06 Detail testing of **a nonrepresentative selection (nonsampling selection)** is appropriate where the auditor knows enough about the population to identify a relatively small number of items of interest, usually because they are likely to be misstated or otherwise have a high risk. (Nonrepresentative selections may also be used to test controls by using inquiry, observation, and walkthrough procedures and to obtain planning information, for example, by performing a walkthrough to understand the items in the population.) While the dollar amount is frequently the characteristic that indicates that an item is of interest, other relevant characteristics might include an unusual nature (such as an item identified on an exception report), an association with certain entities (such as balances due from high-risk financially troubled entities), or a relationship to a particular period or event (such as transactions immediately before and after the year-end date). The effects of any misstatements found should be evaluated; however, unlike sampling, the results of procedures applied to items selected under this method apply only to the selected items and must not be projected to the portion of the population that was not tested. Accordingly, the auditor must apply appropriate analytical and/or other substantive procedures to the remaining items, unless those items are

immaterial in total or the auditor has already obtained enough assurance that there is a low risk of material misstatement in the population.

.07 Detail testing of **a representative selection (sample) of items composing the population** is necessary where the auditor cannot efficiently obtain sufficient assurance (based on the assessed combined risk and other substantive procedures including analytical procedures) about the population from nonrepresentative selections. The auditor selects sample items in such a way that the sample and its results are expected to be representative of the population. Each item in the population must have an opportunity to be selected, and the results of the procedures performed are projected to the entire population. (In random selection, each item has an equal chance of selection (see glossary for further discussion of definition); in dollar-unit sampling (DUS), each dollar has an equal chance of selection; in classical variables estimation sampling, each item in a stratum has an equal chance of selection.)

.08 The auditor may use a nonrepresentative selection for part of the population and a sample for the remainder of the population. For example, the auditor might select all inventory items with a book amount greater than $10,000,000, all items that have not had any activity in the previous 6 months, and a statistical sample of the balance of the population. The auditor would project the misstatements in the statistical sample to the population of items less than $10,000,000 with activity in the last 6 months. The auditor would also compute a combined evaluation for the three selections by adding the results of the 100 percent selections to the conclusion for the statistical selections.

.09 The auditor should document in the workpapers (usually in the audit program) whether a selection is intended to be a representative selection (a sample projectable to the population) or a nonrepresentative selection (not projectable to the population); if it is a nonrepresentative selection, the auditor also should document the basis for concluding that enough work has been done to obtain sufficient assurance that the items not tested are free from aggregate material misstatement.

REPRESENTATIVE SELECTIONS (SAMPLING)

.10 The following paragraphs provide an overview of sampling, primarily with respect to the existence and valuation assertions. Similar concepts and

methods apply to the completeness assertion, except that the population for selection differs. (See paragraphs 480.01-.03.)

.11 AU 350.45 indicates that samples may be either statistical or nonstatistical. In statistical sampling, the auditor uses probability theory to determine sample size, select the sample, and evaluate the results for the purpose of reaching a conclusion about the population. Statistical sampling permits the auditor to objectively determine sample size (based on subjective decisions about risk and materiality), objectively select the sample items, and objectively evaluate the results; thus, the auditor using statistical sampling determines objectively whether enough work has been performed. Because of these advantages, when a sample is necessary, the auditor should use statistical sampling. Software such as Interactive Data Extraction and Analysis (IDEA)[1] allows the auditor to quickly perform the calculations necessary for statistical sampling.

[1] IDEA is the primary software GAO uses. It is distributed by Audimation Services, Inc., Houston, Texas.

.12 In nonstatistical sampling, the auditor considers statistical concepts, but does not explicitly use them to determine sample size, select the sample,[2] or evaluate the results. Because the auditor using statistical sampling objectively considers the same factors that the auditor using nonstatistical sampling should subjectively consider, the size of a nonstatistical sample should not be less than the size of a properly calculated statistical sample.

.13 The auditor who uses nonstatistical sampling generally should first calculate a statistical sample size (generally using dollar-unit sampling), then add at least 25 percent. The 25 percent is protection because the nonstatistical sample is not as objective as the statistical sample. The auditor who wishes to use nonstatistical sampling for a particular test should obtain the approval of the Reviewer, in consultation with the Statistician, before performing the test. Approval is not needed to use nonrepresentative selections (nonsampling) since they do not involve projections.

---

[2] Usually the auditor applying nonstatistical sampling will select a "haphazard sample." A haphazard sample is a sample consisting of sampling units selected without conscious bias, that is, without any special reason for including or excluding items from the sample. It does not consist of sampling units selected in a careless manner; rather it is selected in a way the auditor expects to be representative of the population.

Since a haphazard sample is not the same as a statistical sample, the auditor using a haphazard sample cannot calculate precision at a given confidence level. However, AICPA guidance indicates that the auditor may use the haphazard sample to make a judgment of what a statistical sample might have shown. For example, he or she might use the haphazard sample to make a judgment as to the likely misstatement in areas that are not very significant. Even though the judgment will not be a statistical projection, it may assist the auditor in determining whether the possible misstatement could be material. Thus, the auditor should not avoid making the judgment.

Professional standards and the FAM do not use the term "judgment sample." All selections (including statistical selections) require judgment. The term "judgment sample" is often used to refer to nonrepresentative selections, although it sometimes refers to nonstatistical samples.

.14 In sampling, the sample must be selected from all the items that compose the population so that each item has an opportunity for selection (in statistical sampling, the auditor can determine the probability of selection). For example, the auditor might select sample items from a list of all accounts receivable balances that is reconciled to the related account balance. Selecting sample items from file drawers is not a valid selection method for any type of sampling unless the auditor has determined that all items composing the population are included in the drawers.

.15 For statistical samples, sample items should be selected using random or dollar-unit selection methods. Computer software may be used. Manual selection should be based on random number tables, a computer-based random number generator, or through use of systematic selection (every *n*th item with a random start between 1 and *n*). For example, the auditor might begin with a random start and then choose every *n*th item, where *n* is the sampling interval. The sampling interval would be determined by dividing the number of items in the population by the desired number of selections.

.16 The sample size is a function of the size of the population, the desired confidence level (based on the amount of substantive assurance the auditor requires from detail tests, as shown on the audit matrix in section 495 D), test materiality (based on design materiality, expected misstatements, and other factors discussed in paragraph 230.13), and the sample selection method.

.17 Once the auditor decides that a sample is necessary, the choice of the sample selection method to be used is a matter of the auditor's judgment concerning the most efficient method to achieve the audit objectives. The following methods of sample selection are available for substantive testing:

- dollar-unit sampling (DUS)—see paragraph 480.21,
- classical variables estimation sampling—see paragraph 480.32, and
- classical probability proportional to size (PPS) sampling (evaluating a PPS sample using a classical variables sampling approach)—see paragraph 480.34.

Attributes sampling may be used for tests of controls and for tests of compliance with laws and regulations. To use any sampling method for substantive testing that is not listed in this paragraph, the auditor should consult with the Statistician. (Stratification and/or use of ratio estimates

and regression estimates often lead to smaller sample sizes. Multistage samples may reduce time and travel costs.)

.18 Each of these methods yields a valid projected (likely) misstatement, and a valid upper limit at the desired confidence level. In addition, classical PPS and classical variables sampling yield a valid two-sided confidence interval (DUS yields a valid upper limit). The auditor chooses the method based on the test objectives and efficiency.

.19 When deciding the sampling method, the auditor should consider whether the dollar amounts of the individual items composing the population are available (such as on a detail listing or a computer file), the expected amount of misstatements, and the relative cost and efficiency of each appropriate sampling method. Flowchart 2 (section 495 E) summarizes the process of choosing the sampling method once the auditor has decided a sample is necessary. The subsequent pages of the flowchart indicate the steps that the auditor generally should perform for each sampling method. Example workpapers to document attribute, dollar-unit, and classical variables sampling are in section 495 E.

.20 If the dollar amounts of the individual items composing the population are known, the auditor should use DUS, classical PPS, or classical variables estimation sampling. If dollar amounts of these individual items are not known, see paragraph 480.36.

SAMPLE SELECTION

Dollar-unit sampling (DUS)

.21 Dollar-unit sampling (DUS)[3] is a type of statistical sampling that the auditor generally should use when

a. the dollar amounts of individual items in the population are known,

b. the primary objective is to test the overstatement of the population (see below for testing a population related to the line item),

[3] See *Dollar Unit Sampling*, by Leslie, Teitlebaum, and Anderson (Copp Clark Pitman, 1979), for a more technical discussion of DUS.

c. the auditor expects that the total dollar amount of misstatement in the population is not large,[4] and

d. the amount of misstatement in an individual item cannot exceed the selected amount.[5]

DUS is also known as probability proportional to size (PPS) and monetary unit sampling (MUS). DUS works best in populations where the total misstatement is not large and where the objective is to test for overstatement of a population. When the objective is understatement of a line item, the auditor often is able to define a related population to test for overstatement. For example, to test for understatement of accounts payable, the auditor would select a DUS of subsequent disbursements. See also paragraph 480.36.

---

[4] This expectation affects the efficiency of the sample, not its effectiveness. GAO auditors who use IDEA to calculate sample size (based on the binomial distribution) generally use classical variables estimation sampling when they expect that more than 30 percent of the sampling units contain misstatements (no matter what the size of the misstatement). When GAO auditors expect that 10 percent or fewer of the sampling units contain misstatements, GAO auditors generally use dollar-unit sampling. When GAO auditors expect between 10 and 30 percent of the sampling units contain misstatements, GAO auditors consult with the Statistician. If a large misstatement rate is found, the auditor, in consultation with the Statistician, should consider whether to use classical PPS to evaluate the sample to obtain a smaller precision. Other auditors, in consultation with their Statisticians, may use different rules of thumb in deciding when to use DUS versus classical variables estimation sampling.

[5] This means, for example, that an item that has a selected amount of $1,000 cannot be misstated by more than $1,000. This is usually not an issue in testing existence or valuation (overstatement). However, it might be an issue in testing completeness (understatement). Thus, if understatements larger than the selected amount are expected, classical variables estimation sampling generally should be used.

.22 In a manually applied DUS, a sampling interval (*n*) is used to select every *n*th dollar from the dollars in the individual items that compose the population. These items might be recorded amounts for individual receivable balances, inventory items, invoices, or payroll expenses. The item that contains the *n*th dollar is selected for testing. DUS is representative of all dollars in the population; however, larger items have a higher probability of selection (for example, a $2,000 item has an approximately twenty times greater probability of selection than a $100 item).

.23 When the total misstatement in the population is not large, DUS will yield the smallest sample size for a given population, test materiality, and desired confidence level when all statistical sampling methods are considered. When the auditor expects that the population contains a large amount of misstatement, he or she should use classical variables sampling (see footnote 3 and paragraph 480.33).

.24 In DUS, the auditor may compute the sample size manually (paragraphs 480.24-.26) or by using computer software (paragraph 480.27). To calculate a dollar-unit sample size manually, the auditor uses the dollar amount of the population, test materiality (see section 230), and required confidence level. The auditor calculating sample size manually may use the statistical risk factor from figure 480.1 to determine sample sizes for the appropriate confidence level, as discussed below.

Figure 480.1: Statistical Risk Factors

Confidence Level	Statistical Risk Factor[a]
50%	0.7
63%	1.0
77%	1.5
86%	2.0
92%	2.5
95%	3.0

[a] These are based on the Poisson distribution, which approximates the binomial distribution. Therefore, the sample size computed using this table may differ slightly from the sample size computed using IDEA.

Section 495 D contains the audit matrix with the appropriate risk factor for each level of combined risk and reliance on substantive analytical procedures. See paragraph 480.27 for guidance on using IDEA to compute sample size.

.25 The statistical risk factors are used in the following formulas to determine the sampling interval and sample size for DUS:

1. sampling interval = test materiality ÷ statistical risk factor

2. sample size = recorded amount ÷ sampling interval

Sample sizes should be stated in whole numbers. Uneven amounts should be rounded up to the next whole number. For example, a sample size of 40.2 items should be rounded up to 41 items.

.26 For example, to test a recorded amount of $30 million with a test materiality of $900,000 and a 95 percent confidence level, the statistical risk factor would be 3.0. The sampling interval would be $300,000 (test materiality of

$900,000 divided by the statistical risk factor of 3.0). Essentially, from a random start, every 300,000th dollar is selected. Therefore, the preliminary estimate of sample size of 100 items is calculated by dividing the recorded amount of $30 million by the sampling interval of $300,000. Because the amount of certain items might equal or exceed the sampling interval, a selection might include more than 1 sample item (for example, a $600,000 selection would include 2 of the 100 estimated sample items: $600,000/$300,000 = 2), thereby making the actual number of items tested fewer than 100.

.27 When the auditor uses the IDEA software to calculate sample size, the inputs are materiality, expected total dollar amount of misstatements in the population, confidence level, and the dollar amount of the population. Whether the auditor should input design materiality or test materiality depends on why the auditor reduced design materiality to get test materiality (see paragraph 230.13). If the auditor reduced design materiality to test materiality because not all entity locations are being tested or because the area is sensitive to financial statement users, the auditor should input test materiality. If the auditor reduced design materiality to test materiality solely because misstatements were expected, the auditor should input design materiality rather than test materiality. The reason for this is that the auditor inputs the expected dollar amount of misstatements in the population, and the software considers it in adjusting materiality (if the auditor inputs test materiality, the adjustment will have been made twice).

.28 It is difficult to select additional items for a dollar-unit sample after the original sample is selected. If the auditor believes that extension of the sample might be necessary, the auditor generally should plan for that possibility and consult with the Statistician. For example, the auditor might use a 95 percent confidence level (statistical risk factor of 3.0) to select the sample but test only the number of items necessary to achieve the planned confidence level. The items tested should be spread evenly throughout all of the items selected. For example, in a manual selection, if a statistical risk factor of 1.5 is appropriate based on the planned confidence level, the auditor would make selections using a statistical risk factor of 3.0 (twice as many selections as the factor of 1.5) and initially test every other selection (beginning with a random start).

.29 If the preliminary assessment of combined risk or reliance on substantive analytical procedures is not supported by the results of testing, the substantive assurance needed from detail tests increases, and the auditor would then test the additional items selected in the initial sample.

.30 If additional sample items are not selected during the initial sample and it is necessary to select additional items, the auditor should consult with the Statistician to determine how to select the additional sample items. Selection of these additional items may be more complex and less efficient than if they were chosen during the initial sample.

.31 Section 495 F describes how to manually select items using DUS. Computer software, such as IDEA, generally should be used to select a dollar-unit sample.[6] The choice of selection method used should be based on efficiency considerations.

Classical variables estimation sampling

.32 Classical variables estimation sampling is a type of statistical sampling that the auditor should consider when the auditor expects that one or more of the following exist in the population: the dollar amount of misstatement in the population is large (see footnote 3); individual misstatements may exceed the selected amount of sampling units; significant understatements cannot be identified using other tests; there are no book amounts for each sampling unit; or the auditor cannot add the dollar amounts in the population (see flowchart 2 in section 495 E).

.33 Classical variables estimation sampling is useful because it frequently results in smaller sample sizes in higher misstatement situations than those that would be obtained using DUS. Because applying this method is somewhat complex, the auditor should consult with the Statistician before using it. Classical variables sampling and classical PPS require knowledge

[6] IDEA offers two methods of selecting a dollar-unit sample. The auditor generally should use the cell method rather than the fixed interval method. In the cell method, the program divides the population into cells such that each cell is equal in size to an interval. Then the program selects a random dollar in each cell. The random dollar selected identifies the transaction, account, or line item to be tested (sometimes called the logical unit).

of the population to determine sample size. In many audits, the auditor learns about the population over several audits and improves the plan each time.

Classical PPS Sampling

.34 Classical PPS Sampling is a type of statistical sampling that the auditor should use when he or she is testing for overstatement of the defined population and finds a large misstatement rate. The sample is selected the same way as a dollar-unit sample (proportional to size). Since there is no exact way to determine sample size, the auditor uses DUS to calculate sample size. However, since classical PPS sampling is used when there are large misstatement rates, the auditor uses a conservative (high) estimate of the expected misstatement to avoid needing subsequently to expand the sample size to obtain a sufficient sample size.

.35 Since classical PPS yields a valid measure of likely misstatement and precision, it may be used whenever the only reason for using classical variables sampling otherwise is the expected large misstatement rate.

Sampling when dollar amounts are not known

.36 DUS cannot be used if the dollar amounts of individual items in the population are not known. Classical variables estimation sampling might be used, but this has some difficulties: there is no way to accurately calculate the sample size without the individual dollar amounts, and the method is inefficient unless the auditor finds a large misstatement rate. Lack of individual dollar amounts usually occurs when testing the completeness assertion where the selection is made from a population independent of the population being tested (see paragraphs 480.01-.03). In one approach, the auditor might select a random or systematic sample of the individual items. For example, items might be randomly selected from a shipping log to test the completeness assertion for revenue.

.37 For this type of test, the sample size may be approximated from the total dollar amount of either the population that the auditor is sampling from (the total dollars of the shipping log if the total dollar amount is available) or the dollar amount of the population that the auditor is testing (the total recorded revenue). Because this method is less efficient than DUS, the preliminary estimate of sample size for this sample should exceed the sample size that

would result from using DUS. GAO auditors should use at least a 25 percent increase in sample size.[7]

.38 The auditor should consult with the Statistician in performing the evaluation. If the misstatement rate is large, they should consider using classical variables estimation sampling. While attribute sampling may be used to estimate the misstatement rate in the population, this will yield acceptable results only if just one or two misstatements are found. The auditor generally should use the upper limit of the misstatement rate to make a conservative estimate of the dollar amount of misstatement in the population. If the upper limit is less than materiality, the auditor has evidence that the population is free of material misstatement.

EVALUATION OF SAMPLE RESULTS

.39 Evaluation involves several steps:

a. Projecting the results of the sample to the population (for nonstatistical samples, making a judgment about likely misstatement in the population).

b. Calculating either the upper limit of misstatement in the population or an interval estimate of misstatement or of the population audited value at the desired confidence level (for nonstatistical samples, considering the risk of further misstatement).

c. Considering the qualitative aspects of misstatements.

d. Reaching a conclusion as to whether the population is fairly stated.

e. Considering the effect of misstatements on the financial statements taken as a whole.

Steps a. and b. are usually done with software such as IDEA in consultation with the Statistician.

[7] The 25 percent is a rough estimate that is used because there is no way to calculate the correct sample size.

.40 The effects of any misstatements detected in a sample should be projected to the population. In doing so, the auditor should ask the auditee to determine the cause of any misstatement found. The auditor should project all misstatements unless he or she has obtained highly persuasive evidence that the misstatement is not representative of the entire population. If the evidence is highly persuasive that a misstatement is not representative of the population, the auditor should (1) perform procedures to test that the same type of misstatement does not exist elsewhere in the population, (2) evaluate the misstatement that is not representative, (3) evaluate the sample, excluding the misstatement that is not representative, and (4) obtain the approval of the Audit Director that the evidence is highly persuasive. The projected misstatement amount should be included in the Summary of Possible Adjustments as a likely misstatement, the evaluation of which is discussed in section 540.

.41 At the conclusion of the test, the auditor also should consider whether the assessment of combined risk remains appropriate, particularly in light of any misstatements identified. If the preliminary combined risk assessment was not appropriate, the auditor should consult with the Reviewer to determine whether the extent of substantive procedures is adequate.

.42 When understated amounts are detected in any sample designed primarily to test the existence assertion (i.e., designed to test primarily for overstatement), the auditor should consult with the Statistician in evaluating the sample results.

Calculating the projected misstatement for DUS

.43 If the auditor does not use software to evaluate sample results, he or she may calculate projected misstatement as follows. For a misstatement detected in which the item equals or exceeds the amount of the sampling interval (each of which is selected for testing), the projected misstatement is the amount of the misstatement detected. For any other misstatement detected, the projected misstatement is computed as follows: (1) divide the amount of misstatement by the recorded amount of the sample item and (2) multiply the result by the amount of the sampling interval. The sum of all projected misstatements represents the aggregate projected misstatement for the sample. For example, assume the following two misstatements are detected in a sample for which the sampling interval is $300,000: (1) a $50,000 misstatement detected in a $500,000 item (which exceeds the

amount of the sampling interval) results in a projected misstatement of $50,000, and (2) a $100 misstatement in a $1,000 sample item represents a 10 percent misstatement, which results in a projected misstatement of $30,000 (10 percent of the $300,000 sampling interval). In this case, the aggregate projected misstatement is $80,000.

Converting a DUS to a Classical PPS sample

.44 If a dollar-unit sample results in a large number of misstatements, it is likely that the evaluation calculated using the method illustrated above would indicate that the upper limit of misstatement in the population exceeds materiality (IDEA indicates the number of misstatements that would yield acceptable results). However, if there are a large number of misstatements,[8] the auditor, in consultation with the Statistician, should evaluate the sample using classical PPS. This evaluation is complex and cannot be done directly using IDEA.

Evaluating the results of a classical variables estimation sample

.45 The auditor should consult with the Statistician in evaluating the results of a classical variables estimation sample.

Evaluating the results of other samples

.46 When misstatements are detected in a sample for which guidance on evaluation is not described above, the auditor should consult with the Statistician.

EFFECTS OF MISSTATEMENTS ON THE FINANCIAL STATEMENTS

.47 The quantitative and qualitative effects of all misstatements detected in the audit — both known and likely — must be evaluated in relation to the financial statements as a whole. Section 540 provides guidance on this evaluation.

[8] As a general rule, this means 10 misstatements if the sample size is between 75 and 100, 10 percent if the sample size is between 100 and 300, and 30 if the sample size is over 300. Minimum sample size for classical PPS is 75.

490 - DOCUMENTATION

.01 The auditor should document the nature, timing, and extent of tests performed during this phase of the audit, as well as the conclusions reached. The auditor should specifically identify the procedures used to obtain substantive assurance for an account balance. This identification is particularly important if detail tests are relied on for complete substantive assurance and supplemental analytical procedures are performed to increase the auditor's understanding of the account balances and transactions.

.02 For example, assume an entity incurs and accounts for operating expenses at 50 locations. After considering the guidance in section 295 C regarding multiple-location audits, the auditor decides to obtain all the required substantive assurance from detail tests. The auditor subjects all operating expenses to a statistical sample and visits only the locations for which selections were made. Assume that the auditor decides to obtain additional knowledge of the current-year operations, particularly for locations not visited, through supplemental analytical procedures at all locations. These procedures consist of comparing current-year operating expenses with prior-year audited information by location and between locations.

.03 In the above situation, the auditor is obtaining the entire required amount of substantive assurance from detail tests. The comparison of the current- and prior-year amounts is considered a supplemental analytical procedure and does not provide substantive audit assurance that the auditor may use to reduce the detail tests. During this supplemental analytical procedure, the auditor may detect misstatements that were not detected during the detail tests. The auditor must consider the implications of these misstatements to determine if the original assessment of combined risk was appropriate and if the amount of substantive testing performed (the detail tests) was adequate. Even though misstatements may be detected during supplemental analytical procedures, these procedures cannot be relied on for substantive assurance.

.04 In the audit program, the auditor generally should explain the objectives of audit procedures. Also, written guidance either within or accompanying the audit program to explain possible exceptions, their nature, and why they might be important, may help auditors focus on key matters, more readily determine which exceptions are important, and identify significant exceptions.

.05 The auditor also should document, usually in the audit program, whether a selection is intended to be a representative selection (a sample projectable to the population) or a nonrepresentative selection (not projectable to the population). If it is a nonrepresentative selection, the auditor also should document the basis for concluding that enough work has been done to obtain sufficient assurance that the items not tested are free from aggregate material misstatement.

.06 As the audit work is performed, the auditors may become aware of possible reportable conditions or other matters that should be communicated to the auditee. The auditor generally should document and communicate these as described in paragraph 290.02.

.07 Documentation of this phase should specifically include (see section 495 E for example workpapers):

- For tests involving sampling:
  - the sampling method used and any key factors regarding selection;
  - the sample size and the method of determining it;
  - the audit procedures performed; and
  - the results of tests, including evaluations of sample results, and conclusions.
- For substantive analytical procedures:
  - the model used to develop the expectation and the basis for the model;
  - the data used and the data sources;
  - the auditor's assessment of the reliability of the data used and procedures performed to establish or increase the amount of reliability, if applicable;
  - the amount of the limit and the criteria for establishing the limit;
  - explanations for fluctuations considered significant, sources of these explanations, and corroborating evidence obtained;

  - the additional procedures performed and related conclusions if misstatements are detected or if the initial procedures are not considered adequate; and

  - conclusions regarding findings, including proper treatment of any misstatements detected and assessment of any other effects of these misstatements.

- Interim testing procedures (see section 495 C for documentation guidance).

- Any misstatements detected (which also should be referenced to their posting on the Summary of Possible Adjustments (see section 540) where they will be considered further).

[This page intentionally left blank.]

495 A - DETERMINING WHETHER SUBSTANTIVE ANALYTICAL PROCEDURES WILL BE EFFICIENT AND EFFECTIVE

.01 The following factors should be considered when determining whether analytical procedures will be effective and efficient as a substantive test:

- nature of the account balance, the specific audit objective (including the assertions being tested), and any identified inherent or control risks;
- expected availability and reliability of explanations for fluctuations and related corroborating evidence;
- plausibility and predictability of the relationship;
- availability and reliability of data; and
- preciseness of the expectation.

NATURE OF THE ACCOUNT BALANCE, THE SPECIFIC AUDIT OBJECTIVE, AND ANY IDENTIFIED INHERENT OR CONTROL RISKS

.02 Analytical procedures are usually more effective for testing net cost statement amounts than balance sheet amounts. Balance sheet amounts are more difficult to predict because they are as of a specific point in time. Additionally, net cost statement amounts generally have relationships with various types of other data, such as cost of sales as a percentage of sales, interest expense as a function of the debt balance and interest rates, or sales revenue as a function of the number of units shipped and the average sales price. Analytical procedures are usually less effective for testing amounts that are subject to management discretion or are unpredictable, such as repairs or miscellaneous expenses.

.03 The auditor should consider the specific audit objective, including the assertions being tested, and any identified inherent and control risks to determine whether substantive analytical procedures will be effective and

efficient in achieving the audit objective and level of assurance. The procedures need to be more effective if fraud, inherent, and control risks have been identified. The auditor can obtain three levels of substantive assurance from analytical procedures—complete, partial, or none. The effectiveness and the amount of assurance provided by an individual procedure are matters of the auditor's judgment and are difficult to measure.

.04 As discussed, the auditor may choose to rely completely on analytical procedures when the level of combined risk has been assessed as high. In these cases, the analytical procedures should be extremely effective and persuasive to serve as the sole source of audit evidence for achieving the audit objective. This level of effectiveness is very difficult to achieve when combined risk is assessed as high; therefore, complete reliance on analytical procedures for substantive assurance in these situations is rare, particularly for balance sheet accounts.

EXPECTED AVAILABILITY AND RELIABILITY OF EXPLANATIONS FOR FLUCTUATIONS AND RELATED CORROBORATING EVIDENCE

.05 Explanations for fluctuations and related, reliable corroborating evidence may not always be readily available. This audit evidence is essential to using analytical procedures as a substantive test. The relative ease of obtaining explanations for significant differences and relevant, reliable corroborating evidence should be considered when determining whether analytical procedures will be the most efficient and effective substantive test.

PLAUSIBILITY AND PREDICTABILITY OF THE RELATIONSHIP

.06 Relationships between the amount being tested (the recorded amount) and other data are an essential component of substantive analytical procedures. The relationships identified and used for these procedures should be good indicators of the account balance of the item being tested. To be considered a good indicator of the recorded balance, the relationship between the recorded amount and the other data should be plausible and predictable.

Plausibility

.07 If one set of data provides a reasonable basis for predicting another set of data, the relationship between the two sets of data is considered to be plausible. As the plausibility of the relationship increases, so does the effectiveness of analytical procedures as a substantive test.

.08 For example, there is a plausible relationship between payroll expense, the average number of employees, and the average pay rate. This relationship generally is effective for estimating payroll expense for salaried employees. Alternatively, there is not usually a plausible relationship between revenue and interest expense; therefore, this relationship would not be used for testing.

Predictability

.09 The more predictable the relationship is, the more effective the substantive analytical procedure will be. Relationships are more predictable in a stable environment. As relationships become more complex as a result of increases in the number and type of contributing factors, related amounts become more difficult to effectively and efficiently predict.

.10 For example, payroll expense generally is very predictable if there is little employee turnover during the period, if all employees receive the same percentage raise at the same time, and if all employees are salaried. Payroll expense becomes more difficult to predict if any of these factors changes (e.g., high turnover resulting in a different mix of employee pay, a wide range of raises awarded at different times, or a mix of hourly and salaried employees). Therefore, to effectively estimate payroll expense, the auditor may need to use a more complex relationship that considers these factors.

.11 The relationships identified may be between the recorded amount and either prior-year or current-year data, using financial or nonfinancial data, including underlying business factors. For example, the auditor may estimate current-year (1) interest expense using current-year audited, long-term debt amounts and interest rate information or (2) sales revenue based on the auditor's estimate of the expected gross margin percentage applied to the audited cost of sales amounts. When using current-year relationships, the data used to estimate the recorded amount must be audited by a method

other than a substantive analytical procedure that uses a relationship with the recorded amount.

.12 The auditor should exercise caution when using prior-year amounts as the basis for the expectation of the current-year recorded amount. The workpapers must document why, in the auditor's judgment, the prior-year amount, and any adjustments to that amount, have a plausible and predictable relationship with the current-year recorded amount. Any adjustments to the prior amount, such as for the effects of inflation, must be supported by reliable data and must be corroborated. Additionally, the prior-year amount must meet the criteria discussed below for reliable data. The easiest way to meet these criteria is if the prior-year amount is audited.

.13 As an example of prior-year relationship, assume that the payroll raises for the year were authorized at 5 percent and that the number and salary mix of employees have remained relatively stable. In this example, the auditor might reasonably expect current-year payroll expense to be 5 percent higher than the prior-year's payroll expense. However, the auditor would need to test the reliability of the percentage pay increase and the assumptions regarding the number and mix of employees.

AVAILABILITY AND RELIABILITY OF DATA

Availability of Data

.14 Data needed to perform analytical procedures as a substantive test may not always be readily available. The relative ease of obtaining relevant, reliable data should be considered when determining whether analytical procedures will be the most efficient and effective substantive test.

Reliability of Data

.15 The reliability of the data used is important in determining the effectiveness of the substantive analytical procedures. The more reliable the data are, the more effective these procedures will be as a substantive test. In assessing the reliability of data, which is a matter of auditor judgment, the auditor should consider the following:

- the source of the data, including whether the data are audited or unaudited;

- conditions under which the data were gathered, including related internal controls; and

- other knowledge the auditor may have about the data.

Sources of Data

.16 Data obtained from an independent source outside the entity are generally more reliable than data obtained from inside the entity; however, the auditor should determine if the outside information is comparable to the item being tested. This issue of comparability is particularly important if the auditor is using industry statistics.

.17 Data obtained from entity sources are considered more reliable if the sources are independent of the accounting function and if the data are not subject to manipulation by personnel in the accounting function. If multiple data sources are used, the reliability of all sources should be considered.

Audited versus unaudited data

.18 The auditor should consider whether the data are audited or unaudited because audited data are considered more reliable than unaudited data. If data are audited by the entity's IG office, they may be as reliable as data audited by independent auditors if the IG's work is considered adequate. (See FAM section 650.)

.19 Unaudited data are not considered reliable unless procedures are followed to establish their reliability. These procedures could consist of either tests of controls over data production or tests of the data. The extent of such procedures is left to the auditor's judgment. For example, interest rates from an entity's loan register may be used to estimate interest income. The reliability of this information may be established by including the interest rate on loan confirmations that are sent to the borrowers or by reviewing original loan documents.

Conditions under which the data were gathered

.20 Another consideration of internal data is whether the data were developed under a reliable system with adequate financial reporting or operations controls. In some instances, testing operations controls may be appropriate to assess the reliability of the data used for substantive analytical procedures. The extent of this testing is a matter of the auditor's judgment.

.21 If the system used to develop internal data is computerized rather than manual, the auditor must perform additional procedures before relying on the data. The auditor must test either (1) the general controls and the specific application controls over the IS system that generated the report or (2) the data in the report.

.22 An auditor might choose to test operations controls when using entity-prepared statistics for a substantive analytical procedure. For example, the auditor might choose to use Air Force statistics to test the reasonableness of its Airlift Services aircraft operating costs. The auditor might compare the per hour fuel and maintenance costs for Airlift Services cargo and passenger aircraft with the "block hour" costs incurred by major airlines for similar aircraft as published by *Aviation Week and Space Technology*. The auditor should first determine if the industry statistics are comparable, e.g., if the statistics are for the same or similar types of aircraft and if the types of items included in maintenance costs are similar. If appropriate, the auditor should identify and test the internal controls over the production of these operating statistics.

PRECISENESS OF THE EXPECTATION

.23 The expectation, the auditor's estimate of the account balance, should be precise enough to provide the desired level of substantive assurance. When determining how precise the expectation should be, the auditor should determine the proper balance between effectiveness and efficiency. Any work to make the expectation more precise than the desired level of assurance is unnecessary and inefficient.

.24 To maximize efficiency, the auditor should conduct procedures at the minimum level of effort that can reasonably be expected to provide the assurance needed. If the audit objective cannot be achieved with the original

expectation, the auditor may be able to perform additional procedures to make the expectation more precise. The preciseness of the expectation and changes in this preciseness are difficult to measure in quantifiable terms, unless the auditor uses regression analysis for the analytical procedures. If the auditor uses regression analysis, he or she should consult with the Statistician.

.25 Factors that influence the expectation's preciseness follow:

- **The identification and use of key factors when building the model based on the relationships identified by the auditor:** The expectation generally becomes more precise as additional key factors are identified.

- **The reliability of the data used to develop the expectation:** The expectation becomes more precise as the reliability of the data increases.

- **The degree of disaggregation of the data:** The expectation becomes more precise as the disaggregation of the data increases.

[This page intentionally left blank.]

495 B - EXAMPLE PROCEDURES FOR TESTS OF BUDGET INFORMATION

.01 This section includes example procedures auditors may perform in testing budget information for the statements of budgetary resources and financing.

.02 In addition, if budget controls are ineffective and quantitative provisions of budget-related laws and regulations are considered significant, the auditor should perform audit procedures sufficient to detect the types of budget information misstatements listed in paragraph 460.04. Following is an example of procedures for testing obligation and expended authority transactions for these misstatements. (Test materiality for determination of sample sizes is discussed in paragraph 460.03.)

- **Validity, cutoff, recording, and classification:** Select obligations recorded as of the end of the audit period and expended authority transaction recorded during the audit period. Determine if each selected item is a valid obligation or expended authority transaction based on the criteria set forth in section 395 F and if each is recorded in the appropriate period. If the obligation or expended authority transaction is not recorded or is recorded in the incorrect period, determine the effects of this misstatement on budget amounts and consider whether the auditor's evaluation of budget controls is affected.

  Also determine if each selected item is

  - recorded at the proper amount and

  - classified in the proper appropriation or fund account (also by program and by object, if applicable), including the proper appropriation year.

- **Completeness and cutoff:** First, select obligations and expended authority transactions recorded during the period following the balance sheet date. Second, examine open purchase orders, unpaid invoices, and contracts as of the report date. Third, select items representing payments by Treasury or cash disbursements by the entity during the audit period. (Substantive detail test selections of expenses and additions to inventory, property, and prepaid accounts may be used for this purpose if the populations from which they are selected are

complete.) For each selection, determine whether the obligation or expended authority transaction is recorded in the proper period. If it is not recorded or is recorded in the incorrect period, determine the effects of this misstatement on budget amounts and consider any impact on the evaluation of budget controls.

If the selected obligation or expended authority transaction relates to the audit period and is recorded in that period, determine if it is

- recorded at the proper amount and

- classified in the proper appropriation or fund account (also by program and by object, if applicable), including the proper appropriation year.

- **Summarization:** Test the footing of the detail of the obligation account balance recorded as of the end of the audit period and expended authority accounts recorded during the audit period. Then reconcile the total of these details to the recorded totals for obligation and expended authority accounts as of the end of the audit period. (Audit software is often an effective tool for footing the transactions recorded in the accounts and for simultaneously selecting items for this test.)

.03 The audit procedures discussed above for testing expended authority transactions should be coordinated with the audit of the other financial statement amounts. For example, if appropriate, the tests of accounts payable for completeness may be coordinated with the selection of subsequent obligations and expended authority transactions described above.

.04 Following is an example of procedures for testing outlay transactions. These audit procedures also should be coordinated with the audit of the other financial statement amounts, chiefly cash disbursements.

- **Validity and classification:** Select outlays recorded during the audit period. Determine if an invoice and receiving report supports each selected outlay and determine the obligation that was liquidated by the outlay. Examine the support for the obligation and determine if the invoice billed for goods or services is related to (or properly "matches") the obligation (and, in turn, the appropriation). Obtain the accounting data of the matched obligation to include appropriation and year. Match

these data to the type of services paid for of the selected outlay. Determine if the related appropriation authorizes payment for the services billed and paid.

.05 The auditor also generally should audit upward and downward adjustments of prior year obligations. If any of these adjustments relate to closed accounts, the auditor generally should determine whether the adjustments are in compliance with the requirements of the National Defense Authorization Act for fiscal year 1991, section 1405(a), Closing Appropriation Accounts, 31 U.S.C. 1551-1558.

[This page intentionally left blank.]

495 C - GUIDANCE FOR INTERIM TESTING

MISSTATEMENTS IN INTERIM BALANCES

.01 The auditor should use judgment to determine whether any misstatements detected in interim tests (see section 295 D for a discussion of factors to consider in deciding whether to use interim substantive testing of balance sheet accounts) warrant a revision of (1) the auditor's combined risk assessment and (2) the nature, timing, and extent of planned audit procedures. In determining the effects of such misstatements, the auditor should consider all relevant factors, including

- the nature and cause of the misstatement,
- the estimated effects on the overall line item/account balance,
- whether the entity has subsequently corrected the misstatement, and
- the impact of the misstatement on other parts of the audit.

.02 Any financial statement misstatements detected should be discussed with entity management. Based on the nature and cause of the misstatements detected, the auditor should determine, and obtain supporting evidence on, whether the misstatements are isolated or are likely to occur in the remainder of the line item/account balance at the interim testing date and at the year's end. (See paragraph 480.40 for a discussion of the need to project all misstatements unless evidence is highly persuasive that a misstatement is isolated and the Audit Director approves.) The auditor should encourage management to correct any such misstatements in the population. Based on the following guidance, the auditor should use judgment to determine the extent, if any, that interim testing can be relied on, in conjunction with substantive tests of the rollforward period, to provide evidence on the year-end line item/account balance:

- If the misstatements are not material when projected to the entire population and are expected to be representative of the misstatements of the year-end balance, the auditor may rely on the results of the interim testing.
- If the auditor has obtained highly persuasive evidence that the misstatements are isolated (generally by nature, cause, or extent), the

auditor may be able to rely on unaffected parts of the interim testing and apply procedures at the year's end to test only those financial statement assertions associated with the misstatements. For example, in interim testing of inventory, the auditor might determine that the misstatements concern only the costing of inventory; accordingly, reliance could be placed on other parts of the interim testing, such as those for the accuracy of the physical count, and only cost testing and related procedures would be required at the year's end.

- If the misstatements are material or pervasive, it might be necessary to place no reliance on the interim testing and to perform extensive substantive testing of the line item/account balance as of the balance sheet date.

.03 For any misstatements found during interim testing, the auditor should use judgment to evaluate, in a manner appropriate for the circumstances, the effects on the year-end balance.

TESTING THE ROLLFORWARD PERIOD

.04 Because the auditor reports on the financial statements as of the year's end, not the interim test date, additional procedures must be performed to extend the interim conclusions to the year's end. The auditor should perform substantive tests of the rollforward period activity or the year-end balance. For example, after interim testing of the accounts receivable balance, the auditor might examine supporting documents for selected debits and credits to the balance during the rollforward period and/or might apply analytical procedures to compare the amount of rollforward activity, on a month-by-month basis, with that of preceding months or similar periods of preceding years.

.05 The auditor should determine the extent of the required substantive procedures based on the assessment of combined risk and test materiality, in substantially the same manner as for other substantive tests. In some instances, the auditor may determine that specific combined risk warrants additional substantive procedures at the year's end (such as cutoff tests). If control risk is moderate or low, the auditor should determine whether the internal controls as of the interim testing date were in place and were functioning effectively during the rollforward period (generally by reference

to the results of tests of financial reporting controls which generally cover the entire year under audit for significant systems).

DOCUMENTATION

.06 The auditor should document

- the line items/accounts (and assertions, where applicable) to which interim testing is applied;
- the factors considered when determining whether to use interim testing;
- the audit procedures used to test interim balances and the rollforward period (including tests of controls, findings, and conclusions); and
- the effects of any misstatements found during interim testing.

[This page intentionally left blank.]

495 D - EXAMPLE OF AUDIT MATRIX WITH STATISTICAL RISK FACTORS

The following table illustrates the correlation between combined risk and the substantive assurance obtained from substantive analytical procedures and detail test. This example is based on 95 percent audit assurance.[1] The table also provides the statistical risk factors to be used when the auditor manually computes sample size using DUS (see paragraph 480.17).

Figure 495 D.1: Example Audit Matrix

Assessed combined risk level	Substantive assurance	Substantive assurance from analytical procedures[a]	Minimum confidence level for detail tests	Statistical risk factor[b]
Low	63%	Complete	0%	N/A*
		Partial	50%	0.7
		None	63%	1.0
Moderate	86%	Complete	0%	N/A
		Partial	77%	1.5
		None	86%	2.0
High	95%	Complete	0%	N/A
		Partial	92%	2.5
		None	95%	3.0

[a] Complete assurance from analytical procedures requires procedures that are extremely effective and persuasive to serve as the sole source of audit evidence for achieving the audit objective. This level of effectiveness or persuasiveness is very difficult to achieve when combined risk is assessed as high. Therefore, complete reliance on analytical procedures for substantive assurance in these situations is rare, particularly for balance sheet accounts.

[b] Based on the Poisson distribution; used if sample size computed manually.

* Not applicable.

[1] Audit assurance is not the same as statistical confidence level. Assurance is a combination of quantitative measurement and auditor judgment.

[This page intentionally left blank.]

495 E - SAMPLING

SAMPLING FLOWCHARTS AND EXAMPLE WORKPAPERS

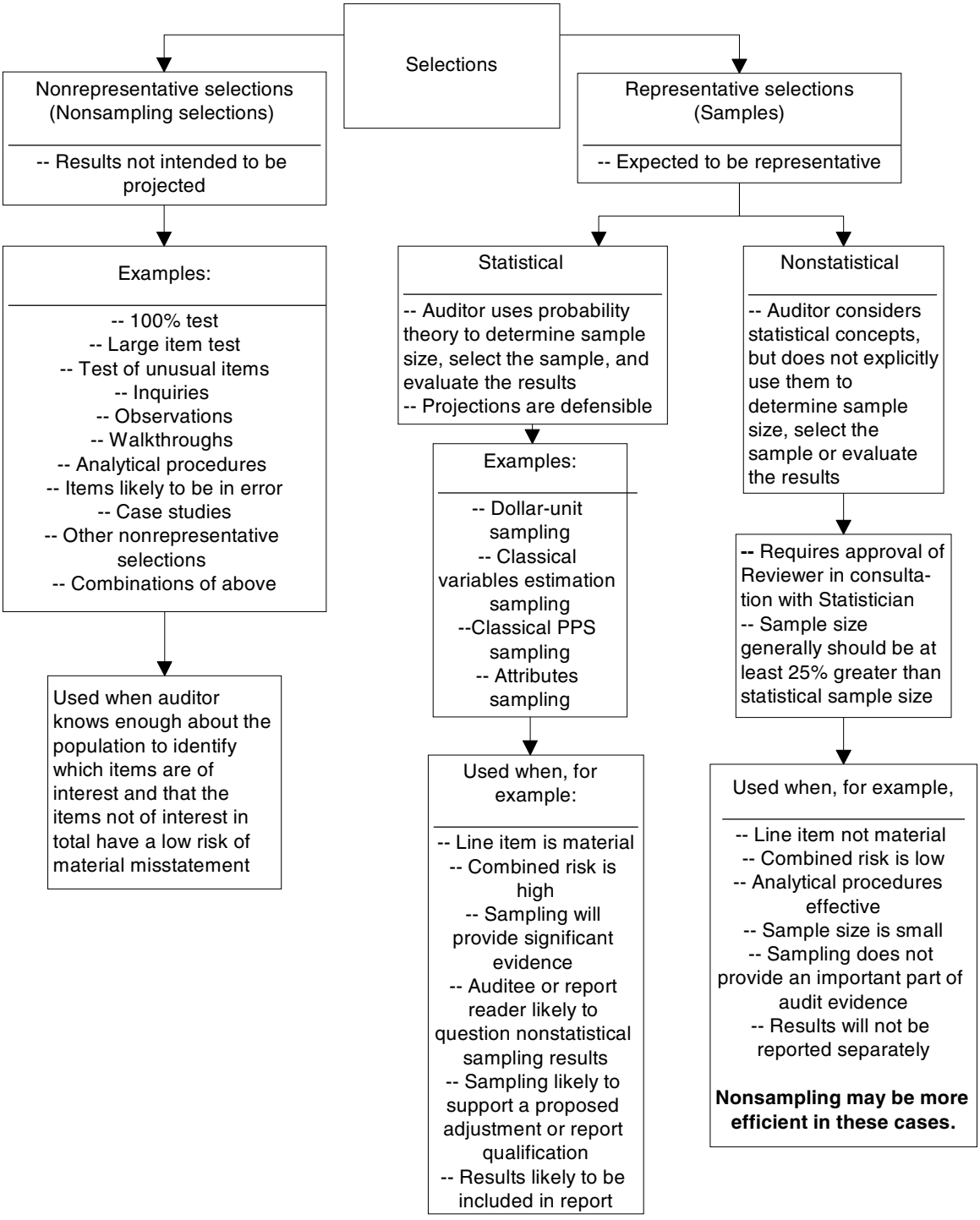
.01 This section contains sampling flowcharts (pages 495 E-2 through 495 E-6) and example workpapers for sampling (pages 495 E-7 through 495 E-19).

.02 Flowchart 1 (page 495 E-2) is to assist the auditor in deciding selection method: nonrepresentative selections versus sampling (statistical or nonstatistical). Flowchart 2 (page 495 E-3) is to help the auditor determine which type of sampling to use in various situations. The second, third, and fourth pages of this flowchart are to assist the auditor in performing attribute, dollar unit, and classical variables estimation sampling.

.03 Example workpapers for documenting sampling are given for attribute sampling (pages 495 E-7 through 495 E-10), for dollar unit sampling (pages 495 E-11 through 495 E-15), and for classical variables sampling (pages 495 E-16 through 495 E-19).

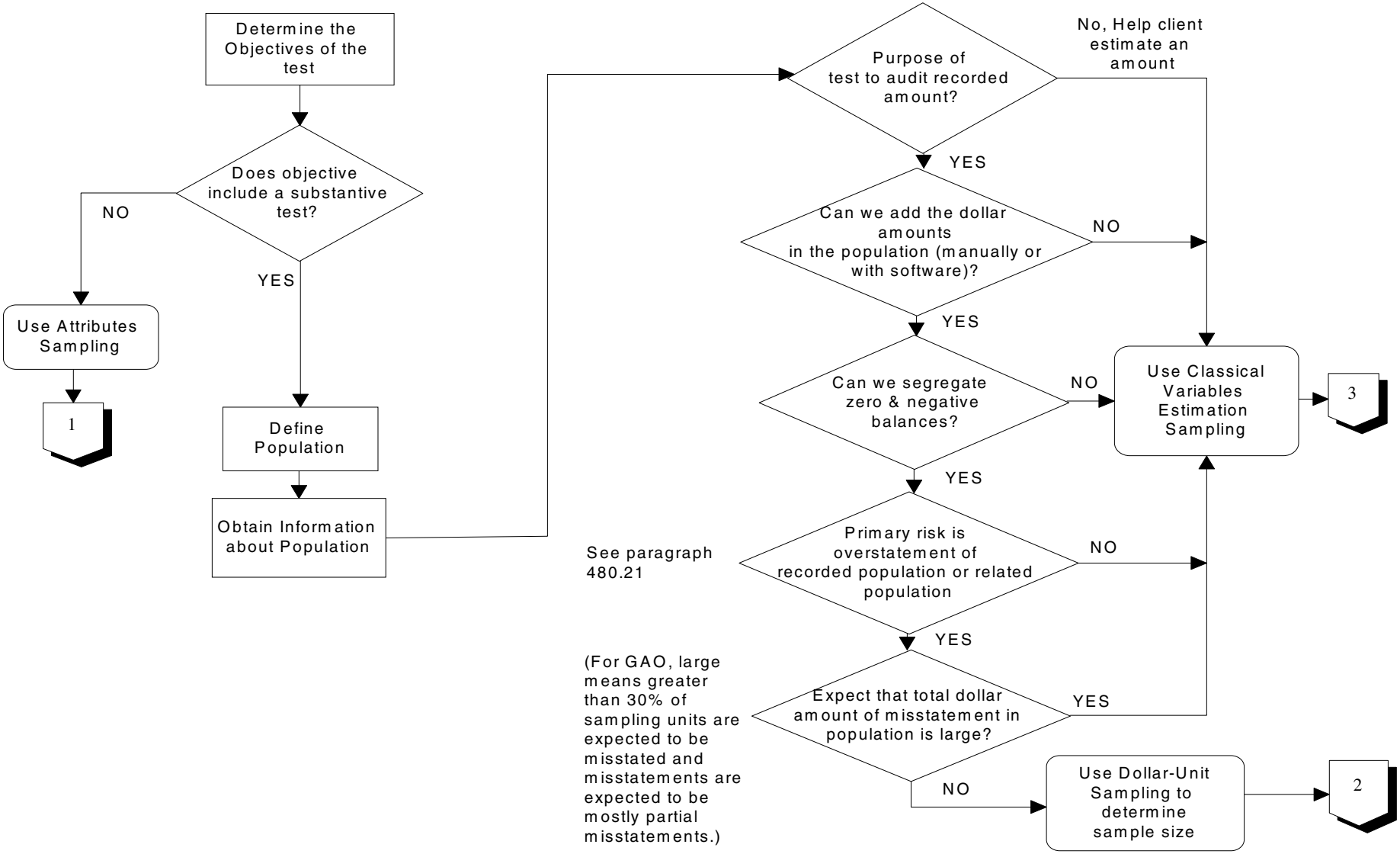
Flowchart 1

DECIDING THE SELECTION METHOD
FOR SUBSTANTIVE, INTERNAL CONTROL, AND COMPLIANCE TESTS



Flowchart of the Sampling Process

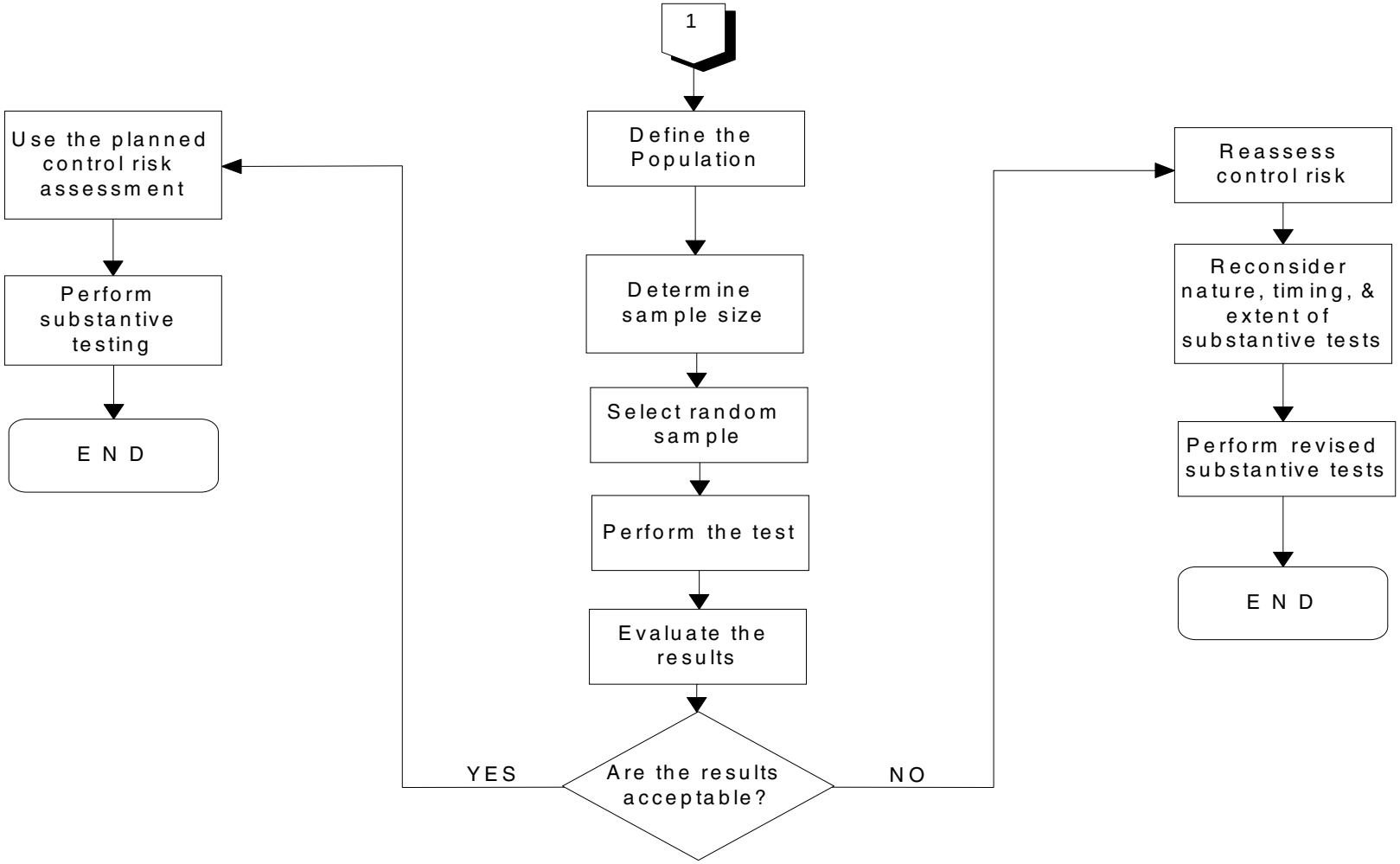
Flowchart 2, p. 1



Flowchart of the Sampling Process

ATTRIBUTES SAMPLING FOR CONTROL TESTS

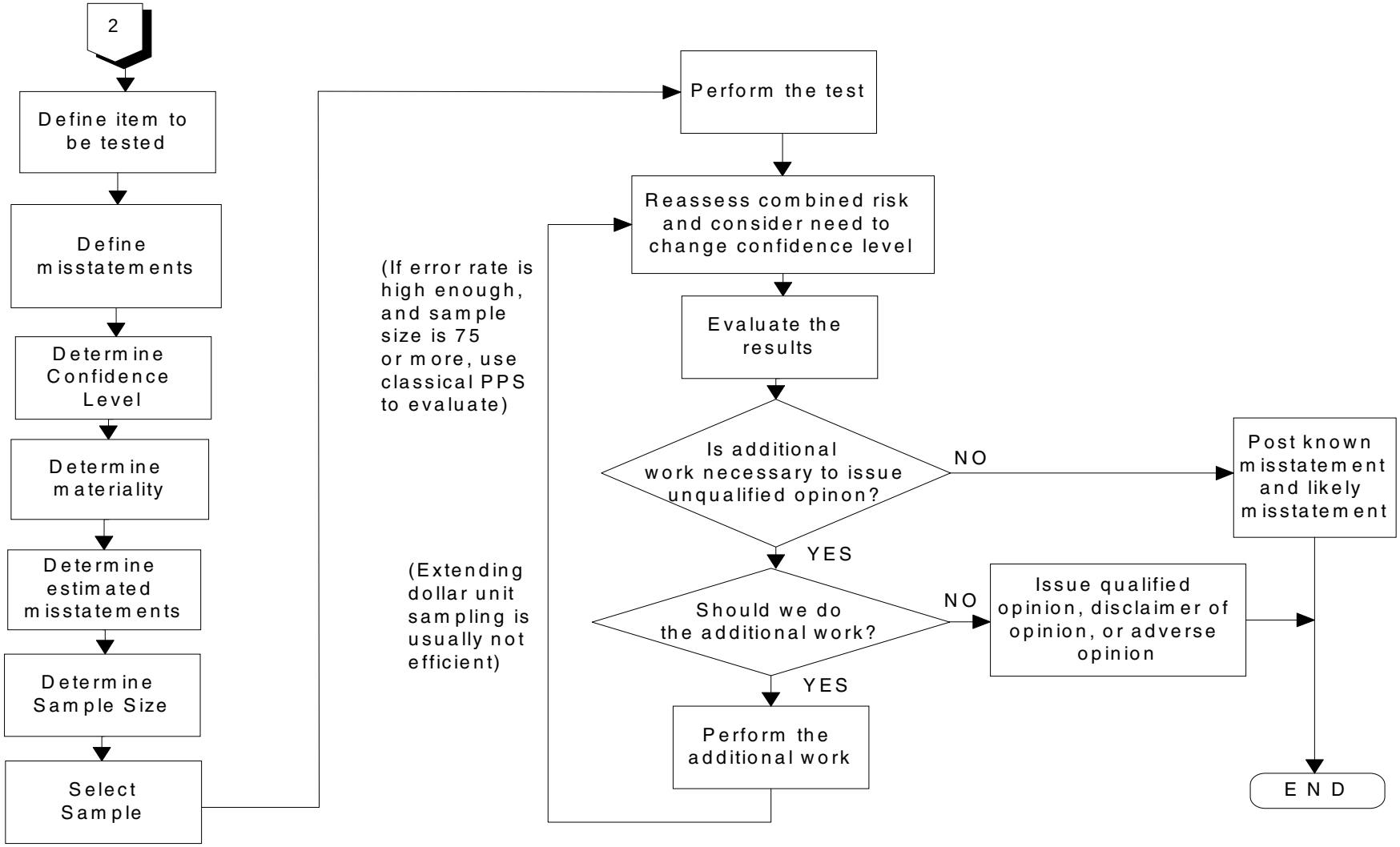
Flowchart 2, p. 2



Flowchart of the Sampling Process

D O L L A R - U N I T S A M P L I N G

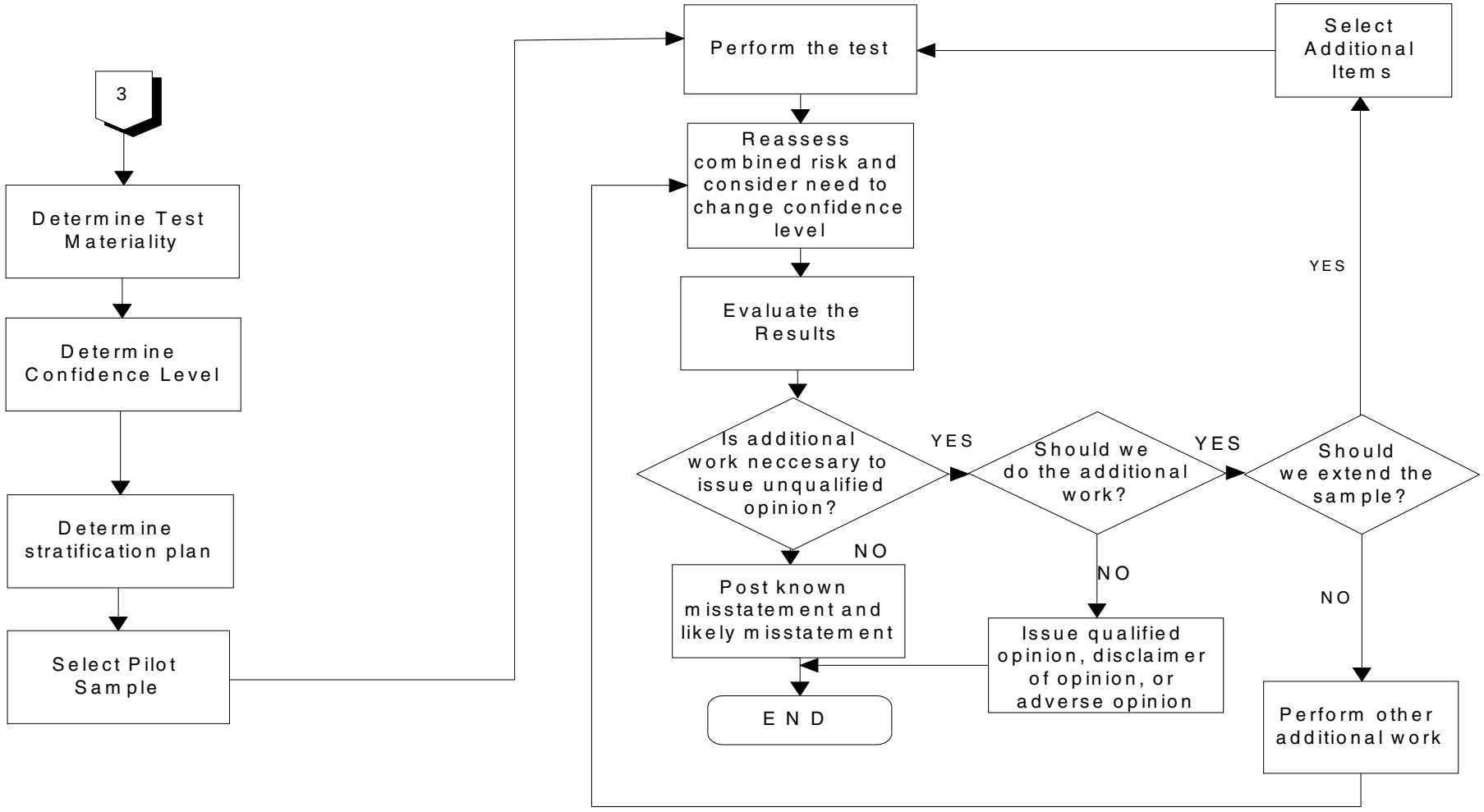
Flowchart 2, p. 3



Flowchart of the Sampling Process

CLASSICAL VARIABLES SAMPLING

Flowchart 2, p. 4



ILLUSTRATIVE WORKPAPERS FOR AUDIT SAMPLING

ATTRIBUTE SAMPLING

Auditee _____

Period Ended _____

	During Planning		At End of Test	
	Initials	Date	Initials	Date
Prepared by	_____	_____	_____	_____
Reviewed by	_____	_____	_____	_____

SECTION I - Definition of control techniques and sampling method

Cycle: _____

Application: _____

Control techniques (from SCE forms): _____

_____

Sampling method:

[ ] Random using IDEA
Workpaper reference to IDEA output _____
[ ] Other—explain _____

SECTION II - Definition of population and attributes to test

Population is: _____

_____

Population size: _____ units

Attribute(s) to test: _____

_____

Document(s) to examine: _____

_____

When this period is less than the entire period under audit or where the population being tested is less than the population in the financial statements, describe briefly (and cross-reference to) procedures for obtaining satisfaction about the remainder of the population:

_____

_____

List steps needed to achieve satisfaction that the selection is from a population equivalent to the defined population:

_____

_____

_____

_____

_____

_____

_____

_____

SECTION III - Determination of sample size and evaluation of sample results:

		A	B	C	D	E
Control activity number	**Deviation definitions (each will constitute a deviation)[1]**	**Preliminary assessment of control risk (see SCEs)**	**Sample size (per Table I in paragraph 450.09)**	**Acceptable number of deviations**	**Number of deviations found**	**Is result acceptable or not acceptable?[2]**

Notes:
1. Insert deviation definitions and data for columns A through C for each control technique before selection of sample.
2. Results are acceptable if column D is less than column C. When results are unacceptable, complete Section IV.

Method of testing when more than one control technique:

[ ] Use largest sample size for all key controls (generally because same documents are tested)
[ ] Use different sample sizes for different controls (using random numbers in order selected)

SECTION IV - Explain unacceptable results and other control deviations

Deviation	Possible cause	Cycles, assertions, and accounts that could be affected	Further action taken	Conclusion/revised control risk assessment*

SECTION V - Overall conclusions about assessed control risk

_____

_____

_____

*Where the preliminary assessment of control risk was low, the risk may be assessed as moderate if the number of deviations found do not exceed the acceptable number of deviations in Table II (paragraph 450.09) for the same sample size.

DOLLAR UNIT SAMPLING

Auditee _____

Period Ended _____

	During planning		At end of test	
	Initials	Date	Initials	Date
Prepared by	_____	_____	_____	_____
Reviewed by	_____	_____	_____	_____

SECTION I - Define objectives and method of testing

Line item: _____

Assertion: _____

Test: _____

SECTION II - Define population

Population is: _____

_____

Population size: _____ dollars

Logical unit (balance or transaction that includes the selected dollar): _____

Direction of test:

Starting from (source): _____
Testing to (documents to be examined): _____

When this period is less than the entire period under audit or where the population being tested is less than the population in the financial statements, describe briefly (and cross reference to) procedures to obtain satisfaction about the remainder of the population: _____

List steps needed to achieve satisfaction that the selection is from a population equivalent to the defined population:

Population analyzed by:
[ ] Review of printout of population
[ ] Review of manual listing of population
[ ] IDEA stratification
[ ] Other computer-assisted method—describe: _____

SECTION III - Determine sample size and interval for DUS

a. Total population (from section II): _____

b. Combined risk from ARA: _____

c. Amount of substantive assurance required (from audit matrix): _____

d. Substantive assurance from analytical procedures that relate to the assertion tested: _____

e. Other substantive tests that relate to the assertion: _____

f. Minimum substantive assurance from detail tests: _____

g. For DUS calculated manually:
   1. Risk factor (from audit matrix): _____
   2. Test materiality: _____

h. For DUS using IDEA:
   1. Confidence level _____%
   2. Materiality (generally design—see FAM 480.27) $_____
   3. Expected misstatement amount $_____

i. Interval based on these factors is: _____
   Random start or seed is _____

j. Sample size based on these factors is: _____
   Workpaper reference to: [ ] Software output (IDEA) _____
   [ ] Manual computation _____

SECTION IV - Evaluation of substantive tests using dollar-unit sampling

If many errors are found and sample size is 75 or greater, consult with the Statistician to evaluate as classical PPS.

Known Substantive Misstatements

Misstatement number	(A) Book amount	(B) Audited amount	(C) Misstatement amount* (A-B)	Nature of misstatement	Possible cause
Items greater than sampling interval					
1					
2					
3					
Total*					

Items less than sampling interval				(D) Misstatement as a percent of book amount* (C/A)			Should misstatement be projected? If not explain:
1							
2							
3							
TOTAL*							

1. When sampling from a different population for understatement of a primary population (such as when sampling subsequent disbursements to test completeness of recorded accounts payable), in computing "Misstatement as a percent of book amount" the "Book amount" is the subsequent disbursement (not the recorded payable); the audited amount is the amount that was correctly accrued or correctly not accrued. For example, assume we find a $10,000 subsequent disbursement that was omitted improperly from accounts payable as of the balance sheet date. The "Book amount" is $10,000 and the "Audited amount" is zero; the "Misstatement as a percent of book amount" is 100%. Thus, the "Book amount" is based on the source of selection, not necessarily what is recorded in the financial statements.
2. If IDEA selects an item twice and it is misstated, include the item twice in this listing.

*Calculated amounts may be omitted if calculation done using IDEA.

Section IV (continued)

Compute projected misstatements:

(Omit steps E through H if computed by IDEA)

(E) Number of equivalent complete misstatements in sample (excluding misstatements found in 100% examined items - see Note) from column D on previous page _____

(F) Sampling interval _____

(G) Projected misstatements (ExF) _____

(H) Misstatements found in 100% examined items _____

(I) Total projected misstatement (G+H) (or from IDEA output) _____

(If from IDEA, W/P Reference to IDEA output) _____

Conclusion: Are we satisfied that book amount is fairly stated? [ ] Yes [ ] No [ ] Not enough evidence
If no or not enough evidence, what will we do?

CLASSICAL VARIABLES SAMPLING

Auditee _____

Period Ended _____

	During planning		At end of test	
	Initials	Date	Initials	Date
Prepared by	_____	_____	_____	_____
Reviewed by	_____	_____	_____	_____

SECTION I - Define objectives and method of testing

Line item: _____

Assertion: _____

Test: _____

Description of 100% examined items: _____

_____

_____

SECTION II - Define Population

Population is: _____

_____

Population size: dollars:_____
number of items: _____

Direction of Test: Starting from (source): _____
Testing to (documents to be examined): _____

When this period is less than entire period under audit or where the population being tested is less than the population in the financial statements, describe briefly (and cross-reference to) procedures to obtain satisfaction about the remainder of the population: _____

_____

_____

Steps to be satisfied that the selection is from a population equivalent to the defined population:

_____

_____

Population analyzed by:
[ ] Review of printout of population
[ ] Review of manual listing of population
[ ] IDEA stratification
[ ] Other computer-assisted method—describe:

_____

SECTION III - Determine sample size

a. Confidence Level _____%
b. Materiality (generally design) $_____
c. Precision for total population $_____
d. Strata Definitions:

Stratum	From	To	Number of items	Dollars
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				

e. Sample size based on these factors is: _____

W/P reference to:

[ ] IDEA _____
[ ] SROSTATS calculation _____
[ ] Pilot sample estimate _____

Section IV - Evaluation of substantive tests

a. Evaluation method -- W/P reference to:

[ ] IDEA _____
[ ] SROSTATS calculation _____
[ ] Spreadsheet _____

b. Estimating technique

[ ] Direct projection
[ ] Difference estimation
[ ] Separate ratio
[ ] Combined ratio
[ ] Combined Regression
[ ] Other _____

c. Point Estimate $ _____

Confidence interval From $ _____ To $ _____
At _____ % Confidence level

Conclusion: Are we satisfied that book amount is fairly stated? [ ] Yes [ ] No [ ] Not enough evidence
If no or not enough evidence, what will we do?

_____
_____
_____
_____

[This page intentionally left blank.]

495 F - MANUALLY SELECTING A DOLLAR UNIT SAMPLE

.01 Even though auditors usually use software (such as IDEA) to select a dollar-unit sample, it is helpful to understand the process for manually selecting a dollar-unit sample. To select a dollar-unit sample manually, the following steps should be performed:

a. Determine the sampling interval using the following formula:

   sampling interval = test materiality ÷ statistical risk factor

b. Clear the calculator

c. Select and document a random start and enter as a negative number in the calculator. The random start should be a number between 1 and the sampling interval.

d. Enter the positive amounts in the test population (items) until the calculator's running subtotal becomes positive. The item that caused the subtotal to become positive is the item selected for testing.

   [See page 495 F-3. Note that the calculator subtotals were positive for invoices #3, 10, 17, 19, and 24.]

   Do not enter into the calculator any items in the population with zero or credit balances. These items should be accumulated separately and tested in conjunction with tests of completeness of the account balance or class of transactions if they are expected to be significant.

e. After each selection, subtract the sampling interval until the subtotal is negative. Even if the last item in the population is selected, the sampling interval should be subtracted until the subtotal is negative.

   [See page 495 F-3. For invoice #19, the auditor had to subtract the sampling interval twice to get a negative subtotal.]

f. Repeat steps d. and e. until all items in the test population have been entered into the calculator and the ending subtotal is negative.

g. To test the footing of the population, reconcile the sample to the recorded amount of the test population as follows:

Add:

(a) Random start

(b) Sampling interval multiplied by the number of times the sampling interval was subtracted during selection of the sample

(c) The remaining subtotal on the calculator.

The total should equal the test population amount.

If the total on the reconciliation is not equal to the population amount, there is either an error in the total population amount or there was an error in entering the population items into the adding machine.

The auditor should consider the amount of any difference when determining whether investigation of the difference is necessary. Immaterial amounts generally do not require investigation.

[See page 495 F-4 for an example reconciliation to test the footing.]

Example of Systematic Selection for DUS

- Random starting point . . . . . $ 6,000
- Sampling interval $50,000

Invoice Register		Adding Machine Tape			
Number	Amount		Entries	Subtotals	Selection
				Start $ 0	
		–	6,000	(6,000)	
1	$ 2,500	+	2,500	(3,500)	
2	2,500	+	2,500	(1,000)	
3	4,500	+	4,500	3,500	X
		–	50,000	(46,500)	
4	12,000	+	12,000	(34,500)	
5	25	+	25	(34,475)	
6	3,500	+	3,500	(30,975)	
7	10,000	+	10,000	(20,975)	
8	8,000	+	8,000	(12,975)	
9	5,000	+	5,000	(7,975)	
10	25,000	+	25,000	17,025	X
		–	50,000	(32,975)	
11	1,000	+	1,000	(31,975)	
12	500	+	500	(31,475)	
13	7,000	+	7,000	(24,475)	
14	10,500	+	10,500	(13,975)	
15	12,000	+	12,000	(1,975)	
16	1,275	+	1,275	(700)	
17	9,500	+	9,500	8,800	X
		–	50,000	(41,200)	
18	10,000	+	10,000	(31,200)	
19	100,000	+	100,000	68,800	X
		–	50,000	18,800	
		–	50,000	(31,200)	
20	20,200	+	20,200	(11,000)	
21	1,800	+	1,800	(9,200)	
22	4,000	+	4,000	(5,200)	
23	250	+	250	(4,950)	
24	20,550	+	20,550	15,600	X
		–	50,000	(34,400)	
25	20,000	+	20,000	(14,400)	
	$291,600				

Reconciliation of book amounts footed to test population:

	Random start	$ 6,000
+	Sampling interval × number of times subtracted ($50,000 × 6)	300,000
+	Remaining subtotal	(14,400)
	Population total	$291,600