
AUDIT REPORT



REVIEW OF HUD'S EFFORTS TO CORRECT YEAR 2000 PROBLEMS (PHASE II)

99-DP-166-0002

March 25, 1999

INFORMATION SYSTEMS AUDIT DIVISION
OFFICE OF AUDIT



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TO: Saul Ramirez, Deputy Secretary, SD

FROM: Benjamin K. Hsiao, Director, Information Systems Audit Division, GAA

SUBJECT: Audit Report of HUD's Efforts to Correct Year 2000 Problems (Phase II)

Attached is the second report on our review of HUD's efforts to correct Year 2000 problems. Our objective was to ensure that mission critical information systems will be made Year 2000 compliant in order to operate properly after January 1, 2000. This review focused specifically on the project management oversight of six highly critical application systems to determine if detailed project work and test plans, and testing and certification processes followed industry accepted best practices and Departmental guidelines to minimize the impact of the Year 2000 date problem.

HUD has committed itself to performing Year 2000 certification for all applications and the process has been in place for a period of time. Since 1996, the Department has invested considerable effort in fixing the Year 2000 date problem. Recently, at the urging of the Chief Information Officer (CIO), the Department placed a moratorium on system enhancements to ensure maximum efforts will be devoted to the Year 2000 date problem.

While the Department has made progress in correcting the Year 2000 problem, a number of weaknesses still exist. The project work and test plans for some of the critical applications were insufficient. The software renovation process lacked controls to ensure that all date fields have been identified for changes. The Year 2000 test standards did not include sufficient requirements for data aging, and conducting system integration and interface testing. Further, the Year 2000 certification was not based on an independent evaluation of the test results. Without adequate plans, change control, testing standards, and certification process, Year 2000 efforts are prone to errors and omissions. As a result, critical systems are vulnerable to Year 2000 failures.

The weaknesses found must be corrected immediately. Our review found that these weaknesses existed because the Year 2000 project office is not functioning at a high level with sufficient authority to ensure best practices and standards are followed. The recent involvement of the CIO in coordinating the Year 2000 effort is a positive step. However, the CIO has no direct authority over HUD's Office of Information Technology (IT) and contractor personnel performing Year 2000 work. A senior official with sufficient authority would ensure that

everything possible is done to minimize the risk of Year 2000 failures. In our first report, we recommended that the Department place the Office of IT within the Office of the CIO. However, the Department decided not to implement this recommendation. We will provide a disagreed management decision regarding this recommendation in the OIG's semi-annual report to Congress.

As discussed at the entrance conference, OIG's approach in reviewing Year 2000 activities is to issue interim reports before we finish the entire review. Given the limited time left to correct the Year 2000 date problem, we are requesting a response to this report's recommendations within 60 days on: (1) action taken; (2) the proposed action and date to be completed; or (3) why action is considered unnecessary.

Should you have any questions or require additional information, please contact me at (202) 708-3444, extension 149.

Attachment

Executive Summary

The Department of Housing and Urban Development (HUD) has committed itself to performing Year 2000 (Y2k) certification for all applications. Since 1996, the Department has invested considerable effort in fixing the Y2k date problem. Recently, at the urging of the Chief Information Officer (CIO), the Department placed a moratorium on system enhancements to ensure maximum efforts will be devoted to the Y2k date problem. With increasing emphasis on Y2k, the Department has made significant progress. However, our audit work shows a number of areas needing immediate attention.

This report is the second review we performed as part of the OIG's continuing oversight of HUD's Y2k initiative. We evaluated project management oversight of six highly critical applications to determine if the detailed project work and test plans, and the testing and certification processes followed Departmental guidelines and industry accepted best practices to minimize the impact of Y2k date problems.

In our first audit report (98-DP-166-0003 dated June 1, 1998), we emphasized the need for a senior official to be involved with the management and coordination of Y2k activities. We also stressed the need to adopt an automated configuration management program to control software changes made to correct the Y2k date problems. The results of our current work have shown an even greater need to address these two areas.

The Department has agreed that software configuration management is a high priority item but has recognized and accepted the risks for not fully implementing an automated configuration management tool for all of HUD's platforms. The Department intends to implement the automated tool when resources become available, possibly after the Y2k renovation work is completed.

HUD is committed to performing Y2k renovation, certification, and testing for all applications and the process has been in place for some time. However, there are weaknesses in all three areas. In particular we are concerned with weak controls over testing. Experience has shown that Y2k testing is consuming between 50 to 70 percent of a project's time and resources.

The weaknesses exist because the Y2k Project Office is not functioning at a high enough level with sufficient authority to ensure best practices and standards are followed. Although the recent involvement of the CIO in coordinating the Y2k effort is a positive step, more needs to be done to provide accountability for the Y2k project and operations. There is a continued need for a senior level manager, such as the CIO, to provide the necessary leadership and accountability over the Office of Information Technology (IT) operations. Currently, the CIO has no direct authority over HUD's IT and contractor personnel performing Y2k work. A senior official with sufficient authority would ensure that everything possible is done to minimize the risk of Y2k failures. In our first report (98-DP-166-0003), we recommended that the Department place the Office of IT within the Office of the CIO. However, the Department decided not to implement this recommendation.

Unless the Y2k problem is corrected, the impact of Y2k failures will be widespread and costly.

On January 1, 2000, it is a real possibility that many of HUD's computer systems will malfunction or produce incorrect information simply because the century date has changed. The Y2k problem is rooted in the way dates are recorded and computed in automated information systems. Programmers have typically used two digits to represent the year, such as "97" to represent 1997. However, starting in the Year 2000, the continued use of two digits will render the date indistinguishable from the year 1900, or 2001 from 1901. As a result of the ambiguity, HUD's system or application programs that use dates to perform calculations, comparisons, or sorting may generate incorrect results. Unless corrected, the impact of these failures will be widespread and costly to the Department.

There is a continued need for a senior level official to provide the leadership and accountability over the Y2k conversion.

Although an adequate support structure exists for HUD's Y2k planning, renovation, testing and certification processes, the HUD Y2k Project Office is not operating at a sufficiently high level of authority to ensure best practices and standards are followed. There is a continued need for a senior level official to provide the necessary leadership and accountability over the Y2k renovation, testing and certification processes. The following are weaknesses that must be addressed to further reduce the risk of Y2k failures.

1. Project work and test plans for the six applications reviewed did not provide sufficient details for management to monitor and control the Y2k conversion process.
2. Automated controls over software changes made are needed.
3. Software renovation lacked a controlled process to ensure all date fields have been identified for changes.
4. Testing standards were not sufficient to ensure adequate test coverage.
5. The Y2k certification process did not include an independent assessment of the adequacy of the tests performed and, as a result, provides no assurance that testing was sufficiently conducted.

We recommend the Department implement the following to reduce the risk of Y2k failures:

- Review and update current work and test plans for all application systems to identify project tasks and associated timelines, costs, resources, test data

specifications and constraints, interfaces, etc., needed to accomplish current and future work.

- As the Department has acknowledged that configuration management is a high priority item and has recognized and accepted the risks of not fully implementing an automated configuration management tool, we recommend the Department develop a schedule for full implementation of the tool for all of HUD's computing platforms.
- The renovation and certification phases are complete and HUD is currently moving forward with Integration Certification Testing (ICeT). We recommend the Department strengthen testing standards and establish a Quality Assurance/Independent Validation and Verification Group to ensure adequate testing is performed.

The Department must address these critical issues as the impact of computer failure will be widespread and costly. As we approach the Year 2000, applications may begin to stop working or provide inaccurate or unpredictable results if the problem is not corrected. The following situations could occur, if:

- One of the HUD disbursement systems experienced inaccurate processing due to a Y2k miscalculation, incorrect transactions may result in improper payments made by Treasury;
- The Computerized Home Underwriting Management System (CHUMS) was unable to accept new customers from banks, HUD underwriting would not be possible;
- Insurance claims were miscalculated, HUD would incur responsibility for interest payments.

RESPONSE TO REPORT

We provided the draft report to the Office of the Deputy Secretary on January 8, 1999. We received the written response to the draft report on March 8, 1999. The Deputy Secretary agreed with one out of five recommendations

contained in the draft report. We removed one of the recommendations based on the auditee's comments.

The comments and our response are provided in Appendix A.

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Introduction

The Year 2000 challenge is being faced by all businesses, including the Department of Housing and Urban Development (HUD), that depend on information technology for critical business processing. Sometimes called the "millennium bug," the Year 2000 (Y2k) problem results from the long standing practice of writing computer programs to store and handle only the last two digits of the year, assuming the first two would always be "19." In most cases, entering a year of "00" will be interpreted as "1900," and create an exception. As we approach the Year 2000, this will cause many computers and applications to stop working or provide inaccurate or unpredictable results if the problem is not corrected. As a result, prior to the Year 2000, the Department must address Y2k issues associated with internal applications, system clocks, and system software and hardware. Unless corrected, the impact of these failures will be widespread and costly to the Department.

This report is the second in a series of point-in-time reviews performed by the Office of Inspector General (OIG) as part of our continuing oversight of HUD's Y2k initiative. In our first audit report (98-DP-166-0003 dated June 1, 1998), we emphasized the need to establish an agency-level project office to manage and coordinate Y2k activities. We also stressed the need to adopt a configuration management program to control software changes made to correct the Y2k date problems. The results of our current work have shown even a greater need to address these two areas.

Audit Objectives

The overall audit objective was to determine whether HUD's Y2k resolution plan and its execution are adequate to ensure that mission critical information systems will be made Y2k compliant and, continue to operate without an interruption of service after January 1, 2000.

Audit Scope and Methodology

To accomplish the objective, we evaluated the project management oversight of six highly critical application systems to determine if detailed project work and test plans, and testing and certification processes followed industry accepted best practices and Departmental guidelines to minimize the impact of the Y2k date problems. These systems include:

- Single Family Claims (SFC)
- Single Family Insurance (SFI)
- Computerized Home Underwriting Management System (CHUMS)
- Integrated Disbursement and Information System (IDIS)

- Lines of Credit Control System (LOCCS)
- Program Accounting System (PAS)

We interviewed staff from the Year 2000 Project Office and the Office of Information Technology. We also reviewed guidelines and procedures promulgated by the Year 2000 Project Office, and based on industry-wide accepted best practices, as well as documentation provided by the application systems project teams.

We performed our work from June through December 1998. We conducted the audit in accordance with generally accepted governmental auditing standards.

Improvements are Needed in the Quality Assurance Process Over the Year 2000 Planning, Testing, and Certification Activities

Although an adequate support structure exists for HUD's Year 2000 (Y2k) planning, renovation, testing, and certification processes, the quality assurance process needs significant improvements. There is also a continued need for a senior level official to provide the necessary leadership and accountability over the Y2k conversion process. We found that: (1) project work and test plans for the six systems reviewed did not provide sufficient details for management to monitor and control the Y2k conversion process; (2) automated controls over software changes are needed; (3) software renovation lacked a controlled process to ensure that all date fields have been identified for changes; (4) testing standards did not include sufficient requirements for data aging, and conducting system integration and interface testing; and (5) the certification process did not provide assurance that adequate testing was performed. These weaknesses exist because the Y2k Project Office is not at a sufficiently high level of authority to ensure best practices and standards are followed. There is a continued need for a high level Departmental Y2k project office to provide the necessary accountability over the renovation, testing and certification processes. This office would ensure that everything possible is done to minimize the risk of Y2k failures.

As of December 18, 1998, HUD reported that 100% of their mission critical systems requiring renovation have been renovated and 85% are certified as Y2k compliant. We recognize that the Y2k staff, both at the project (Y2k Project Office) and application levels, have worked hard and accomplished much to make sure that HUD's systems are Y2k ready. HUD has committed itself to performing Y2k certification for all applications and the process has been in place for a period of time. However, significant improvements are still needed in HUD's Y2k conversion process.

We met with the Deputy Secretary on November 16, 1998, and the Department has agreed that software configuration management is a high priority item and has recognized and accepted the risks for not fully implementing an automated configuration management tool for all of HUD's platforms. The Department intends to fully implement the automated tool when resources become available, possibly after the Year 2000. We were informed that the Department will develop and provide the OIG a schedule for full implementation of the tool. However, to date, OIG has not received this schedule.

Although an adequate support structure exists for HUD's Y2k planning, renovation, testing and certification processes, the HUD Y2k Project Office is not operating at a sufficiently high level of authority to ensure best practices and standards are followed. The recent involvement of the Chief Information Officer (CIO) in coordinating the Year 2000 effort is a positive step. However, there is a continued need for a senior level manager, such as the CIO, to provide the necessary leadership and accountability over the Office of Information Technology (IT) operations, including the Year 2000 project. Currently, the CIO has no direct authority over HUD IT and contractor personnel performing Year 2000 work. A senior official with sufficient authority would ensure that everything possible is done to minimize the risk of Y2k failures. The following are weaknesses that must be addressed to further reduce the risk of Y2k failures.

Insufficient Project Work and Test Plans Prepared For the Six Systems Reviewed

Plans did not provide sufficient details for management to monitor and control the Y2k projects.

The project work plans reviewed did not provide sufficient details for management to monitor and control the Y2k projects. The HUD Year 2000 Readiness Guide requires each application develop a detailed work plan. These plans identify project tasks and associated timelines, costs, and resources needed to accomplish the work as well as interfaces and configuration management strategy to be used. A complete and reasonably accurate estimate of the work to be performed is vital in determining and scheduling projects to assure optimum resource utilization, achieve HUD's goals, and assure sufficient coordination and sequencing of work.

The following matrix summarizes our review of the work plans to determine whether the requirements specified in the Year 2000 Readiness Guide were developed for each of the systems.

REQUIREMENTS	CHUMS	IDIS	PAS	LOCCS	SFI	SFC
Cost Estimate	N	N	N	N	N	N
Time Constraints	Y	N	Y	Y	Y	I
Test Plan	I	I	I	I	I	I
Resource Estimate	Y	N	Y	N	Y	N
Interface Strategy	Y	Y	Y	Y	N	N
Configuration Management Strategy	N	N/A	N	Y	N	N

I = Insufficient N = No Y = Yes N/A = Not Applicable

Two of the six application systems reviewed did not have a detailed work plan. Instead, they had separate and incomplete components of a work plan. The remaining four application systems reviewed had work plans but did not contain Work Breakdown Structures, which define specific tasks, and associated timelines, costs, and resources needed to accomplish the work, as well as interfaces and configuration management strategy to be used. Examples of deficiencies in the work plans include the following.

Cost details were not provided in the plans.

- There were no detailed cost estimates or anticipation of resource interdependencies, requirements, and impediments. This data must be developed so that the proper dollars and resources can be budgeted and allocated to fix the Y2k problem.

System interfaces with either internal or external applications were not addressed.

- System interfaces with either internal or external applications were not addressed. Identification of interfaces helps to determine the renovation approach, the bridges that must be built, and the timing for the testing and implementation of the renovated application. The number of interfaces adds to the complexity in renovating or upgrading an application. In addition, different systems which interface may interpret the century differently if they both use windowing, but use a different pivot year. The greater the number of interfaces, the greater the possibility of dependent systems becoming corrupt.

Configuration management was not addressed.

- Configuration management was not addressed to ensure that certified code is not inadvertently replaced by earlier, non-certified versions of code. The Readiness Guide acknowledges that current methods of

configuration management will severely strain resources as the amount of change grows in response to the breadth and depth of Year 2000 activity.

Insufficient test plans could lead to applications not being adequately tested resulting in Y2k failure.

In addition, we found insufficient test plans that could lead to applications not being adequately tested, resulting in an increased risk of Y2k failure. The purpose of testing is to ensure that the application will compute HUD business rules accurately before, during, and after January 1, 2000.

The following matrix summarizes our review of test plan requirements from the Year 2000 Readiness Guide and whether or not they were developed for each of the systems.

REQUIREMENTS	CHUMS	IDIS	PAS	LOCCS	SFI	SFC
System Description	Y	Y	Y	Y	Y	Y
Testing Schedule	Y	N	I	N	I	I
Test Conditions	Y	Y	Y	Y	Y	Y
Extent of Test	Y	Y	Y	Y	Y	Y
Data Recording	N	N	Y	Y	Y	N
Test Constraints	Y	N	Y	Y	N	N
Test Progression	Y	Y	Y	Y	Y	Y

I = Insufficient N = No Y = Yes

As identified in the matrix above, we found:

- Lack of testing schedules depicting the locations at which the integration testing will be scheduled and time frames during which the test will be conducted.
- There were no data recording specifications, such as test scripts and procedures, for the test process.
- Test constraints were not specified to anticipate limitations imposed on the test due to system or test conditions, such as timing interfaces, equipment, personnel, etc.

Automated Controls Over Software Changes Made are Needed

Although HUD management has recently frozen new non-Year 2000 development, there is no automated process to identify exceptions to this rule. In the past, concurrent year 2000 changes, non-Year 2000 maintenance, and non-Year

There are no automated means to synchronize Year 2000 and non-Year 2000 changes.

2000 software development to the Computerized Home Underwriting Management System were made with no automated means of synchronizing concurrent changes. Because there is no automated process to identify Year 2000 changes from non-Year 2000 exceptions to the rules, in the event that concurrent changes are not properly merged, Year 2000 changes could remove the non-Year 2000 changes which could cause a system failure.

Current configuration management process does not force changed programs to re-compile.

The current configuration management process does not force changed programs to re-compile. Configuration management is the continuous control of changes made to a system's hardware, software, and documentation throughout the development and operational life of the system. Although formal management approval is required prior to implementation of changed programs or subprograms into production, there is no automated tool to force program compile. One of the tasks performed during a program compile is the linking of all subprograms necessary for the program to successfully execute. A program re-compile will link new versions of program(s) and subprogram(s) so that changes containing Year 2000 compliant codes will execute. Because current configuration management does not force the re-compile, programs may not be running the most current code. Implementation of the automated configuration management tool, will help ensure systems execute the most current versions of software, which may contain Year 2000 changes.

PAS does not use an automated check-in and check-out tool to control software changes.

The Program Accounting System (PAS) does not use an automated check-in and check-out tool to control software changes. Such a tool is currently being used by the Lines of Credit Control System (LOCCS), which resides on the same mainframe platform as PAS. While PAS is supported by a small development group, which requires less formalized controls, the tool should be installed and used to control software changes on PAS.

Software Renovation Lacked a Controlled Process to Ensure that All Date Fields Have Been Identified for Changes

The method Single Family Claims (SFC) used to identify date definitions may not identify all dates that need remediation and testing. Date usage was determined through

The method SFC used to identify date definitions may not identify all dates needed for remediation and testing.

manual reviews of files containing data format and definitions, and shared programs, commonly referred to as copybooks. However, unless all date definitions are stored in copybooks, they would not be identified for remediation and testing. For example, date variables, such as "19," may be imbedded in the program code itself, and thus, a review of the copybook would not identify all codes that require Y2k changes and testing. In addition, there is no guarantee the most current versions of copybooks are being used. Part of the remediation process should have included reviews of programs to identify dates that would not show up in copybooks. It is critical that all areas of programs which use dates as part of logic processing are correctly identified in order to insert the program logic to correctly identify the century. Also, if a date calculation within the code is not identified for remediation, it may not be disclosed during testing.

SFI did not use automated tools to identify dates.

Single Family Insurance (SFI) did not use automated tools to identify dates, which were based on names defined in the data dictionary. This did not appear to adversely affect SFI remediation efforts because our limited compliance test found that a consistent naming convention was used. However, in applications that do not use proper naming conventions, all dates that require remediation and testing would not be disclosed. Use of an automated tool to identify date definitions would help ensure that none are missed.

Automated tools are not used to the maximum extent possible.

Use of an automated tool, by both SFC and SFI, would have provided additional assurance that dates requiring remediation are identified. The Y2k Project Office has purchased automated tools and made them available to the application project teams for use in their Y2k remediation efforts. However, not all application project teams are using them, even though best practices recommend that they be used to the maximum extent possible. The Y2k Project Manager indicated that she can only encourage their use, and does not have the authority to ensure usage of the tools. This issue has been discussed on several occasions between the application and Y2k Project Offices.

Testing Standards Did Not Include System Integration, Data Aging and Interface Testing

Although HUD has a good testing standard base, standards need to be expanded in the following areas to ensure adequate test coverage:

- Systems integration testing requirements
- Data aging standards
- External interface standards
- Levels of testing requirements

Systems integration testing did not include a determination of how far back the originating input to date calculations needs to be tested, and how far forward validation needs to occur.

Systems integration testing standards should be expanded to include a determination of how far back the originating input to date calculations needs to be tested, and how far forward validation needs to occur.

Systems integration testing is performed to verify that units of software, when combined, work together as intended. The test interconnects sets of previously tested units to ensure that the sets behave as well as they did as independently tested units. Because each system is typically dependent upon various other conditions or occurrences, integration testing is necessary to ensure these relationships operate properly.

For example, a date calculation is performed in system B, which receives data from system A. It would be necessary to identify the originating transaction data in system A which ultimately results in the date calculation in system B. In addition, data from this calculation in system B may be fed to another system, system C, which also uses the data for further calculations. Therefore, any testing would need to take into account the originating, intermediate, and ending sources of the data when performing the integrated test.

Data aging standards did not include requirements for aging through "time warping" versus aging through execution of business cycles.

Data aging standards did not include requirements for aging through "time warping" versus aging through execution of business cycles. Data aging is a technique used to prepare test data so that they have the right dates with respect to the simulated system time. Data aging through "time warping" requires changing the data – and sometimes the logic – to appear as if it were some year in the future. It requires taking existing dates in the system and adding a specified number of years. Aging based on business cycles is the execution of jobs at specific time intervals in order to naturally age the

data based on how each normal processing cycle advances the dates. Standards for 20xx testing should indicate when each method is most appropriate.

External interface standards did not include validation requirements.

External interface standards did not include validation requirements such as internal balancing, manual reconcilements, and before and after compares of aged data to ensure complete and accurate interface processing.

On March 26, 1998, HUD issued a letter to all of its business partners requiring that dates be expanded to the four digit year format, unless there has been a mutual agreement by both partners to a different format. All interfaces with HUD's business partners are scheduled to be certified as compliant and implemented prior to March 31, 1999. In many cases, business partners' systems send and/or receive data whose format must be modified to meet the four digit year requirement. Not only must data be made compliant, it must be tested to certify that changes are compliant. Thus, testing must be completed for all interfaces. Validation is the process for testing results of a century-date compliance conversion to ensure their correctness. It is accomplished by processing a series of tests that show: (1) the century dates were properly handled, and (2) existing functionality has not been adversely affected. The existence of validation requirements such as internal balancing, manual reconcilements, and before and after compares of aged data will help ensure complete and accurate interface processing. Thus, overall quality and confidence in the data exchanged with partners are increased.

Testing documentation standards did not identify the level or type of testing required based on risk and project strategies.

Testing documentation standards did not identify the level or type of testing required based on risk and project strategies. Examples of factors which impact the level of testing include but are not limited to date expansion versus windowing, concurrent development, and compiler upgrade.

The Year 2000 Certification Process Did Not Provide Assurance that Adequate Testing Was Performed

The certification process does not provide assurance that adequate testing was performed. HUD has committed itself to perform Year 2000 certifications for all application components, and the process has been in place for a period of time. Our review did not disclose any issues on how the certification was administered. However, we found significant

weaknesses with the methods used to determine whether sufficient testing was performed.

The scope of the tests was not independently assessed as part of the certification review.

The certification process did not include an independent initial assessment of the project and implementation strategy to determine whether the scope of testing was sufficient to certify the application. Also, the system application groups determined the scope of testing without input or sign-off from users. Therefore, the certification review would not disclose whether sufficient testing was performed.

The certification process does not include an independent assessment of the adequacy of the tests conducted.

The certification process did not include an independent assessment of the adequacy of the tests. The primary focus of the certification process was limited to compliance. Certification teams reviewed documentation for the purpose of determining whether individual components were tested and results documented according to prescribed guidelines. However, although technically skilled resources were assigned, there was no independent assessment as to whether the testing was sufficient to provide assurance the application will properly process Year 2000 related dates.

The testing approach was not analyzed for appropriateness and completeness.

The testing approach was not analyzed for appropriateness and completeness. For example, if the impact analysis did not disclose all dates processed by the application, undetected dates may not be renovated or tested. If the impact analysis was correctly done, it would still be necessary to ensure that the test plan and scripts account for the date processing identified. Without such an assessment, it would be difficult for the certification group to determine whether sufficient test coverage was provided.

There were no means to determine whether all programs with date related changes were tested.

The certification process did not include any analysis to determine whether full functional testing was performed. Also, there were no means to determine whether all programs with date related changes were tested as part of the certification process. HUD has committed itself to performing full functional testing, which ensures that all application components function in a manner required to support the business. Although full functional testing is comprehensive, unless it is actually performed to the appropriate level, all date related calculations may not be tested.

Recommendations

We recommend the Deputy Secretary direct the Chief Information Officer and the Acting Assistant Secretary for Administration work together to:

1. Review and update the current work and test plans for all application systems to determine project tasks and associated timelines, costs, resources, test data specifications and constraints, interfaces, etc., needed to accomplish current and future work.
2. Develop a schedule for full implementation of automated tools for configuration management on all computing platforms. Also, in the interim, PAS should install the check-in and check-out tool used by LOCCS.
3. Strengthen the certification process by including the following steps:
 - A. Use automated tools to independently verify and validate that all critical date fields have been properly renovated.
 - B. Include as part of systems integration testing requirements, a determination of how far back the originating input to date calculations needs to be tested and how far forward validation needs to occur.
 - C. Include as part of data aging standards, requirements for aging data through "time warping" and/or through execution of business cycles.
 - D. Include as part of external interface standards, validation requirements such as internal balancing, manual reconciliation, and before and after compares of aged data to ensure complete and accurate interface processing.
 - E. Include as part of levels of testing requirements, types of testing required based on risk and project strategies.
4. Establish a Quality Assurance/Independent Validation and Verification Group, as recommended by the GAO's Y2k testing guide, to provide an independent assessment of HUD's integration testing efforts at all phases of the ICeT project. The Group should be

involved in reviewing and approving the scheduling and planning guidance, test procedures and data provided by the Testing Coordination team, Cluster Teams and Program Areas, as well as observing and signing off on the results of the integration tests performed.

Auditee Comments



U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
THE DEPUTY SECRETARY
WASHINGTON, DC 20410-0059

March 8, 1999

TO: Susan Gaffney, Inspector General, G

FROM: Saul N. Ramirez, Jr., Deputy Secretary, SD

A handwritten signature in black ink, appearing to read "Saul N. Ramirez, Jr.", written over the printed name in the "FROM" field.

SUBJECT: Response to Draft Audit Report of HUD's Efforts to Correct
Year 2000 Problems, dated January 8, 1999

Attached are responses to the five recommendations in the draft audit report of HUD's efforts to correct Year 2000 problems, dated January 8, 1999. We recommend closing four of the five recommendations, leaving only recommendation #3 open.

Should you have specific questions regarding the Year 2000 responses, please feel free to contact Pam Woodside, 708-0614 x6310. Scott Cragg is also available for questions concerning the Office of Information Technology, and he can be reached at 708-0306.

Attachment

Response to the Draft Audit Report of HUD's Efforts to Correct Year 2000 Problems
dated January 8, 1999

Recommendation #1: Our review found that these weaknesses existed because the Year 2000 Project Office is not functioning at a high level with sufficient authority to ensure best practices and standards are followed. A senior official with sufficient authority would ensure that everything possible is done to minimize the risk of Year 2000 failures. We recommend the CIO be assigned sufficient authority to directly control IT, including the Year 2000 conversion, to ensure that everything possible is done to minimize the risk of Year 2000 failures.

See OIG
Comment 1

Response: Representatives of both organizations (the Office of the Deputy Secretary and the Office of the Inspector General) met on November 16, 1998, to discuss the organizational responsibilities of the Chief Information Officer (CIO). Although executive level involvement and oversight have always been present in HUD's Year 2000 effort, on December 1, 1998, the CIO was given organizational responsibility and authority for the direct oversight and control of the Year 2000 project staff.

The Department's Year 2000 (Y2K) compliance program is doing very well under the executive leadership of the CIO. The program also receives the direct oversight attention of both Secretary Cuomo and myself, and is reviewed at the monthly Technology Investment Board Executive Committee meetings. The Office of the CIO and the Office of Information Technology are working together in close cooperation, and have my full confidence and support. Irrespective of the merits, or lack thereof, of your recommendation to place the Office of Information Technology within the Office of the Chief Information Officer, additional organizational changes of this scope at this point in time would do more harm than good. Such an organizational change would only disrupt and delay the successful completion of HUD's Y2K compliance activities. I will not allow that to happen. Please close this recommendation.

Recommendation #2: The project work and test plans for some of the critical applications were insufficient. We recommend the current work and test plans for all applications systems be reviewed and updated to identify project tasks and associated timelines, costs, resources, test data specifications and constraints, interfaces, etc., needed to accomplish current and future work.

See OIG
Comment 2

Response: On September 25, 1998, HUD completed renovation of the eighty systems reported to the OMB as To-Be-Renovated, ahead of the mandate of September 30, 1998, established by the Office of Management and Budget (OMB). On January 28, 1999, HUD completed certification of the 174 systems reported to the OMB as needing to be certified, ahead of the OMB mandate of January 31, 1999. HUD is well on its way to completing implementation of *all* systems, ahead of the OMB mandate of March 31, 1999. HUD can be especially proud of these achievements, because each of these OMB mandates applied only to mission-critical systems, not the entire inventory which HUD achieved. Your suggestion that some of our planning products can be improved upon will be considered as we return to a business-as-usual development environment. We recommend closure of this recommendation.

Response to Draft Audit of January 8, 1999 (cont.)

Recommendation #3: Without adequate plans, change control, testing standards, and certification process, Year 2000 efforts are prone to errors and omissions. As a result, critical systems are vulnerable to Year 2000 failures. As the Department has recognized that configuration management is a high priority item and has recognized and accepted the risks for not fully implementing an automated configuration management tool, we recommend the Department develop a schedule for full implementation of the tool. Also in the interim, PAS should install the check-in and check-out tool used by LOCCS.

See OIG
Comment 3

Response: The new Office of IT management team has made configuration management a high priority. Within the first week of their tenure, they initiated a project to inventory and investigate all HUD systems for configuration management compliance. This comprehensive study will provide concrete information to assist management in making decisions about configuration management schedule commitments throughout IT. Furthermore, modifications to the custom configuration management software, used by LOCCS, to encompass the Program Accounting System (PAS) are underway. The automated compilation process of the LOCCS CM tool has been implemented. Modifications to the CM tool's check-in/out process for PAS source items and source libraries will be completed by June 1, 1999.

Recommendation #4: Year 2000 test standards did not include sufficient requirements for data aging, and conducting system integration and interface testing. Because certain processes were not done or done incorrectly during the renovation phase, and the renovation phase is currently considered complete, we recommend strengthening the certification process by including the following steps:

- A. Use automated tools to independently verify and validate that all critical date fields have been properly renovated;
- B. Include as part of systems integration testing requirements, a determination of how far back the originating input to date calculations needs to be tested and how far forward validation needs to occur;
- C. Include as part of data aging standards, requirements for aging data through "time warping" and/or through execution of business cycles;
- D. Include as part of external interface standards, validation requirements such as internal balancing, manual reconciliements, before and after compares of aged data, etc. to ensure complete and accurate interface processing;
- E. Include as part of levels of testing requirements, types of testing required based on risk and project strategies.

See OIG
Comment 4

Response: Based upon prior recommendations from the Office of the Inspector General (OIG) and the Independent Validation and Verification (IV&V) team, the steps in the Attachment were incorporated into the Department's Integrated Certification Testing (ICeT) plan. The objective of ICeT is to perform a test of the major business functions that were identified in the Business Continuity and Contingency Plan (BPCCP). During 1999, when this testing takes place, critical transactions will test both

Response to Draft Audit of January 8, 1999 (cont.)

the Department's internal and external interfaces. We recommend closure of this recommendation.

Recommendation #5: The Year 2000 certification was not based on an independent evaluation of the test results. We recommend the certification process be enhanced to require an independent evaluation of whether sufficient testing was performed to provide reasonable assurance that Year 2000 related dates will process properly. This evaluation should include an:

- A. Initial assessment of project and implementation strategy, with user input and sign-off, to determine the scope of testing necessary to certify the application.
- B. Analysis of the testing approach to determine appropriateness and completeness of the tests performed.
- C. Analysis to determine whether full functional testing was performed.

Response: The Year 2000 certification process developed by Team 2000 was designed to provide an independent evaluation of the date functionality of HUD's information technology systems. The application teams, already familiar with the source code and business functionality, were responsible for Year 2000 renovations, which the Department completed as of September 25, 1998.

Team 2000 provided the independent evaluation of the testing; providing reasonable assurance that Year 2000 date related data will process properly. A separate, independent validation and verification (IV&V) team has been in place since the second quarter of 1998. The IV&V Team (contracted by PricewaterhouseCoopers) performs validation and verification of Team 2000 methods and procedures. As part of the IV&V effort, the IV&V Team analyzed and evaluated HUD's certification process. The recommendations they provided were incorporated by Team 2000 into the existing certification procedures.

HUD's certification process was completed on January 25, 1999. We recommend closure of this recommendation.

See OIG
Comment 5

ATTACHMENT
to the Response to draft Audit of January 8, 1999

- A. Team 2000 and SEG will fund an effort that will use an automated tool to conduct code review of legacy COBOL applications. The tool will detect date instances and examine and flag possible associated date logic errors (i.e., six digit date field comparisons).
- B. The Integrated Certification Testing (ICeT) Approach Document, which details ICeT Standards and Methodology, will be updated. It will include language about the inclusion of boundary analysis and existing date window logic analysis in test data generation.
- C. HUD's Year 2000 Testing and Certification Methodology, as per HUD's Year 2000 Readiness Guide, calls for testing systems with aged data in a date forwarded environment. In testing systems, date simulation software was utilized. Furthermore, the ICeT Approach Document calls for the use of aged data sets in a date forwarded environment. The ICeT methodology requires that cluster planners identify the business cycles to be included in cluster testing, e.g., monthly, quarterly.
- D. ICeT Methodology includes the comparison of two test runs; one using current data and system clock, and one using aged data sets in a date forwarded environment. The results of these two runs will be compared. Any discrepancies will be investigated to determine whether they are attributable to Year 2000 date logic errors. Because ICeT is a test of groups of systems, this comparison is designed to validate accurate system and interface processing for both internal and external systems.
- E. ICeT utilizes a risk-based approach. To define test scope and emphasis, SEG and Program Area personnel will rank the relative importance of interfaces to HUD's critical business functions as defined in the Business Process Continuity Contingency Plan. Testing requirements will be based upon which areas are deemed most critical.

OIG Evaluation of Auditee Comments

1. Based on comments from the Deputy Secretary, we have removed our original recommendation to place the Office of IT within the Office of the CIO. In our first report (98-DP-166-0003), we recommended that the Department place the Office of IT within the Office of the CIO. However, the Deputy Secretary decided not to implement this recommendation. We will provide a disagreed management decision regarding this recommendation in the OIG's semi-annual report to Congress
2. The focus of this recommendation is not on the self-reported completion dates of HUD's Y2k efforts. The intent is to ensure that adequate Y2k testing is performed. Experiences have shown that Y2k testing is consuming between 50 to 70 percent of a project's time and resources. The next phase for most of HUD's mission critical systems is ICeT. We recommend plans for each systems be updated to identify project tasks and associated timelines, costs, resources, test data specifications and constraints, interfaces, etc., needed to accomplish ICeT.
3. We applaud your efforts in making CM a high priority project. The Deputy Secretary promised, during a meeting on November 16, 1998 and memorandum dated January 14, 1999, to provide OIG with a comprehensive plan containing schedules with milestones for implementing automated CM on all platforms. However, we have yet to receive the plan. We will not render a management decision on this finding and similar findings in other OIG reports until we receive the promised documentation and have the opportunity to review it.
4. We agree with the positive response to incorporate the tests into the Department's ICeT plan.
5. The intent of this recommendation is to ensure adequate Y2k testing is performed. The Y2k certification process and Independent Validation and Verification team only reviewed the testing process and did not evaluate the adequacy of the tests performed. We have revised our recommendation. We recommend the Department establish a Quality Assurance/Independent Validation

and Verification (IV&V) Group. The GAO's Y2k testing guide recommends that an IV&V function be established to provide an independent assessment of HUD's integration testing efforts at all phases of integration testing. The IV&V Group should be involved in reviewing and approving the scheduling and planning guidance, test procedures and data provided by the Testing Coordination team, Cluster Teams and Program Areas, as well as observing and signing off on the results of the integration tests performed.

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