

Sandia National Laboratories

Albuquerque, New Mexico 87185

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'84 MAY 16 P3:18

May 11, 1984

WM Record File
A-1166

WM Project 10, 11, 16
Docket No. _____
PDR ✓ w/enc. encl.
LPDR ✓ (B, N, S) w/enc. encl.

Dr. Richard Codell
Geotechnical Branch
Division of Waste Management
U.S. Nuclear Regulatory Commission
7915 Eastern Avenue
Silver Spring, MD 20910

Distribution: _____
RCodell w/enclosures

(Return to W.M. 623-SS) _____ C2
Enc: with enclosures

Dear Dr. Codell:

Enclosed is the monthly report for FIN A-1166, Maintenance of Computer Programs, for April 1984.

The question posed in your letter dated May 3, 1984 concerning the update from the regular NWFT/DVM code to the Generalized Network version has been clarified in this monthly report.

The \$30K carryover for A-1166 is based on the attached accounting sheet dated November 30, 1983. In addition, \$100K was received on February 14, 1984 from the attached DOE work order number 50-84-33. This brings our current budget to \$130K for 1984.

The quality assurance documents that you discussed with Gene Runkle entitled "Quality Assurance (QA) Policy for Computer Software in Directorate 1500," SAND83-0905 and "Intera Quality Assurance Procedures" dated 5/1/82 are included for your use. Please note that the document from Intera is confidential and should not be distributed further.

Please call or write if you have any questions or comments.

Sincerely,

Robert M. Cranwell

Robert M. Cranwell, Supervisor
Waste Management Systems
Division 6431

RMC:6431:jm

Enclosure

8409060122 840511
PDR WMRES EXISANL
A-1166 PDR

Copy to:
Office of the Director, NMSS
Attn: Program Support
Robert Browning, Director
Division of Waste Management
Malcolm R. Knapp
Division of Waste Management
Cal Belote
Division of Risk Analysis
John Randall
Health Siting & Waste Management Division
6400 R. C. Cochrell
6431 R. M. Cranwell
6431 E. J. Bonano
6431 P. A. Davis
6431 G. E. Runkle

PROGRAM: Maintenance and Validation of Computer Programs FIN#: A-1166
CONTRACTOR: Sandia National Laboratories BUDGET PERIOD: 10/83 - 9/84
NMSS PROGRAM MANAGER: R. Codell BUDGET AMOUNT: \$130K
CONTRACT PROGRAM MANAGER: R. M. Cranwell FTS PHONE: 844-8368
PRINCIPAL INVESTIGATORS: P. A. Davis FTS PHONE: 846-5421

PROJECT OBJECTIVES

The objective is a maintenance task that will ensure that the Sandia computer programs remain consistent with current operating systems, are as error-free as possible, and have up-to-date documentation for NRC. There is also a validation assessment task to identify real physical situations which could provide data for validation of the Sandia computer program.

ACTIVITIES DURING APRIL 1984

Maintenance of Computer Codes

NWFT/DVM Verification Report

An original of the report entitled "Verification of the Network Flow and Transport/Distributed Velocity Method (NWFT/DVM) Computer Code" was forwarded to the NRC on April 16, 1984 for publication. This version of the report incorporated the review comments and subsequent rewrites of the problem descriptions to include more detail.

SWIFT II Version 12.83

This version of the SWIFT II code has been installed on the Sandia computer system. The first two sample problems from the SWIFT Verification and Field Comparison have been executed and the results agree with those presented on the microfiche. In addition, the nine sample problems for the SWIFT II Self-Teaching Curriculum being prepared under FIN A-1158 (Technology Transfer) have been executed and the results appear to have excellent agreement with those provided from Geotrans/Houston following changes in the input parameters. Further efforts are underway to verify the remaining 25 problems from the SWIFT Verification and Field Comparison report.

The final verified version of SWIFT II 12.83 is expected to be forwarded to the NRC in June, 1984.

Generalized NWFT/DVM

Comparison of the Generalized and Fixed Network Versions of NWFT/DVM continued during April. This effort is time consuming in that each segment of the updates from the fixed to the generalized network is being analyzed to gain a thorough understanding of the changes. We are stepping our way up from the fixed network to what is referred to as generalized network version so that when differences are observed between the two codes, these differences can be identified. As to date, the updates that have been made have not resulted in any differences.

TOUGH

Following discussions with R. Codell, G. Runkle and R. Cranwell, it appears that a task or new effort may be added to the development of a Self-Contained Curriculum for TOUGH (being initiated under FINA A-1158) to provide a document to verify and validate the TOUGH code. The results of the TOUGH code would be compared to suitable field or laboratory data. The funding needs and task definitions for the verification of TOUGH will be developed in the next couple of months as the contractual arrangements between Sandia and K. Pruess (under FIN A-1158) are finalized.

A-1166
 1265.020
 April 1984

THIS IS AN ESTIMATE ONLY AND MAY NOT MATCH THE INVOICES SENT TO NRC BY SANDIA'S ACCOUNTING DEPARTMENT.

	Month	Current Year-to-Date
I. Direct Manpower (man-months of charged effort)	0.3	3.5
II. Direct Loaded Labor Costs	3.0	37.0
Materials and Services	0.0	0.0
ADP Support (computer)	2.0	9.0
Subcontracts*	8.0	38.0
Travel	0.0	0.0
Other	0.0	-4.0
TOTAL COSTS	13.0	80.0

Other - rounding approximation by computer

III. Funding Status

Prior FY Carryover	FY84 Projected Funding Level	FY84 Funds Received to Date	FY84 Funding Balance Needed
30K	130K	100K	None

*Subcontractor charges from Geotrans, OAO Corporation, and Raytheon.

DISTRIBUTION
 5400 6432
 5430 6433
 5431 6000

6400 CASE STATUS REPORT
 F184
 (Dollars in Thousands)
 DEPT 6430

PAGE 1
 DATE 11-30-83

PROGRAM	CASE	R/D	NFC FIN NO.	FUND EFF	FUNDING			COSTS				MAN YEARS				EST COMP DATE	COMMENTS		
					CARRY OVER	FY 84	TOTAL BUDGET.	AMIS.	CUR. NO.	YTD.	OPEN CONTR	UNCOM FUNDS	CUR. NO	YTD	BUDGET			AMIS	
WASTE ISOLATION ALT GEO MEDIA	0590.030	6431	A1266	PRA	0	300	300	497	580	60	122	75	103	3.3	3.3	2.9	2.1	9-86	
ASST FUTURE EVENTS FOR HLW DIS	0646.400	6431		WSSS			0	0	360	0	0	0	0	0.0	0.0	0.0	1.2	9-86	EXPECTING FUNDING IN F
REFERENCE WASTE REPOSITORY	0976.000	6431	A1158	WSSS	569		569	730	570	54	89	433	47	3.5	2.9	3.0	2.7	9-86	
TECH ASS'T FOR PERFORMANCE ASSMNT	1183.000	6431	A1165	WSSS	170		170	190	170	21	33	152	(15)	1.1	1.2	1.1	1.0	9-83	
MAINTNCE VALIDATION OF COMP PRG	1265.000	6431	A1166	WSSS	30		30	146	150	20	31	33	(34)	0.6	0.7	0.7	0.7	9-86	200K EXPECTED
DETAILED BEDDED SALTS REP	1284.000	6431	A1168	WSSS	0		0	0	0	(5)	(4)	1	3	0.0	0.0	0.0	0.0	5-83	COMPLETE
HLW PRECLOSURE SFTY SYS ANAL	1476.000	6431	A1380	FRA	163		163	0	200	27	(80)	95	148	0.3	0.2	0.0	0.3	9-87	
DEVELOP EPA HLW STDS	1485.030	6431		EPA	39		39	0	141	0	0	0	39	0.0	0.0	0.0	1.0	9-86	
PWL FUEL CYCLE RISK ASSESSMENT	1487.010	6431		PWL	23		23	0	0	0	0	0	23	0.0	0.0	0.0	0.0	9-83	COMPLETE
PHYSICAL PROTECTION OF NUC FAC	0617.010	6432	A1060	RFD	4		4	0	0	6	6	0	(2)	0.6	0.3	0.0	0.0	4-83	COMPLETE
IN-TRANSIT	0617.050	6432	A1173	RFD	150		150	0	0	0	0	0	150	0.0	0.0	0.0	0.0	4-83	COMPLETE
NAT'L LICENSE APPLICATION REVIEW	1120.000	6432	A1163	WSSS	271		271	413	400	40	79	73	119	1.5	1.5	0.5	0.6	8-83	
TAC IMPROV & SEC FORCE EVAL PRG	1149.000	6432	A1162	WSSS	70		70	0	0	0	0	2	68	0.0	0.0	0.0	0.0	10-83	COMPLETE
NUC PMR PLT ALARM PRIORITIZATION	1246.000	6432	A1332	RFD	0	150	150	149	150	16	28	0	122	1.1	1.1	1.1	1.1	9-84	COMPLETE
MTHDS FOR SYS MDLNG & ANAL	1357.000	6432	A1360	FRA	32		32	12	45	11	31	0	1	1.1	1.5	0.1	0.3	3-84	
CRIT MAN P/E OF EMERG PREP&RESP	1397.000	6432	A1367	RFD	53		53	0	85	10	8	31	14	0.0	0.0	0.0	0.1	9-84	
CRIT MAN P/E OF EMERG PREP&RESP	1398.000	6432	A1371	RFD	36		36	0	85	10	8	31	(3)	0.0	0.0	0.0	0.2	7-84	
AFML/NTYMS NUCLEAR SAFETY SUP	1474.000	6433		USAF	68		68	197	68	17	36	0	32	1.3	1.5	1.2	0.5	2-84	

TOTAL DEPT 6430

\$1,678 \$450 \$2,128 \$2,334 \$2,944 \$287 \$387 \$926 \$815 14.4 14.2 10.6 11.6

2/14/84

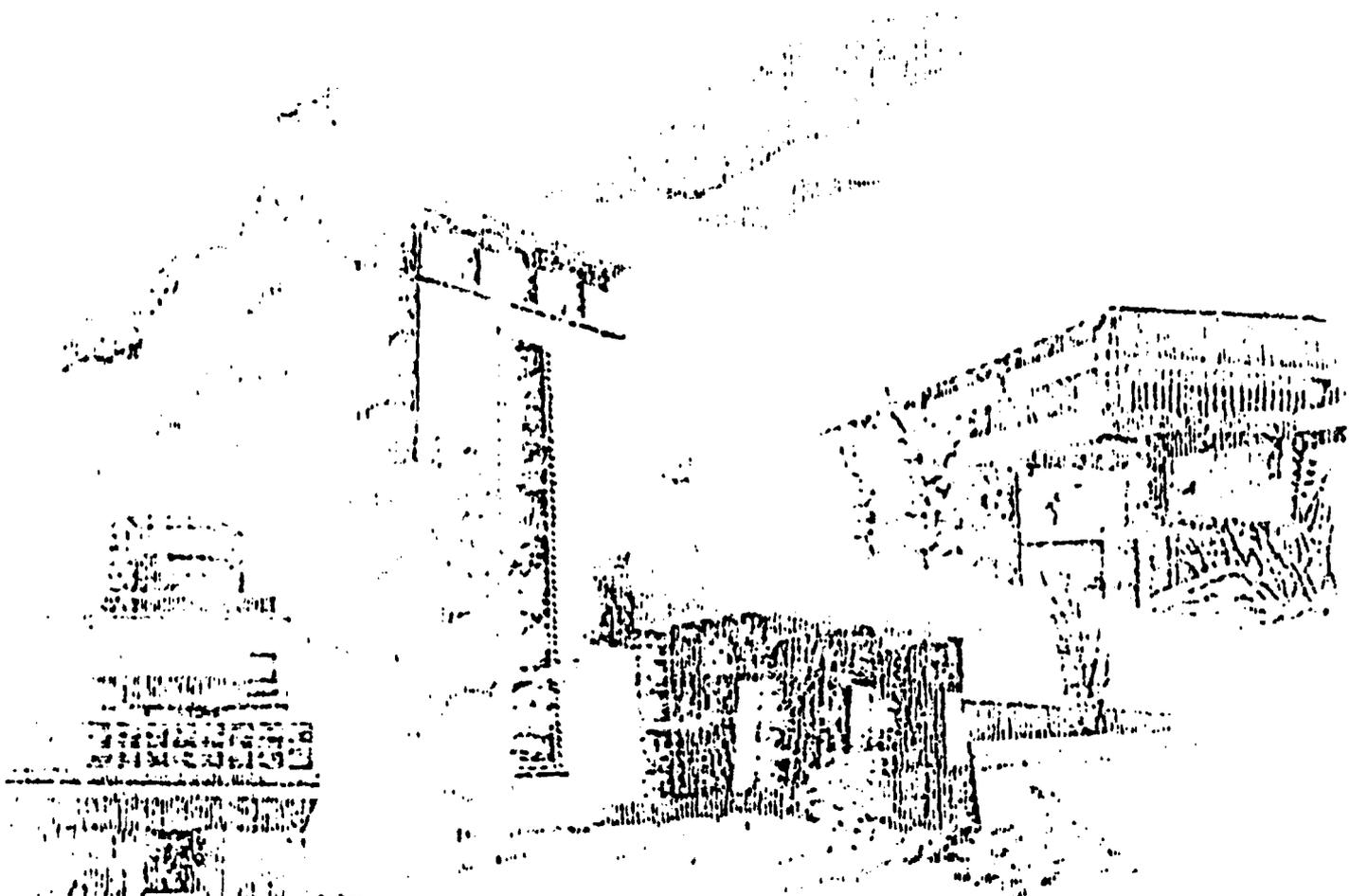
NRC FORM 173 (5-79)		U.S. NUCLEAR REGULATORY COMMISSION		ORDER NUMBER 50-84-33	
STANDARD ORDER FOR DOE WORK				DATE JAN 04 1984	
				ACCOUNTING CITATION APPROPRIATION SYMBOL 31X0200. 504	
ISSUED TO: (DOE Office) Albuquerque Operations Office		ISSUED BY: (NRC Office) Office of Nuclear Material Safety and Safeguards, NMSS		B&R NUMBER 50-19-03-01	
PERFORMING ORGANIZATION AND LOCATION Sandia National Laboratories (SNL) Albuquerque, New Mexico 87115				FIN NUMBER A 1166-4	
FIN TITLE Maintenance of Computer Programs				WORK PERIOD - THIS ORDER FIXED <input checked="" type="checkbox"/> ESTIMATED <input type="checkbox"/>	
				FROM: 01/04/84 TO: 9/30/85	
OBLIGATION AVAILABILITY PROVIDED BY:					
A THIS ORDER				\$ 100,000	
B TOTAL OF ORDERS PLACED PRIOR TO THIS DATE WITH THE PERFORMING ORGANIZATION UNDER THE SAME "APPROPRIATION SYMBOL" AND THE FIRST FOUR DIGITS OF THE "B&R NUMBER" CITED ABOVE				\$ 0	
C TOTAL ORDERS TO DATE (TOTAL A & B)				\$ 100,000	
D AMOUNT INCLUDED IN "C" APPLICABLE TO THE "FIN NUMBER" CITED IN THIS ORDER.				\$ 100,000	
FINANCIAL FLEXIBILITY. <input checked="" type="checkbox"/> FUNDS WILL NOT BE REPROGRAMMED BETWEEN FINs. LINE D CONSTITUTES A LIMITATION ON OBLIGATIONS AUTHORIZED. <input type="checkbox"/> FUNDS MAY BE REPROGRAMMED NOT TO EXCEED ± 10% OF FIN LEVEL UP TO \$50K. LINE C CONSTITUTES A LIMITATION ON OBLIGATIONS AUTHORIZED					
STANDARD TERMS AND CONDITIONS PROVIDED DOE ARE CONSIDERED PART OF THIS ORDER UNLESS OTHERWISE NOTED.					
ATTACHMENTS THE FOLLOWING ATTACHMENTS ARE HEREBY MADE A PART OF THIS ORDER <input checked="" type="checkbox"/> STATEMENT OF WORK <input type="checkbox"/> ADDITIONAL TERMS AND CONDITIONS <input type="checkbox"/> OTHER			SECURITY: <input checked="" type="checkbox"/> WORK ON THIS ORDER IS NOT CLASSIFIED. <input type="checkbox"/> WORK ON THIS ORDER INVOLVES CLASSIFIED INFORMATION. NRC FORM 187 IS ATTACHED.		
REMARKS (Reference the proposal by number and date, and indicate if the attached statement of work modifies the DOE proposal): This order provides FY84 funds to continue work on this project in accordance with the Statement of Work, which is hereby enclosed. The balance of funding will be provided upon receipt of an acceptable Form 189. Please submit a Form 189 in five copies to the Office of Nuclear Material Safety and Safeguards (Attn: Program Support) within 45 days of the date of this order. Form 189 should be based on the enclosed SOW.					
ISSUING AUTHORITY			ACCEPTING ORGANIZATION		
SIGNATURE R. S. Brown, Jr.			SIGNATURE D. L. Krenz		
TITLE Assistant to the Director and Chief Program Support Branch, NMSS			TITLE D. L. Krenz, Director Energy Technologies Div		
NRC FORM 173 (5-79)			DATE 1/20/84		

40-10-01-05 P/10/84
A 1166
001
Date: 1/20/84 John J. Johnson

Quality Assurance (QA) Policy for Computer Software in Directorate 1500

Jace W. Nunziato, Merton E. Fewell, Ray D. Krieg,
Don W. Lobitz, Billy J. Thorne, Mark P. Sears

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185 and Livermore, California 94550
for the United States Department of Energy
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QUALITY ASSURANCE (QA) POLICY FOR COMPUTER SOFTWARE
IN DIRECTORATE 1500

Jace W. Nunziato
Fluid Mechanics and Heat Transfer Division I, 1511

Merton E. Fewell
Fluid Mechanics and Heat Transfer Division III, 1513

Ray D. Krieg
Applied Mechanics Division I, 1521

Don W. Lobitz
Applied Mechanics Division III, 1523

Billy J. Thorne
Mark P. Sears
Computational Physics and Mechanics Division I, 1531
Sandia National Laboratories, Albuquerque, NM 87185

ABSTRACT

This document outlines the current policy in the Engineering Sciences Directorate 1500 with regard to quality assurance (QA) of computer software. It includes the definitions of QA, proposes a management system for implementing QA, and gives QA standards including code classification.

CONTENTS

	<u>Page</u>
1.0 PURPOSE	6
2.0 DEFINITION OF QUALITY ASSURANCE	6
3.0 IMPLEMENTATION OF QUALITY ASSURANCE	7
3.1 The Computer Code Committee (CCC)	8
3.2 The Computer Code Management System (CCMS)	8
4.0 STANDARDS FOR QUALITY ASSURANCE	8
4.1 Code Classification	9
4.1.1 Standard Code Classification System	9
4.1.2 Progression of Code Classification	9
4.1.3 Downgrading of Code Classification	10
4.2 Code Storage	10
4.2.1 Archiving Codes for Retrievability	10
4.2.2 Code Listings	11
4.2.3 Verification Test Cases	11
4.2.4 Code Retrievability	11
4.3 Code Documentation	12
4.3.1 Internal Documentation Requirements	12
4.3.2 Traceability Documentation Requirements	12
4.3.3 Formal Reports and Supporting Documents	12
4.3.4 Reporting Code Discrepancies	13
4.3.5 Storage of Documentation	13
4.4 Verification	14

1.0 PURPOSE

This document defines quality assurance (QA) for computer software created and/or maintained by departments in Directorate 1500. The primary components for implementing the QA program are the formation of a Computer Code Committee (CCC) and a Computer Code Management System (CCMS) for each department. In addition, a uniform classification of computer software is defined for QA purposes.

It is important to recognize that the ultimate responsibility for implementing any QA program lies with each department. Consequently, this document focuses on general policy and purposes uniform standards for the Directorate.

For the purposes of this document, the terms code and software are used interchangeably and may include, but are not limited to, computer programs, libraries, subroutines, a collection of fixed data, mesh generators, plot packages, and control language procedures. If a code has parts which vary from one problem to another, such as input data, mesh, etc., then whatever determines the variable part is considered problem data. The QA of problem data is the responsibility of the user.

2.0 DEFINITION OF QUALITY ASSURANCE

Quality assurance, as related to computer software, means that a user of software has a reasonable degree of assurance, that the software addresses the posed problem, and when given the proper input, will provide a satisfactory solution.

The properties of quality assured computer software considered here are:

1. Traceability: The ability to identify the actual computer code used in a calculation. This includes only software maintained by the departments in 1500.
2. Documentation: The documentation must be sufficiently complete to allow an understanding of what class of problems are addressed, what equations are solved, what solution methods are used, the input requirements, which languages are used, the machine dependency, and what supporting software are required. The documentation must include the verification test cases and should include code usage that contributes to qualification.*

*Some Project Groups at Sandia are using the term "validation" to imply code qualification.

3. **Retrievability:** The ability to retrieve all previous versions of a computer code over a reasonable period of time even though all versions may not be executable due to hardware and/or system software changes.
4. **Verification:** Verification is the process which demonstrates that a code correctly performs its stated capabilities. Primarily, verification will be the execution of a set of verification test problems designed to show that the stated equations are solved in a satisfactory manner. The verification processes do not indicate that a model is a valid representation of any particular physical system. Feedback from diversified use of a code becomes part of the verification process by building confidence in the code and detecting limitations and errors that may then be documented and corrected.
5. **Qualification:** Qualification is an ongoing process that defines the domains wherein solutions generated by a code are acceptable representations of physical processes. Code usage in diversified applications, including comparisons with laboratory and field data, builds confidence in the code and shows regions of applicability. The code user is responsible for deciding whether a code is qualified for solving a particular problem.

It is the responsibility of the code's sponsor and of the appropriate Computer Code Committee (CCC) to ensure that properties 1-4 are met in accordance with the QA standards for computer software set forth below and to provide information that will support users in their qualification decisions. Neither the code's sponsor nor the CCC is responsible for ensuring the competence of code users. Code users must, in addition to determining the qualification of computer software, be responsible for correct input and archiving the problem data and results of the calculation.

3.0 IMPLEMENTATION OF QUALITY ASSURANCE

The responsibility for formally implementing QA for computer software lies with each department. However, in order to provide uniform standards for the Directorate and aid the departments in meeting their QA responsibilities, each department will set up a Computer Code Committee (CCC) and a Computer Code Management System (CCMS).

3.1 The Computer Code Committee (CCC)

The Computer Code Committee in each department will set up and administrate its CCMS and review computer software to ensure that it meets 1500 QA standards. The CCC should consist of both code developers and code users, and may include persons not in the department. The CCC of each department should cooperate with those of the other departments in disseminating information about the software each maintains, and should attempt to make software and documentation easily accessible.

3.2 The Computer Code Management System (CCMS)

The Computer Code Management System in each department provides the mechanics for implementing QA for that department.

The CCMS for each department has two major functions. These are to institute:

1. A repository for current and previously used versions of the computer software. This archiving system should maintain current versions of the computer software in an immediately accessible form, and previous versions in less accessible archived states, depending on the QA classification of the software (Paragraph 4.1). The archiving system must be sufficient to permit traceability and retrievability.
2. A repository for documentation about the software in the system, including original reports, documentation of bugs, modifications and enhancements, results of verification test runs, CCC memoranda, and so forth.

Any system command procedures and libraries of data required to run the codes should be present in the CCMS. The CCMS must also have methods for backing up all computer files and should maintain the documentation in a reasonably secure form for retrieval purposes. The CCC should make sure that the CCMS adapts to changing hardware and system software. The CCMS may be physically split for different machines.

4.0 STANDARDS FOR QUALITY ASSURANCE

All software developed and/or maintained in Directorate 1500 must comply with the standards set forth herein.

4.1 Code Classification

4.1.1 Standard Code Classification System

Software is divided into classes for QA purposes. Entry into a particular class and movement from class to class is decided by the CCC as stated below. The classes are:

- A These codes are the immediately available, most recent versions of quality assured software. A code sponsor must be identified to answer questions about the code and to respond to problems with the code. The code must have the quality assurance properties of traceability, retrievability, documentation, and verification in order to be in this class.
- C These codes are candidates for A status and only the QA properties of traceability and retrievability are met. The code must have a sponsor and some internal documentation is required.
- D These are codes which have been in A or C status but which have been archived due to lack of use, lack of a sponsor, or existence of a more recent version of the code.
- X These codes are developmental and have not begun formal procedures to attain QA status. They are entered in the CCMS in order to make their existence known to potential users in the Directorate.

4.1.2 Progression of Code Classification

All software entries are initially in class X, where a code name, a CCMS code number, and the initial version number are assigned. Admission to class X requires submission of an application to the CCC. There are no documentation or retrievability requirements for class X. When codes are reentered into the system as new versions, they also go into class X and are assigned a new version number.

Upon further application by the code sponsor, and acceptance by the CCC, the code is moved from class X to class C. At this time a new version number must be assigned to the code to distinguish between the class X version (where the code is free to change) and the class C version (with fixed code). Code traceability and retrievability requirements must be met at this time. In addition,

the code must be internally documented (Paragraph 4.3.1). A copy of the code is placed on an active file* for direct accessibility by SNLA users and on an archive file for access only by CCC. Once a code enters class C, the code for that version remains fixed even though the code may be reclassified to class A or D. Preliminary documentation must be made available to the CCC upon entry into class C. Upon satisfying the requirements for class A, the code can be upgraded. If the code version entered into class C does not meet the requirements for class A, it can be reclassified to class D when a new version of the code is entered into class C.

4.1.3 Downgrading of Code Classification

Code versions classified in class A have satisfied the verification testing requirements. However, since most codes are complex, the possibility of discovering new limitations and inaccuracies will always exist. If significant problems are found, the code version will be reclassified to class C for reevaluation. Before the code can again reside in class A, a corrected version must be submitted and verification tests performed. The new version should require less review and, when classified as class A, will allow the old version to be reclassified to class D.

Only operational codes with a sponsor can be classified in classes A or C. Loss of operational status, loss of sponsor, or a decision by the CCC is sufficient to reclassify the code from any of those classes to class D. Only code versions that have been classified in class A or C can ever enter class D. If a code version, which is in case A or C, has never been used, then it may be removed from the CCMS at the discretion of the CCC.

4.2 Code Storage

4.2.1 Archiving Codes for Retrievability

All computer software entering or reentering the CCMS will be placed into an archive file in a format that is compatible with operational equipment at that time. Each code must have a backup

*Except for document(ation) files, file means a computer-readable storage medium.

file. Archive files cannot be destroyed without an audit that determines if retrievability requirements can still be satisfied (Paragraph 4.2.4).

4.2.2 Code Listing

A code listing must be included for each computer code version entered into the CCMS. This listing will be retained by the CCMS and the form of the listing will be determined by the CCC.

NOTE: The requirements for code listing can be waived if sufficient evidence is provided to show that the source is proprietary. For example, purchased software may have to be protected in accordance with the purchase agreement.

4.2.3 Verification Test Cases

The CCMS will retain a usable copy of verification test cases for each code version. The storage medium and accessibility will be established by the CCC.

4.2.4 Code Retrievability

Once a year the CCC will audit the CCMS to assure availability of a documented version of a code for a specified time period that starts when that code version exists only in archive form (class D). The retrievability period for each code version depends on the highest QA classification that the code version attained. The retrievability schedule is as follows:

Highest Classification	Minimum CCMS Retention Period (Years after code version is reduced to archive-only status)	
	Archive File (Source)	Listing and Documentation
A	5	10
C	1	2
X	n/a	n/a

4.3 Code Documentation

Before approval for code reclassification to class A or C, each computer code must satisfy reasonable requirements for documentation. The responsibility for completing the documentation falls on the code sponsor. Formal documentation will be required to conform to established departmental procedures. The CCC will be responsible to assure adequacy of formal documentation. The paragraphs below outline requirements for code documentation and storage.

4.3.1 Internal Documentation

All class A and C software residing in CCMS must contain internal documentation within the code as follows:

- * CCMS designation (such as code name/CCMS number/version number)
- * Brief description of code
- * Original source of code
- * Name of Author(s)
- * History of modifications including name of Modifier(s) and extent of modification(s)
- * Proprietary details (if applicable)
- * Disclaimer
- * Language and level
- * Machines where operative
- * Documentation sources

4.3.2 Traceability Documentation

All software residing in CCMS must output (on each output device) its CCMS designation (code name/ CCMS number/version number) and/or sufficient output to allow traceability. (The traceability requirement might be satisfied, for example, by a load map and day-file). It is the responsibility of the user to maintain a record of traceability to support QA requirements for his computer code usage.

4.3.3 Formal Reports and Supporting Documentation

Referenceable* documentation must accompany all software residing in CCMS in the A class. This documentation should be

*Sandia Report or equivalent.

sufficiently complete to allow an understanding of what class of problems are addressed, what equations are solved, what solution methods are used, the input requirements, which languages are used, what supporting software is required, and supporting verification test cases.

Supporting documentation will be required to define machine dependency, the current control statements, and any additional verification tests run to satisfy Paragraphs 4.4, and to record limitations or discrepancies (see Paragraph 4.3.4) that are not included in the formal documentation. The supporting documentation should show all efforts that contribute to code qualification including discussion of improvements or corrections made to previous code versions.

4.3.4 Reporting Code Discrepancies

Important elements in improving the quality of computer codes are the identification and correction of observed errors, inaccuracies, and limitations in software and/or documentation. Reports of discrepancies submitted by users will be maintained by the sponsor and will be filed in CCMS documentation files. If significant discrepancies are reported, the code may be reclassified to class C. The sponsor should take action to correct problems and submit a new code version to the CCMS. The format for discrepancy reporting and the method for disseminating the information to users will be provided by the CCC.

4.3.5 Storage of Documentation

Each department will establish adequate facilities for storage of all required documentation. Reference material for inactive codes will be maintained by the CCC until retrievability requirements have expired. While the code is active, availability of copies of code documentation is the responsibility of the code sponsor, but this responsibility transfers to the CCC when a code version becomes inactive.

4.4 Verification

Each code submitted to the CCMS must be verified before reclassification to A category. Verification processes must include adequate tests to demonstrate that the code satisfactorily performs its stated capabilities. Since each code is different, an exact definition of the code testing requirements cannot be described. It is the responsibility of the department CCC to judge when a code has been adequately tested.

The significant verification processes should be documented as test cases and stored in the CCMS as discussed in Paragraph 4.3. The documented verification test cases provide a point of reference and demonstrate code capability. Retesting the code on a new machine (or testing a new version of the code) should employ the existing documented test cases.

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Unlimited Release
UC-13

1100	F. L. Vook	1521	D. M. Webb
1200	G. Yonas	1522	T. G. Priddy
1500	W. Herrmann	1522	T. J. Baca
1510	D. B. Hayes	1522	J. T. Black
1511	J. W. Nunziato	1522	B. B. Bradford
1511	N. E. Bixler	1522	E. Chen
1511	R. R. Eaton	1522	C. A. Davidson
1511	D. K. Gartling	1522	J. T. Foley
1511	G. R. Hadley	1522	C. F. Magnuson
1511	C. E. Hickox	1522	D. R. Martinez
1511	C. M. Korbin	1522	S. D. Meyer
1511	M. J. Martinez	1522	B. C. Mills-Curran
1511	D. F. McTigue	1522	R. M. Russo
1511	R. K. Wilson	1522	M. J. Sagartz
1512	J. C. Cummings	1522	P. P. Stirbis
1512	D. A. Benson	1523	R. C. Reuter
1512	R. Beraun	1523	D. B. Clauss
1512	F. G. Blottner	1523	C. Conley
1512	B. A. Boughton	1523	K. W. Gwinn
1512	F. D. Chavez	1523	J. R. Koterak
1512	G. D. Miller	1523	D. W. Lobitz
1512	L. A. Mondy	1523	R. A. May
1512	D. C. Reda	1523	J. D. Miller
1512	A. W. Reed	1523	R. C. Rentzsch
1512	A. J. Russo	1523	M. A. Richgels
1512	C. E. Sisson	1524	W. N. Sullivan
1513	D. W. Larson	1524	D. P. Flanagan
1513	N. R. Baer	1524	N. D. Gilbertsen
1513	R. D. Boyd	1524	D. B. Longcope
1513	B. M. Brake	1524	R. F. Rechard
1513	D. D. Cline	1524	R. Rodeman
1513	M. E. Fewell	1524	K. W. Schuler
1513	O. L. George	1524	D. V. Swenson
1513	S. K. Griffiths	1524	L. M. Taylor
1513	R. J. Gross	1524	B. K. Thomas
1513	S. N. Kempka	1524	P. S. Veers
1513	M. E. Larsen	1530	L. W. Davison
1513	A. C. Ratzel	1531	B. J. Thorne
1520	T. B. Lane	1531	M. L. Blanford
1521	R. D. Krieg	1531	T. Canfield
1521	C. R. Adams	1531	P. F. Chavez
1521	Z. E. Beisinger	1531	P. F. Martinez
1521	J. H. Biffle	1531	A. F. Schkade
1521	L. J. Branstetter	1531	M. P. Sears
1521	S. N. Burchett	1531	C. B. Selleck
1521	H. S. Morgan	1533	P. Yarrington
1521	D. S. Preece	1533	T. K. Bergstresser
1521	B. J. Sieger	1533	W. T. Brown
1521	C. M. Stone	1533	W. R. Davey
1521	S. R. Subia	1533	M. E. Kipp

1533	H. S. Lauson	7000	O. E. Jones
1533	S. T. Montgomery	7410	W. C. Kraft
1533	F. R. Norwood	7411	W. P. Thomas
1533	S. L. Passman	7411	A. C. Ellingson
1533	J. W. Swegle	9200	W. C. Myre
1534	J. R. Asay	9300	R. L. Peurifoy
1534	L. M. Barker	9400	A. W. Snyder
1534	T. J. Burns	9700	E. H. Beckner
1534	L. Chhabildas	9730	W. D. Weart
1534	D. Cox	9730	J. T. Henderson
1534	D. S. Drumheller	9740	R. K. Traeger
1534	D. E. Grady	9750	V. L. Dugan
1534	R. D. Hardy	9760	R. W. Lynch
1534	C. H. Konrad	3141	L. J. Erickson (5)
1534	J. M. Miller	3151	W. L. Garner (3)
1534	R. L. Moody	3154-3	C. Dalin (25)
1534	D. D. Scott		for DOE/TIC
1534	T. G. Trucano	8214	M. A. Pound
1534	J. L. Wise		
1534	L. M. Barker		
1540	W. C. Luth		
1541	H. C. Hardee		
1541	L. C. Bartel		
1541	C. R. Carrigan		
1541	J. C. Dunn		
1541	R. D. Jacobson		
1541	J. B. Rundle		
1541	R. P. Striker		
1542	B. M. Butcher		
1542	L. S. Costin		
1542	D. W. Hannum		
1542	D. J. Holcomb		
1542	A. K. Jones		
1542	M. J. McNamee		
1542	W. A. Olsson		
1542	R. H. Price		
1542	S. Spence		
1542	L. W. Teufel		
1542	W. R. Wawersik		
1542	D. H. Zeuch		
1542	J. A. Zirzow		
1543	T. M. Gerlach		
1543	J. C. Eichelberger		
1543	G. D. Jarrell		
1543	J. L. Krumhansl		
1543	M. Reece		
1543	H. W. Stockman		
1543	H. R. Westrich		
1600	D. B. Shuster		
1800	R. L. Schwoebel		
2600	L. Hollingsworth		

**PERSONAL AND
CONFIDENTIAL**

ID # 83-01H

Date Effective 5/1/83

Date Prepared 4/20/83

INTERA
QUALITY ASSURANCE
PROCEDURES

Approved:

M. Shultz

DQA 4/20/83 Date

R. B. Jantz

QAM 5/23/83 Date

Distribution # _____

PREFACE

These Quality Assurance Procedures are intended to be consistent with, and largely reflective of, INTERA's Quality Assurance Program Plan and Quality Assurance Manual. They present much of the same information and requirements contained in those other documents, but in a format which facilitates "cook book" implementation. Each Procedure is intended to be essentially self-contained, but references to pertinent sections of the Program Plan and Manual are included to provide supplemental information for those who need it.

ID # 83-01H
5/1/83

LISTING OF INTERA QA PROCEDURES/CONTROL DATE

1. Baselineing and Revising the Project QA Plan (PQAP) (5/1/83)
2. Baselineing and Revising Baselineed Specifications (5/1/83)
3. Baselineing and Revising Baselineed Codes (5/1/83)
4. Baselineing and Revising Baselineed Test/Application Data (5/1/83)
5. Baselineing Test Results (5/1/83)
6. Baselineing Application Results (5/1/83)
7. Baselineing and Revising Baselineed Technical Reports and Model Documentation (5/1/83)
8. Cross-Check Team (CCT) Reviewsd (5/1/83)
9. External QA Team (EQAT) Reviews (5/1/83)
10. Problem Reports (PRs)/Remedial Action (5/1/83)
11. QA Control File and Index (5/1/83)
12. QA Audits (5/1/83)
13. Control of Incoming and Outgoing Documents (5/1/83)
14. Computer Modeling Technology Transfer (5/1/83)

List of QA Flow Charts

1. Model Development and Revision Activity (5/1/83)
- 1A. Model Application Activity (5/1/83)
2. QAP 2 (7): Baselineing and Revising Baselineed Specifications (Reports) (5/1/83)
- 2A. QAP 2 (7): Baselineing of Acquired Specifications (Reports) (5/1/83)
3. QAP 3: Baselineing and Revising Baselineed Codes (5/1/83)
4. QAP 4: Baselineing and Revising Baselineed Test/Application Data (5/1/83)
5. QAP 5: Baselineing Test Results (5/1/83)
6. QAP 6: Baselineing Application Results (5/1/83)
7. See 2.
8. QAP 8: Cross Check Team Reviews (5/1/83)
9. None
10. QAP 10: Problem Reports/Remedial Action (5/1/83)
11. None
12. None
13. QAP 13: Incoming/Outgoing Documents (5/1/83)
14. QAP 14: CMT Transfer (5/1/83)

List of QA Control Documents

- Form 1: PQAP (5/1/83)
- Form 2: Specifications/Report Baselines (5/1/83)
- Form 3: Code (5/1/83)
- Form 4: Test/Application Data (5/1/83)
- Form 5: Test/Application Results (5/1/83)
- Form 8: Review Report (5/1/83)
- Form 10: Problem Report/Remedial Action (5/1/83)
- Form 12: Project Audit Report (5/1/83)
- Form 13A: Incoming Document Log (5/1/83)
- Form 13B: Outgoing Document Log (5/1/83)
- Form 14A: Request for Transfer. (5/1/83)
- Form 14B: CMT Transmittal Form (5/1/83)

GLOSSARY

CD	--	QA control Document
CCT	--	Cross Check Team
CF	--	QA Control File
CFI	--	QA Control File Index
CIN	--	QA Control Identification Number
DQA	--	Director of Quality Assurance
EQAT	--	External QA Team
PL	--	Project Leader or Project Task Leader
PQAP	--	Project QA Plan
PR	--	Problem Report/Remedial Action
PTM	--	Project Team member
QAA	--	Quality Assurance Administrator
QAM	--	Project Quality Assurance Manager
VPO	--	Vice President of Operations

INTERA QA PROCEDURE NUMBER 1 REVISION 2 DATE 5/1/83

TITLE: Baselineing and Revising The Project QA Plan (PQAP)

1.0 Purpose -- to prescribe the steps and essential elements in the development and baselineing of a PQAP to adapt Intera's QA Program to a specific Project.

2.0 Scope -- applies as an initial step to every Intera project. The requirements for a PQAP vary depending on the level of QA assigned to the project.

3.0 References and Definitions

3.1 References

3.1.1 Intera Program Plan (see following sections):

- I. Organization and Responsibilities
- II.D. Definitions
- III. Design Control
- VI. Document Control
- XVIII. Audits

3.2 Definitions

- 3.2.1 **Baseline** -- an evolutionary state of a document committed to QA Control.
- 3.2.2 **Task Identification** -- project subdivision ideally corresponding to a development and/or application of a single model.
- 3.2.3 **Personnel Assignment** -- listing of professionals assigned to each task, their qualifications, and their responsibilities.
- 3.2.4 **Cross-Check Team (CCT) Assignment** -- listing of professionals not directly involved in a particular task assigned to function as an internal peer technical review group for that task, along with their qualifications and a description of their responsibilities.

- 3.2.5 External QA Team (EQAT) Assignment -- listing of professionals from outside Intera assigned to function as an external peer technical review group for the project, along with their qualifications and a description of their responsibilities.
- 3.2.5 Organization Charts -- charts showing the applicable project management structure and the applicable QA structure with names of the assigned personnel appropriately displayed. Any subcontractor involvement will also be displayed.
- 3.2.6 Client QA Requirements and Acceptance Procedures -- any particular requirements pertaining to documentation, QA program approval, problem reporting, acceptance testing, etc.
- 3.2.7 Project Schedule -- display of an estimate of sequential timing for various project events.
- 3.2.8 Deliverables -- Reports, manuals, codes, or other items identified by contract to be delivered to the client.

4.0 Responsibilities

4.1 Project leader --

- (a) recommending a QA level;
- (b) developing a proposed PQAP;
- (c) recommending its establishment as a baseline via a QA Control Document (CD) (Form 1);
- (d) obtaining approval of the QAM and the DQA;
- (e) filing approved documents with the QAA.

4.2 QAA --

- (a) reviewing QA Control Documents for proper completion;

- (b) filing and maintaining the PQAP in the Control File.

4.3 QAM --

- (a) assigning to the project, in consultation with PL and DQA, the proper QA level;
- (b) approving establishment and major revisions of PQAP baseline .

4.4 DQA --

- (a) assigning to the project, in consultation with PL and QAM, the proper QA level;
- (b) approving establishment and major revisions of PQAP baseline for projects of QA levels 3 and 4.

5.0 Procedure

- 5.1 A QA level shall be assigned to every project by the QAM and the DQA, acting jointly and in consultation with the PL, at the time a project is proposed.
- 5.2 A project proposal shall address the elements of a PQAP corresponding to the assigned QA level.
- 5.3 The PQAP shall be prepared and baselined when the project is initiated.
- 5.4 A QA level 1 PQAP shall consist of --
 - (a) Task Identification;
 - (b) Personnel Assignments;
 - (c) Identification of deliverables subject to QA Control;
 - (d) Project Schedule (unless otherwise contained in, e.g., a management plan) showing deliverable milestones.

A QA Level 2 PQAP shall consist of --

- (a) Task Identification;
- (b) Personnel Assignments;

- (c) Identification of deliverables subject to QA Control;
- (d) Any Client QA Requirements and/or Acceptance Procedures called for in the contract;
- (e) Project Schedule (unless otherwise contained in, e.g., a management plan) showing --
 - (i) deliverable milestones
 - (ii) other baselines

A QA Level 3 PQAP shall consist of --

- (a) Task Identification;
- (b) Personnel Assignments;
- (c) Cross-Check Team (CCT) Assignments;
- (d) Identification of deliverables subject to QA Control;
- (e) Client QA Requirements and Acceptance Procedures;
- (f) Organization Chart;
- (g) Project Schedule (unless otherwise contained in, e.g., a management plan) showing --
 - (i) deliverable milestones
 - (ii) other baselines
 - (iii) CCT baseline reviews (formal (if any) and informal)
 - (iv) Scheduled QA audit.

A QA Level 4 PQAP shall consist of --

- (a) Task Identification;
- (b) Personnel Assignments;
- (c) CCT Assignments;
- (d) External QA Team (EQAT) Assignments;
- (e) Identification of deliverables subject to QA Control;
- (f) Client QA Requirements and Acceptance Procedures;

- (g) Organization Chart;
- (h) Project Schedule (unless otherwise contained in, e.g., a management plan) Showing --
 - (i) deliverable milestones
 - (ii) other baselines
 - (iii) CCT baseline and in-process reviews (formal (if any) and informal)
 - (iv) EQAT baseline reviews
 - (v) Scheduled QA audits.

5.5 The PQAP shall be revised when significant changes occur with respect to any element of the PQAP. All significant revisions of the PQAP shall be justified and baselined.

6.0 Acceptance Criteria

6.1 Baselining is accomplished by --

- (a) completion of the PQAP as described in 5.4;
- (b) completion of QA Control Document (Form 1), and;
- (c) filing the documents with the QAA.

6.2 Baseline revision is accomplished by --

- (a) documentation of justification of changes;
- (b) incorporation of changes;
- (c) completion of CD (Form 1);
- (d) filing the documents with the QAA.

7.0 Exhibits

7.1 Form 1 -- QA Control Document (PQAP)

8.0 Approval

Prepared by *M. Shetty*
Approved by *M. Shetty* DQA
Approved by *[Signature]* VPO
Approved by *[Signature]* President

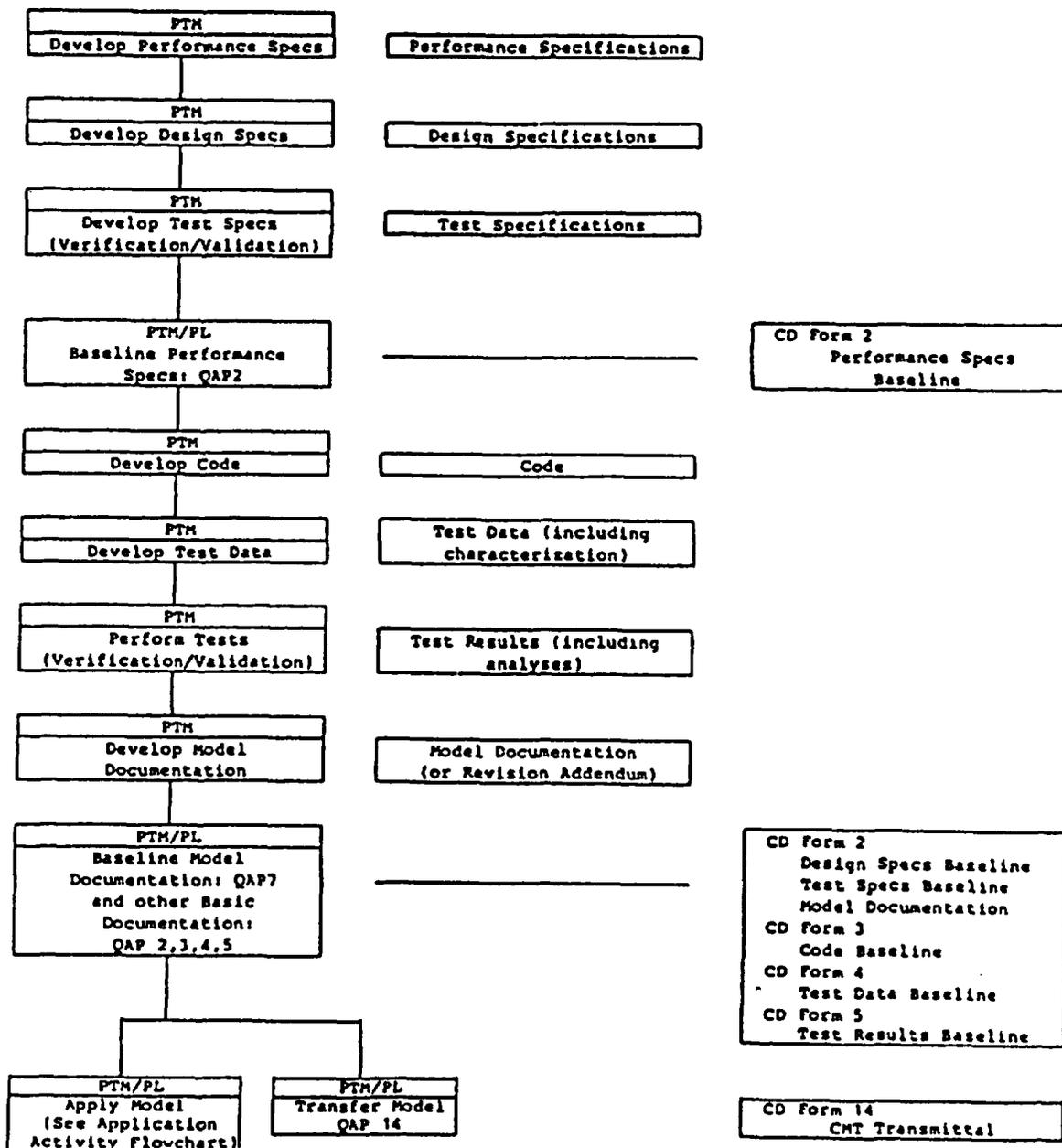
QA Flow Chart #1

Model Development
(and Revision) Activity

Basic Documentation

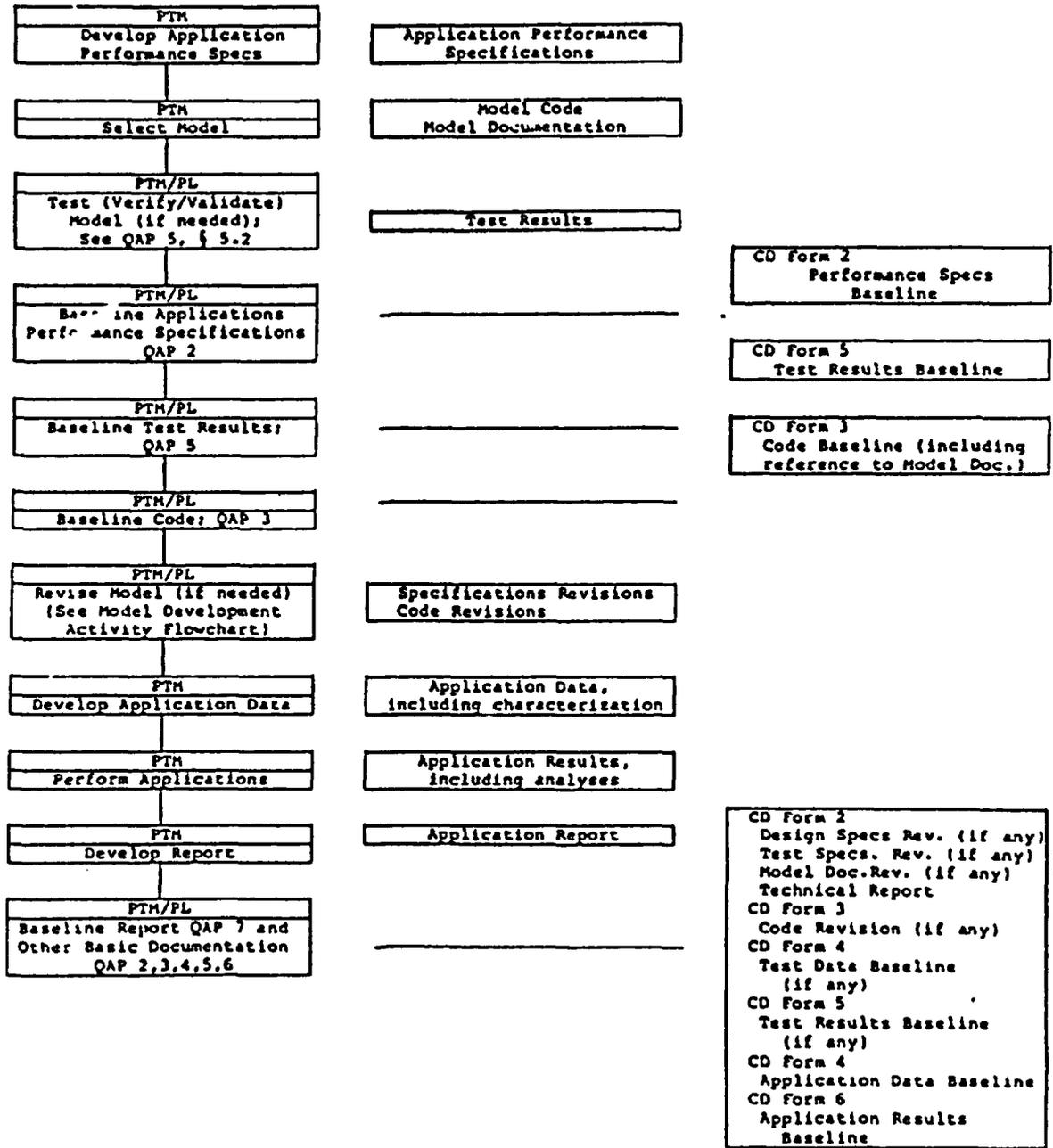
QA Documentation

QA Level 2, 3, 4



Model Application Activity
QA Level 2, 3, 4

Basic Documentation



INTERA QA PROCEDURE NUMBER 2 REVISION 3 DATE 5/1/83

TITLE: Baselining and Revising Baselined Specifications

1.0 Purpose -- to prescribe the steps to be taken to develop and baseline model or system specifications.

2.0 Scope -- describes both the technical content of performance, design, and test specifications and the process for documenting and committing those specifications and revisions thereof to control (baselining). The procedure applies to all Intera projects, although it varies somewhat for QA Level 1 projects as compared to projects of QA Levels 2, 3, or 4.

3.0 References and Definitions

3.1 References

Intera Program Plan (see following sections):

- I. Organization and Responsibilities
- III. Design Control
- VI. Document Control
- XVII. Quality Assurance Records

3.2 Definitions

- 3.2.1 Baselined Specifications -- an evolutionary state of documented specifications committed to QA control.
- 3.2.2 Baselining -- the process of documentation and committing such documentation to QA control.
- 3.2.3 Performance Specifications -- detailed performance criteria in terms of function, physics, chemistry, mathematics, etc., (i.e., the information to be obtained from a model application), usually dictated by, or derived directly from, contract specifications.
- 3.2.4 Design Specifications -- detailed description of means by which performance criteria will be met, including equations to be solved, methods of solving equations, and code flow charts or program design language including identification and organization of subprograms and sub-routines.

- 3.2.5 Test Specifications -- the purpose, criteria, methods and limits of testing a model to assess its adherence to performance and design specifications and its overall scientific and operational validity.
- 3.2.6 Model -- a mathematical simulation of a process, event, or state of being; includes a system of combined models; does not include elementary straightforward calculations even though performed by computer.
- 3.2.7 Major Revision -- substantive change in a baseline, usually arising from unforeseen limitations, conceptual or significant formulation errors, or a need to expand capability or improve quality; also, any revision that affects a related baseline.
- 3.2.8 Minor Revision -- minor change in a baseline arising usually as a result of mechanical or implementation errors; does not affect related baselines.

4.0 Responsibilities

- 4.1 PTM -- developing and documenting technically sound specifications as assigned.
- 4.2 PL --
 - (a) developing, documenting, and/or reviewing proposed specifications and/or revisions thereof for technical quality and adequate documentation;
 - (b) classifying any revision as major or minor;
 - (c) recommending establishment and/or revision of a baseline via a QA Control Document (CD) (Form 2);
 - (d) obtaining QAM approval of the baseline and of any major revision thereof;
 - (e) determining in consultation with the QAM the effects of any revisions on other baselines in the same project;
 - (f) determining in consultation with the QAA the effects of any revisions on baselines in other projects;
 - (g) filing approved documents with the QAA.

4.3 QAA --

- (a) reviewing CDs received from PLs for proper completion, including assigning or correcting CIN's where necessary, assigning control date to CD; and entering references in CFI when CDs are omitted pursuant to 5.6.
- (b) filing and maintaining baseline documentation;
- (c) providing notice of revisions to affected Model Users;
- (d) tracking baseline revisions required as a result of a related baseline revision and initiating PRs (QAP 10) for revisions not initiated within two weeks.

4.4 QAM --

- (a) performing or securing competent technical review of recommended baselines or revisions thereof;
- (b) approving documentation of baselines and baseline revisions;
- (c) approving classification of minor revisions.

5.0 Procedure

- 5.1 Performance, design, and test specifications shall be baselined for each model and each system of models developed and/or applied in each project. Acquired documentation containing specifications need not be baselined until the corresponding code is acquired.
- 5.2 For QA Level 1, all specifications, etc. developed by INTERA need only be baselined at the conclusion of the project and only as a part of a final report.

For QA Levels 2, 3, and 4:

in the case of models being developed or modified, performance specifications shall be baselined prior to coding. Design and test specifications, the code, test data, test results, and model documentation shall be baselined prior to application or model transfer outside INTERA.

in the case of off-the-shelf models ready for application, all specifications shall be baselined prior to initial model application in the project.

Elementary, straightforward calculations not constituting models need be only given QA Level 1 treatment.

5.3 Performance specifications shall:

- (a) provide general description and intended use of information expected from the model, including any relevant contract specifications;
- (b) describe any physical and chemical phenomena accounted for and important phenomena neglected;
- (c) state relevant differential mathematical equations and derivations;
- (d) state and rationalize applicable assumptions, limitations, and simplifications;
- (e) describe output information (specifically);
- (f) describe input information (specifically);

5.4 Design Specifications shall:

- (a) describe numerical techniques;
- (b) state relevant discretized (or otherwise transformed for numerical solution) equations and derivations;
- (c) state and rationalize applicable assumptions and limitations;
- (d) be consistent with the Performance Specifications;
- (e) describe the structure and organization of the computer program by flow chart, program design language, or other appropriate means;
- (f) describe program storage and handling;
- (g) describe desired data input/output layout;
- (h) describe model/system interfaces;
- (i) specify nomenclature consistent with field in which model is to be applied and consistent with related models;
- (j) specify any applicable program design or coding standards; and

- (k) specify any important computational characteristics (core requirements, running time, accuracy or precision).

5.5 Test Specifications shall:

- (a) state the purposes and limitations of the tests;
- (b) state criteria for a successful test;
- (c) include applicable equations (e.g., analytical solutions);
- (d) include verification tests;
- (e) include validation tests;
- (f) specify test data covering realistic range;
- (g) exercise all program elements;
- (h) include any client acceptance testing.

5.6 The Specifications may incorporate other statements of specifications by reference (using Intera library reference numbers) if such other statements are readily available for review in the Intera Library. When one or more types of specification are contained in a referenced document, such reference shall appear on at least one Specification or Code CD, and the CDs for the other types of specifications may be omitted. The QAA shall enter references in the CFI for specifications thus baselined without corresponding CDs.

5.7 All specifications and test data associated with models acquired externally by Intera shall be baselined along with the code (QAP 3) as and when the code is received.

5.8 All specifications of all models developed, modified, and/or applied by Intera shall be:

- (a) technically sound;
- (b) technically complete (consistent with project budget and intended use);
- (c) technically feasible (capable of being met);
- (d) practically feasible (can be met within budget).

5.9 Baselines shall be revised to correct problems, improve quality, or expand capability.

5.10 All revisions of baselined specifications shall be justified, baselined, and evaluated for effects on related baselines.

6.0 Acceptance Criteria

6.1 Baselining of the respective specifications shall be accomplished by --

- (a) documentation of the elements set forth respectively in 5.3, 5.4, and 5.5.
- (b) completion of a CD (Form 2) or reference to the documentation from a related CD pursuant to 5.6.
- (c) filing the documents with the QAA.

6.2 Revisions of the respective Baseline Specifications shall be accomplished by:

- (a) documentation of justification of changes in terms of the elements set forth in 5.3, 5.4, and 5.5;
- (b) incorporation of changes;
- (c) description of effects on related baselines;
- (d) completion of a CD (Form 2);
- (e) filing the documents with the QAA.

7.0 Exhibits

7.1 Form 2 -- QA Control Document (Specification/Report Baselines)

7.2 QA Flow Chart #2, 2A

8.0 Approvals

Prepared by *[Signature]*
Approved by *[Signature]* DQA
Approved by *[Signature]* VPO
Approved by *[Signature]* President

SPECIFICATIONS/REPORT BASELINES

- Original Baseline (Complete Section 1 only)
- Revision to Previous Baseline (Complete Sections 1 and 2)

ID #:

	T		M	F	S	R
-	-	-	-	-	-	-

Project Title: _____

Task Title: _____

Control Date: _____

Section 1 Baseline

Model/Report Name: _____

Baseline Type (Check as Applicable):

- A. Performance Specs
- B. Design Specs
- D. Test Specs
- G. Report/Model Documentation

References and Location (if not attached):

Source (Check One and Complete):

- This baseline/revision was developed by _____
Signature
- This baseline/revision was acquired from _____

Section 2 Baseline Revision

Check One: Major Minor (no other baseline affected) Revision:

Description of and Reason for Revisions (if not attached):

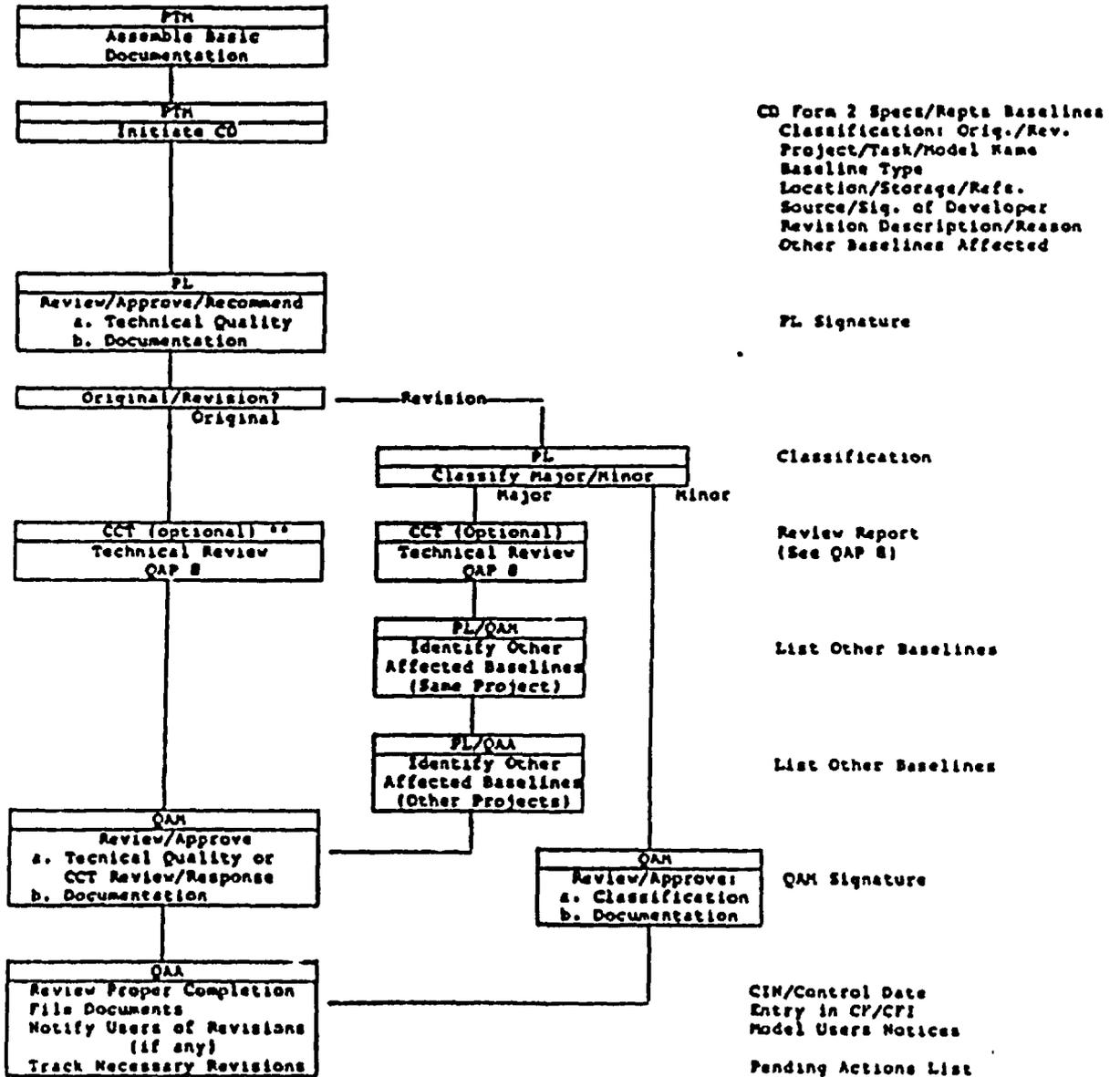
List Other Baselines Affected by this Revision:

Recommended by: _____ PL Date: _____

Approved By: _____ QAM Date: _____

QAP 2(7): Baseline and Revising
Baselined Specifications (Reports)

QA Documentation

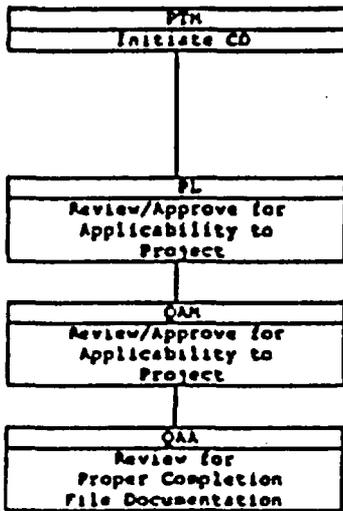


** Mandatory (QA Levels 3,4)
for Tech Reports and Model
Doc.

**QAP 2(7);
Baselining of Acquired
Specifications (Reports)**

QA Documentation

Activities



CD Form 2 Specs/Repts Baselines
Classification: Orig./Rev.
Project/Task/Model Name
Baseline Type
Location/Storage/Refs.
Source/Sig. of Developer
Revision Plan Description
Other Baselines Affected

PL Signature

QAM Signature

**CIN/Control Date
Entry in CF/CFI**

INTERA QA PROCEDURE NUMBER 3 REVISION 4 DATE 5/1/83

TITLE: Baselining and Revising Baselined Codes

1.0 Purpose -- to prescribe the steps to be taken to develop and baseline model codes.

2.0 Scope -- applies to all model codes used by Intera, including codes developed and/or modified by Intera and codes acquired externally by Intera.

3.0 References and Definitions

3.1 References

3.1.1 Intera Program Plan (see following sections):

- I. Organization and Responsibilities
- III. Design Control
- VI. Document Control
- XIII. Handling, Storage
- XVII. Quality Assurance Records

3.2 Definitions

- 3.2.1 Baselined Code -- an evolutionary state of a model code which is committed to QA control.
- 3.2.2 Model -- a mathematical simulation of a process, event, or state of being; includes a system of combined models; does not include elementary straightforward calculations even though performed by computer.
- 3.2.3 Project Tape -- magnetic tape containing all codes and library data baselined and used during the project.
- 3.2.4 Project Tape Index -- List of contents (codes, data) on Project Tape.
- 3.2.5 Code Track Index -- cross reference list between models and projects allowing tracking of various model baselines across projects or tasks.
- 3.2.6 Code Track -- diagram illustrating evolutionary track of models within and across project lines.

- 3.2.7 Major Revision --- substantive change in a baseline, usually arising from unforeseen limitations, conceptual or significant formulation errors, or a need to expand capability or improve quality; also, any revision that affects a related baseline.
- 3.2.8 Minor Revision -- minor change in a baseline arising usually as a result of mechanical or implementation errors; does not affect related baselines.
- 3.2.9 Code Custodian -- designated person familiar with design and programming of a specified code whose approval is required for all revisions to that code.

4.0 Responsibilities

4.1 PTM -- developing technically sound and practical codes as assigned.

4.2 PL --

- (a) developing and/or reviewing codes and/or revisions thereof for consistency with design specifications;
- (b) reviewing (or assigning CCT to review) programming for accuracy and efficiency.
- (c) classifying any revision as major or minor;
- (d) recommending establishment and/or revision of a baseline via a CD (Form 3);
- (e) obtaining approval of the QAM of the baseline and of any major revision thereof;
- (f) determining in consultation with the QAM the effects of any revisions on other baselines in the same project;
- (g) determining in consultation with the QAA the effects of any revisions on baselines in other projects;
- (h) filing approved documents with the QAA;

4.3 QAA --

- (a) reviewing CDs received from PLs for proper completion and signatures, including assigning or correcting CINs where necessary, and assigning control date to CD;
- (b) filing and maintaining CDs;
- (c) writing Project Tape;
- (d) generating back-up Project Tapes;
- (e) maintaining Project Tape Index;
- (f) obtaining microfiche of codes;
- (g) maintaining Model Track;
- (h) maintaining Model Track Index;
- (i) providing notice of revisions to affected Model Users;
- (j) tracking baseline revisions required as a result of a related baseline revision and initiating PRs (QAP 10) for revisions not initiated within two weeks.
- (k) maintaining a list of codes and corresponding Code Custodians.

4.4 QAM --

- (a) performing or securing competent technical review of recommended baselines or major revisions thereof;
- (b) approving documentation of baselines and baseline revisions;
- (c) approving classification of minor revisions.

4.5 VPO -- Assign Code Custodians for all codes.

4.6 Code Custodian -- making or reviewing and approving (at his option) all baseline revisions as operationally compatible with baselined code.

4.7 Cross Check Team -- reviewing (if assigned) programming for accuracy and efficiency.

5.0 Procedures

5.1 Codes shall be baselined for each model and model system interface developed and/or applied in each project. No code shall be baselined without previous or corresponding baselining of applicable performance, design, and test specs (QAP2) and applicable Test Results when required (QAP5).

5.2 For QA Level 1, codes need only be baselined at the conclusion of the project.

For QA Levels 2, 3, and 4, model codes being developed or modified shall be reviewed by a (CCT) independent programmer and baselined before or at the time of baselining Model Documentation (QAP7);

Off-the shelf model codes ready for application shall be baselined before Application and at the time of baselining any required Test Results (QAP5).

5.3 Model codes acquired from outside INTERA shall be baselined as and when received. Associated documentation including performance, design, and test specifications (if any) which accompany the code shall also be baselined at that time. Such specifications may be baselined by reference to, e.g., documentation in INTERA's library, directly from the Code CD (See QAP2).

5.4 Codes shall be baselined again at the time of baselining Test Results after conversion by INTERA for compatibility with INTERA's computing hardware.

5.5 Codes shall:

- (a) conform to and evolve directly and obviously from applicable design specifications;
- (b) be logically correct;
- (c) be efficient, consistent with project budget;
- (d) be straightforward and easily used, consistent with efficiency and project budget;
- (e) be internally well documented.

5.6 All source code baselines shall be written on the Project Tape in the Update format (after any necessary conversion).

- 5.7 The QA CIN consists of three numeric-alpha groups (xxxa-xxa-xxa), the first of which consists of the project number and task identifier, the second the model number and baseline type, and the third the sequence number and revision identifier (see QAP11). The sequence number is incremented for independent baselines, the revision identifier is incremented for dependent baselines. In the case of a code, the sequence number will usually remain 01.

Any new baseline for a code will usually be dependent on the previous baseline and hence will be identified by an incremented revision identifier, e.g., 01A, 01B, etc. An exception might exist where a version of a code, e.g., 778A-01C-01B, in a project is to be replaced by another version of the same parent code (same model name) from another project, e.g., 800A-01C-01B, which has evolved independently of the code version to be replaced. In that case, the new code CIN for project 778 would increment the sequence number, e.g., 778A-01C-02.

Any code baseline derived from another Project/Task shall be referenced on the CD.

- 5.8 Each code baseline and its revision history shall be identifiable by QA CIN from an Update Directory, a source code listing, and any execution printout. To this end, each revised code baseline shall have as its last Ident the addition of, at the beginning of the source code, a format statement "Code Revision QA CIN xxxa-xxa-xxa" and a Write instruction. This last Ident shall be named for the project number, the task identifier, the model sequence number, and the code revision identifier, e.g., 778A01B. The middle three characters of the complete CIN are not needed. The result will be a "model track" that can cross project lines and which will appear on any Update Directory, any source code listing, and on any printout.
- 5.9 Any code version undergoing revision shall be identified in any listing or on any output (as described in § 5.8) by the anticipated new version identifier and three asterisks (***) to denote an unbaselined version.
- 5.10 Initial baselines of acquired codes and code conversions shall be microfiched as and when acquired and when converted.

- 5.11 Final baselines of all codes shall also be microfiched at the Project's conclusion.
- 5.12 For QA Levels 2, 3, and 4, back-up copies of the project tapes to which additions have been made shall be re-generated (updated) quarterly and stored on different premises from the primary tapes. Each quarterly tape update shall be cumulative such that only the most recent tape need be retained.
- 5.13 Baseline codes shall be revised as necessary to correct problems, improve quality, or expand capability. Revisions shall be baselined before (or at the same time) associated Application Results are baselined.
- 5.14 All revisions of baselined codes shall be justified and baselined at the time of baselining any required Test Results (QAP5). All revisions of baselined codes shall be made or reviewed and approved (at his option) by the Code Custodian for operational compatibility with the baselined code.
- 5.15 Each code baseline shall be identified on the CD by model name, CIN, tape format, Intera tape number, source file number, object file number (optional), compiler used, and date. The associated verification Test Results (if required) shall also be referenced on the CD.
- 5.16 A Model Track diagram and Model Track Index shall be maintained to track model evolution across project lines.

6.0 Acceptance Criteria

- 6.1 Baselining of codes shall be accomplished by:
 - (a) completion of a CD (Form 3);
 - (b) writing the code on the Project tape;
 - (c) microfiching (if initial baseline of acquired or converted code);
 - (d) filing the CD with the QAA.
- 6.2 Baselining of code revisions shall be accomplished by:
 - (a) documentation of justification of changes in terms of the elements set forth in 5.5;

- (b) incorporation of changes;
- (c) completion of a CD (Form 3);
- (d) writing the code on the Project Tape;
- (e) filing the CD with the QAA.

7.0 Exhibits

7.1 Form 3 -- QA Control Document (Code)

7.2 QA Flow Chart #3

8.0 Approval

Prepared by	<u><i>M. Shultz</i></u>	
Approved by	<u><i>M. Shultz</i></u>	DQA
Approved by	<u><i>M. Shultz</i></u>	VPO
Approved by	<u><i>R. D. Jantz</i></u>	President

Code (C)

- Original Baseline (Complete Section 1 only)
- Revision to Previous Baseline (Complete Sections 1 and 2)

Project Title:
Task Title:

ID #:

T		M	F	S	R
-	-	-	C	-	-

Control Date: _____

Section 1: Code Baseline

Model Name: _____ Code Custodian: _____

Format: Update Card Image

	INTSRA Tape #	Source File	Object File (Optional)	
Code Storage:	- - - - -	. - - - -	- - - - -	Compiler Used: F4 _____ F5 _____

References (if any) for Performance , Design , and/or Test Specifications. _____

- This baseline/revision was developed by _____
Signature
- This baseline/revision was acquired from _____

Test Results ID #:

-	-	-	-	-	-

 (if needed; see QAP5)

Programming reviewed by _____
Signature

Section 2: Code Revision Update Ident: _____

Check One: Major Minor (no other baseline affected) Revision
Description of and Reason for Revision (if not attached):

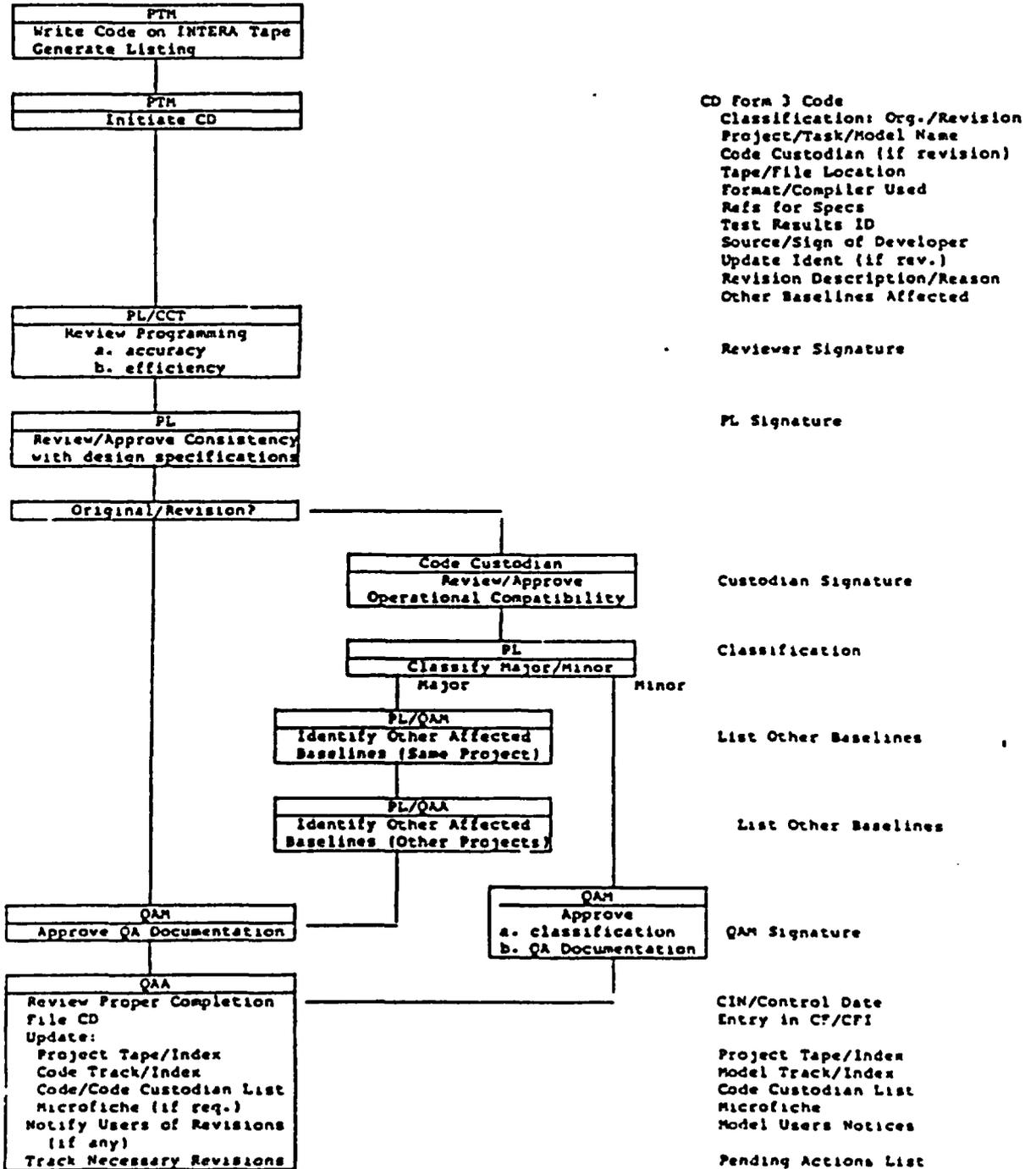
List Other Baselines Affected by this Revision:

Revision Approved by: _____
Code Custodian

Recommended by: _____ PL Date: _____
Approved by: _____ QAM Date: _____

QAP 3: Baseline and Revising Baseline Codes

QA Documentation

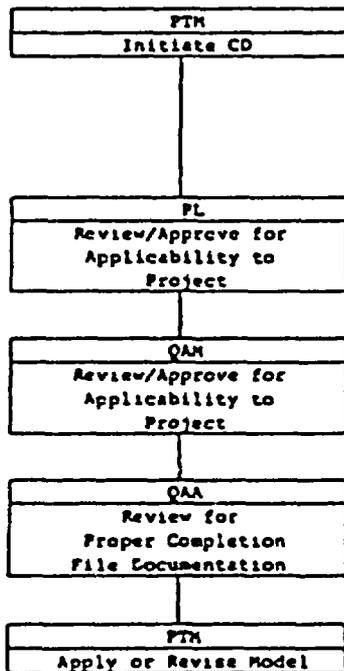


QA Flow Chart #3A

QAP 3:
Baselining of Acquired
Codes

QA Documentation

Activities



CD Form 3 Code
Classification: Orig./Rev.
Project/Task/Model Name
Tape/File Location
Refs for Specs
Source

PL Signature

QAM Signature

CIN/Control Date
Entry in CF/CF:

INTERA QA PROCEDURE NUMBER 4 REVISION 3 DATE 5/1/83

TITLE: Baselining and Revising Baselined Test/Application Data

1.0 Purpose -- to prescribe the steps to be taken in baselining model input data and field or laboratory data required in model validation.

2.0 Scope -- applies to all data used in formal testing or in applications.

3.0 References and Definitions

3.1 References

3.1.1 Intera Program Plan (see following sections):

- I. Organization and Responsibilities
- III. Design Control
- VI. Document Control
- XVII. Quality Assurance Records

3.2 Definitions

- 3.2.1 Data - numerical values of all constant and all independently variable parameters used as input to a model, and numerical values of all dependently variable parameters acquired other than from the model. Does not include numbers generated as output by the model. Data may be obtained from direct field or laboratory measurements, from the literature or reference books, or from best judgment.
- 3.2.2 Library Data - reference data, usually voluminous, used by the model in virtually all applications and not normally printed with output.
- 3.2.3 Project Tape - magnetic tape containing all codes and Library Data baselined and used during the project.
- 3.2.4 Generic Data - data of anticipated utility but not prepared or identified for a specific model or problem.

4.0 Responsibilities

4.1 PTM,-- obtaining and documenting data as assigned.

4.2 PL --

- (a) reviewing data for adequate documentation and for technical quality;
- (b) classifying any revision as major or minor;
- (c) recommending establishment and/or revision of a baseline via a CD (Form 4);
- (d) obtaining approval of the QAM of the baseline or of any major revision thereof;
- (e) determining in consultation with the QAM the effects of any revisions on other baselines in the same project;
- (f) determining in consultation with the QAA the effects of any revisions on baselines in other projects;
- (g) filing approved documents with the QAA.

4.3 QAA --

- (a) reviewing CDs received from PLs for proper completion and signatures, including assigning or correcting CINS where necessary, and assigning control date to CD, and entering references in CFI when CDs are omitted pursuant to 5.2.
- (b) filing and maintaining CD's;
- (c) writing Project Tape;
- (d) generating back-up tapes;
- (e) obtaining microfiche of data if on tape;
- (f) providing notice of revisions to affected Model Users;
- (g) tracking baseline revisions required as a result of a related baseline revision and initiating PRs (QAP10) for revisions not initiated within two weeks.

4.4 QAM --

- (a) performing or securing competent technical review of recommended baselines or revisions thereof;
- (b) approving documentation of baselines and baseline revisions;
- (c) approving classification of minor revisions.

5.0 Procedure

- 5.1 All data (raw and/or processed) used for formal testing or in applications shall be baselined in each project.
- 5.2 Test data (other than library data) may be baselined as part of Test Specs or with Test Results if no characterization, evaluation, or processing is required. In such case the Data CD may be omitted and the QAA shall note the reference in the CFI.
- 5.3 Problem-specific input data other than library data shall be printed in conjunction with corresponding output from any Tests or Applications for which Results are baselined. The Data shall be identified by parameter name and units.
- 5.4 For QA Level 1, data need only be baselined at the conclusion of the project.

For QA Levels 2, 3, and 4, data shall be baselined before or at the time of baselining Model Testing (QAP5) or Application (QAP6), whichever is applicable.
- 5.5 Data acquired from outside Intera in other than bound and published form shall be baselined as and when received.
- 5.6 Data shall be documented (characterized) as to:
 - (a) source and method of acquisition;
 - (b) appropriateness for the intended model application, including accuracy and reliability;
 - (c) derivation (if any) of input data (processed data) from raw data.
- 5.7 All Library data baselines shall be written on the Project Tape.

- 5.8 Final baselines of Library data used in a project shall be microfiched at the Project's conclusion.
- 5.9 Back-up copies of the Project Tape to which additions have been made shall be generated (updated) quarterly and stored on different premises from the primary tape.
- 5.10 Baseline data shall be revised as necessary to correct problems or improve quality.
- 5.11 All revisions of baselined data shall be justified and baselined prior to or at the time of baselining Model (Re) Testing (QAP5) or (Re) Application (QAP6), as applicable.

6.0 Acceptance Criteria

6.1 Baselining of data shall be accomplished by:

- (a) documentation in terms of the elements of 5.6;
- (b) completion of a CD (Form 4);
- (c) writing library data on the Project Tape;
- (d) filing the CD with the QA-AA;

6.2 Baseline data revisions shall be accomplished by:

- (a) documentation of justification in terms of the elements set forth in 5.6;
- (b) completion of a CD (Form 4);
- (c) writing library data on the Project Tape;
- (d) filing the CD with the QA-AA.

7.0 Exhibits

7.1 Form 5.1D -- QA Control Document (Data)

7.2 QA Flow Chart #4

8.0 Approval

Prepared by *[Signature]*
Approved by *[Signature]* DQA
Approved by *[Signature]* VPO
Approved by *[Signature]* President

TEST/APPLICATION DATA (E)

- Original Baseline (Complete Section 1 only)
- Revision to Previous Baseline (Complete Sections 1 and 2)

Project Title:
Task Title:

ID #:	T	M	F	S	R
	E				
	-	-	-	-	-

Control Date: _____

Section 1: Data Baseline

Data Type (check one and complete):

- Problem-Specific Input
- Library
- Generic

If problem specific or library, identify model name _____

Model CIN

-	-	-	-	-	-
---	---	---	---	---	---

Source (Check one and complete):

- This baseline/revision was developed from (Identify applicable references) and by (sign)
 - Lab
 - Field
 - Literature
 - Judgment

Signature _____

- This baseline/revision was acquired from _____

Storage: Tape

Tape	File
-	-

- Other (Describe Location if not attached)

Documentation (characterization) (if not attached):

Section 2: Data Revision

Check One: Major Minor (no other baseline affected) Revision:

Description of and Reason for Revision (if not attached):

List Other Baselines Affected by this Revision:

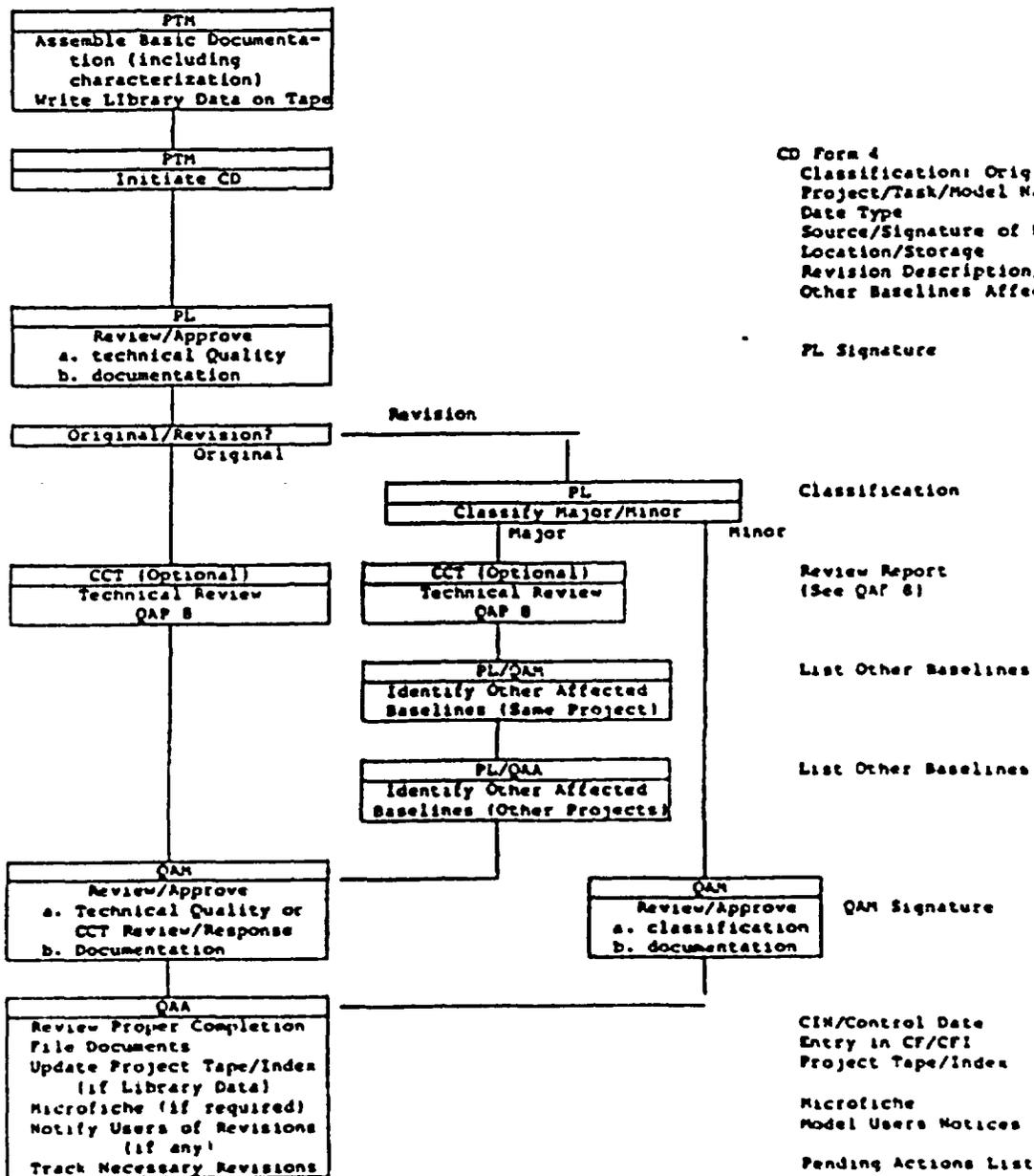
Recommended by: _____ PL Date: _____

Approved by: _____ QAM Date: _____

QAP Flow Chart #4

QAP 4: Baseline and Revising Baseline Test/Application Data

QA Documentation



INTERA QA PROCEDURE NUMBER 5 REVISION 3 DATE 5/1/83

TITLE: Baselining Test Results

1.0 Purpose -- to prescribe the steps to be taken in the formal testing of models and baselining the results thereof.

2.0 Scope -- applies to verification and validation testing pursuant to test specifications, and client acceptance testing (if any), of all models after all expected development/modifications are completed and prior to model application. Does not apply to developmental testing (debugging) or practice test runs.

3.0 References and Definitions

3.1 References

3.1.1 Intera Program Plan (see following sections):

- I. Organization and Responsibilities
- III. Design Control
- VI. Document Control
- XI. Test Control

3.2 Definitions

- 3.2.1 Verification Testing -- testing for conformance to design specifications, e.g., by comparing model results to analytical solutions.
- 3.2.2 Validation Testing -- testing for conformance to performance specification, e.g., by comparing model results to laboratory or field data.
- 3.2.3 Results -- values of dependent variables calculated by a model, including analyses thereof.

4.0 Responsibilities

- 4.1 PTM -- operating model and/or analyzing results as assigned.

4.2 PL --

- (a) verifying (or assigning CCT to verify) the test procedures, input, and output for integrity.
- (b) reviewing results (including analysis) for technical quality, adequate documentation, and consistency with baselined test specifications;
- (c) recommending baselining the results via a CD (Form 5);
- (d) filing the approved documents with the QAA.

4.3 QAA --

- (a) reviewing CDs received from PLs for proper completion and signatures, including assigning or correcting CINS where necessary, and assigning control date to CD;
- (b) filing and maintaining baseline documentation.

4.4 QAM --

- (a) performing or securing competent technical reviewing of test results and analyses;
- (b) approving documentation of baseline results.

4.5 CCT -- verifying (if assigned) test procedures, input, and output for integrity.

5.0 Procedure

- 5.1 All models, including off-the-shelf models, shall be formally tested according to Test Specifications most relevant to an intended Application before Application commences in a Project and/or before transfer outside INTERA.
- 5.2 Formal testing shall occur after all developmental testing (debugging, practice testing) is considered finished, after any revisions of a baselined code (unless judged by the PL and approved by the QAM to be so minor as not to require formal testing), after any computer alterations, and/or after any significant shelf time (more than one year). Test Results baselined under one Project/Task may be referenced from the CF for another Project/Task.

- 5.3 Formal testing shall be reviewed by persons (PL, QAM, or CCT if needed) not involved in development or modification of the model.
- 5.4 Codes for which testing is required shall be baselined at the time of baselining Test Results, and data used in testing shall be baselined before or at the time of testing (except for QA Level 1) according to QAP3 and 4, respectively.
- 5.5 Input data (other than library data) shall be printed out with Test Results output.
- 5.6 Test results shall be analyzed for satisfaction of Test Specifications.
- 5.7 Test results, the analyses thereof, and any useful information drawn therefrom regarding the model's limitations or capabilities must be documented and baselined.
- 5.8 Print-out of Test Results and Test Data shall be filed with the QAA when Results are baselined. The Baseline CD shall contain the unique job date and time identifier.

6.0 Acceptance Criteria

- 6.1 Baselining is accomplished by:
 - (a) documentation of the results and analyses;
 - (b) completion of a CD (Form 5);
 - (c) filing the documents, including print-out of Results and Data, with the QAA.

7.0 Exhibits

- 7.1 Form 5 -- QA Control Document (Test/Application Results)
- 7.2 QA Flow Chart #5

8.0 Approval

Prepared by	<u>[Signature]</u>	
Approved by	<u>[Signature]</u>	DQA
Approved by	<u>[Signature]</u>	VPO
Approved by	<u>[Signature]</u>	President

QA Control Document
Form 5
5/1/83

Test/Application Results (F)
(Circle One)

Project Title: _____

Task Title: _____

ID #:

	T		M	F	S	R
-	-	-	-	-	-	-

Model Name: _____

Control Date: _____

Model Code ID:

-	-	-	-	-	-	-
---	---	---	---	---	---	---

Input Data ID:

-	-	-	-	-	-	-
---	---	---	---	---	---	---

Library Data ID (if applicable):

-	-	-	-	-	-	-
---	---	---	---	---	---	---

Section 1. Test Job Date: _____ Time: _____

Nature of Test: _____

Analysis of Results (if not attached): _____

Performed by: _____
Signature

Verified by: _____
Signature Date

Section 2. Application Job Date: _____ Time: _____

Nature of Application: _____

Analysis of Results (if not attached): _____

Relevant Test Results ID:

-	-	-	-	-	-	-
---	---	---	---	---	---	---

Application performed by: _____
Signature

Recommended by: _____ PL Date: _____

Approved by: _____ QAM Date: _____

QA Flow Chart #5

QAP 5: Baselineing Test Results

QA Documentation

PTM
Assemble Basic Documentation (output and analysis)

PTM
Initiate CD

PL/CCT
Verify Procedures, input and output for integrity

PL
Review/Approve Technical a. Technical Quality b. Documentation

CCT (optional)
Technical Review QAP 8

QAM
Review/Approve a. Technical Quality or CCT Review/Response b. Documentation

QAA
Review Proper Completion File Documents File Output

CD Form 5 Test/Application Results
 Project/Task/Model Name
 Code/Data CINS
 Job Date/Time
 Nature of Test
 Analysis of Results
 PTM Signature

Verifier signature

PL Signature

Review Report (See QAP 8)

QAM Signature

CIN/Control Date
Entry in CF/CFI
Output File/Log

INTERA QA PROCEDURE NUMBER 6 REVISION 2 DATE 5/1/83
TITLE: Baselining Application Results

1.0 Purpose -- to prescribe the steps to be taken in the application of models and baselining the results thereof.

2.0 Scope -- applies to all applications of models by Intera.

3.0 References and Definitions

3.1 References

3.1.1 Intera Program Plan (see following sections):

- I. Organization and Responsibilities
- III. Design Control
- VI. Document Control
- XI. Test Control

3.2 Definitions

3.2.1 Results -- values of dependent variables calculated by the model, including analyses thereof.

4.0 Responsibilities

4.1 PTM -- selecting and operating model and/or analyzing results, as assigned.

4.2 PL --

- (a) selecting or reviewing selection of appropriate model;
- (b) reviewing test specifications, procedures, and results to assure proper verification and validation of model for particular application;
- (c) reviewing application, analysis, and documentation of results of model application for technical quality;
- (d) recommending baselining the results via CD (Form 5);

- (e) obtaining the approval of the QAM;
- (f) filing the approved documents with the QAA.

4.3 QAA --

- (a) reviewing CDs received from PLs for proper completion and signatures, including assigning or correcting CINS where necessary, and assigning control date to CD;
- (b) filing and maintaining baseline documentation.

4.4 QAM --

- (a) performing or securing competent review of test specifications, procedures and results to assure proper verification and validation of model for particular application;
- (b) performing or securing competent technical review of model application and analyses of results of model application;
- (c) approving documentation of baseline results.

5.0 Procedure

- 5.1 Prior to application in a new project, each model shall be qualified by review or repeat of previous testing or by new testing pursuant to applicable test specifications according to QAP5.
- 5.2 The results of all model applications to be transmitted outside of, or relied upon by, Intera or which yield significant information about the model's capabilities or limitations, or about measured data, or about the system or process being modeled shall be baselined.
- 5.3 Input Data (other than Library Data) shall be printed out with Application Results output.
- 5.4 Print-out of Application Results and Application Data shall be filed with the QAA when Results are baselined. The baseline CD shall contain the unique job date and time identifier.

6.0 Acceptance Criteria

6.1 Baselineing is accomplished by:

- (a) documentation of the results and analyses;
- (b) completion of a CD (Form 5);
- (c) filing the documents, including print-out of Results and Data, with the QAA.

7.0 Exhibits

7.1 Form 5 -- QA Control Document (Test/Application Results)

7.2 QA Flow Chart #6

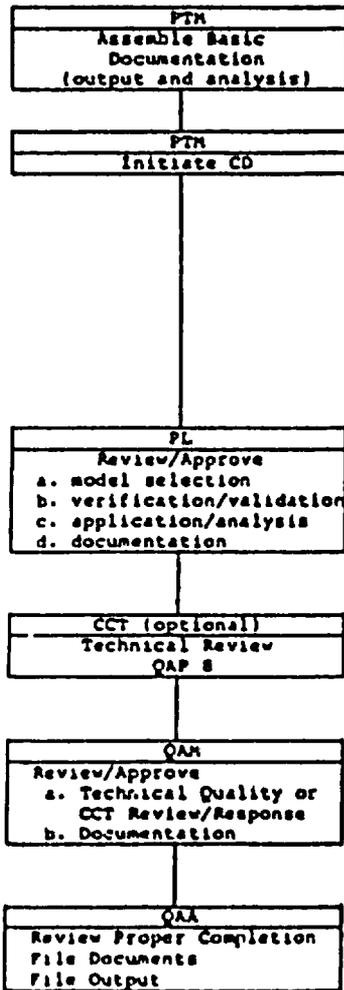
8.0 Approval

Prepared by	<u><i>M. Hertz</i></u>	
Approved by	<u><i>M. Hertz</i></u>	DQA
Approved by	<u><i>J. Perkins</i></u>	VPO
Approved by	<u><i>R. Zank</i></u>	President

QA Flow Chart 86

QAP 6: Baselineing Application Results

QA Documentation



CD Form 5 Test/Application Results
 Project/Task/Model Name
 Code/Data CINS
 Job Date/Time
 Nature of Test
 Relevant Test Results ID
 Analysis of Results
 PTM Signature

PL Signature

Review Report (See QAP 8)

QAM Signature

CIN/Control Date
 Entry in CF/CFI
 Output File/Log

INTERA QA PROCEDURE NUMBER 7 REVISION 2 DATE 5/1/83

TITLE: Baselining and Revising Baselined Technical Reports and Model Documentation

1.0 Purpose -- to prescribe the steps to be taken in baselining Project or Task Technical Reports and Model Documentation and to revise (upgrade) acquired Model Documentation.

2.0 Scope -- applies to all deliverables subject to QA requirements.

3.0 References and Definitions

3.1 References

- 3.1.1 Intera Program Plan (see following sections):
- I. Organization and Responsibilities
 - III. Design Control
 - VI. Document Control
 - XVII. Quality Assurance Records

3.2 Definitions

- 3.2.1 Deliverables - Reports, Model Documentation, and other items identified by contract to be delivered to the client.
- 3.2.2 Model Documentation - documentation reflecting model performance, design and test specifications, test data and results, and user instruction necessary to enable valid application and/or reconstruction of the model by those knowledgeable in computer modeling.

4.0 Responsibilities

4.1 PTM -- preparing Reports and Model Documentation.

4.2 PL --

- (a) reviewing Reports and Model Documentation for communicative and technical quality;
- (b) classifying any revision as major or minor;
- (c) recommending establishment and/or revision of a baseline via a CD (Form 2);
- (d) obtaining approval of the QAM of the baseline and of any major revision thereof;

- (e) determining in consultation with the QAM the effects of any revisions on other baselines in the same project;
- (f) determining in consultation with the QAA the effects of any revisions on baselines in other projects;
- (g) filing approved documents with the QAA.

4.3 QAA --

- (a) reviewing CDs received from PLs for proper completion;
- (b) filing and maintaining CDs;
- (c) providing notice of revisions to affected Model Users;
- (d) initiating PRs (Procedure No. 10) for baseline revisions required as a result of a related baseline revision and not initiated within two weeks.

4.4 QAM --

- (a) performing or securing competent technical and editorial review of recommended baselines or revisions thereof;
- (b) approving documentation of baselines and baseline revisions;
- (c) approving classification of minor revisions.

5.0 Procedure

5.1 All Reports, Model Documentation, and other deliverables identified in the PQAP for QA Control shall be baselined before transmission outside Intera.

5.2 Reports and Model Documentation shall:

- (a) be readable;
- (b) be complete;
- (c) be technically sound;

- (d) accurately reflect the record of their evolution;
- (e) conform with contract specifications.

5.3 Model Documentation shall include as a minimum (1) model theory and design, (2) model test and evaluation, and (3) a user's manual.

5.4 Baselined Reports or Model Documentation shall be revised as necessary to correct problems, improve quality, or to bring (e.g., acquired) Model Documentation up to the minimum standards reflected in 3.2.2 and 5.3.

5.5 All revisions shall be justified and baselined before transmission outside Intera.

6.0 Acceptance Criteria

6.1 Baselining of Reports and Model Documentation shall be accomplished by:

- (a) documentation;
- (b) completion of a CD (Form 2);
- (c) filing of the CD with the QAA.

6.2 Baselining of Reports and Model Documentation revisions shall be accomplished by:

- (a) documentation of justification in terms of the elements set forth in 5.4;
- (b) incorporation of the changes;
- (c) completion of a CD (Form 2);
- (d) filing the documents with the QAA.

7.0 Exhibits

7.1 Form 2 -- QA Control Document (Specification/Report Baselines)

7.2 QA Flow Charts #2, 2A

8.0 Approval

Prepared by [Signature]
Approved by [Signature] DQA
Approved by [Signature] VPO
Approved by [Signature] President

INTERA QA PROCEDURE NUMBER 8 REVISION 3 DATE 5/1/83

TITLE: Cross-Check Team (CCT) Reviews

1.0 Purpose -- to prescribe the requirements for the conduct and documentation of a CCT Review of project work for technical quality.

2.0 Scope -- applies to projects of QA Levels 3 and 4 and covers both informal and formal CCT Reviews. Reviews are implemented according to the schedule and apply to the subject matter identified in the Project QA Plan (PQAP). Reviews may also be undertaken at the request of the QAM to assist him in technical reviews of baselines. The members of the CCT are also identified in the PQAP.

3.0 References and Definitions

3.1 References

- 3.1.1 Intera Program Plan (see following sections):
- I. Organization and Responsibilities
 - III. Design Control
 - VI. Document Control

3.2 Definitions

- 3.2.1 Cross-Check Team (CCT) -- a peer review group from within Intera composed of one or more persons technically qualified to perform the required technical reviews and who are not otherwise involved in the work being reviewed.
- 3.2.2 Informal Reviews -- technical reviews requiring documentation only of the time of review, the material reviewed, and the participants, and any Required Changes and responses thereto.
- 3.2.3 Formal Reviews -- technical reviews requiring written findings and recommendations, including Required Changes, and a written response in addition to the documentation of an informal review.
- 3.2.4 Required Changes -- corrections of clear and substantive errors.

4.0 Responsibilities

4.1 PTM -- cooperating with the CCT by freely disclosing and explaining as necessary work he has performed.

4.2 PL --

(a) scheduling the CCT Review and initiating the Review Report CD (Form 8);

(b) assuring that the review is conducted;

(c) ~~acknowledging~~ acknowledging the Review Report (Form 8);

(d) responding to formal Review Reports and/or Required Changes.

4.3 QAA --

(a) monitoring the formal CCT Review process to assure proper completion;

(b) assuring receipt of response to formal Review Reports and/or Required Changes;

(c) obtaining the necessary acknowledgments of the Review Report;

(d) filing and maintaining the Review Report documentation.

4.4 CCT --

(a) reviewing baselines and/or work in process for scientific and operational soundness and for adherence to baselined specifications, and reporting any Required Changes;

(b) if the review is formal, reporting a written summary of Required Changes, observations, and recommendations.

4.5 QAM --

(a) requesting CCT Review (optional);

(b) acknowledging the Review Report;

(c) approving the response to a formal Review Report and/or Required Changes.

- (b) Preparation of a response (for formal reviews and/or Required Changes);
- (c) completion of a CD (Form 8);
- (d) filing the documents with the QAA.

7.0 Exhibits

7.1 Form 8 -- QA Control Document (Baseline Review Report)

7.2 Intra QA Baseline Review Checklist

7.3 QA Flow Chart #8

8.0 Approvals

Prepared by	<u><i>[Signature]</i></u>	
Approved by	<u><i>[Signature]</i></u>	DQA
Approved by	<u><i>[Signature]</i></u>	VPO
Approved by	<u><i>[Signature]</i></u>	President

Intera QA Baseline Review Checklist

A. Performance Specifications

1. Describe information expected from model
2. Conform with contract specifications
3. Describe physical/chemical phenomena accounted for and important phenomena neglected
4. Include relevant equations/derivations
5. State applicable assumptions/limitations/simplifications
6. Rationalize assumptions/limitations/simplifications
7. Are technically sound
8. Are technically complete
9. Are technically feasible (capable of being met)
10. Are practically feasible (can be met within budget)
11. Specify output information
12. Specify input information required
13. Justify and explain all changes

b. Design Specifications

1. Describe numerical techniques
2. Include relevant equations/derivation
3. State applicable assumptions/limitations
4. Rationalize assumptions/limitations
5. Are technically sound
6. Are practically feasible
7. Are consistent with performance specs
8. Describe structure and organization of program by flow charts, PDL, etc.

9. Describe program storage and handling
10. Describe data input/output
11. Describe model/system interfaces
12. Design is efficient consistent with project budget.
13. Specify nomenclature consistent with related models and the field of intended use.
14. Specify program design or coding standards
15. Specify computational characteristics (core requirements, running time, accuracy or precision)
18. Justify and explain all changes

C. Codes

1. Satisfy applicable design specs
2. Are logically correct
3. Are efficient consistent with project budget.
4. Evolve directly and obviously from the design specs
5. Are straight forward and easily used consistent with efficiency and project budget.
6. Are internally well documented

D. Test Specifications

1. State purpose of tests
2. State limitations of tests
3. State criteria for successful test
4. Include applicable equations (e.g., analytical solutions)
5. Include test to exercise all program elements

6. Include tests to confirm satisfaction of all design specs (verification tests) and performance specs (validation tests)
7. Specify data to be used
8. Specify data covering realistic range
9. Specify adequate testing
10. Includes any "acceptance testing" required by contract

E. Test/Application Data

1. Are realistic
2. Are best available
3. Are fully described (source, method of acquisition, accuracy)
4. Changes are explained and justified
5. Problems discovered

F. Test/Application Results

1. Are fully described
2. Are analyzed properly and completely
3. Are accurately characterized
4. Reflect ease or difficulty of use of model

G. Reports (or other deliverables)

1. Are readable
2. Are complete
3. Are technically sound
4. Accurately reflect their record of evolution
5. Conform with contract specifications
6. Users Manuals make codes actually useable by others

QA Control Document
Form 8
5/1/83

Review Report (I)

Formal Informal

ID #:

T	M	F	S	R
-	-	I	-	-

Control Date: _____

Project Title:

Task Title:

Baseline(s) Reviewed (including ID # or other description if not baselined):

Review performed by:

Date of Review:

Required Changes:

Other Findings/Recommendations (if formal; if not attached):

Response:

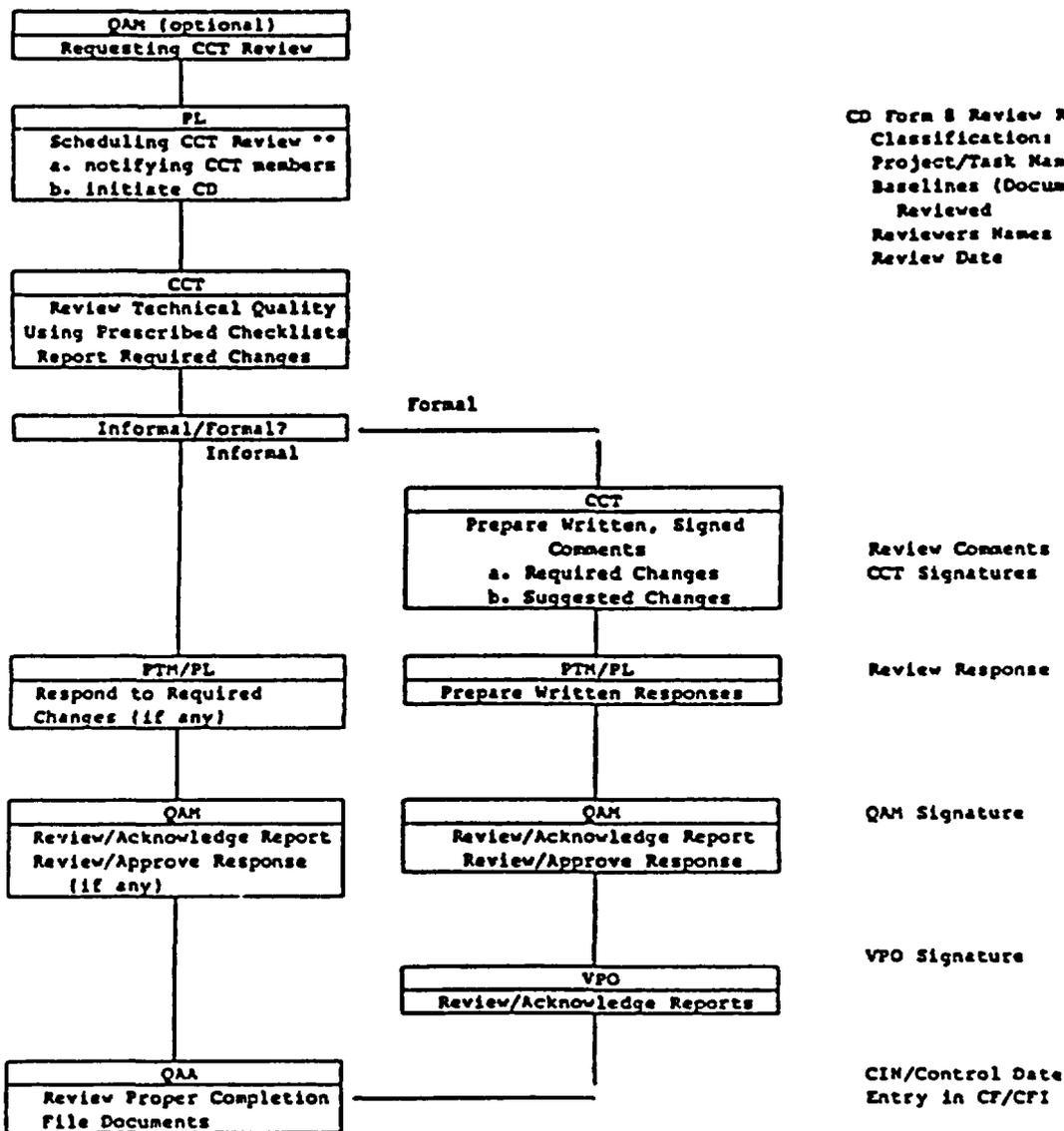
Report acknowledged by:

_____ PL (Response approved, if any) Date: _____

_____ QAM (Response approved, if any) Date: _____

_____ VPO (if formal) Date: _____

QAP 8(9): CCT (EQAT) Reviews



** Mandatory (QA Levels 3,4)
 for Tech Reports and
 Model Doc.

INTERA QA PROCEDURE NUMBER 9 REVISION 2 DATE 5/1/83

TITLE: External QA Team (EQAT) Reviews

1.0 Purpose -- to prescribe the requirements for the conduct and documentation of an EQAT Review of project work for technical quality. The procedure provides a review perspective independent of Intera to assure the highest quality.

2.0 Scope -- applies only to projects of QA Level 4. It is implemented according to the schedule and applies to the subject matter identified in the PQAP. The members of the EQAT are also identified in the PQAP.

3.0 References and Definitions

3.1 References

- 3.1.1 Intera Program Plan (see following sections):
- I. Organization and Responsibilities
 - III. Design Control
 - VI. Document Control

3.2 Definitions

- 3.2.1 External QA Team -- a peer review group from outside Intera composed of one or more persons technically qualified to perform the required technical reviews, whose independence from Intera permits them to be unbiased in their reviews, and whose perspectives are likely to be different from those of Intera employees. The EQAT is chaired by the DQA.
- 3.2.2 Formal Reviews -- technical reviews requiring written findings and recommendations, including Required Changes, and a written response.
- 3.2.3 Required Changes -- corrections of clear and substantive errors.

4.0 Responsibilities

- 4.1 PTM -- making prepared presentations freely disclosing and explaining as necessary work he has performed which is to be reviewed.
- 4.2 PL --
 - (a) preparing the agenda and scheduling the review in coordination with the QAM and the DQA, and in conformance with the PQAP;
 - (b) directing and/or making the presentations made at the review session;
 - (c) acknowledging and responding to the Review Report (Form 8).
- 4.3 QAA --
 - (a) assuring receipt of response to the Review Report;
 - (b) filing and maintaining the Review Report documentation;
 - (c) providing information copies of the Review Report to the VPO and the President.
- 4.4 EQAT -- reviewing baselines for scientific and operational soundness and for adherence to related baseline specifications.
- 4.5 QAM --
 - (a) acknowledging the Review Report.
 - (b) approving the response to the Review Report.
- 4.6 DQA --
 - (a) chairing the EQAT;
 - (b) conducting the EQAT review;
 - (c) preparing the findings and recommendations;
 - (d) filing the Report with the QAA.

5.0 Procedure

- 5.1 For QA Level 4, one or more formal EQAT reviews of selected baselines shall be conducted. More than one baseline may be reviewed at a time.
- 5.2 EQAT reviews shall be scheduled and EQAT members identified in the PQAP.
- 5.3 The reviews shall be conducted as nearly as practical in accordance with the PQAP schedule.
- 5.4 The EQAT reviews shall be guided by the applicable review checklists (Exhibit 7.2, QAP 8).
- 5.5 The Required Changes, observations, and recommendations of the EQAT shall be documented with a Baseline Review Report (Form 8), signed by all members of the EQAT, and filed in the QA Control File, with information copies provided to the VPO and the President.
- 5.6 Response to the Review Report shall be provided by the PL and appended to the Review Report. Editorial recommendations may be acknowledged in summary fashion, e.g., "implemented where appropriate." Responses to marked-up drafts may be made in the form of annotations on the draft.

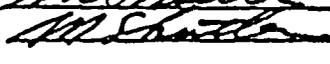
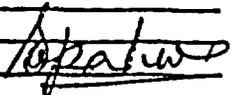
6.0 Acceptance Criteria

- 6.1 Baselining is accomplished by:
 - (a) documentation of findings and recommendations;
 - (b) preparation of a response;
 - (c) completion of a CD (Form 8);
 - (d) filing the documents with the QAA.

7.0 Exhibits

- 7.1 Form 8 -- QA Control Document (Baseline Review Report)
- 7.2 QA Flow Chart #8

8.0 Approval

Prepared by 
Approved by  DQA
Approved by  VPO
Approved by _____ President

INTERA QA PROCEDURE NUMBER 10 REVISION 3 DATE 5/1/83

TITLE: Problem Reports (PRs)/Remedial Action

1.0 Purpose -- to prescribe the steps to be taken to report and assure the remedy of problems or conditions causing repetitive problems related to work quality during a project.

2.0 Scope -- applies to problems which are minor, major, or critical in severity; applies to technical problems, to procedural problems and to conditions which cause repetitive problems. Problems require remedial action; conditions causing repetitive problems require a remedial action known as Corrective Action. The Procedure applies to all Intera projects.

3.0 References and Definitions

3.1 References

- 3.1.1 Intera Program Plan (see following sections):
- I. Organization and Responsibilities
 - VI. Document Control
 - XV. Control of Nonconforming Items
 - XVI. Corrective Action

3.2 Definitions

- 3.2.1 Technical Problem -- a mechanical implementation error or a conceptual formulation error which affects an existing baseline, or a deviation from baselined specifications.
- 3.2.2 Procedural Problem -- a non-conformance with QA Procedures, or a deficiency in QA requirements or Procedures.
- 3.2.3 Minor Problem -- a technical or procedural problem arising from inadvertence or misunderstanding requiring at most a minor revision and not significantly affecting work previously completed.
- 3.2.4 Major Problem -- a technical or procedural problem arising from apparently significant negligence or wrongful intent, or an otherwise minor problem requiring a major baseline revision or significantly affecting work previously completed.

- (c) circulating copies of technical PRs to all personnel using baseline affected;
- (d) filing and maintaining completed PRs;
- (e) initiating and/or recirculating PRs for approval/acknowledgment every 30 days for unremedied problems first reported more than 30 days previously;
- (f) initiating PRs for collateral baseline revisions indicated by CDs but not initiated within two weeks;
- (g) assuring that problems are reported to clients when required by contract.

4.4 QAM --

- (a) approving or disapproving (with explanation) PRs as to:
 - (i) adequacy and accuracy of description
 - (ii) classification (critical major, minor; technical, procedural)
 - (iii) remedial/corrective action for major or critical problems
- (b) Consulting, when necessary, with the VPO, DQA, and/or the President regarding remedy of major or critical problems.

4.5 DQA --

- (a) reviewing all disapproved major or critical PRs
- (b) assuring action by QAM, VPO, and President, as necessary to remedy major or critical problems.

4.6 VPO --

- (a) reviewing all disapproved major or critical PRs
- (b) authorizing or redirecting personnel time, as necessary, and determining method of remedying major or critical problems.

4.7 President -- assuring remedy of critical problems.

5.0 Procedure

- 5.1 A PR (CD Form 10) shall be initiated by any professional staff member;
 - (a) for any critical or any major technical or procedural problem;
 - (b) for any minor technical or procedural problem that is not remedied within 48 hours; and
 - (c) for any baseline revision required as an effect of a related baseline revision but which is not performed within two weeks.
- 5.2 Every initiated PR shall be registered with the QAA before circulation for reviews/approval and shall be filed with the QAA after the review/approval process. Disapprovals shall be explained, and disapprovals of major PRs shall be reviewed.
- 5.3 A problem which affects a baseline shall be remedied through issuance of a Baseline Revision (Forms 2,3,4) and documentation of the remedial action on the PR. Remedial action shown on a different PR form from the original PR (e.g., when action to be taken is determined subsequent to issuance of the PR) is identified as a revision of the original PR.
- 5.4 A problem represented by non-conformance with QA procedures shall be remedied through documentation of the remedial action on the PR. Remedial action shown on a different form from the original PR is identified as a revision of the original PR.
- 5.5 A critical PR shall be initiated by the QAA and/or re-circulated every 30 days for uncorrected major problems reported more than 30 days previously.
- 5.6 A problem represented by conditions which cause repetitive problems shall be classified as a critical problem, and remedial action shall be classified as Corrective Action and described on the PR.
- 5.7 PRs shall be approved by the PL and the QAM (major and critical problems) and acknowledged by the VPO, DQA, and President (critical problems).

5.8 PRs affecting baselines shall be circulated by the QAA to all personnel using the affected baseline.

5.9 Problems shall be reported to clients if required by contract.

6.0 Acceptance Criteria

6.1 A PR is complete upon:

- (a) documentation of the problem;
- (b) completion of a PR CD (Form 10);
- (c) filing the documents with the QAA.
- (d) documentation of Remedial Action;
- (e) completion of a PR CD (Form 10) revision (if necessary) and any necessary Baseline Revision (Forms 2,3,4)

7.0 Exhibits

7.1 Form 10 -- QA Control Document (Problem Report/Remedial Action)

7.2 QA Flowchart #10

8.0 Approval

Prepared by	<u><i>[Signature]</i></u>	
Approved by	<u><i>[Signature]</i></u>	DQA
Approved by	<u><i>[Signature]</i></u>	VPO
Approved by	<u><i>[Signature]</i></u>	President

Problem Report/Remedial Action (H)

ID #:

	T		M	F	S	R
-	-	-	-	-	-	-

Control Date: _____

Project Title:

Task Title:

Reported by: _____
Signature

Date Reported: _____

Type of Problem: Technical

Procedural (QA)

Severity of Problem: Minor
(definitions in QAP 10)

Major

Critical

Problem Explanation:

Baselines Affected:

Action Recommended:

Action Taken:

 Approved Disapproved (explanation attached) by:
_____ Date
PL

 Approved Disapproved (explanation attached) by:
_____ Date
QAM

Critical or Disapproval Acknowledgement:

VPO Date

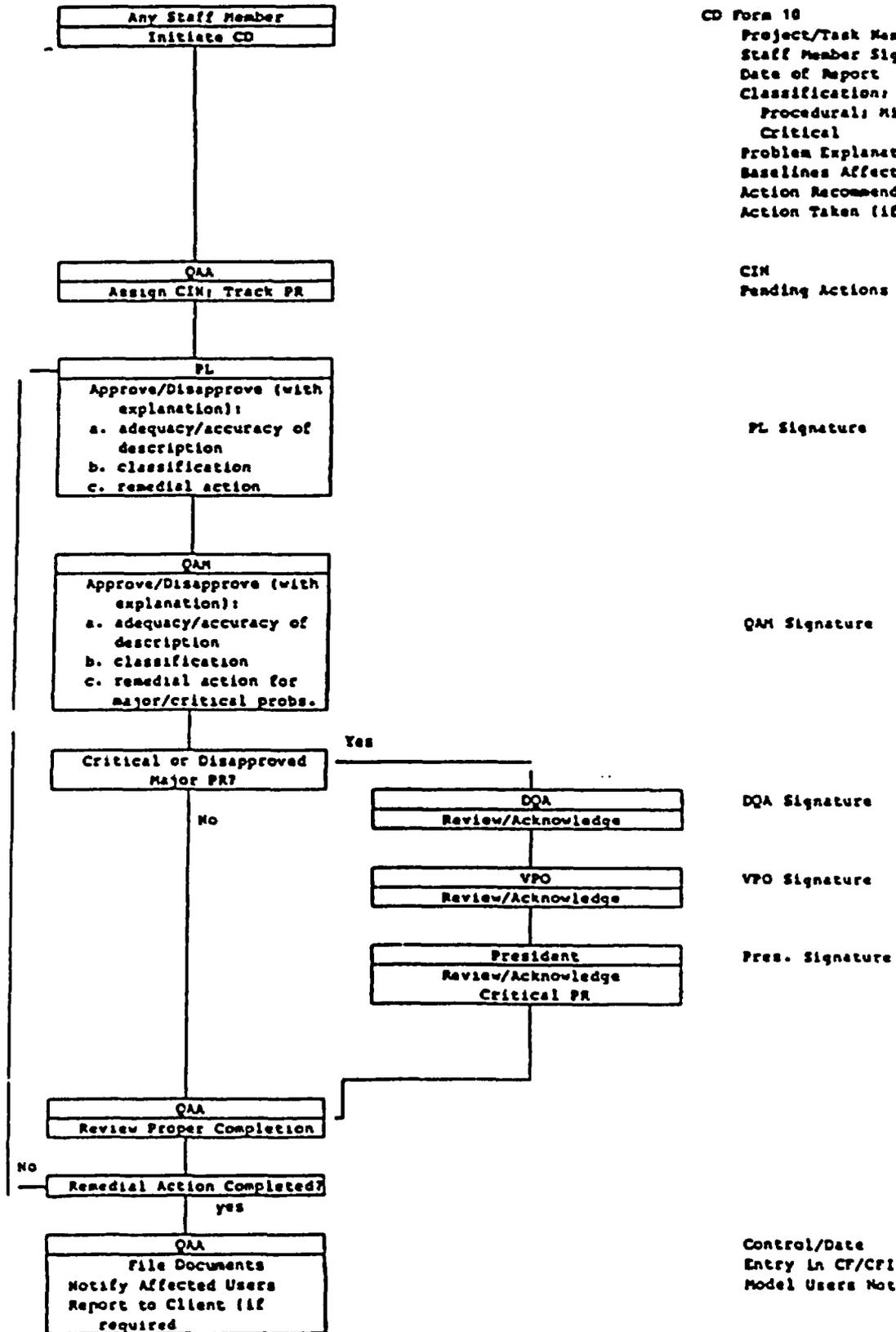
DQA Date

Critical Problem Acknowledgement:

President Date

QAP 10: Problem Reports/Remedial Action

QA Documentation



CD Form 10
 Project/Task Name
 Staff Member Signature
 Date of Report
 Classification: Technical,
 Procedural; Minor, Major,
 Critical
 Problem Explanation
 Baselines Affected (if any)
 Action Recommended (if any)
 Action Taken (if any)

CIN
 Pending Actions List

PL Signature

QAM Signature

DQA Signature

VPO Signature

Pres. Signature

Control/Date
 Entry In CF/CFI
 Model Users Notices

INTERA QA PROCEDURE NUMBER 11 REVISION 4 DATE 5/1/83

TITLE: QA Control File and Index

1.0 Purpose -- to prescribe the essential elements in filing and indexing QA records in the QA Control File.

2.0 Scope -- applies to all Quality Assurance Records and all Intera projects.

3.0 References and Definitions

3.1 References

- 3.1.1 Intera QA Program Plan (see following sections):
 - I. Organization and Responsibilities
 - III. Design Control
 - VI. Document Control
 - XVII. Quality Assurance Records

3.2 Definitions

- 3.2.1 Quality Assurance Records -- all documents required to be created under Intera's QA program (including performance, design, and test specifications, codes, data, results, technical reports, manuals, review reports, problem/remedial action reports, audit reports, and all QA Control Documents), all additional deliverable items identified by the PQAP for QA Control, and all communications from the client affecting technical baselines.
- 3.2.2 QA Control File (CF) -- the collection of properly filed, retrievable, and indexed QA Records consisting of hard copy stored in a fire resistant container and tapes stored in a secure location other than the location of the Central Processor.
- 3.2.3 QA Control File Index (CFI) -- a sequential listing of the contents of the Control File showing CIN, record title, and date of filing (Control Date).
- 3.2.4 QA Control Identification Number (CIN) -- the unique number assigned to each QA Control

Document and Record containing project, task, model, record type, item sequence, and revision identifiers.

- 3.2.5 QA Control Document (CD) -- a cover page for QA documentation containing the CIN and other pertinent information.
- 3.2.6 Custody Log -- list containing names of persons removing records from the CF, record names and CINs, and dates of removals and returns.
- 3.2.7 Project Tape -- magnetic tape containing all codes and library data baselined during the project.
- 3.2.8 Project Tape Index -- list of contents (code, library data) of Project Tape.
- 3.2.9 Code Track Index -- list of Code Track Diagrams and corresponding most recent code version
- 3.2.10 Code Track Diagram - diagram showing evolution of codes within and across project lines.
- 3.2.11 QA Distribution Log - list containing names of persons receiving copies of a PQAP or the QA Procedures and the file containing their return acknowledgements.
- 3.2.12 Model User List - a list of all known users of a model developed or a model revised and distributed by INTERA.
- 3.2.13 Incoming/Outgoing Document Logs - Logs reflecting recipient, addressee, source and date.
- 3.2.14 Pending Actions - actions required to be taken as a result of related baseline revisions (QAP 2, 3, 4) or Problem Reports (QAP 10) or Audits (QAP 12).

4.0 Responsibilities

4.1 PL -- responsible for:

- (a) identifying (in consultation with QAA) QA Records with proper Control Identification Number (CIN);
- (b) filing approved documents and pertinent client communications, along with corresponding CDs, with the QAA;

4.2 QAA -- responsible for:

- (a) assigning, in consultation with Accounting, appropriate Project Identifier;
- (b) reviewing CDs for proper completion and signatures, including assigning or correcting CINS where necessary, assigning control date to CD, and entering references in CFI when CDs are omitted;
- (c) preparing filing materials (folders, labels, etc.) to initiate proper vital records storage;
- (d) filing and maintaining CDs and associated documents in proper sequence in the CF;
- (e) maintaining Control File Index;
- (f) writing Project Tape;
- (g) generating back-up Project Tapes;
- (h) maintaining Project Tape Index;
- (i) maintaining Code Track Diagram;
- (j) maintaining Code Track Index;
- (k) exercising control over access to the Control File, including maintaining the Custody Log;
- (l) distributing copies of PQAPs and QA Procedures in cases of revisions or new employees, maintaining Distribution Log, and requiring and filing return acknowledgements;
- (m) maintaining a Training File reflecting the training of company employees;
- (n) maintaining the Model Users List, distributing to users copies of Problem Reports affecting models used by them, and requiring and filing return acknowledgments.
- (o) maintaining a list of Pending Actions.

4.3 CCT -- responsible for:

- (a) filing CCT review reports and associated CD with QAA.

4.4 DQA -- responsible for:

- (a) filing EQAT review reports, Audit reports, and associated CDs with QAA.

5.0 Procedure

- 5.1 Each QA Record shall be assigned an applicable QA Control Document (CD) (except under 5.7) and a unique Control Identification Number (CIN), filed in the QA Control File (CF), and entered into the Control File Index (CFI). Each Record, if attached to a CD, shall be identified by CIN, date of preparation, and the pages attached together, e.g., stapled, and the pages numbered, e.g., 1/5, 2/5, etc. Each development or report record should be signed by the author.
- 5.2 The CF shall be under the control of the QAA.
- 5.3 Removal of records from the CF shall be discouraged. Any person requiring removal must sign the Custody Log identifying himself, the record removed, and the dates of removal and return.

identifier corresponding to the Accounting identifier. The associated alpha shall be the task identifier. The second number shall be the model identifier within the task. The associated alpha shall be the record type identifier according to the following key:

A	-	Performance Specifications
B	-	Design Specifications
C	-	Code
D	-	Test Specifications
E	-	Test/Application Data
F	-	Test/Application Results
G	-	Reports
H	-	Problems/Remedial Action
I	-	Reviews
J	-	Audits

The third number shall be a record item sequence number for use when multiple independent records of a common type exist (as, e.g., for data or reviews). The associated alpha is a baseline revision identifier for use in tracking baselines which evolve through multiple, dependent revisions (e.g, performance specifications).

- 5.5 For records applicable to an entire task (e.g., Task Report (See Exhibit 7.2)), the model identifier shall be 00. For records applicable to an entire project (e.g., Audit Report), the task identifier shall be blank.

- 5.6 Baseline documentation shall not be repeated within a Project file. Where, e.g., a model is used in each of several tasks, model specific baselines shall be documented under one task, and reference to that documentation from other tasks shall be shown on the CFI (See Exhibit 7.2).
- 5.7 Baseline documentation published and contained in the Intera Library may be incorporated into the CF by reference to the Intera Library from the CD. When such documentation contains one or more types of specifications, the reference shall appear on at least one Specification or Code CD, and the CD's for the other types of specifications may be omitted. The QAA shall enter references in the CFI for specifications baselined without corresponding CDs.
- Baseline documentation not contained in the Intera Library but contained in whole or in part in the CF of another project may similarly be referenced provided no revision of the baseline occurs in the immediate project. When any such revision occurs, the documentation contained in the CF of the other project shall be physically incorporated into the CF of the immediate project.
- 5.8 A CFI shall be maintained for each project and updated as necessary to maintain currency. A copy of the CFI shall be generated quarterly and entered into the CF as a permanent, historical record itself. Any changes in, or deletion or alteration, of CINs shall be documented and justified.
- 5.9 In addition to a CIN, model code baselines shall be identified on the CD by Model Name, tape format, Intera tape number, source file number, object file number (optional), compiler used, and date.
- 5.10 All baselined codes and library data shall be written on the Project Tape, and a Project Tape Index maintained.
- 5.11 Backup copies of the Project Tape to which additions have been made shall be re-generated in its entirety (updated) quarterly and stored on different premises from the primary tape.
- 5.12 A Code Track Diagram and Code Track Index relating parent-daughter code baselines across projects shall be maintained to track code evolution across project lines.

- 5.13 QA Records shall remain in the CF in paper, magnetic tape, or micrographic form for three years beyond project conclusion or such other time as is specified in the PQAP.
- 5.14 QA Records shall be transferred to dead storage for three additional years and then discarded, unless other provision is specified in the PQAP.
- 5.15 The CF shall be subject to audit by the DQA and by client QA representatives as required by contract.
- 5.16 Copies of the PQAP and the QA Procedures shall be distributed under a transmittal memo to new employees as needed and to all affected employees in the event of revisions of the PQAP or Procedures. Return of replaced versions of the PQAP and Procedures, if any, and sign-off on the QA Distribution Log (or return of signed copies of transmittal memos) shall verify receipt. Records of distribution and receipt shall be maintained in the QA Distribution Log.
- 5.17 A company-wide Training File reflecting any employee training, its nature, date, and attendees shall be maintained.
- 5.18 A Model Users List shall be maintained.

6.0 Acceptance Criteria

- 6.1 The Control File and Index, Project Tape Index, and Code Track Diagram and Index must be complete and properly sequenced.

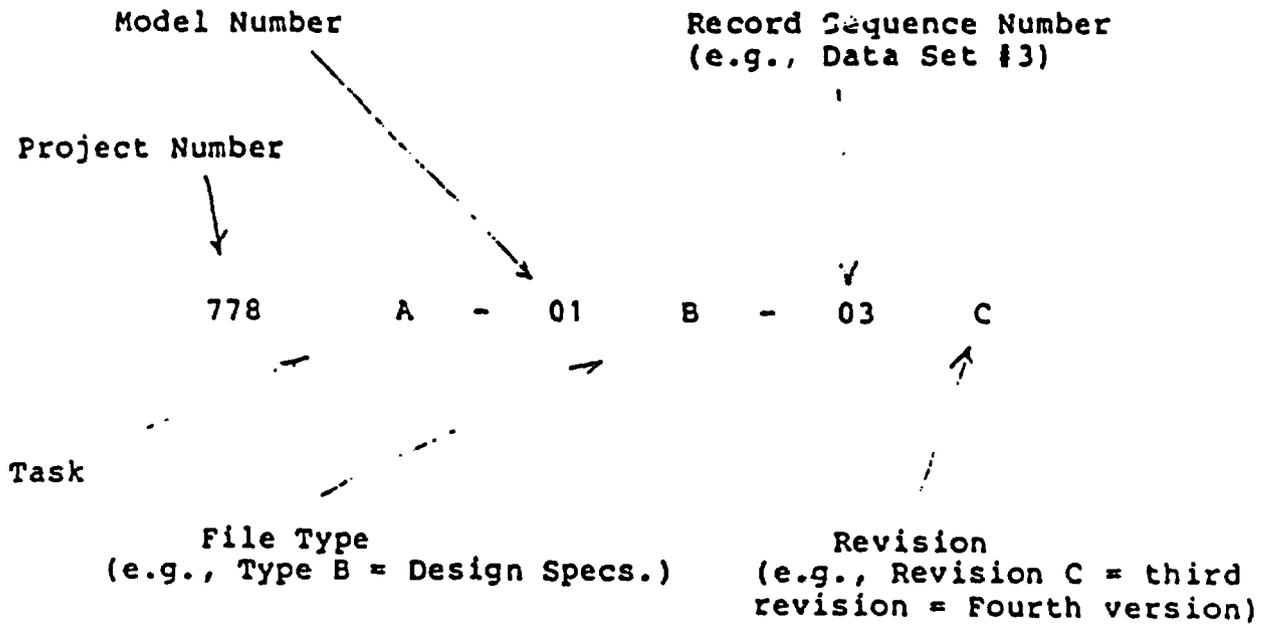
7.0 Exhibits

- 7.1 Control Identification Number
- 7.2 File Sequence

8.0 Approvals

Prepared by *[Signature]*
Approved by *[Signature]* DQA
Approved by *[Signature]* VPO
Approved by *[Signature]* President

Exhibit 7.1
CONTROL IDENTIFICATION NUMBER



INTERA QA PROCEDURE NUMBER 12 REVISION 3 DATE 5/1/83

TITLE: QA Audits

1.0 Purpose -- to prescribe the procedure for the internal audit of Intera activities for compliance with Intera's QA requirements, and for performance of QA audits by clients.

2.0 Scope -- applies to audits of Intera's QA Control File and desk audits of Intera's employees and their activities. QA audits are required in PQAPs only for projects of QA Levels 3 and 4.

3.0 References and Definitions

3.1 References

- 3.1.1 Intera Program Plan (see following sections):
- I. Organization and Responsibilities
 - III. Design Control
 - VI. Document Control
 - XVII. Quality Assurance Records
 - XVIII. Audits

3.2 Definitions

- 3.2.1 Control File -- that system of documentation of baseline specifications, codes, and data and of problem reports, reviews, and audits which forms the basis of Intera's QA program.
- 3.2.2 Desk Audit -- oral interviews by auditors regarding responsibilities and performance under the QA Program.

4.0 Responsibilities

- 4.1 PTM -- cooperating with the QA auditor by fully responding to questions and describing his activities during desk audits.
- 4.2 PL --
- (a) requiring project team members' conformance with QA procedures;

- (b) cooperating with the QA auditors when being audited;
- (c) acknowledging Project Audit Reports (Form 12).

4.3 QAA --

- (a) performing scheduled or unscheduled audits as directed by the PQAP and/or the DQA;
- (b) performing a continuous, internal audit on control documents submitted for the Control File;
- (c) cooperating with the DQA when being audited.

4.4 QAM --

- (a) requiring the Project Leader's conformance with QA procedures;
- (b) cooperating with the QA auditor when being audited;
- (c) acknowledging Project Audit Reports.

4.5 DQA --

- (a) performing scheduled audits as set forth in the PQAP, and unscheduled audits as he deems advisable;
- (b) approving all Project Audit Reports;
- (c) monitoring all client audits and reporting the findings thereof.

5.0 Procedure

- 5.1 Scheduled internal audits shall be conducted according to the PQAP schedule for all projects of QA Level 3 or 4.
- 5.2 Unscheduled informal audits shall be conducted as the DQA deems advisable on any project.
- 5.3 Client audits shall be conducted as the client requires at a time mutually agreeable to Intera and the Client.

Client audits shall be monitored and a corresponding Audit Report filed by the DQA containing the Client's findings.

5.4 Project Audit Reports (Form 12) shall be completed for all audits documenting the date, the auditor, the findings and recommendations, and the approval and acknowledgments.

5.5 Internal audits shall be guided by the Intera QA Audit Checklist (Exhibit 7.2).

5.6 Problem Reports shall be issued in the event of any findings or recommendations, and Remedial Action (or Corrective Action) reports shall be filed to document such action.

6.0 Acceptance Criteria

6.1 Audits are completed upon:

- (a) documentation of findings and recommendations;
- (b) completion of a CD (Form 12);
- (c) filing the documents with the QAA.

7.0 Exhibits

7.1 Form 12 -- QA Control Document (Project Audit Report)

7.2 Intera QA Audit Checklist.

8.0 Approval

Prepared by *[Signature]*
Approved by *[Signature]* DQA
Approved by *[Signature]* VPO
Approved by *[Signature]* President

Intera QA Audit Checklist

A. QA Control File

1. (a) Control File Index present
- (b) Control File Index accurately reflects File contents
- (c) Project Tape Index present and current
- (d) Model Track Index present and current
- (e) Custody Log continuous

2. (a) PQAP present
- (b) all forms correctly sequenced
- (c) all forms correctly completed

3. (a) PQAP identifies and provides reference to or states qualifications of personnel
 - (1) assigned to project (including responsibilities)
 - (2) assigned to Internal QA Cross-Check Teams and shows by organizational chart their separation from the Project Team
 - (3) assigned to External QA Team
- (b) PQAP identified tasks
- (c) PQAP identified models to be developed
- (d) PQAP identified models to be modified
- (e) PQAP identified models to be applied
- (f) PQAP identified applications to be performed
- (g) PQAP identified reports or other deliverables to be prepared
- (h) PQAP identified baselines to be established
- (i) PQAP estimates when baselines will be established
- (j) PQAP schedules QA reviews

- (k) PQAP schedules QA audits
 - (l) PQAP is consistent with contract requirements
4. Control File Index and File correspond to PQAP in
- (a) Task Identification
 - (b) Model Identification
 - (c) Baselines established
 - (d) Reviews performed
 - (e) Audits performed
5. Previous Audit
- (a) Forms/reports present and appropriately acknowledged
 - (b) Recommendations implemented or otherwise appropriately disposed of
6. For each baseline, for each model, for each task:
- (a) Baseline exists in proper sequence among baselines
 - (b) All forms correctly sequenced
 - (c) All forms correctly completed
 - (d) Effects of changes on other baselines are reflected in other baseline changes or in problem reports if more than 2 weeks old
 - (e) All referenced documents are in Intera Library
7. For each task:
- (a) Problem reports in continuous sequence
 - (b) Problem reports appropriately acknowledged
 - (c) Problem reports reflected in baseline changes or critical problem reports if more than 30 days old

- (d) Critical problem reports repeated every 30 days until reflected in baseline change

8. For each Baseline Review Report:

- (a) Reports in continuous sequence
- (b) Reports properly acknowledged
- (c) Recommendations implemented or otherwise appropriately disposed of

B. Desk Audit (Interview)

1. Project QA Manager

- (a) has approved and is familiar with PQAP
- (b) has reviewed all baselines for technical and operational soundness
- (c) has authorized and is familiar with major changes in baselines
- (d) has reviewed and is familiar with critical baseline problem reports
- (e) has approved and is familiar with test reports
- (f) is familiar with state of conformance to PQAP schedule

2. Project Leader

- (a) maintaining project in conformance with all elements of original or amended PQAP
- (b) is familiar with all baselines, baseline changes, and problem reports
- (c) has maintained all baseline current, i.e., accurately reflecting work product in most recent, settled state of evolution
- (d) has performed periodic reviews of project work to assure adherence to baseline specifications
- (e) has acted to assure adherence by project team members to QA procedures

- (f) has reported all major or critical problems arising with baseline and all minor problems not corrected within 48 hours
- (g) has baselined all required material as required by the QA Program Plan
- (h) has baselined all materials transmitted outside Intera

3. Project Team Member

- (a) is familiar with QA procedures
- (b) is familiar with and has copy of PQAP
- (c) is working in accordance with baseline specifications
- (d) has reported all major and critical problems arising with baselines and all minor problems not corrected within 48 hours
- (e) has reported all baseline changes

4. CCT Member

- (a) is independent of task to be checked
- (b) has performed indicated reviews and reported all major problems detected

INTERA QA PROCEDURE NUMBER 13 REVISION 4 DATE 5/1/83

TITLE: Control of Incoming and Outgoing Documents

1.0 Purpose -- to establish control over all incoming and outgoing documents which require preservation in company general files, project files, the QA Control File, or company library.

2.0 Scope -- applies to all documents received by INTERA, with the exception of advertisements and other unsolicited documents not likely to be important to any INTERA project or company administration, and all documents transmitted by INTERA.

3.0 References and Definitions

3.1 References

NONE

3.2 Definitions

- 3.2.1 Incoming and Outgoing Documents -- records of any media (microfiche, magnetic tape, paper, etc.) that contain information likely to be important to any INTERA project or company administration.
- 3.2.2 Incoming and Outgoing Document Logs -- logs reflecting recipient, addressee, source, and date and QA CIN (if any, for outgoing log).
- 3.2.3 General Files -- all documents not associated with particular projects and not contained in the library.
- 3.2.4 Project Files -- all documents associated with particular projects, but not necessarily contained in the QA files and not contained in the library.
- 3.2.5 QA Control File (CF) -- (See QAP 11).
- 3.2.6 Library -- the collection of all published documents.

4.0 Responsibilities

4.1 Receptionist

- (a) Recording addressee, recipient, source and date of all incoming documents on Incoming Document Log except advertisements and other unsolicited documents not likely to be important to any INTERA project or company administration;
- (b) Stamping documents with date received;
- (c) Distributing logged-in documents to addressee or other pre-arranged recipients.

4.2 All Secretaries

- (a) Assure that all outgoing documents have been copied;
- (b) Assure that outgoing technical documents are baselined or appropriately disclaimed;
- (c) Log all outgoing documents in Outgoing Document Log.

4.3 All Professional Staff

- (a) Review of received documents for project relevance.
- (b) Forwarding project-relevant documents to appropriate PL.
- (c) Forwarding non-project-relevant documents to the General Corporate Records Manager.

4.4 PL

- (a) Review of received or transmitted documents for project relevance and technical content of QA significance;
- (b) Noting the document's sections for technical relevance to existing or evolving baselines;
- (c) Baselining of incoming or outgoing documents (see QA Procedure 1-10) when applicable;
- (d) Noting desired distribution of document copies;

- (e) Routing of original document to the QAA, if of QA significance, or to general corporate records manager or INTERA's library, as appropriate.

4.5 QAA

- (a) Receiving, filing and retaining, in accordance with QA Procedure, all documents being baselined;

4.6 QAM - Reviewing or obtaining review of outgoing baselined documents for proper format, style, and production quality.

4.7 General Corporate Records Manager

- (a) Receiving, filing and retaining all documents not entered into the QA Control File or the Library;
- (b) Maintaining the General Files and the Project Files;
- (c) Maintaining a Project File Inventory for all projects of QA rating 3 or 4.

4.8 Librarian

- (a) Receiving, indexing and retaining all published documents;
- (b) Maintaining the Library.

4.9 VPO - approving transmission of unbaselined technical documents.

5.0 Procedure

5.1 All incoming documents shall:

- (a) Be logged in as to addressee, recipient, and date, and distributed to appropriate recipients;
- (b) Be reviewed for project relevance and technical content;
- (c) Have sections identified and marked for relevance to existing or evolving baselines;
- (d) Have desired distribution noted;
- (e) Be forwarded to the QAA with appropriate baseline CD if of QA significance; otherwise to the general

corporate records manager or Library as appropriate.

5.2 All outgoing documents shall:

- (a) If baselined, be reviewed for proper format, style, and production quality;
- (b) Be copied before transmittal;
- (c) Be distributed internally according to indicated distribution;
- (d) Be logged out as to originator, addressee, date and QA CIN and Reviewer (if applicable).

5.3 All drafts of specifications, reports, or other documents generated by subcontractors or consultants to INTERA and received by INTERA for review, and all reviews of such documents by INTERA, shall be baselined.

5.4 With VPO approval, a technical document may be transmitted even though unbaselined, provided it is stamped DRAFT: NOT FOR DISTRIBUTION.

5.5 All incoming and all outgoing documents shall be filed in the QA Control File, the Project File, the General File or the Library, as appropriate.

6.0 Acceptance Criteria

- 6.1 Documents are accepted upon log-in or upon log-out.
- 6.2 Control is completed when document is appropriately identified on logs and incorporated into QA Control File, the Project Files, the General Files, or INTERA's library.

7.0 Exhibits

- 7.1 Form 13A - Incoming Document Log
- 7.2 Form 13B - Outgoing Document Log
- 7.3 QA Flow Chart #13

8.0 Approval

Prepared by [Signature]
Approved by [Signature] DQA
Approved by [Signature] VPO
Approved by [Signature] President

QA Control Document
 Form 13A
 5/1/83

INTERA INCOMING DOCUMENT LOG

PREFIX LEGEND:

C - Correspondence MF - Microfiche Film MT - Magnetic Tape
 R - Report TX - Telex
 P - Proposal TG - Telegram

Log Date: _____

Receptionist: _____

DOC #	Recipient	Sending Company	Signature	Document Date
1				
	RE:			
2				
	RE:			
3				
	RE:			
4				
	RE:			
5				
	RE:			
6				
	RE:			
7				
	RE:			
8				
	RE:			
9				
	RE:			
10				
	RE:			
	RE:			

QA Control Document
 Form 13B
 5/1/83

INTERA OUTGOING DOCUMENT LOG

PREFIX LEGEND:

C - Correspondence MF - Microfiche Film MT - Magnetic Tape
 R - Report TX - Telex
 P - Proposal TG - Telegram

Log Date: _____

Secretary: _____

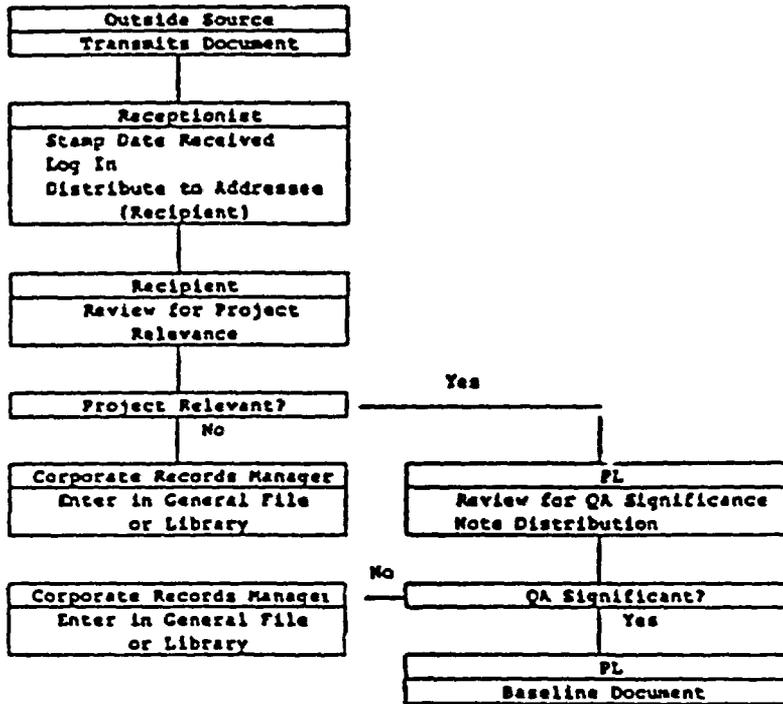
DOC #	Originator	Addressee	QACIN/Reviewer	Shipment Method/ Document Date
1				
RE:				
2				
RE:				
3				
RE:				
4				
RE:				
5				
RE:				
6				
RE:				
7				
RE:				
8				
RE:				
9				
RE:				
10				
RE:				
RE:				

QA Flow Chart #13

QAP 13: Incoming/Outgoing Documents

QA Documentation

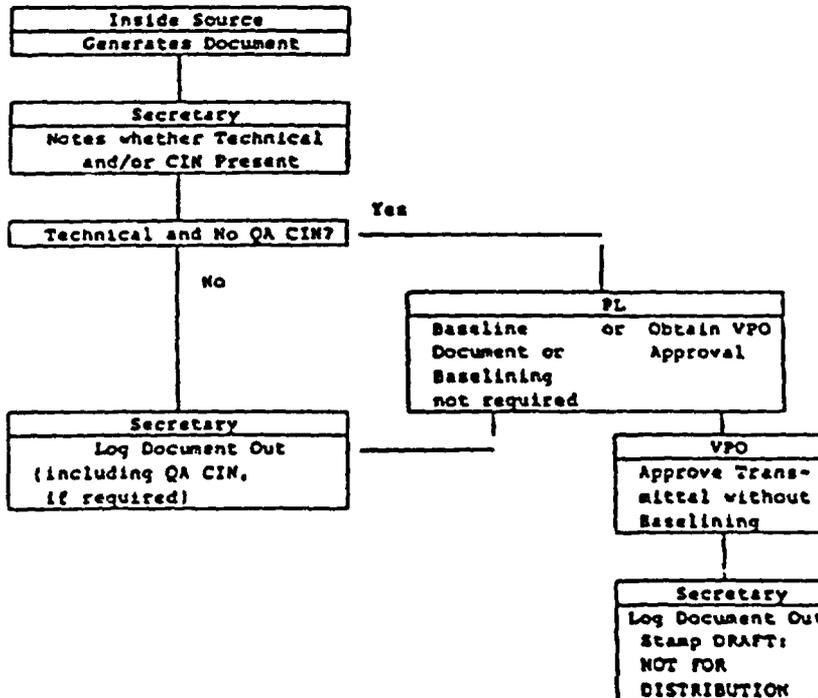
Incoming:



CD Form 13A Incoming/
Document Log
(Log) Date Received
Addressee (Recipient)
Source
Document Date

See Appropriate QAP

Outgoing:



CD Form 13B Outgoing
Document Log
Originator
Addressee
QA CIN
Nature
Subject Matter

INTERA QA PROCEDURE NUMBER 14 REVISION 2 DATE 5/1/83

TITLE: Computer Modeling Technology Transfer

1.0 Purpose -- to describe a method to assure efficient, complete, and accurate transfer of computer modeling technology (codes, test data, test results, and documentation) and associated updates.

2.0 Scope -- applies to all computer modeling technology (CMT) developed or acquired for use by INTERA and to be transferred or received by INTERA. The Procedure specifies transmittal, receipt, and installation procedures for technology and associated updates. It addresses transfer of codes, test data, test results, and documentation necessary to enable valid application or reconstruction of the model by those knowledgeable in computer modeling.

3.0 References and Definitions

3.1 References -- (none at present)

3.2 Definitions.

- 3.2.1 Benchmark - A reference case used as a basis of comparison for software; a test problem including input and output results for verifying correct model operation. (See Section 5.2.8)
- 3.2.2 Code - An instruction written in any program language to be acted upon by a computer.
- 3.2.3 Model - The collection of relationships and assumptions represented by mathematical equations and reference data sets and embodied in a computer code, reference data sets, and associated documentation.
- 3.2.4 Computer Modeling Technology (CMT) - The computer code, reference data sets, benchmark test data, benchmark tests results, and associated documentation, including updates thereto, necessary to enable valid application and/or reconstruction of the model by those knowledgeable in computer modeling.
- 3.2.5 Reference Data Sets (or Library Data) - Input data required in all applications, or in broad sets of applications, but which are relatively independent of application.

- 3.2.6 Validation - The demonstration of correctness, adequacy, and applicability of a model in performing its intended function by comparing model test results with empirical data.
- 3.2.7 Verification - The demonstration of consistency, completeness, and correctness of model design and construction at any stage of development and at completion; methods include peer review and comparison of model test results calculated by alternative means, e.g., from an analytical solution.
- 3.2.8 Recipient - Person or organization to which INTERA transfers CMT.
- 3.2.9 Transmitting Supplier - Person or organization which transfers CMT to INTERA.

4.0 Responsibilities

4.1 PTM --

- (a) preparing transfer request or transmittal package as assigned; and
- (b) performing installation and verification testing as assigned.

4.2 PL --

- (a) approving requests from INTERA to potential Transmitting Supplier for transfer of CMT to INTERA;
- (b) acknowledging to Transmitting Supplier acceptance or contingent acceptance of transferred CMT;
- (c) reporting any installation problems to Transmitting Supplier;
- (d) recommending associated baselining of CMT transferred to INTERA, and
- (e) reviewing and approving CMT package transferred by INTERA.

4.3 QAA --

- (a) performing normal responsibilities with respect to baselining CMT transferred to INTERA; and
- (b) reviewing and approving CMT package transmitted by INTERA.

4.4 VPO --

- (a) approving notices of availability of CMT transfer by INTERA;
- (b) approving CMT transfer by INTERA.

5.0 Procedure

5.1 Pretransfer Communications

- 5.1.1 Transfer by INTERA -- Notice of availability of CMT for transfer from INTERA shall be provided by INTERA to potentially interested Recipients when deemed appropriate and approved by the VPO, and when verification testing and documentation are complete, or as otherwise directed by the client.
- 5.1.2 Transfer to INTERA -- A request for transfer of technology to INTERA shall be made by INTERA to a potential Transmitting Supplier when deemed appropriate and approved by the PL. Requests shall be made using Form 14A.
- 5.1.3 Request for Transfer -- The Request for Transfer shall identify the specific model to be transferred, the intended application, and the complete address and phone number of the person to whom the model should be sent.

5.2 Transfer by INTERA

- 5.2.1 Transmittal Package -- The transmittal package shall be composed of (a) a transmittal letter or (Form 14B), (b) model documentation, (c) a Model Tape, (d) a Model Tape File Index, and (e) a Model Tape Listing (optional with Recipient).
- 5.2.2 CMT Transmittal Form -- The transmittal form shall identify the model by name, INTERA QA identification number, and client model control number (if any); describe the intended application; specify the tape read format; and list the other contents of the Transmittal Package.
- 5.2.3 Model Documentation -- Documentation transferred as a part of each model shall contain, as a minimum (1) model theory and design, (2) model test and evaluation, and (3) a user's manual.

- 5.2.4 Model Tape -- The model tape shall contain a tape file index, the model code, any reference data base, and the benchmark test data and test results. The model tape reel shall be labeled with the model name, client model control number (if any), supplier QA identification number, and tape read format.
- 5.2.5 Tape Read Format - The tape read format shall be unlabeled, nine track, 1,600 bits per inch, EBCDIC character coding, and ten 80-column card images per record, unless otherwise specified in the request for transfer.
- 5.2.6 Upon receipt of written authorization by the VPO on the CMT Transmittal Form (Form 14B) to transfer the CMT, the assigned PTM shall generate the Model Tape. The Code and any Library Data shall be copied from the appropriate Project (or QA Backup) Tape, or from disk if the model has only been recently baselined and the QAA confirms by audit that the files on disk have not since been altered. The files copied shall be verified, the documentation set compiled, and a hard copy (microfiche acceptable) of the code listing and the documentation generated and retained if not already extant in the QA CF. If additional subsequent transfers of the model are expected, a back-up or "master" Model Tape may be retained to facilitate generation of additional Model Tapes.
- 5.2.7 The recipient shall be requested to acknowledge receipt and acceptance by return of a signed copy of the CMT transmittal form (Form 14B).
- 5.2.8 The benchmark test problem shall be composed of a description of the test (sample problem) in the User's Manual and the input test data and test results on the Model Tape. The problem should utilize as many options of the code as is reasonable and is to (a) insure that the version of the code that is implemented on the computer system performs properly, and (b) provide a demonstration of code usage. A benchmark test problem, in addition to the one described in the model documentation, may be transmitted if appropriately documented and if judged by INTERA to be more closely oriented to the Recipient's intended application.

5.2.9 The Recipient shall be requested to execute the benchmark test problem upon installation and to report any problems to INTERA.

5.2.10 The Recipient shall be requested to notify INTERA of any problems discovered with the model and of any corrections or other modifications considered of general utility.

5.3 Receipt by INTERA

5.3.1 INTERA shall, upon receipt of a transmittal package from a Transmittal Supplier, assure that the contents meet the requirements of the transfer request. Notice of acceptance or contingent acceptance shall be forwarded to the transmitting supplier by INTERA.

5.3.2 Upon receipt, the technology shall be baselined to protect its integrity. The code shall be preserved as received by making a working copy and committing the originally transmitted model tape (or cards) to backup status.

5.3.3 A code listing (if desired) shall be generated from the model tape (or cards) received and retained as required in baselining codes (QAP 3).

5.4 Installation by INTERA

5.4.1 INTERA shall convert the transferred technology for operation on the computer to be used.

5.4.2 The converted code shall be verified using the benchmark test problem and results (if any) provided with the transmittal package.

5.4.3 After completion of the verification:

- o the converted code and associated test results shall be baselined to protect their integrity.

- o Any problems encountered during conversion and testing by INTERA shall be reported to the Transmitting Supplier.

- o Changes or modifications required for accurate conversion shall be baselined.

5.5 Updating

- 5.5.1 Transmitting Supplier shall be notified of any problems discovered and any corrective action taken by INTERA with respect to transferred technology.
- 5.5.2 Transmittal of computer program changes shall be made using the format of Form 14A.
- 5.5.3 Model Update -- A model update shall consist of a description of the purpose of the update, an errata sheet, revised pages or a revised document, a listing of changed code statements or a revised model tape (depending on the extent of the changes), and an assessment of possible impact on the results of analyses as compared to results obtained from the previous version of the model.
- 5.5.4 A Recipient may be notified of the availability of any supplemental modifications to transferred technology performed by INTERA which is considered of general utility.
- 5.5.5 INTERA shall consult with model originators, if available, when performing updates.
- 5.5.6 Transfer of updates shall follow the procedures outlined in Sections 5.1 and 5.2.

6.0 Acceptance Criteria

- 6.1 CMT transfer to INTERA is complete when (1) the CMT is received, found to be physically complete, baselined, and notice to that effect provided to the Transmitting Supplier, and (2) the CMT is installed and verified to be operating correctly and any problems encountered during of the installation reported to the Transmitting Supplier.
- 6.2 CMT transfer by INTERA is complete when acceptance is acknowledged by the Recipient.

7.0 Exhibits

- 7.1 Form 14A - Request for Transfer
- 7.2 Form 14B - CMT Transmittal Form
- 7.3 Example Job Control Language to Write Tape
- 7.4 QA Flowchart #14

8.0 Approval

Prepared by *[Signature]*
Approved by *[Signature]* DQA
Approved by *[Signature]* VPO
Approved by *[Signature]* President

QA Control Document
Form 14A
5/1/83

REQUEST FOR TRANSFER

Please transfer the following described computer modeling technology to:

INTERA Environmental Consultants, Inc.
11999 Katy Freeway Suite 610
Houston, Texas 77079
Telephone: (713) 496-0993
Attn: _____

Model Name: _____

QA ID No. _____

Other Identifiers: _____

Intended Application: _____

Model Tape Contents Requested:

1. Code
2. Library Data
3. Benchmark Test Data
4. Benchmark Tests Results

Preferred Tape Read Format: Unlabeled, 9 track, 1600 bpi, EBCDIC, 10-80 column card images per record.

Documents Requested:

Complete Documentation for Model and Benchmark Problem

Signed: _____
For INTERA

```

DSN,P4,STKNE.          **** WRITE CAT  EBCDIC  SCEPTER TRANSFER TAPES ****
USER,KTERAHN,HOUSTON,AME.
CHARGE,M317&VS,426.
REWIND,OUTPUT.
HEADING.*ISTFLO
HEADING.*0 CAT
HEADING.*OTRANSFER
HEADING.*ISTFLO
HEADING.*0 CAT
HEADING.*OTRANSFER
COMMENT.
COMMENT. *****
COMMENT.          COMPUTER MODELING
COMMENT.          TECHNOLOGY TRANSFER
COMMENT. *****
COMMENT. THE FOLLOWING JCL WILL WRITE AN EBCDIC SCEPTER TRANSFER TAPE.
COMMENT. FOR ADDITIONAL INSTRUCTIONS, SEE UA PROCEDURE 14.
COMMENT.
COMMENT. ----- GET SYSTEM ROUTINES -----
GET,RCOPY/UN=PSORLIS.
COMMENT.
COMMENT. ----- REQUEST A SCRATCH TAPE -----
REQUEST,TAPE,MT,0=1400,PD=N,LD=KU,F=3,CV=EB,USM=SCRATCH.
COMMENT.
COMMENT. ----- TEN 80 CHARACTER CARDS PER RECORD (6LUCK) -----
FILE,TAPE, RT=F,DT=K,FL=80,AB=10,ANL=800,CN=YES.
COMMENT.
COMMENT. ----- INDEX -----
GET,INDEX=STCONT/NA.
REWIND,INDEX.
COPYSBF,INDEX,OUTPUT.
REWIND,INDEX.
FILE,INDEX, RT=F,DT=K,FL=80,AB=10,ANL=800,CN=YES.
RCOPY, P=RCOPY,FL=INDEX, FZ=TAPE.
COMMENT.
COMMENT. ----- USE UPDATE TO GENERATE AN 80 COLUMN CARD TRACE OF
COMMENT. THE PROGRAM LISTING -----
GET,LOPE=STFLUP/NA.
DELETE,P=C,F,I=ALL,C=4124,0,0.
FILE,COMPILE,RT=F,DT=K,FL=80,AB=10,ANL=800,CN=YES.
RCOPY, P=RCOPY,FZ=COMPILE, FZ=TAPE.
COMMENT.
COMMENT. ----- DATA SET -----
GET,STOAT/NA.
FILE,STOAT, RT=F,DT=K,FL=80,AB=10,ANL=800,CN=YES.
RCOPY, P=RCOPY, FZ=STOAT, FZ=TAPE.
COMMENT.
COMMENT. ----- CHANGE TAPE BOOKING FORMAT TO ACCEPT 136 COLUMN OUTPUT -----
FILE,TAPE,RT=F,DT=K,FL=80,AB=10,ANL=800,CN=YES.
COMMENT.
COMMENT. ----- OUTPUT MEMBER -----
GET,STOAT/NA,DISK.
FILE,STOAT,RT=F,DT=K,FL=80,AB=10,ANL=800,CN=YES.
RCOPY, P=RCOPY, FZ=STOAT, FZ=TAPE.
COMMENT.
COMMENT. ----- REQUEST A SCRATCH TAPE -----
REQUEST,TAPE,MT,0=1400,PD=N,LD=KU,F=3,CV=EB,USM=SCRATCH.
COMMENT.

```

QA Control Document
Form 14B
5/1/83

P	M	F	S	R
-	-	K	-	-

Control Date: _____

COMPUTER MODELING TECHNOLOGY TRANSMITTAL FORM

To: _____

Date: _____

From: INTERA Environmental Consultants, Inc.
11999 Katy Freeway, Suite 610
Houston, Texas 77079

Attn: _____ (713) 496-0993

Subject: Computer Modeling Technology Transfer
Model Name _____ QA CIN _____
Reference: Request for Transfer _____
Intended Application _____

Enclosed are the items as described below. Please report to us your acceptance of the materials, any problems encountered during your installation of the model and execution of the benchmark test problem on your computer, and any other problems you may encounter or modifications you make which either correct problems or might be of general utility.

Model Tape File Index

Documentation Name and QA CIN

Model Tape Listing (Optional)

Magnetic Tape (9-Track)

Unlabeled Other _____

1600 bpi Other _____

EBCDIC Other _____

10-80 column card images per record ; other _____ ; Files _____
RECFM _____ LRECL _____ BLKSIZE _____

10-136 column output images per record ; other _____ ; Files _____
RECFM _____ LRECL _____ BLKSIZE _____

Model Tape generated and files verified by _____ (PTM)

Transmittal Package reviewed and approved by _____ (PL)

Transmittal Package reviewed and approved by _____ (QAA)

Transfer approved by _____ (VPO)

For use by Recipient: Please complete and return copy to INTERA.

Above items accepted ; acceptance contingent upon receipt of following: _____

Comment: _____

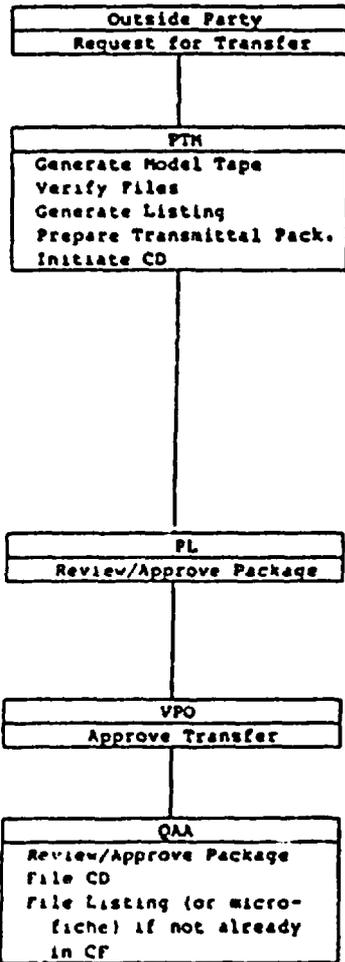
Signed: _____

Date: _____

QAP Flow Chart #14

QAP 14: CMT Transfer
Transfer By INTERA

QA Documentation



Model/Requested
Intended Application

Model Tape

CD Form 14C
Recipient
Transfer Date
Model Name/CIN
Reference Request
Intended Application
Description of Package
Contents

PL signature

VPO signature

QAA signature
Entry in CF/CFI
Entry in Output Log