

MAY 16 1995

ENGINEERING DATA TRANSMITTAL

JUN 01 1995

Page 1 of 1

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Document Title: ABAQUS 5.4 Software Configuration

Release Date: 5/16/95

**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

V.L. Birkland
V.L. Birkland

5/16/95

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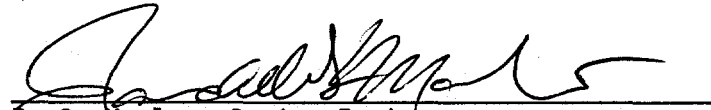
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7. Abstract ABAQUS 5.4 is a powerful general purpose finite-element computer program. This document describes the verification and validation of ABAQUS 5.4 as installed on the Scientific and Engineering Computing Center.		
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ABAQUS 5.4 SOFTWARE CONFIGURATION
AND INSTALLATION VERIFICATION ON THE SECC

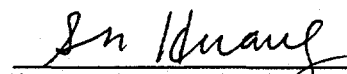
April 1995

Prepared by:


R. S. Marlow, Senior Engineer
Packaging Safety Engineering

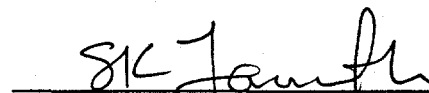
5/3/95
Date

Reviewed by:


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Multi-Function Waste Tank Project

5/2/95
Date

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5/3/95
Date

ICF Kaiser Hanford Company
Richland, Washington
Hanford Operations and Engineering Contractor
for the
U.S. Department of Energy

INDEPENDENT REVIEW

Document Reviewed ABAQUS¹ 5.4 Software Configuration and Installation
Verification on the SECC

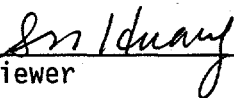
Author R. S. Marlow Report No. WHC-SD-SQA-CSWD-20022 EDT No. 140096

The subject document has been reviewed by the undersigned. The reviewer reviewed and verified the following items as applicable [EP.4.1].

- Engineering Specification
- Design Input
- Basic Assumption
- Approach/Design Methodology
- Related Information
- Conclusion/Result Interpretation

S.N. HUANG

Reviewer



5/2/95

Date

¹ABAQUS is a trademark of Hibbit, Karlsson, Sorensen, Inc.

CHECKLIST FOR INDEPENDENT REVIEW

Document Reviewed ABAQUS 5.4 Software Configuration and Installation
Verification on the SECC

Author R. S. Marlow

Yes No N/A

☒	☐	☐	Problem completely defined.
☒	☐	☐	Necessary assumptions explicitly stated and supported.
☒	☐	☐	Computer codes and data files documented.
☒	☐	☐	Data used in calculations explicitly stated in document.
☒	☐	☐	Data checked for consistency with original source information as applicable.
☐	☐	☒	Mathematical derivations checked including dimensional consistency of results.
☒	☐	☐	Models appropriate and used within range of validity or use outside range of established validity justified.
☐	☐	☒	Hand calculations checked for errors.
☒	☐	☐	Code run streams correct and consistent with analysis documentation.
☒	☐	☐	Code output consistent with input and with results reported in analysis documentation.
☒	☐	☐	Acceptability limits on analytical results applicable and supported. Limits checked against sources.
☐	☐	☒	Safety margins consistent with good engineering practices.
☐	☐	☒	Conclusions consistent with analytical results and applicable limits.
☒	☐	☐	Results and conclusions address all points required in the problem statement.

MANDATORY

Software QA Log Number

Sn Huang
Reviewer

5/2/95
Date

ENGINEERING ANALYSIS SOFTWARE REPORT FORM

SOFTWARE APPLICATION

ABAQUS Version 5.4

SOFTWARE LOG # 95-011

ANALYSTS

R. S. Marlow

EDT # 140096

ANALYST MANAGER

DOCUMENT #

WHC-SD-SQA-CSWD-20022, Rev. 0

DATE PERFORMED

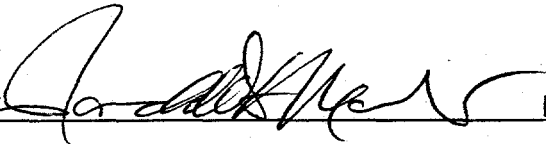
APRIL 28, 1995

DESCRIPTION OF ANALYSIS:

Roof Snap-Through:
Static analysis using:
*STATIC,RIKS
S4R5 elements

Explosively Loaded Panel:
Dynamic analysis using
*DYNAMIC,HAFTOL=
S4R5 elements

SIGNATURE OF ANALYST



DATE

5/3/95

CONTENTS

1.0	INTRODUCTION	1
2.0	APPROVAL DESIGNATOR	1
3.0	DOCUMENTATION	1
4.0	VERIFICATION AND VALIDATION	1
5.0	INSTALLATION VERIFICATION	1
5.1	TEST PROBLEM 1: ROOF SNAP-THROUGH	1
5.1.1	TEST PROBLEM 1 INPUT FILE	2
5.1.2	TEST PROBLEM 1 LOG FILE FROM HP1	3
5.1.3	TEST PROBLEM 1 LOG FILE FROM HP2	3
5.1.4	TEST PROBLEM 1 LOG FILE FROM HP3	3
5.2	TEST PROBLEM 2: EXPLOSIVELY LOADED PANEL	4
5.2.1	TEST PROBLEM 2 INPUT FILE	4
5.2.2	TEST PROBLEM 2 LOG FILE FROM HP1	7
5.2.3	TEST PROBLEM 2 LOG FILE FROM HP2	7
5.2.4	TEST PROBLEM 2 LOG FILE FROM HP3	7
6.0	CONFIGURATION STATUS	7
7.0	REVISIONS	12
8.0	REFERENCES	12

FIGURES

1. Comparison of Solutions	13
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ABAQUS 5.4 SOFTWARE CONFIGURATION AND INSTALLATION VERIFICATION ON THE SECC

1.0 INTRODUCTION

The purpose of this document is to demonstrate that the ABAQUS Standard Version 5.4 finite-element computer program, herein referred to as ABAQUS 5.4, complies with the requirements of the Westinghouse Hanford Company document WHC-CM-3-10 (WHC 1993). This document also demonstrates installation verification on the three Hewlett-Packard computers named hp1, hp2, and hp3 respectively. These three computers are part of the Scientific and Engineering Computer Center (SECC).

ABAQUS 5.4, a software product of Hibbitt, Karlsson, and Sorensen, Inc. (HKS), is a multipurpose finite-element program with extensive capabilities. It may be used to solve a wide variety of structural mechanics problems and is very useful for analyzing those which are nonlinear.

2.0 APPROVAL DESIGNATOR

ABAQUS 5.4 is assigned approval designator SQ.

3.0 DOCUMENTATION

The ABAQUS documentation supplied by HKS includes a theory manual (HKS 1994a), a user's manual (HKS 1994b), a verification manual (HKS 1994c), an example problems manual (HKS 1994d), a post-processor manual (HKS 1994e), and release notes (HKS 1994f).

4.0 VERIFICATION AND VALIDATION

HKS has extensively verified and validated ABAQUS 5.4. HKS documented the results in the verification manual (HKS 1994c). The example problems manual also contains many solved problems demonstrating the capabilities of the computer program. The number of different types of problems that ABAQUS has been shown to be able to accurately solve is very impressive. The different types include problems of buckling, vibration, heat transfer, plasticity, creep, etc. Refer to the program documentation for further details.

5.0 INSTALLATION VERIFICATION

Two test problems supplied by HKS with ABAQUS 5.4 were run on hp1, hp2, and hp3 workstations to verify the correct installation of the program. The machines hp1, hp2, and hp3 reproduced the results given by HKS for the two test cases. Therefore, the installation is verified.

5.1 TEST PROBLEM 1: ROOF SNAP-THROUGH

Test problem 1 is the snap-through of a shallow, cylindrical roof under a point load. Section 4.2.6 of the example problems manual (HKS 1994d) describes this problem in complete detail. The input file for the test case is listed in Section 5.1.1. The log file for the analysis on hp1 is in

Section 5.1.2. The log file for the analysis on hp2 is in Section 5.1.3. The log file for the analysis on hp3 is in Section 5.1.4.

Figure 1 shows the deflections of the point under the point of the application of the load. The deflection histories produced by each computer are identical. Furthermore, these histories are the same as the one given in Figure 4.2.6-3 of the example problems manual (HKS 1994d).

5.1.1 Test Problem 1 Input File

```
*HEADING
  SHALLOW CYLINDRICAL SHELL VIA S4R5                                4-2-6-1
*NODE
1,2.54,0.,0.,1.
7,2.5273106,.2535769,0.,.9950042,.0998334
61,2.54,0.,.254,1.
67,2.5273106,.2535769,.254,.9950042,.0998334
*NGEN,LINE=C ,NSET=EDGE
1,7,1,0,0.,0.,0.
*NGEN,LINE=C,NSET=ZSYMM
61,67,1,0,0.,0.,.254
*NFill
EDGE,ZSYMM,6,10
*NGEN,NSET=YSYMM
1,61,10
*NGEN,NSET=HINGE
7,67,10
*NSET,NSET=N61
61
*ELEMENT,TYPE=S4R5
1,1,2,12,11
*ELGEN,ELSET=EALL
1,6,1,1,6,10,10
*MATERIAL,NAME=ROOF
*ELASTIC
3.103E9,.3
*SHELL SECTION ,MATERIAL=ROOF,ELSET=EALL
6.35E-3
*BOUNDARY
ZSYMM,ZSYMM
YSYMM,YSYMM
HINGE,1,5
*STEP,NLGEOM,INC=50
*STATIC,RIKS
.025,1.,0.,0.04,.06
*CLOAD
61,1,-3000.
*MONITOR,NODE=61,DOF=1
*NODE PRINT,FREQUENCY=2
U
RF
*NODE FILE,NSET=N61
U,CF
*EL PRINT,FREQUENCY=0
*END STEP
```

5.1.2 Test Problem 1 Log File From HP1

ABAQUS JOB roof
Fri Apr 28 10:58:14 PDT 1995
BEGIN USER INPUT PROCESSING
Run /p_hp/abaqus/abaqus54/bin/pre.x
0.3u 0.2s 0:05 10%
END OF USER INPUT PROCESSING
BEGIN IMPLICIT ANALYSIS
Run /p_hp/abaqus/abaqus54/bin/standard.x
6.0u 0.4s 0:08 80%
END OF ANALYSIS
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
Fri Apr 28 10:59:29 PDT 1995
ABAQUS JOB roof COMPLETED

5.1.3 Test Problem 1 Log File From HP2

ABAQUS JOB roof
Fri Apr 28 10:58:20 PDT 1995
BEGIN USER INPUT PROCESSING
Run /p_hp/abaqus/abaqus54/bin/pre.x
0.2u 0.3s 0:04 12%
END OF USER INPUT PROCESSING
BEGIN IMPLICIT ANALYSIS
Run /p_hp/abaqus/abaqus54/bin/standard.x
6.1u 0.6s 0:09 73%
END OF ANALYSIS
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
Fri Apr 28 10:59:47 PDT 1995
ABAQUS JOB roof COMPLETED

5.1.4 Test Problem 1 Log File From HP3

ABAQUS JOB roof
Fri Apr 28 10:57:58 PDT 1995
BEGIN USER INPUT PROCESSING
Run /p_hp/abaqus/abaqus54/bin/pre.x
0.3u 0.3s 0:33 1%
END OF USER INPUT PROCESSING
BEGIN IMPLICIT ANALYSIS

```
Run /p_hp/abaqus/abaqus54/bin/standard.x
6.0u 0.5s 0:08 81%
END OF ANALYSIS
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
Fri Apr 28 10:59:41 PDT 1995
ABAQUS JOB roof COMPLETED
```

5.2 TEST PROBLEM 2: EXPLOSIVELY LOADED PANEL

Test problem 2 is the impulse loading of a thin panel. This test problem is described in complete detail in Section 5.2.3 of the example problems manual (HKS 1994d). The input file for the test case is listed in Section 5.2.1. The log file for the analysis on hp1 is in Section 5.2.2. The log file for the analysis on hp2 is in Section 5.2.3. The log file for the analysis on hp3 is in Section 5.2.4.

The example problems manual gives the maximum deflection along the centerline of the panel as 30.48 mm. Each of the three computers gives the same maximum deflection.

5.2.1 Test Problem 2 Input File

```
*HEADING
EXPLOSIVELY LOADED CYLINDRICAL PANEL:  8 x 16 MESH S4R5      5-2-3-1
**
*RESTART,WRITE,FREQUENCY=50
***PREPRINT,ECHO=NO,MODEL=NO,HISTORY=NO
**
*NODE
  1, 0., 0., 2.9375
 33, 2.54395, 0., 1.46875
6401, 0., 12.56, 2.9375
6433, 2.54395, 12.56, 1.46875
*NGEN,NSET=EDGEA,LINE=C
1,33,2,, 0.,0.,0., 0.,1.,0.
*NGEN,NSET=EDGEB,LINE=C
6401,6433,2,, 0.,12.56,0., 0.,1.,0.
*NFILL
EDGEA,EDGEB,32,200
*NSET,NSET=EDGEA,GENERATE
33,6433,200
*NSET,NSET=EDGED,GENERATE
1,6401,200
*ELEMENT,TYPE=S4R5
1, 1,5,405,401
**1, 1,3,203,201
*ELGEN,ELSET=SHELL
1, 8,4,4, 16,400,200
```

```
**1, 16,2,2, 32,200,100
*BOUNDARY
EDGEA, ENCASTRE
EDGEB, ENCASTRE
EDGE C, ENCASTRE
EDGED, XSYMM
*SHELL SECTION, ELSET=SHELL, MATERIAL=ALUMINUM
.125
**
*MATERIAL, NAME=ALUMINUM
*ELASTIC
10.5E6, 0.333
*PLASTIC
4.4E4
*DENSITY
2.5E-4
**
*NSET, NSET=BLAST1, GENERATE
1, 5201, 400
** 1, 5201, 200
***NSET, NSET=BLAST3, GENERATE
** 3, 5203, 200
*NSET, NSET=BLAST5, GENERATE
5, 5205, 400
** 5, 5205, 200
***NSET, NSET=BLAST7, GENERATE
** 7, 5207, 200
*NSET, NSET=BLAST9, GENERATE
9, 5209, 400
** 9, 5209, 200
***NSET, NSET=BLAST11, GENERATE
**11, 5211, 200
*NSET, NSET=BLAST13, GENERATE
13, 5213, 400
**13, 5213, 200
***NSET, NSET=BLAST15, GENERATE
**15, 5215, 200
*NSET, NSET=BLAST17, GENERATE
17, 5217, 400
**17, 5217, 200
*INITIAL CONDITIONS, TYPE=VELOCITY
BLAST1, 3, -5650.
**BLAST3, 3, -5638.
BLAST5, 3, -5575.
**BLAST7, 3, -5502.
BLAST9, 3, -5407.
**BLAST11, 3, -5288.
BLAST13, 3, -5146.
**BLAST15, 3, -5983.
BLAST17, 3, -4893.
BLAST1, 1, -0.
**BLAST3, 1, -370.
BLAST5, 1, -737.
**BLAST7, 1, -1102.
BLAST9, 1, -1463.
```

```
**BLAST11,1,-1816.  
BLAST13,1,-2162.  
**BLAST15,1,-2499.  
BLAST17,1,-2825.  
**  
*NSET,NSET=ABC  
1601,3201,4801,5201  
*ELSET,ELSET=ABC  
1613  
*STEP,INC=1000,NLGEOM  
*DYNAMIC,HAFTOL=1.E10  
1.E-6,4.E-4  
*MONITOR,NODE=3201,DOF=3  
*EL PRINT,FREQUENCY=500  
S,  
E,  
*NODE PRINT,FREQUENCY=50,NSET=ABC  
U,  
V,  
*ENERGY PRINT,FREQUENCY=5  
*NODE FILE,NSET=ABC  
U,V  
*EL FILE,ELSET=ABC,FREQUENCY=10  
E,ER,ERP  
*ENERGY FILE,FREQUENCY=50  
*END STEP  
*STEP,INC=250,NLGEOM  
*DYNAMIC,HAFTOL=1.E10,INITIAL=NO  
4.E-6,1.E-4  
*END STEP
```

5.2.2 Test Problem 2 Log File From HP1

```
ABAQUS JOB panel  
Fri Apr 28 12:20:29 PDT 1995  
BEGIN USER INPUT PROCESSING  
Run /p_hp/abaqus/abaqus54/bin/pre.x  
0.6u 0.2s 0:05 16%  
END OF USER INPUT PROCESSING  
BEGIN IMPLICIT ANALYSIS  
Run /p_hp/abaqus/abaqus54/bin/standard.x  
189.4u 5.4s 3:19 97%  
END OF ANALYSIS  
stty: : Not a typewriter  
stty: : Not a typewriter  
stty: : Not a typewriter  
stty: : Not a typewriter  
stty: : Not a typewriter  
stty: : Not a typewriter  
stty: : Not a typewriter  
stty: : Not a typewriter  
Fri Apr 28 12:23:55 PDT 1995  
ABAQUS JOB panel COMPLETED
```

5.2.3 Test Problem 2 Log File From HP2

```
ABAQUS JOB panel
Fri Apr 28 12:18:04 PDT 1995
BEGIN USER INPUT PROCESSING
Run /p_hp/abaqus/abaqus54/bin/pre.x
0.7u 0.4s 0:05 21%
END OF USER INPUT PROCESSING
BEGIN IMPLICIT ANALYSIS
Run /p_hp/abaqus/abaqus54/bin/standard.x
187.2u 5.9s 3:16 98%
END OF ANALYSIS
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
Fri Apr 28 12:21:29 PDT 1995
ABAQUS JOB panel COMPLETED
```

5.2.4 Test Problem 2 Log File From HP3

```
ABAQUS JOB panel
Fri Apr 28 12:17:08 PDT 1995
BEGIN USER INPUT PROCESSING
Run /p_hp/abaqus/abaqus54/bin/pre.x
0.7u 0.4s 0:04 26%
END OF USER INPUT PROCESSING
BEGIN IMPLICIT ANALYSIS
Run /p_hp/abaqus/abaqus54/bin/standard.x
187.2u 6.1s 3:16 98%
END OF ANALYSIS
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
stty: : Not a typewriter
Fri Apr 28 12:20:29 PDT 1995
ABAQUS JOB panel COMPLETED
```

6.0 CONFIGURATION STATUS

Installation: ABAQUS 5.4 is installed on SECC file system
/p_hp/abaqus/abaqus54.

User access: To access ABAQUS 5.4, the user must have an SECC account. The program is invoked by typing /p_hp/abaqus/abaqus54 from the prompt of the machine hp1, hp2, or hp3.

Code Custodian: Larry J. Gannon is responsible for the installation and maintenance of the software. (Randall S. Marlow can answer questions regarding the use of the software. HKS also provides technical assistance and error reporting.)

Files:

/p_hp/abaqus/abaqus54

total 372

-r--r--r--	1	e40511	whc_misc	52	Jan	11	13:15	ASAVE
-rwxr-xr-x	1	e40511	whc_misc	391	Jan	27	15:14	abaqus
-rwxr-xr-x	1	e40511	whc_misc	151552	Dec	1	15:51	abaqus.54.x
-rwxr-xr-x	1	e40511	whc_misc	1980	Jan	11	13:15	abaqus.env.tst
-rwxr-xr-x	1	e40511	whc_misc	276	Jan	27	15:05	abaqus.sv
-rwxr-xr-x	1	e40511	whc_misc	574	Jan	27	15:19	abaqus_anau
-rwxr-xr-x	1	e40511	whc_misc	459	Jan	27	15:05	abaqus_anau.sv
-rwxr-xr-x	1	e40511	whc_misc	957	Jan	27	15:17	babaqus
-rwxr-xr-x	1	e40511	whc_misc	688	Jan	11	13:15	babaqus.sv
-rwxr-xr-x	1	e40511	whc_misc	735	Jan	11	13:15	babaqus.tst
drwxr-xr-x	2	e40511	whc_misc	1024	Apr	28	09:39	bin
drwxrwxrwx	2	e40511	whc_misc	1024	Mar	1	15:51	cn.inp.dir
-rwxr-xr-x	1	e40511	whc_misc	535	Jan	27	15:29	iabaqus
drwxr-xr-x	2	e40511	whc_misc	2048	Jan	11	09:59	info
drwxr-xr-x	2	e40511	whc_misc	1024	Feb	9	13:39	lib
-rwxr-xr-x	1	e40511	whc_misc	3882	Jan	26	08:17	readme
drwxr-xr-x	5	e40511	whc_misc	1024	Feb	9	13:47	samples
drwxr-xr-x	2	e40511	whc_misc	1024	Feb	9	09:43	site
drwxr-xr-x	2	e40511	whc_misc	1024	Jan	11	09:59	source
drwxrwxrwx	2	e40511	whc_misc	1024	Jan	27	16:34	test
-rwxr-xr-x	1	e40511	whc_misc	1672	Jan	27	16:48	test-abaqus-run

/p_hp/abaqus/abaqus54/bin

total 30264

-rwxr-xr-x	1	e40511	whc_misc	102400	Dec	1	15:52	abares.x
-rwxr-xr-x	1	e40511	whc_misc	102400	Dec	1	15:52	ascfil.x
-rwxr-xr-x	1	e40511	whc_misc	143360	Dec	1	15:52	cps.x
-r-xr-xr-x	1	e40511	whc_misc	2031616	Feb	9	13:30	explicit.x
-r-xr-xr-x	1	e40511	whc_misc	266240	Feb	9	13:30	extract.x
-rwxr-xr-x	1	e40511	whc_misc	122880	Dec	1	15:52	hgl.x
-r-xr-xr-x	1	e40511	whc_misc	155648	Feb	9	13:31	import.x
-rwxr-xr-x	1	e40511	whc_misc	9002	Dec	2	06:41	install
-rwxr-xr-x	1	e40511	whc_misc	20480	Dec	1	15:51	neuter_res
-r-xr-xr-x	1	e40511	whc_misc	1458176	Feb	9	13:31	package.x
-rwxr-xr-x	1	e40511	whc_misc	2117632	Dec	1	15:52	post.x
-rwxr-xr-x	1	e40511	whc_misc	3674112	Dec	1	15:52	pre.x
-rwxr-xr-x	1	e40511	whc_misc	126976	Dec	1	15:52	qms.x
-r-xr-xr-x	1	e40511	whc_misc	126976	Feb	9	13:32	select.x
-rwxr-xr-x	1	e40511	whc_misc	4608000	Dec	1	15:52	standard.x
-rwxr-xr-x	1	e40511	whc_misc	126976	Dec	1	15:52	t41.x
-rwxr-xr-x	1	e40511	whc_misc	7208	Apr	28	09:49	verify
-rwxr-xr-x	1	e40511	irm_supp	7086	Apr	28	09:39	verify.hks
-rwxr-xr-x	1	e40511	whc_misc	122880	Dec	1	15:52	x11.x

/p_hp/abaqus/abaqus54/cn.inp.dir

total 24

-rw-r--r--	1	e40511	whc_misc	390	Mar	1	15:51	c1.inp
-rw-r--r--	1	e40511	whc_misc	1331	Mar	1	15:51	c10.inp
-rw-r--r--	1	e40511	whc_misc	353	Mar	1	15:51	c11.inp
-rw-r--r--	1	e40511	whc_misc	205	Mar	1	15:51	c13.inp
-rw-r--r--	1	e40511	whc_misc	611	Mar	1	15:51	c2.inp
-rw-r--r--	1	e40511	whc_misc	1482	Mar	1	15:51	c4.inp
-rw-r--r--	1	e40511	whc_misc	246	Mar	1	15:51	c5.inp
-rw-r--r--	1	e40511	whc_misc	856	Mar	1	15:51	c7.inp
-rw-r--r--	1	e40511	whc_misc	1298	Mar	1	15:51	c8.inp

/p_hp/abaqus/abaqus54/info

total 13048

-rwxr-xr-x	1	e40511	whc_misc	1974	Dec	1	15:54	ANIMATE.HLP
-rwxr-xr-x	1	e40511	whc_misc	4910	Dec	1	15:54	BCDISPLA.HLP
-rwxr-xr-x	1	e40511	whc_misc	4911	Dec	1	15:54	BCDISPLAY.HLP
-rwxr-xr-x	1	e40511	whc_misc	3806	Dec	1	15:54	BCSTYLE.HLP
-rwxr-xr-x	1	e40511	whc_misc	5790	Dec	1	15:54	COLORSET.HLP
-rwxr-xr-x	1	e40511	whc_misc	1780	Dec	1	15:54	COLORTAB.HLP
-rwxr-xr-x	1	e40511	whc_misc	1416	Dec	1	15:54	CONTOUR.HLP
-rwxr-xr-x	1	e40511	whc_misc	2885	Dec	1	15:54	CSET.HLP
-rwxr-xr-x	1	e40511	whc_misc	4859	Dec	1	15:54	CURVESTY.HLP
-rwxr-xr-x	1	e40511	whc_misc	4262	Dec	1	15:54	CURVESTYLE.HLP
-rwxr-xr-x	1	e40511	whc_misc	9926	Dec	1	15:54	DEFINECU.HLP
-rwxr-xr-x	1	e40511	whc_misc	7760	Dec	1	15:54	DEFINECURVE.HLP
-rwxr-xr-x	1	e40511	whc_misc	646	Dec	1	15:54	DELETECU.HLP
-rwxr-xr-x	1	e40511	whc_misc	389	Dec	1	15:54	DELETECURVE.HLP
-rwxr-xr-x	1	e40511	whc_misc	4308	Dec	1	15:54	DETAIL.HLP
-rwxr-xr-x	1	e40511	whc_misc	1476	Dec	1	15:54	DISPLAYC.HLP
-rwxr-xr-x	1	e40511	whc_misc	615	Dec	1	15:54	DISPLAYCURVE.HLP
-rwxr-xr-x	1	e40511	whc_misc	1430	Dec	1	15:54	DRAW.HLP
-rwxr-xr-x	1	e40511	whc_misc	7694	Dec	1	15:54	ELSET.HLP
-rwxr-xr-x	1	e40511	whc_misc	77	Dec	1	15:54	END.HLP
-rwxr-xr-x	1	e40511	whc_misc	715	Dec	1	15:54	FONT.HLP
-rwxr-xr-x	1	e40511	whc_misc	5065	Dec	1	15:54	GRAPHAXE.HLP
-rwxr-xr-x	1	e40511	whc_misc	5069	Dec	1	15:54	GRAPHAXES.HLP
-rwxr-xr-x	1	e40511	whc_misc	583	Dec	1	15:54	GRAPHDAT.HLP
-rwxr-xr-x	1	e40511	whc_misc	2158	Dec	1	15:54	GRAPHLEG.HLP
-rwxr-xr-x	1	e40511	whc_misc	2164	Dec	1	15:54	GRAPHLEGEND.HLP
-rwxr-xr-x	1	e40511	whc_misc	2032	Dec	1	15:54	HELP.HLP
-rwxr-xr-x	1	e40511	whc_misc	7380	Dec	1	15:54	HISTORY.HLP
-rwxr-xr-x	1	e40511	whc_misc	1994	Dec	1	15:54	INPUT.HLP
-rwxr-xr-x	1	e40511	whc_misc	3340	Dec	1	15:54	LOADDISP.HLP
-rwxr-xr-x	1	e40511	whc_misc	3340	Dec	1	15:54	LOADDISPLAY.HLP
-rwxr-xr-x	1	e40511	whc_misc	3283	Dec	1	15:54	LOADSTYL.HLP
-rwxr-xr-x	1	e40511	whc_misc	3283	Dec	1	15:54	LOADSTYLE.HLP
-rwxr-xr-x	1	e40511	whc_misc	2072	Dec	1	15:54	NSET.HLP
-rwxr-xr-x	1	e40511	whc_misc	9002	Dec	1	15:54	PATH.HLP
-rwxr-xr-x	1	e40511	whc_misc	1004	Dec	1	15:54	PAUSE.HLP
-rwxr-xr-x	1	e40511	whc_misc	1403	Dec	1	15:54	PRINTCUR.HLP
-rwxr-xr-x	1	e40511	whc_misc	1710	Dec	1	15:54	PRINTELE.HLP

-rwxr-xr-x	1	e40511	whc_misc	6391	Dec	1	15:54	PRINTHIS.HLP
-rwxr-xr-x	1	e40511	whc_misc	1837	Dec	1	15:54	PRINTNOD.HLP
-rwxr-xr-x	1	e40511	whc_misc	2892	Dec	1	15:54	PRINTVAL.HLP
-rwxr-xr-x	1	e40511	whc_misc	4950	Dec	1	15:54	PRINTVAR.HLP
-rwxr-xr-x	1	e40511	whc_misc	10306	Dec	1	15:54	READCURV.HLP
-rwxr-xr-x	1	e40511	whc_misc	2135	Dec	1	15:54	REPORTEL.HLP
-rwxr-xr-x	1	e40511	whc_misc	2306	Dec	1	15:54	REPORTNO.HLP
-rwxr-xr-x	1	e40511	whc_misc	2980	Dec	1	15:54	REPORTVA.HLP
-rwxr-xr-x	1	e40511	whc_misc	553	Dec	1	15:54	RESET.HLP
-rwxr-xr-x	1	e40511	whc_misc	3699	Dec	1	15:54	RESTART.HLP
-rwxr-xr-x	1	e40511	whc_misc	819	Dec	1	15:54	RESULTS.F.HLP
-rwxr-xr-x	1	e40511	whc_misc	964	Dec	1	15:54	SELECTED.HLP
-rwxr-xr-x	1	e40511	whc_misc	5302	Dec	1	15:54	SEQUENCE.HLP
-rwxr-xr-x	1	e40511	whc_misc	34844	Dec	1	15:54	SET.HLP
-rwxr-xr-x	1	e40511	whc_misc	271	Dec	1	15:54	SHOW.HLP
-rwxr-xr-x	1	e40511	whc_misc	1646	Dec	1	15:54	SUPERPAT.HLP
-rwxr-xr-x	1	e40511	whc_misc	3484	Dec	1	15:54	SURFACES.HLP
-rwxr-xr-x	1	e40511	whc_misc	560	Dec	1	15:54	SYSTEM.HLP
-rwxr-xr-x	1	e40511	whc_misc	1521	Dec	1	15:54	TITLE.HLP
-rwxr-xr-x	1	e40511	whc_misc	4392	Dec	1	15:54	VARIABLE.HLP
-rwxr-xr-x	1	e40511	whc_misc	4571	Dec	1	15:54	VECTORPL.HLP
-rwxr-xr-x	1	e40511	whc_misc	1275	Dec	1	15:54	VERIFYCU.HLP
-rwxr-xr-x	1	e40511	whc_misc	1433	Dec	1	15:54	VIEW.HLP
-rwxr-xr-x	1	e40511	whc_misc	2576	Dec	1	15:54	WINDOW.HLP
-rwxr-xr-x	1	e40511	whc_misc	1187	Dec	1	15:54	ZOOM.HLP
-rwxr-xr-x	1	e40511	whc_misc	1844	Dec	1	15:54	help.info
-rwxr-xr-x	1	e40511	whc_misc	474	Dec	1	15:54	local.info
-rwxr-xr-x	1	e40511	whc_misc	4264	Dec	1	15:54	memory.info
-rwxr-xr-x	1	e40511	whc_misc	1531	Dec	1	15:54	release.info
-rwxr-xr-x	1	e40511	whc_misc	5847606	Dec	1	15:54	release_notes.ps
-rwxr-xr-x	1	e40511	whc_misc	127856	Dec	2	11:33	release_notes.txt
-rwxr-xr-x	1	e40511	whc_misc	375595	Dec	1	15:54	site_guide.ps
-rwxr-xr-x	1	e40511	whc_misc	1160	Dec	1	15:54	status.info
-rwxr-xr-x	1	e40511	whc_misc	3212	Dec	1	15:54	status_explicit.info
-rwxr-xr-x	1	e40511	whc_misc	6179	Dec	1	15:54	status_post.info
-rwxr-xr-x	1	e40511	whc_misc	2802	Dec	1	15:54	status_pre.info
-rwxr-xr-x	1	e40511	whc_misc	6469	Dec	1	15:54	status_standard.info
-rwxr-xr-x	1	e40511	whc_misc	360	Dec	1	15:54	status_utility.info
-rwxr-xr-x	1	e40511	whc_misc	2345	Dec	2	11:40	support.info

/p_hp/abaqus/abaqus54/samples

total 41850

-rwxr-xr-x	1	e40511	whc_misc	133120	Dec	1	15:53	corstd.tar
-rw-r--r--	1	e40511	whc_misc	51200	Feb	9	13:47	corxpl.tar
-rwxr-xr-x	1	e40511	whc_misc	6164480	Dec	1	15:52	exastd.tar
-rw-r--r--	1	e40511	whc_misc	245760	Feb	9	13:47	exaxpl.tar
drwxr-xr-x	2	e40511	whc_misc	1024	Jan	11	09:58	installpst
drwxr-xr-x	2	e40511	whc_misc	1024	Jan	11	09:57	installstd
drwxr-xr-x	2	e40511	whc_misc	1024	Feb	9	13:47	installxpl
-rwxr-xr-x	1	e40511	whc_misc	5662720	Dec	1	15:53	postqa.tar
-rwxr-xr-x	1	e40511	whc_misc	593920	Dec	1	15:53	timerstd.tar
-rwxr-xr-x	1	e40511	whc_misc	7884800	Dec	1	15:53	verstd.tar
-rw-r--r--	1	e40511	whc_misc	604160	Feb	9	13:47	verxpl.tar

/p_hp/abaqus/abaqus54/site

total 430

-rwxr-xr-x	1	e40511	whc_misc	1723	Jan	13:39	a.ter.sv
-rwxr-xr-x	1	e40511	whc_misc	58	Dec	1 15:53	aba_param.inc
-rw-r--r--	1	e40511	whc_misc	1455	Jan	26 08:04	abaqus.env
-rwxr-xr-x	1	e40511	whc_misc	2799	Jan	26 08:11	abaqus.env.batch
-rwxr-xr-x	1	e40511	whc_misc	45260	Dec	2 05:40	abaqus.env.hks
-rwxr-xr-x	1	e40511	whc_misc	2365	Jan	26 08:12	abaqus.env.inter
-rw-r--r--	1	e40511	whc_misc	1455	Jan	26 08:15	abaqus.env.rl
-rw-r--r--	1	e40511	whc_misc	2440	Jan	13:56	abaqus.env.sv
-rw-rw-rw-	1	e40511	whc_misc	2375	Jan	12 09:49	abaqus.env.tmp
-rwxr-xr-x	1	e40511	whc_misc	114610	Dec	1 15:53	abaqus.fnt
-rwxr-xr-x	1	e40511	whc_misc	512	Jan	16 15:59	abq.notify
-rwxr-xr-x	1	e40511	whc_misc	2924	Jan	16 14:03	ae.batch.sv
-rwxr-xr-x	1	e40511	whc_misc	327	Dec	1 15:53	cps.opt
-rwxr-xr-x	1	e40511	whc_misc	201	Dec	1 15:53	hgl.opt
-rwxr-xr-x	1	e40511	whc_misc	558	Dec	1 15:53	hks.env
-rwxr-xr-x	1	e40511	whc_misc	408	Jan	11 10:01	install.log
-rw-rw-rw-	1	e40511	whc_misc	132	Jan	27 15:39	junk
-rwxr-xr-x	1	e40511	whc_misc	201	Dec	1 15:53	qms.opt
-rwxr-xr-x	1	e40511	whc_misc	3882	Jan	26 08:08	readme
-rw-r--r--	1	e40511	whc_misc	400	Feb	9 09:43	startup.stp
-rwxr-xr-x	1	e40511	whc_misc	285	Jan	11 13:49	startup.stp.sv
-rwxr-xr-x	1	e40511	whc_misc	61	Dec	1 15:53	t41.opt
-rwxr-xr-x	1	e40511	whc_misc	19	Dec	1 15:53	tek4105.pst
-rwxr-xr-x	1	e40511	whc_misc	19	Dec	1 15:53	tek4109.pst
-rwxr-xr-x	1	e40511	whc_misc	19	Dec	1 15:53	tek4207.pst
-rwxr-xr-x	1	e40511	whc_misc	49	Dec	1 15:53	tek4236.pst
-rw-rw-rw-	1	e40511	whc_misc	2221	Jan	13:27	temp.env
-rwxr-xr-x	1	e40511	whc_misc	21	Dec	1 15:53	terminal.pst
-rw-rw-rw-	1	e40511	whc_misc	1045	Jan	12 09:34	tmp
-rwxr-xr-x	1	e40511	whc_misc	180	Dec	1 15:53	vaba_param.inc
-rwxr-xr-x	1	e40511	whc_misc	192	Dec	1 15:53	vaba_param_dp.inc
-rwxr-xr-x	1	e40511	whc_misc	61	Dec	1 15:53	x11.opt
-rwxr-xr-x	1	e40511	whc_misc	66	Dec	1 15:53	xwindow.pst

/p_hp/abaqus/abaqus54/source

total 780

-rwxr-xr-x	1	e40511	whc_misc	378880	Dec	1 15:53	plot.tar
-rwxr-xr-x	1	e40511	whc_misc	6132	Dec	1 15:53	vumat.f

/p_hp/abaqus/abaqus54/test

total 654

-rw-r--r--	1	e40511	whc_misc	767	Jan	11 16:26	c2.inp
-rw-r--r--	1	e40511	whc_misc	2007	Jan	27 16:37	c2.rl.com
-rw-r--r--	1	e40511	whc_misc	43909	Jan	27 16:37	c2.rl.dat
-rw-rw-rw-	1	e40511	whc_misc	43326	Jan	27 16:38	c2.rl.dat.ndt
-rw-r--r--	1	e40511	whc_misc	41040	Jan	27 16:37	c2.rl.fil
-rw-r--r--	1	e40511	whc_misc	8208	Jan	27 16:37	c2.rl.mpl
-rw-r--r--	1	e40511	whc_misc	45405	Jan	27 16:37	c2.rl.msg
-rw-rw-rw-	1	e40511	whc_misc	43326	Jan	27 16:37	c2.rl.ndt
-rw-r--r--	1	e40511	whc_misc	98304	Jan	27 16:37	c2.rl.res

```
-rw-r--r-- 1 e40511 whc_misc 833 Jan 27 16:37 c2.rl.sta  
-rwxr-xr-x 1 e40511 whc_misc 318 Jan 27 16:00 cp-new-files  
-rwxr-xr-x 1 e40511 whc_misc 1672 Jan 27 16:29 test-abaqus-run
```

Permanent storage: A permanent copy of the software is stored on an optical disk. Contact Larry Gannon for additional information.

Error reporting: Report perceived errors to HKS. HKS maintains updated error reports on their computer argo.hks.com. These reports are available via anonymous ftp. Contact Randall Marlow for additional information.

7.0 REVISIONS

Version identification appears in the ABAQUS output files.

8.0 REFERENCES

- HKS, 1994a, *ABAQUS Theory Manual*, HKS, Pawtucket, Rhode Island.
- HKS, 1994b, *ABAQUS User's Manual, Volumes I and II*, HKS, Pawtucket, Rhode Island.
- HKS, 1994c, *ABAQUS Verification Manual*, HKS, Pawtucket, Rhode Island.
- HKS, 1994d, *ABAQUS Example Problems Manual, Volumes I and II*, HKS, Pawtucket, Rhode Island.
- HKS, 1994e, *ABAQUS/Post Manual*, HKS, Pawtucket, Rhode Island.
- HKS, 1994f, *ABAQUS Release Notes, Version 5.4*, HKS, Pawtucket, Rhode Island.
- WHC, 1993, *Software Practices*, WHC-CM-3-10, Westinghouse Hanford Company, Richland, Washington.

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¹ ABAQUS is a trademark of HKS.

Figure 1. Comparison of Solutions

