September 2002

Revision STC-02F

NAC-STC

NAC Storage Transport Cask

SAFETY ANALYSIS REPORT

Volume 1 of 2

Docket No. 71-9235

NAC INTERNATIONAL

Atlanta Corporate Headquarters 3930 East Jones Bridge Road, Norcross, Georgia 30092 USA
Phone 770-447-1144, Fax 770-447-1797, www.nacintl.com

List of Effective Pages

List of Effective Pages

Master Table of Contents

i .....Revision STC-01A
ii .....Revision STC-01A
iii ..... Revision 10
iv ..... Revision 11
v..... Revision 10
vi ..... Revision 10
vii ..... Revision 12
viii ..... Revision 12
ix ..... Revision 10
x ..... Revision STC-02F
xi ..... Revision STC-02F
xii ..... Revision STC-02F
xiii .....Revision STC-01A

Chapter 1

1-i .....Revision STC-01A
1-ii .....Revision STC-01A
1-iii ..... Revision STC-02F
1-iv ..... Revision STC-02F
1-1 .....Revision STC-01A
1-2 .....Revision STC-01A
1-3 ..... Revision STC-02F
1-4 .....Revision STC-01A
1-5 ..... Revision STC-02F
1-6 ..... Revision STC-02F
1-7 .....Revision STC-01A
1.1-1 ..... Revision STC-02F
1.1-2 .....Revision STC-01A
1.1-3 ..... Revision STC-02F
1.1-4 ..... Revision STC-02F
1.1-5 .....Revision STC-01A
1.1-6 .....Revision STC-01A
1.2-1 .....Revision STC-01A
1.2-2 .....Revision STC-01A
1.2-3 .....Revision STC-01A
1.2-4 .....Revision STC-01A
1.2-5 ..... Revision STC-02F
1.2-6 ..... Revision STC-02F
1.2-7 ..... Revision STC-02F
1.2-8 .....Revision STC-01A
1.2-9 .....Revision STC-01A
1.2-10 .....Revision STC-02F
1.2-11 .....Revision STC-01A
1.2-12 ..... Revision STC-02F
1.2-13 ..... Revision STC-02F
1.2-14 .....Revision STC-01A
1.2-15 .....Revision STC-01A
1.2-16 .....Revision STC-01A
1.2-17 .....Revision STC-01A
1.2-18 .....Revision STC-01A
1.2-19 .....Revision STC-01A
1.2-20 ..... Revision 10
1.2-21 ..... Revision 10
1.2-22 ..... Revision 10
1.2-23 .....Revision STC-01A
1.2-24 .....Revision STC-01A
1.2-25 .....Revision STC-01A
1.2-26 ..... Revision STC-02F
1.2-27 ..... Revision STC-02F
1.2-28 ..... Revision STC-02F
1.2-29 ..... Revision STC-02F
1.2-30 .....Revision STC-01A
1.2-31 .....Revision STC-01A
1.3-1 ..... Revision 10

41 License Drawings

List of Effective Pages (Continued)

Chapter 2

2-i ..... Revision STC-01A
2-ii ..... Revision STC-01A
2-iii ..... Revision 12
2-iv ..... Revision 12
2-v ..... Revision 12
2-vi ..... Revision 12
2-vii ..... Revision 12
2-viii ..... Revision 12
2-ix ..... Revision STC-01A
2-x ..... Revision 12
2-xi ..... Revision 12
2-xii ..... Revision 12
2-xiii ..... Revision 12
2-xiv ..... Revision 12
2-xv ..... Revision 12
2-xvi ..... Revision 12
2-xvii ..... Revision 12
2-xviii ..... Revision 12
2-xix ..... Revision 12
2-xx ..... Revision 12
2-xxi ..... Revision STC-01A
2-xxii ..... Revision 12
2-xxiii ..... Revision 12
2-xxiv ..... Revision 12
2-xxv ..... Revision 12
2-xxvi ..... Revision 12
2-xxvii ..... Revision 12
2-xxviii ..... Revision 12
2-xxix ..... Revision 12
2-xxx ..... Revision 12
2-xxxi ..... Revision 12
2-xxxii ..... Revision 12
2-xxxiii ..... Revision 12
2-xxxiv ..... Revision 12
2-xxxv ..... Revision 12
2-xxxvi ..... Revision 12
2-xxxvii ..... Revision 12
2-xxxviii ..... Revision 12
2-xxxix ..... Revision 12
2-xl ..... Revision 12
2-xli ..... Revision 12
2-xlii ..... Revision 12
2-xliii ..... Revision 12
2-xliv ..... Revision 12
2-xlv ..... Revision 12
2-xlvi ..... Revision 12
2.0-1 ..... Revision 10
2.1.1-1 ..... Revision STC-02F
2.1.1-2 ..... Revision STC-01A
2.1.1-3 ..... Revision STC-01A
2.1.1-4 ..... Revision STC-01A
2.1.2-1 ..... Revision 1
2.1.2-2 ..... Revision STC-01A
2.1.2-3 ..... Revision 10
2.1.2-4 ..... Revision 10
2.1.2-5 ..... Revision 10
2.1.3-1 ..... Revision 10
2.1.3-2 ..... Revision 10
2.1.3-3 ..... Revision 10
2.1.3-4 ..... Revision 10
2.1.3-5 ..... Revision 10
2.1.3-6 ..... Revision 10
2.1.3-7 ..... Revision 10
2.1.3-8 ..... Revision 10
2.1.3-9 ..... Revision 10
2.1.3-10 ..... Revision 10
2.1.3-11 ..... Revision 10
2.1.3-12 ..... Revision 10
2.1.3-13 ..... Revision 10

List of Effective Pages (Continued)

2.1.3-14 ..... Revision 10
2.1.3-15 ..... Revision 10
2.1.3-16 ..... Revision 10
2.2.0-1 ..... Revision STC-01A
2.2.0-2 ..... Revision STC-01A
2.2.0-3 ..... Revision STC-01A
2.2.0-4 ..... Revision STC-01A
2.3.1-1 ..... Revision STC-01A
2.3.1-2 ..... Revision 10
2.3.2-1 ..... Revision 10
2.3.2-2 ..... Revision STC-01A
2.3.2-3 ..... Revision 10
2.3.2-4 ..... Revision STC-01A
2.3.2-5 ..... Revision 10
2.3.3-1 ..... Revision 2
2.3.3-2 ..... Revision 10
2.3.4-1 ..... Revision 1
2.3.4-2 ..... Revision 2
2.3.4-3 ..... Revision 2
2.3.5-1 ..... Revision 10
2.3.5-2 ..... Revision 2
2.3.6-1 ..... Revision STC-01A
2.3.6-2 ..... Revision STC-01A
2.3.6-3 ..... Revision 1
2.3.6-4 ..... Revision STC-01A
2.3.6-5 ..... Revision 1
2.3.7-1 ..... Revision 10
2.4-1 ..... Revision 10
2.4.1-1 ..... Revision 10
2.4.2-1 ..... Revision 10
2.4.3-1 ..... Revision 1
2.4.4-1 ..... Revision 10
2.4.4-2 ..... Revision 10
2.4.4-3 ..... Revision 10
2.4.4-4 ..... Revision 10
2.4.4-5 ..... Revision 10
2.4.4-6 ..... Revision 10
2.4.4-7 ..... Revision 10
2.4.4-8 ..... Revision 10
2.4.4-9 ..... Revision STC-01A
2.4.5-1 ..... Revision 1
2.4.6-1 ..... Revision 1
2.5.1-1 ..... Revision 1
2.5.1-2 ..... Revision 2
2.5.1-3 ..... Revision 1
2.5.1-4 ..... Revision 10
2.5.1-5 ..... Revision 10
2.5.1-6 ..... Revision 1
2.5.1-7 ..... Revision 10
2.5.1-8 ..... Revision 10
2.5.1-9 ..... Revision 10
2.5.1-10 ..... Revision 10
2.5.1-11 ..... Revision 10
2.5.1-12 ..... Revision 1
2.5.1-13 ..... Revision 1
2.5.1-14 ..... Revision 10
2.5.1-15 ..... Revision 10
2.5.1-16 ..... Revision STC-01A
2.5.1-17 ..... Revision 1
2.5.1-18 ..... Revision 1
2.5.1-19 ..... Revision 1
2.5.1-20 ..... Revision STC-01A
2.5.1-21 ..... Revision 1
2.5.1-22 ..... Revision 10
2.5.1-23 ..... Revision 10
2.5.1-24 ..... Revision 10
2.5.1-25 ..... Revision 10
2.5.1-26 ..... Revision 10
2.5.1-27 ..... Revision 10
2.5.1-28 ..... Revision 10

List of Effective Pages (Continued)

2.5.1-29 ..... Revision 10
2.5.1-30 ..... Revision 10
2.5.1-31 ..... Revision 10
2.5.1-32 ..... Revision 10
2.5.1-33 ..... Revision 10
2.5.2-1 ..... Revision 1
2.5.2-2 ..... Revision 1
2.5.2-3 ..... Revision 1
2.5.2-4 ..... Revision 1
2.5.2-5 ..... Revision 1
2.5.2-6 ..... Revision 1
2.5.2-7 ..... Revision 1
2.5.2-8 ..... Revision 1
2.5.2-9 ..... Revision 1
2.5.2-10 ..... Revision 1
2.5.2-11 ..... Revision 1
2.5.2-12 ..... Revision 1
2.5.2-13 ..... Revision 2
2.5.2-14 ..... Revision 2
2.5.2-15 ..... Revision 2
2.5.2-16 ..... Revision 2
2.5.2-17 ..... Revision 2
2.5.2-18 ..... Revision 2
2.5.2-19 ..... Revision 2
2.5.2-20 ..... Revision 2
2.5.2-21 ..... Revision 2
2.5.2-22 ..... Revision 10
2.5.2-23 ..... Revision 10
2.5.2-24 ..... Revision 10
2.5.2-25 ..... Revision 10
2.5.2-26 ..... Revision 10
2.5.2-27 ..... Revision 2
2.5.2-28 ..... Revision 2
2.5.2-29 ..... Revision 2
2.6-1 ..... Revision 10
2.6-2 ..... Revision 10
2.6.1.0-1 ..... Revision 1
2.6.1.0-2 ..... Revision 10
2.6.1.0-3 ..... Revision 10
2.6.1.0-4 ..... Revision 10
2.6.1.0-5 ..... Revision 2
2.6.1.0-6 ..... Revision 10
2.6.2.0-1 ..... Revision 10
2.6.2.0-2 ..... Revision 10
2.6.2.0-3 ..... Revision 10
2.6.2.0-4 ..... Revision 10
2.6.2.0-5 ..... Revision 10
2.6.2.0-6 ..... Revision 10
2.6.3.0-1 ..... Revision 10
2.6.4.0-1 ..... Revision 1
2.6.5.0-1 ..... Revision 10
2.6.5.0-2 ..... Revision 10
2.6.5.0-3 ..... Revision 10
2.6.6.0-1 ..... Revision 1
2.6.7.0-1 ..... Revision 1
2.6.7.1-1 ..... Revision 10
2.6.7.1-2 ..... Revision 10
2.6.7.1-3 ..... Revision 10
2.6.7.1-4 ..... Revision 10
2.6.7.1-5 ..... Revision 10
2.6.7.1-6 ..... Revision 10
2.6.7.1-7 ..... Revision 10
2.6.7.1-8 ..... Revision 10
2.6.7.1-9 ..... Revision 10
2.6.7.2-1 ..... Revision 10
2.6.7.2-2 ..... Revision 10
2.6.7.2-3 ..... Revision 10
2.6.7.2-4 ..... Revision 10
2.6.7.2-5 ..... Revision 10
2.6.7.2-6 ..... Revision 10

List of Effective Pages (Continued)

2.6.7.2-7 ..... Revision 10
2.6.7.2-8 ..... Revision 10
2.6.7.2-9 ..... Revision 10
2.6.7.2-10 ..... Revision 10
2.6.7.2-11 ..... Revision 10
2.6.7.2-12 ..... Revision 10
2.6.7.2-13 ..... Revision 10
2.6.7.2-14 ..... Revision 10
2.6.7.3-1 ..... Revision 10
2.6.7.3-2 ..... Revision 10
2.6.7.3-3 ..... Revision 10
2.6.7.3-4 ..... Revision 10
2.6.7.3-5 ..... Revision 10
2.6.7.3-6 ..... Revision 10
2.6.7.3-7 ..... Revision 10
2.6.7.3-8 ..... Revision 10
2.6.7.3-9 ..... Revision 10
2.6.7.3-10 ..... Revision 10
2.6.7.3-11 ..... Revision 10
2.6.7.4-1 ..... Revision 10
2.6.7.4-2 ..... Revision 10
2.6.7.4-3 ..... Revision 10
2.6.7.4-4 ..... Revision 10
2.6.7.4-5 ..... Revision 10
2.6.7.4-6 ..... Revision 10
2.6.7.4-7 ..... Revision 10
2.6.7.4-8 ..... Revision 10
2.6.7.4-9 ..... Revision 10
2.6.7.4-10 ..... Revision 10
2.6.7.4-11 ..... Revision 10
2.6.7.4-12 ..... Revision 10
2.6.7.4-13 ..... Revision 10
2.6.7.4-14 ..... Revision 10
2.6.7.4-15 ..... Revision 10
2.6.7.4-16 ..... Revision 10
2.6.7.4-17 ..... Revision 10
2.6.7.4-18 ..... Revision 10
2.6.7.4-19 ..... Revision 10
2.6.7.4-20 ..... Revision 10
2.6.7.4-21 ..... Revision 10
2.6.7.4-22 ..... Revision 10
2.6.7.4-23 ..... Revision 2
2.6.7.4-24 ..... Revision 2
2.6.7.4-25 ..... Revision 2
2.6.7.4-26 ..... Revision 2
2.6.7.4-27 ..... Revision 2
2.6.7.4-28 ..... Revision 2
2.6.7.4-29 ..... Revision 2
2.6.7.4-30 ..... Revision 2
2.6.7.4-31 ..... Revision 3
2.6.7.4-32 ..... Revision 2
2.6.7.4-33 ..... Revision 2
2.6.7.4-34 ..... Revision 2
2.6.7.4-35 ..... Revision 2
2.6.7.4-36 ..... Revision 2
2.6.7.4-37 ..... Revision 2
2.6.7.4-38 ..... Revision 2
2.6.7.4-39 ..... Revision 2
2.6.7.4-40 ..... Revision 2
2.6.7.5-1 ..... Revision STC-01A
2.6.7.5-2 ..... Revision 10
2.6.7.5-3 ..... Revision STC-01A
2.6.7.5-4 ..... Revision STC-01A
2.6.7.5-5 ..... Revision 10
2.6.7.5-6 ..... Revision 10
2.6.7.5-7 ..... Revision 10
2.6.7.5-8 ..... Revision 10
2.6.7.5-9 ..... Revision 10
2.6.7.5-10 ..... Revision 10
2.6.7.5-11 ..... Revision STC-01A

List of Effective Pages (Continued)

2.6.7.5-12 ..... Revision 10
2.6.7.5-13 ..... Revision 10
2.6.7.5-14 ..... Revision 10
2.6.7.5-15 ..... Revision 10
2.6.7.5-16 ..... Revision 10
2.6.7.5-17 ..... Revision 10
2.6.7.5-18 ..... Revision 10
2.6.7.6-1 ..... Revision 7
2.6.7.6-2 ..... Revision 10
2.6.7.6-3 ..... Revision 1
2.6.7.6-4 ..... Revision 1
2.6.7.6-5 ..... Revision 1
2.6.7.6-6 ..... Revision 7
2.6.7.6-7 ..... Revision 7
2.6.7.6-8 ..... Revision 7
2.6.7.6-9 ..... Revision 7
2.6.7.6-10 ..... Revision 10
2.6.7.6-11 ..... Revision 7
2.6.7.6-12 ..... Revision 7
2.6.7.6-13 ..... Revision 7
2.6.7.6-14 ..... Revision 7
2.6.7.6-15 ..... Revision 7
2.6.7.6-16 ..... Revision 7
2.6.7.6-17 ..... Revision 7
2.6.7.7-1 ..... Revision 1
2.6.7.7-2 ..... Revision 1
2.6.7.7-3 ..... Revision 1
2.6.7.7-4 ..... Revision 1
2.6.7.7-5 ..... Revision 1
2.6.8.0-1 ..... Revision 1
2.6.9.0-1 ..... Revision 1
2.6.10.0-1 ..... Revision 1
2.6.10.1-1 ..... Revision 1
2.6.10.2-1 ..... Revision 1
2.6.10.2-2 ..... Revision 1
2.6.10.2-3 ..... Revision 1
2.6.10.2-4 ..... Revision 1
2.6.10.3-1 ..... Revision 1
2.6.10.3-2 ..... Revision 2
2.6.10.3-3 ..... Revision 1
2.6.10.3-4 ..... Revision 1
2.6.10.3-5 ..... Revision 1
2.6.10.3-6 ..... Revision 1
2.6.10.3-7 ..... Revision 1
2.6.11.0-1 ..... Revision 2
2.6.11.0-2 ..... Revision 2
2.6.11.1-1 ..... Revision 2
2.6.11.1-2 ..... Revision 2
2.6.11.1-3 ..... Revision 2
2.6.11.1-4 ..... Revision 2
2.6.11.2-1 ..... Revision 2
2.6.11.2-2 ..... Revision 2
2.6.11.2-3 ..... Revision 2
2.6.11.2-4 ..... Revision 2
2.6.11.2-5 ..... Revision 2
2.6.11.2-6 ..... Revision 2
2.6.11.2-7 ..... Revision 2
2.6.11.2-8 ..... Revision 2
2.6.11.2-9 ..... Revision 2
2.6.11.2-10 ..... Revision 2
2.6.11.2-11 ..... Revision 2
2.6.11.2-12 ..... Revision 2
2.6.11.3-1 ..... Revision 2
2.6.12.0-1 ..... Revision 10
2.6.12.0-2 ..... Revision 10
2.6.12.0-3 ..... Revision 10
2.6.12.0-4 ..... Revision 10
2.6.12.0-5 ..... Revision 10
2.6.12.1-1 ..... Revision 10
2.6.12.2-1 ..... Revision 10

List of Effective Pages (Continued)

2.6.12.2-2 ..... Revision 10
2.6.12.2-3 ..... Revision 10
2.6.12.2-4 ..... Revision 10
2.6.12.2-5 ..... Revision 10
2.6.12.2-6 ..... Revision 10
2.6.12.3-1 ..... Revision 10
2.6.12.3-2 ..... Revision 10
2.6.12.3-3 ..... Revision 10
2.6.12.3-4 ..... Revision 10
2.6.12.3-5 ..... Revision 10
2.6.12.3-6 ..... Revision 10
2.6.12.3-7 ..... Revision 10
2.6.12.4-1 ..... Revision 10
2.6.12.4-2 ..... Revision 10
2.6.12.4-3 ..... Revision 10
2.6.12.5-1 ..... Revision 10
2.6.12.5-2 ..... Revision 10
2.6.12.5-3 ..... Revision 10
2.6.12.6-1 ..... Revision STC-01A
2.6.12.6-2 ..... Revision 10
2.6.12.7-1 ..... Revision 10
2.6.12.7-2 ..... Revision 10
2.6.12.7-3 ..... Revision 10
2.6.12.7-4 ..... Revision 10
2.6.12.7-5 ..... Revision 10
2.6.12.7-6 ..... Revision 10
2.6.12.7-7 ..... Revision 10
2.6.12.7-8 ..... Revision 10
2.6.12.7-9 ..... Revision 10
2.6.12.7-10 ..... Revision 10
2.6.12.7-11 ..... Revision 10
2.6.12.7-12 ..... Revision 10
2.6.12.7-13 ..... Revision 10
2.6.12.7-14 ..... Revision 10
2.6.12.7-15 ..... Revision 10
2.6.12.7-16 ..... Revision 10
2.6.12.7-17 ..... Revision 10
2.6.12.7-18 ..... Revision 10
2.6.12.7-19 ..... Revision 10
2.6.12.7-20 ..... Revision 10
2.6.12.7-21 ..... Revision 10
2.6.12.7-22 ..... Revision 10
2.6.12.8-1 ..... Revision 10
2.6.12.8-2 ..... Revision 10
2.6.12.9-1 ..... Revision 10
2.6.12.9-2 ..... Revision 10
2.6.12.9-3 ..... Revision 10
2.6.12.9-4 ..... Revision 10
2.6.12.9-5 ..... Revision 10
2.6.12.9-6 ..... Revision 10
2.6.12.9-7 ..... Revision 10
2.6.12.9-8 ..... Revision 10
2.6.12.9-9 ..... Revision 10
2.6.12.9-10 ..... Revision 10
2.6.12.9-11 ..... Revision 10
2.6.12.10-1 ..... Revision 10
2.6.12.11-1 ..... Revision 10
2.6.12.12-1 ..... Revision 10
2.6.12.13-1 ..... Revision 10
2.6.12.13-2 ..... Revision 10
2.6.12.13-3 ..... Revision 10
2.6.12.13-4 ..... Revision 10
2.6.13-1 ..... Revision 10
2.6.13-2 ..... Revision 10
2.6.13-3 ..... Revision 10
2.6.13.1-1 ..... Revision 11
2.6.13.1-2 ..... Revision 11
2.6.13.2-1 ..... Revision 10
2.6.13.2-2 ..... Revision 10
2.6.13.2-3 ..... Revision 10

List of Effective Pages (Continued)

2.6.13.2-4 ..... Revision 10
2.6.13.2-5 ..... Revision 10
2.6.13.2-6 ..... Revision 10
2.6.13.2-7 ..... Revision 10
2.6.13.3-1 ..... Revision 10
2.6.13.3-2 ..... Revision 10
2.6.13.3-3 ..... Revision 10
2.6.13.3-4 ..... Revision 10
2.6.13.4-1 ..... Revision 11
2.6.13.4-2 ..... Revision 11
2.6.13.4-3 ..... Revision 11
2.6.13.4-4 ..... Revision 11
2.6.13.4-5 ..... Revision 11
2.6.13.5-1 ..... Revision 10
2.6.13.5-2 ..... Revision 11
2.6.13.6-1 ..... Revision 10
2.6.13.6-2 ..... Revision 11
2.6.13.7-1 ..... Revision 10
2.6.13.7-2 ..... Revision 11
2.6.13.8-1 ..... Revision 10
2.6.13.9-1 ..... Revision 11
2.6.13.10-1 ..... Revision 10
2.6.13.11-1 ..... Revision 10
2.6.13.11-2 ..... Revision 10
2.6.13.11-3 ..... Revision 10
2.6.13.12-1 ..... Revision 11
2.6.13.12-2 ..... Revision 11
2.6.14-1 ..... Revision 10
2.6.14-2 ..... Revision 10
2.6.14-3 ..... Revision 10
2.6.14-4 ..... Revision 10
2.6.14-5 ..... Revision 10
2.6.14-6 ..... Revision 10
2.6.14-7 ..... Revision 10
2.6.14-8 ..... Revision 10
2.6.14-9 ..... Revision 10
2.6.14-10 ..... Revision 10
2.6.14-11 ..... Revision 10
2.6.14-12 ..... Revision 10
2.6.14-13 ..... Revision 10
2.6.14-14 ..... Revision 10
2.6.14-15 ..... Revision 10
2.6.14-16 ..... Revision 10
2.6.14-17 ..... Revision 10
2.6.14-18 ..... Revision 10
2.6.14-19 ..... Revision 10
2.6.14-20 ..... Revision 10
2.6.14-21 ..... Revision 10
2.6.14-22 ..... Revision 10
2.6.14-23 ..... Revision 10
2.6.14-24 ..... Revision 10
2.6.14-25 ..... Revision 10
2.6.14-26 ..... Revision 10
2.6.14-27 ..... Revision 10
2.6.14-28 ..... Revision 10
2.6.14-29 ..... Revision 10
2.6.14-30 ..... Revision 10
2.6.14-31 ..... Revision 10
2.6.14-32 ..... Revision 10
2.6.14-33 ..... Revision 10
2.6.14-34 ..... Revision 10
2.6.14-35 ..... Revision 10
2.6.14-36 ..... Revision 10
2.6.14-37 ..... Revision 10
2.6.14-38 ..... Revision 10
2.6.14-39 ..... Revision 10
2.6.14-40 ..... Revision 10
2.6.14-41 ..... Revision 10
2.6.14-42 ..... Revision 10
2.6.14-43 ..... Revision 10

List of Effective Pages (Continued)

2.6.14-44 ..... Revision 10
2.6.14-45 ..... Revision 10
2.6.14-46 ..... Revision 10
2.6.14-47 ..... Revision 10
2.6.14-48 ..... Revision 10
2.6.14-49 ..... Revision 10
2.6.14-50 ..... Revision 10
2.6.14-51 ..... Revision 10
2.6.14-52 ..... Revision 10
2.6.14-53 ..... Revision 10
2.6.14-54 ..... Revision 10
2.6.14-55 ..... Revision 10
2.6.14-56 ..... Revision 10
2.6.14-57 ..... Revision 10
2.6.14-58 ..... Revision 10
2.6.14-59 ..... Revision 10
2.6.14-60 ..... Revision 10
2.6.14-61 ..... Revision 10
2.6.14-62 ..... Revision 10
2.6.14-63 ..... Revision 10
2.6.14-64 ..... Revision 10
2.6.15-1 ..... Revision 10
2.6.15-2 ..... Revision 10
2.6.15-3 ..... Revision 10
2.6.16-1 ..... Revision 10
2.6.16-2 ..... Revision 10
2.6.16-3 ..... Revision 10
2.6.16-4 ..... Revision 10
2.6.16-5 ..... Revision 10
2.6.16-6 ..... Revision 10
2.6.16-7 ..... Revision 10
2.6.16-8 ..... Revision 10
2.7-1 ..... Revision 10
2.7-2 ..... Revision 10
2.7.1-1 ..... Revision 10
2.7.1-2 ..... Revision 10
2.7.1.1-1 ..... Revision 10
2.7.1.1-2 ..... Revision 10
2.7.1.1-3 ..... Revision 10
2.7.1.1-4 ..... Revision 10
2.7.1.1-5 ..... Revision 10
2.7.1.1-6 ..... Revision 10
2.7.1.1-7 ..... Revision 10
2.7.1.2-1 ..... Revision 10
2.7.1.2-2 ..... Revision 10
2.7.1.2-3 ..... Revision 10
2.7.1.2-4 ..... Revision 10
2.7.1.2-5 ..... Revision 10
2.7.1.2-6 ..... Revision 1
2.7.1.2-7 ..... Revision 10
2.7.1.2-8 ..... Revision 2
2.7.1.2-9 ..... Revision 10
2.7.1.2-10 ..... Revision 10
2.7.1.3-1 ..... Revision 10
2.7.1.3-2 ..... Revision 10
2.7.1.3-3 ..... Revision 10
2.7.1.3-4 ..... Revision 10
2.7.1.3-5 ..... Revision 10
2.7.1.3-6 ..... Revision 10
2.7.1.3-7 ..... Revision 10
2.7.1.3-8 ..... Revision 10
2.7.1.3-9 ..... Revision 10
2.7.1.4-1. ..... Revision 10
2.7.1.4-2 ..... Revision 1
2.7.1.4-3 ..... Revision 10
2.7.1.4-4 ..... Revision 10
2.7.1.4-5 ..... Revision 10
2.7.1.4-6 ..... Revision 10
2.7.1.4-7 ..... Revision 1
2.7.1.4-8 ..... Revision 1

List of Effective Pages (Continued)

2.7.1.4-9 ..... Revision 10
2.7.1.4-10 ..... Revision 1
2.7.1.4-11 ..... Revision 10
2.7.1.4-12 ..... Revision 10
2.7.1.5-1 ..... Revision 10
2.7.1.5-2 ..... Revision 10
2.7.1.5-3 ..... Revision 10
2.7.1.6-1 ..... Revision 2
2.7.1.6-2 ..... Revision 2
2.7.1.6-3 ..... Revision 10
2.7.1.6-4 ..... Revision 10
2.7.1.6-5 ..... Revision 10
2.7.1.6-6 .....Revision STC-01A
2.7.1.6-7 ..... Revision 10
2.7.1.6-8 ..... Revision 10
2.7.1.6-9 ..... Revision 10
2.7.1.6-10 ..... Revision 1
2.7.1.6-11 ..... Revision 1
2.7.1.6-12 ..... Revision 1
2.7.1.6-13 ..... Revision 2
2.7.1.6-14 ..... Revision 2
2.7.1.6-15 ..... Revision 10
2.7.1.6-16 ..... Revision 10
2.7.1.6-17 ..... Revision 10
2.7.1.6-18 ..... Revision 10
2.7.2-1 ..... Revision 10
2.7.2.1-1 ..... Revision 1
2.7.2.1-2 ..... Revision 2
2.7.2.1-3 ..... Revision 1
2.7.2.1-4 ..... Revision 1
2.7.2.2-1 ..... Revision 2
2.7.2.2-2 ..... Revision 2
2.7.2.2-3 ..... Revision 1
2.7.2.2-4 ..... Revision 1
2.7.2.2-5 .....Revision STC-01A
2.7.2.2-6 ..... Revision 1
2.7.2.3-1 ..... Revision 1
2.7.2.3-2 ..... Revision 1
2.7.2.3-3 ..... Revision 1
2.7.2.3-4 ..... Revision 2
2.7.2.3-5 ..... Revision 2
2.7.2.3-6 ..... Revision 1
2.7.2.3-7 ..... Revision 1
2.7.2.4-1 ..... Revision 1
2.7.2.4-2 ..... Revision 1
2.7.2.4-3 ..... Revision 1
2.7.2.4-4 ..... Revision 1
2.7.2.4-5 ..... Revision 1
2.7.2.4-6 ..... Revision 1
2.7.2.4-7 ..... Revision 1
2.7.2.5-1 ..... Revision 1
2.7.2.6-1 ..... Revision 1
2.7.3.1-1 ..... Revision 10
2.7.3.2-1 ..... Revision 10
2.7.3.2-2 ..... Revision 10
2.7.3.2-3 ..... Revision 10
2.7.3.2-4 ..... Revision 10
2.7.3.2-5 ..... Revision 10
2.7.3.2-6 ..... Revision 10
2.7.3.3-1 ..... Revision 1
2.7.3.3-2 ..... Revision 10
2.7.3.3-3 ..... Revision 10
2.7.3.4-1 ..... Revision 10
2.7.3.4-2 ..... Revision 1
2.7.3.5-1 ..... Revision 1
2.7.3.6-1 ..... Revision 1
2.7.4-1 ..... Revision 10
2.7.5-1 ..... Revision 10
2.7.6-1 ..... Revision 10
2.7.7-1 ..... Revision 10

List of Effective Pages (Continued)

2.7.7-2 ..... Revision 10
2.7.7-3 ..... Revision 10
2.7.7-4 ..... Revision 10
2.7.8-1 ..... Revision 10
2.7.8-2 ..... Revision 10
2.7.8-3 ..... Revision 10
2.7.8-4 ..... Revision 10
2.7.8.1-1 ..... Revision 10
2.7.8.1-2 ..... Revision 2
2.7.8.1-3 ..... Revision 10
2.7.8.1-4 ..... Revision 2
2.7.8.1-5 ..... Revision 2
2.7.8.1-6 ..... Revision 10
2.7.8.1-7 ..... Revision STC-01A
2.7.8.1-8 ..... Revision 10
2.7.8.1-9 ..... Revision 10
2.7.8.1-10 ..... Revision 2
2.7.8.1-11 ..... Revision 2
2.7.8.1-12 ..... Revision 2
2.7.8.1-13 ..... Revision 2
2.7.8.1-14 ..... Revision 2
2.7.8.1-15 ..... Revision 2
2.7.8.1-16 ..... Revision 2
2.7.8.1-17 ..... Revision 2
2.7.8.1-18 ..... Revision 2
2.7.8.1-19 ..... Revision 2
2.7.8.1-20 ..... Revision 2
2.7.8.1-21 ..... Revision 2
2.7.8.1-22 ..... Revision 2
2.7.8.1-23 ..... Revision 2
2.7.8.1-24 ..... Revision 2
2.7.8.1-25 ..... Revision 2
2.7.8.1-26 ..... Revision 2
2.7.8.1-27 ..... Revision 2
2.7.8.1-28 ..... Revision 2
2.7.8.1-29 ..... Revision 2
2.7.8.1-30 ..... Revision 2
2.7.8.1-31 ..... Revision 2
2.7.8.1-32 ..... Revision 2
2.7.8.1-33 ..... Revision 2
2.7.8.1-34 ..... Revision 2
2.7.8.1-35 ..... Revision 2
2.7.8.1-36 ..... Revision 2
2.7.8.1-37 ..... Revision 2
2.7.8.1-38 ..... Revision 2
2.7.8.1-39 ..... Revision 2
2.7.8.1-40 ..... Revision 2
2.7.8.1-41 ..... Revision 2
2.7.8.1-42 ..... Revision 2
2.7.8.1-43 ..... Revision 2
2.7.8.2-1 ..... Revision STC-01A
2.7.8.2-2 ..... Revision STC-01A
2.7.8.3-1 ..... Revision 2
2.7.8.3-2 ..... Revision 2
2.7.8.3-3 ..... Revision 2
2.7.8.3-4 ..... Revision 2
2.7.8.3-5 ..... Revision 2
2.7.8.3-6 ..... Revision 2
2.7.8.3-7 ..... Revision STC-01A
2.7.8.3-8 ..... Revision STC-01A
2.7.8.3-9 ..... Revision 10
2.7.8.3-10 ..... Revision 2
2.7.8.3-11 ..... Revision 2
2.7.8.3-12 ..... Revision 2
2.7.8.3-13 ..... Revision 2
2.7.8.4-1 ..... Revision 2
2.7.8.4-2 ..... Revision 10
2.7.8.4-3 ..... Revision 5
2.7.8.4-4 ..... Revision 5
2.7.8.4-5 ..... Revision 5

List of Effective Pages (Continued)

2.7.8.4-6 ..... Revision 5
2.7.8.4-7 ..... Revision 10
2.7.8.4-8 ..... Revision 5
2.7.8.4-9 ..... Revision 5
2.7.8.4-10 ..... Revision 5
2.7.8.5-1 ..... Revision 3
2.7.9-1 ..... Revision 10
2.7.9-2 ..... Revision 10
2.7.9-3 ..... Revision 10
2.7.9-4 ..... Revision 10
2.7.9-5 ..... Revision 10
2.7.9-6 ..... Revision 10
2.7.9-7 ..... Revision 10
2.7.9-8 ..... Revision 10
2.7.9-9 ..... Revision 10
2.7.9-10 ..... Revision 10
2.7.9-11 ..... Revision 10
2.7.9-12 ..... Revision 10
2.7.9-13 ..... Revision 10
2.7.9-14 ..... Revision 10
2.7.9-15 ..... Revision 10
2.7.9-16 ..... Revision 10
2.7.9-17 ..... Revision 10
2.7.9-18 ..... Revision 10
2.7.9-19 ..... Revision 10
2.7.9-20 ..... Revision 10
2.7.9-21 ..... Revision 10
2.7.9-22 ..... Revision 10
2.7.9-23 ..... Revision 10
2.7.9-24 ..... Revision 10
2.7.9-25 ..... Revision 10
2.7.9-26 ..... Revision 10
2.7.9-27 ..... Revision 10
2.7.9-28 ..... Revision 10
2.7.9-29 ..... Revision 10
2.7.9-30 ..... Revision 10
2.7.9-31 ..... Revision 12
2.7.9-32 ..... Revision 10
2.7.9-33 ..... Revision 10
2.7.9-34 ..... Revision 10
2.7.9-35 ..... Revision 10
2.7.9-36 ..... Revision 10
2.7.9-37 ..... Revision 10
2.7.10-1 ..... Revision 10
2.7.10-2 ..... Revision 10
2.7.10-3 ..... Revision 10
2.7.10-4 ..... Revision 10
2.7.10-5 ..... Revision 10
2.7.10-6 ..... Revision 10
2.7.10-7 ..... Revision 10
2.7.10-8 ..... Revision 10
2.7.10-9 ..... Revision 10
2.7.11-1 ..... Revision 10
2.7.11-2 ..... Revision 10
2.7.11-3 ..... Revision 11
2.7.11-4 ..... Revision 10
2.7.11-5 ..... Revision 11
2.7.11-6 ..... Revision 11
2.7.11-7 ..... Revision 11
2.7.11-8 ..... Revision 11
2.7.11-9 ..... Revision 10
2.7.11-10 ..... Revision 11
2.7.11-11 ..... Revision 12
2.7.11-12 ..... Revision 12
2.7.11-13 ..... Revision 12
2.7.11-14 ..... Revision 12
2.7.11-15 ..... Revision 12
2.7.11-16 ..... Revision 12
2.8.0-1 ..... Revision 1
2.9-1 ..... Revision 12

List of Effective Pages (Continued)

2.9-2 ..... Revision 12
2.9-3 ..... Revision 12
2.9-4 ..... Revision 12
2.9-5 ..... Revision 12
2.9-6 ..... Revision 12
2.9-7 ..... Revision 12
2.9-8 ..... Revision 12
2.9-9 ..... Revision 12
2.10.1-1 ..... Revision 10
2.10.1-2 ..... Revision 10
2.10.1-3 ..... Revision 1
2.10.2-1 ..... Revision 10
2.10.2-2 ..... Revision 1
2.10.2-3 ..... Revision 1
2.10.2-4 ..... Revision 2
2.10.2-5 ..... Revision 10
2.10.2-6 ..... Revision 1
2.10.2-7 ..... Revision 1
2.10.2-8 ..... Revision 1
2.10.2-9 ..... Revision 1
2.10.2-10 ..... Revision 1
2.10.2-11 ..... Revision 1
2.10.2-12 ..... Revision 10
2.10.2-13 ..... Revision 10
2.10.2-14 ..... Revision 10
2.10.2-15 ..... Revision 10
2.10.2-16 ..... Revision 10
2.10.2-17 ..... Revision 10
2.10.2-18 ..... Revision 10
2.10.2-19 ..... Revision 10
2.10.2-20 ..... Revision 10
2.10.2-21 ..... Revision 10
2.10.2-22 ..... Revision 10
2.10.2-23 ..... Revision 10
2.10.2-24 ..... Revision 10
2.10.2-25 ..... Revision 10
2.10.2-26 ..... Revision 10
2.10.2-27 ..... Revision 10
2.10.2-28 ..... Revision 10
2.10.2-29 ..... Revision 1
2.10.2-30 ..... Revision 1
2.10.2-31 ..... Revision 1
2.10.2-32 ..... Revision 2
2.10.2-33 ..... Revision 1
2.10.2-34 ..... Revision 1
2.10.2-35 ..... Revision 1
2.10.2-36 ..... Revision 1
2.10.2-37 ..... Revision 1
2.10.2-38 ..... Revision 1
2.10.2-39 ..... Revision 1
2.10.2-40 ..... Revision 1
2.10.2-41 ..... Revision 1
2.10.2-42 ..... Revision 1
2.10.2-43 ..... Revision 1
2.10.2-44 ..... Revision 1
2.10.2-45 ..... Revision 1
2.10.2-46 ..... Revision 1
2.10.2-47 ..... Revision 1
2.10.2-48 ..... Revision 1
2.10.2-49 ..... Revision 1
2.10.2-50 ..... Revision 1
2.10.2-51 ..... Revision 1
2.10.2-52 ..... Revision 1
2.10.2-53 ..... Revision 1
2.10.2-54 ..... Revision 1
2.10.2-55 ..... Revision 1
2.10.2-56 ..... Revision 1
2.10.2-57 ..... Revision 1
2.10.2-58 ..... Revision 1
2.10.2-59 ..... Revision 1

List of Effective Pages (Continued)

2.10.2-60 ..... Revision 1
2.10.2-61 ..... Revision 1
2.10.2-62 ..... Revision 1
2.10.2-63 ..... Revision 1
2.10.2-64 ..... Revision 1
2.10.2-65 ..... Revision 1
2.10.2-66 ..... Revision 1
2.10.2-67 ..... Revision 1
2.10.2-68 ..... Revision 1
2.10.2-69 ..... Revision 1
2.10.2-70 ..... Revision 1
2.10.2-71 ..... Revision 1
2.10.2-72 ..... Revision 1
2.10.2-73 ..... Revision 1
2.10.2-74 ..... Revision 1
2.10.2-75 ..... Revision 1
2.10.2-76 ..... Revision 2
2.10.2-77 ..... Revision 1
2.10.2-78 ..... Revision 1
2.10.2-79 ..... Revision 1
2.10.2-80 ..... Revision 1
2.10.2-81 ..... Revision 1
2.10.2-82 ..... Revision 1
2.10.2-83 ..... Revision 1
2.10.2-84 ..... Revision 1
2.10.2-85 ..... Revision 1
2.10.2-86 ..... Revision 1
2.10.2-87 ..... Revision 1
2.10.2-88 ..... Revision 1
2.10.2-89 ..... Revision 1
2.10.2-90 ..... Revision 1
2.10.2-91 ..... Revision 1
2.10.2-92 ..... Revision 1
2.10.2-93 ..... Revision 1
2.10.2-94 ..... Revision 1
2.10.3-1 ..... Revision 1
2.10.4-1 ..... Revision 10
2.10.4-2 ..... Revision 1
2.10.4-3 ..... Revision 1
2.10.4-4 ..... Revision 1
2.10.4-5 ..... Revision 1
2.10.4-6. ..... Revision 1
2.10.4-7. ..... Revision 1
2.10.4-8. ..... Revision 1
2.10.4-9 ..... Revision 1
2.10.4-10 ..... Revision 1
2.10.4-11 ..... Revision 1
2.10.4-12 ..... Revision 1
2.10.4-13 ..... Revision 1
2.10.4-14 ..... Revision 1
2.10.4-15 ..... Revision 1
2.10.4-16 ..... Revision 1
2.10.4-17 ..... Revision 1
2.10.4-18 ..... Revision 1
2.10.4-19 ..... Revision 1
2.10.4-20 ..... Revision 1
2.10.4-21 ..... Revision 1
2.10.4-22 ..... Revision 1
2.10.4-23 ..... Revision 1
2.10.4-24 ..... Revision 1
2.10.4-25 ..... Revision 1
2.10.4-26 ..... Revision 1
2.10.4-27 ..... Revision 1
2.10.4-28 ..... Revision 1
2.10.4-29 ..... Revision 1
2.10.4-30 ..... Revision 1
2.10.4-31 ..... Revision 1
2.10.4-32 ..... Revision 1
2.10.4-33 ..... Revision 1
2.10.4-34 ..... Revision 1

List of Effective Pages (Continued)

2.10.4-35 ..... Revision 1
2.10.4-36 ..... Revision 1
2.10.4-37 ..... Revision 1
2.10.4-38 ..... Revision 1
2.10.4-39 ..... Revision 1
2.10.4-40 ..... Revision 1
2.10.4-41 ..... Revision 1
2.10.4-42 ..... Revision 1
2.10.4-43 ..... Revision 1
2.10.4-44 ..... Revision 1
2.10.4-45 ..... Revision 1
2.10.4-46 ..... Revision 1
2.10.4-47 ..... Revision 1
2.10.4-48 ..... Revision 1
2.10.4-49 ..... Revision 1
2.10.4-50 ..... Revision 1
2.10.4-51 ..... Revision 1
2.10.4-52 ..... Revision 1
2.10.4-53 ..... Revision 1
2.10.4-54 ..... Revision 1
2.10.4-55 ..... Revision 1
2.10.4-56 ..... Revision 1
2.10.4-57 ..... Revision 1
2.10.4-58 ..... Revision 1
2.10.4-59 ..... Revision 1
2.10.4-60 ..... Revision 1
2.10.4-61 ..... Revision 1
2.10.4-62 ..... Revision 1
2.10.4-63 ..... Revision 1
2.10.4-64 ..... Revision 1
2.10.4-65 ..... Revision 1
2.10.4-66 ..... Revision 1
2.10.4-67 ..... Revision 1
2.10.4-68 ..... Revision 1
2.10.4-69 ..... Revision 1
2.10.4-70 ..... Revision 1
2.10.4-71 ..... Revision 1
2.10.4-72 ..... Revision 1
2.10.4-73 ..... Revision 1
2.10.4-74 ..... Revision 1
2.10.4-75 ..... Revision 1
2.10.4-76 ..... Revision 1
2.10.4-77 ..... Revision 1
2.10.4-78 ..... Revision 1
2.10.4-79 ..... Revision 1
2.10.4-80 ..... Revision 1
2.10.4-81 ..... Revision 1
2.10.4-82 ..... Revision 1
2.10.4-83 ..... Revision 1
2.10.4-84 ..... Revision 1
2.10.4-85 ..... Revision 2
2.10.4-86 ..... Revision 2
2.10.4-87 ..... Revision 2
2.10.4-88 ..... Revision 1
2.10.4-89 ..... Revision 1
2.10.4-90 ..... Revision 1
2.10.4-91 ..... Revision 1
2.10.4-92 ..... Revision 1
2.10.4-93 ..... Revision 1
2.10.4-94 ..... Revision 1
2.10.4-95 ..... Revision 1
2.10.4-96 ..... Revision 1
2.10.4-97 ..... Revision 2
2.10.4-98 ..... Revision 2
2.10.4-99 ..... Revision 2
2.10.4-100 ..... Revision 1
2.10.4-101 ..... Revision 1
2.10.4-102 ..... Revision 1
2.10.4-103 ..... Revision 1
2.10.4-104 ..... Revision 1

List of Effective Pages (Continued)

2.10.4-105 ..... Revision 1
2.10.4-106 ..... Revision 1
2.10.4-107 ..... Revision 1
2.10.4-108 ..... Revision 1
2.10.4-109 ..... Revision 1
2.10.4-110 ..... Revision 1
2.10.4-111 ..... Revision 2
2.10.4-112 ..... Revision 2
2.10.4-113 ..... Revision 2
2.10.4-114 ..... Revision 2
2.10.4-115 ..... Revision 2
2.10.4-116 ..... Revision 2
2.10.4-117 ..... Revision 2
2.10.4-118 ..... Revision 2
2.10.4-119 ..... Revision 2
2.10.4-120 ..... Revision 1
2.10.4-121 ..... Revision 1
2.10.4-122 ..... Revision 1
2.10.4-123 ..... Revision 1
2.10.4-124 ..... Revision 1
2.10.4-125 ..... Revision 1
2.10.4-126 ..... Revision 1
2.10.4-127 ..... Revision 1
2.10.4-128 ..... Revision 1
2.10.4-129 ..... Revision 1
2.10.4-130 ..... Revision 1
2.10.4-131 ..... Revision 2
2.10.4-132 ..... Revision 2
2.10.4-133 ..... Revision 2
2.10.4-134 ..... Revision 2
2.10.4-135 ..... Revision 2
2.10.4-136 ..... Revision 2
2.10.4-137 ..... Revision 2
2.10.4-138 ..... Revision 2
2.10.4-139 ..... Revision 2
2.10.4-140 ..... Revision 1
2.10.4-141 ..... Revision 1
2.10.4-142 ..... Revision 2
2.10.4-143 ..... Revision 1
2.10.4-144 ..... Revision 1
2.10.4-145 ..... Revision 1
2.10.4-146 ..... Revision 1
2.10.4-147 ..... Revision 1
2.10.4-148 ..... Revision 1
2.10.4-149 ..... Revision 2
2.10.4-150 ..... Revision 2
2.10.4-151 ..... Revision 2
2.10.4-152 ..... Revision 1
2.10.4-153 ..... Revision 1
2.10.4-154 ..... Revision 1
2.10.4-155 ..... Revision 1
2.10.4-156 ..... Revision 1
2.10.4-157 ..... Revision 1
2.10.4-158 ..... Revision 10
2.10.4-159 ..... Revision 1
2.10.4-160 ..... Revision 1
2.10.4-161 ..... Revision 1
2.10.4-162 ..... Revision 1
2.10.4-163 ..... Revision 1
2.10.4-164 ..... Revision 1
2.10.4-165 ..... Revision 1
2.10.4-166 ..... Revision 1
2.10.4-167 ..... Revision 1
2.10.4-168 ..... Revision 1
2.10.4-169 ..... Revision 1
2.10.4-170 ..... Revision 1
2.10.4-171 ..... Revision 1
2.10.4-172 ..... Revision 2
2.10.4-173 ..... Revision 2
2.10.4-174 ..... Revision 2

List of Effective Pages (Continued)

2.10.4-175 ..... Revision 1
2.10.4-176 ..... Revision 1
2.10.4-177 ..... Revision 1
2.10.4-178 ..... Revision 1
2.10.4-179 ..... Revision 1
2.10.4-180 ..... Revision 1
2.10.4-181 ..... Revision 1
2.10.4-182 ..... Revision 1
2.10.4-183 ..... Revision 1
2.10.4-184 ..... Revision 1
2.10.4-185 ..... Revision 10
2.10.4-186 ..... Revision 1
2.10.4-187 ..... Revision 1
2.10.4-188 ..... Revision 1
2.10.4-189 ..... Revision 1
2.10.4-190 ..... Revision 2
2.10.4-191 ..... Revision 2
2.10.4-192 ..... Revision 2
2.10.4-193 ..... Revision 1
2.10.4-194 ..... Revision 1
2.10.4-195 ..... Revision 1
2.10.4-196 ..... Revision 1
2.10.4-197 ..... Revision 1
2.10.4-198 ..... Revision 1
2.10.4-199 ..... Revision 1
2.10.4-200 ..... Revision 1
2.10.4-201 ..... Revision 1
2.10.4-202 ..... Revision 1
2.10.4-203 ..... Revision 1
2.10.4-204 ..... Revision 1
2.10.4-205 ..... Revision 2
2.10.4-206 ..... Revision 2
2.10.4-207 ..... Revision 2
2.10.4-208 ..... Revision 2
2.10.4-209 ..... Revision 2
2.10.4-210 ..... Revision 2
2.10.4-211 ..... Revision 1
2.10.4-212 ..... Revision 1
2.10.4-213 ..... Revision 1
2.10.4-214 ..... Revision 1
2.10.4-215 ..... Revision 1
2.10.4-216 ..... Revision 1
2.10.4-217 ..... Revision 2
2.10.4-218 ..... Revision 2
2.10.4-219 ..... Revision 2
2.10.4-220 ..... Revision 2
2.10.4-221 ..... Revision 2
2.10.4-222 ..... Revision 2
2.10.4-223 ..... Revision 1
2.10.4-224 ..... Revision 1
2.10.4-225 ..... Revision 1
2.10.4-226 ..... Revision 1
2.10.4-227 ..... Revision 1
2.10.4-228 ..... Revision 2
2.10.4-229 ..... Revision 2
2.10.4-230 ..... Revision 1
2.10.4-231 ..... Revision 1
2.10.4-232 ..... Revision 1
2.10.4-233 ..... Revision 1
2.10.4-234 ..... Revision 1
2.10.4-235 ..... Revision 1
2.10.4-236 ..... Revision 1
2.10.4-237 ..... Revision 1
2.10.4-238 ..... Revision 1
2.10.4-239 ..... Revision 1
2.10.4-240 ..... Revision 1
2.10.4-241 ..... Revision 2
2.10.4-242 ..... Revision 2
2.10.4-243 ..... Revision 1
2.10.4-244 ..... Revision 1

List of Effective Pages (Continued)

2.10.4-245 ..... Revision 1
2.10.4-246 ..... Revision 1
2.10.4-247 ..... Revision 1
2.10.4-248 ..... Revision 1
2.10.4-249 ..... Revision 1
2.10.4-250 ..... Revision 1
2.10.4-251 ..... Revision 1
2.10.4-252 ..... Revision 1
2.10.4-253 ..... Revision 1
2.10.4-254 ..... Revision 2
2.10.4-255 ..... Revision 2
2.10.4-256 ..... Revision 1
2.10.4-257 ..... Revision 1
2.10.4-258 ..... Revision 10
2.10.4-259 ..... Revision 1
2.10.4-260 ..... Revision 1
2.10.4-261 ..... Revision 2
2.10.4-262 ..... Revision 1
2.10.4-263 ..... Revision 1
2.10.4-264 ..... Revision 1
2.10.4-265 ..... Revision 1
2.10.4-266 ..... Revision 1
2.10.4-267 ..... Revision 2
2.10.4-268 ..... Revision 2
2.10.4-269 ..... Revision 1
2.10.4-270 ..... Revision 1
2.10.4-271 ..... Revision 1
2.10.4-272 ..... Revision 1
2.10.4-273 ..... Revision 1
2.10.4-274 ..... Revision 2
2.10.4-275 ..... Revision 2
2.10.4-276 ..... Revision 1
2.10.4-277 ..... Revision 1
2.10.4-278 ..... Revision 1
2.10.4-279 ..... Revision 1
2.10.4-280 ..... Revision 1
2.10.4-281 ..... Revision 2
2.10.4-282 ..... Revision 2
2.10.4-283 ..... Revision 1
2.10.4-284 ..... Revision 1
2.10.4-285 ..... Revision 1
2.10.4-286 ..... Revision 1
2.10.4-287 ..... Revision 1
2.10.4-288 ..... Revision 1
2.10.5-1 ..... Revision 10
2.10.5-2 ..... Revision 10
2.10.5-3 ..... Revision 1
2.10.5-4 ..... Revision 1
2.10.5-5 ..... Revision 1
2.10.5-6 ..... Revision 1
2.10.5-7 ..... Revision 10
2.10.5-8 ..... Revision 10
2.10.5-9 ..... Revision 10
2.10.5-10 ..... Revision 10
2.10.5-11 ..... Revision 10
2.10.5-12 ..... Revision 10
2.10.5-13 ..... Revision 10
2.10.5-14 ..... Revision 10
2.10.5-15 ..... Revision 10
2.10.5-16 ..... Revision 10
2.10.5-17 ..... Revision 10
2.10.5-18 ..... Revision 10
2.10.5-19 ..... Revision 10
2.10.5-20 ..... Revision 10
2.10.5-21 ..... Revision 10
2.10.5-22 ..... Revision 10
2.10.6-1 ..... Revision 10
2.10.6-2 ..... Revision 10
2.10.6-3 ..... Revision 10
2.10.6-4 ..... Revision 2

List of Effective Pages (Continued)

2.10.6-5 ..... Revision 2
2.10.6-6 ..... Revision 2
2.10.6-7 ..... Revision 2
2.10.6-8 ..... Revision 2
2.10.6-9 ..... Revision 2
2.10.6-10 ..... Revision 2
2.10.6-11 ..... Revision 2
2.10.6-12 ..... Revision 2
2.10.6-13 ..... Revision 2
2.10.6-14 ..... Revision 2
2.10.6-15 ..... Revision 2
2.10.6-16 ..... Revision 2
2.10.6-17 ..... Revision 2
2.10.6-18 ..... Revision 2
2.10.6-19 ..... Revision 2
2.10.6-20 ..... Revision 2
2.10.6-21 ..... Revision 2
2.10.6-22 ..... Revision 2
2.10.6-23 ..... Revision 2
2.10.6-24 ..... Revision 2
2.10.6-25 ..... Revision 2
2.10.6-26 ..... Revision 2
2.10.6-27 ..... Revision 2
2.10.6-28 ..... Revision 2
2.10.6-29 ..... Revision 2
2.10.6-30 ..... Revision 2
2.10.6-31 ..... Revision 2
2.10.6-32 ..... Revision 2
2.10.6-33 ..... Revision 2
2.10.6-34 ..... Revision 2
2.10.6-35 ..... Revision 2
2.10.6-36 ..... Revision 2
2.10.6-37 ..... Revision 2
2.10.6-38 ..... Revision 2
2.10.6-39 ..... Revision 2
2.10.6-40 ..... Revision 2
2.10.6-41 ..... Revision 2
2.10.6-42 ..... Revision 2

13 drawings

2.10.6-43 ..... Revision 2
2.10.6-44 ..... Revision 2
2.10.6-45 ..... Revision 2
2.10.6-46 ..... Revision 2
2.10.6-47 ..... Revision 2
2.10.6-48 ..... Revision 2
2.10.6-49 ..... Revision 2
2.10.6-50 ..... Revision 2
2.10.6-51 ..... Revision 2
2.10.6-52 ..... Revision 2
2.10.6-53 ..... Revision 2
2.10.6-54 ..... Revision 2
2.10.6-55 ..... Revision 2
2.10.6-56 ..... Revision 2
2.10.6-57 ..... Revision 2
2.10.6-58 ..... Revision 2
2.10.6-59 ..... Revision 2
2.10.6-60 ..... Revision 2
2.10.6-61 ..... Revision 2
2.10.6-62 ..... Revision 2
2.10.6-63 ..... Revision 2
2.10.6-64 ..... Revision 2
2.10.6-65 ..... Revision 2
2.10.6-66 ..... Revision 2
2.10.6-67 ..... Revision 2
2.10.6-68 ..... Revision 2
2.10.6-69 ..... Revision 2
2.10.6-70 ..... Revision 2
2.10.6-71 ..... Revision 2

List of Effective Pages (Continued)

2.10.6-72 ..... Revision 2
2.10.6-73 ..... Revision 2
2.10.6-74 ..... Revision 2
2.10.6-75 ..... Revision 2
2.10.6-76 ..... Revision 2
2.10.6-77 ..... Revision 2
2.10.6-78 ..... Revision 2
2.10.6-79 ..... Revision 2
2.10.6-80 ..... Revision 2
2.10.6-81 ..... Revision 2
2.10.6-82 ..... Revision 2
2.10.6-83 ..... Revision 2
2.10.6-84 ..... Revision 2
2.10.6-85 ..... Revision 2
2.10.6-86 ..... Revision 2
2.10.6-87 ..... Revision 2
2.10.6-88 ..... Revision 2
2.10.6-89 ..... Revision 2
2.10.6-90 ..... Revision 2
2.10.6-91 ..... Revision 2
2.10.6-92 ..... Revision 2
2.10.6-93 ..... Revision 2
2.10.6-94 ..... Revision 2
2.10.7-1 ..... Revision 10
2.10.7-2 ..... Revision 2
2.10.7-3 ..... Revision 10
2.10.7-4 ..... Revision 2
2.10.7-5 ..... Revision 2
2.10.7-6 ..... Revision 10
2.10.7-7 ..... Revision 10
2.10.7-8 ..... Revision 10
2.10.7-9 ..... Revision 2
2.10.7-10 ..... Revision 2
2.10.7-11 ..... Revision 2
2.10.7-12 ..... Revision 2
2.10.7-13 ..... Revision 2
2.10.7-14 ..... Revision 10
2.10.7-15 ..... Revision 2
2.10.7-16 ..... Revision 2
2.10.7-17 ..... Revision 2
2.10.7-18 ..... Revision 2
2.10.7-19 ..... Revision 2
2.10.7-20 ..... Revision 2
2.10.7-21 ..... Revision 2
2.10.7-22 ..... Revision 2
2.10.7-23 ..... Revision 2
2.10.7-24 ..... Revision 2
2.10.7-25 ..... Revision 2
2.10.7-26 ..... Revision 2
2.10.7-27 ..... Revision 2
2.10.7-28 ..... Revision 2
2.10.7-29 ..... Revision 2
2.10.8-1 ..... Revision 10
2.10.8-2 ..... Revision 10
2.10.8-3 ..... Revision 10
2.10.8-4 ..... Revision 10
2.10.8-5 ..... Revision 10
2.10.8-6 ..... Revision 10
2.10.8-7 ..... Revision 10
2.10.8-8 ..... Revision 10
2.10.8-9 ..... Revision 10
2.10.8-10 ..... Revision 10
2.10.8-11 ..... Revision 10
2.10.8-12 ..... Revision 10
2.10.8-13 ..... Revision 10
2.10.8-14 ..... Revision 10
2.10.8-15 ..... Revision 10
2.10.8-16 ..... Revision 10
2.10.8-17 ..... Revision 10
2.10.8-18 ..... Revision 10

List of Effective Pages (Continued)

2.10.8-19 ..... Revision 10
2.10.8-20 ..... Revision 10
2.10.8-21 ..... Revision 10
2.10.8-22 ..... Revision 10
2.10.8-23 ..... Revision 10
2.10.8-24 ..... Revision 10
2.10.8-25 ..... Revision 10
2.10.8-26 ..... Revision 10
2.10.8-27 ..... Revision 10
2.10.9-1 ..... Revision 10
2.10.9-2 ..... Revision 2
2.10.9-3 ..... Revision 1
2.10.9-4 ..... Revision 1
2.10.9-5 ..... Revision 1
2.10.9-6 ..... Revision 1
2.10.9-7 ..... Revision 1
2.10.9-8 ..... Revision 1
2.10.9-9 ..... Revision 1
2.10.9-10 ..... Revision 1
2.10.9-11 ..... Revision 1
2.10.9-12 ..... Revision 1
2.10.10-1 ..... Revision 10
2.10.10-2 ..... Revision 2
2.10.10-3 ..... Revision 2
2.10.10-4 ..... Revision 2
2.10.10-5 ..... Revision 2
2.10.10-6 ..... Revision 2
2.10.10-7 ..... Revision 2
2.10.10-8 ..... Revision 2
2.10.10-9 ..... Revision 2
2.10.10-10 ..... Revision 10
2.10.10-11 ..... Revision 10
2.10.11-1 ..... Revision 10
2.10.11-2 ..... Revision 10
2.10.11-3 ..... Revision 10
2.10.11-4 ..... Revision 10
2.10.11-5 ..... Revision 10
2.10.11-6 ..... Revision 10
2.10.11-7 ..... Revision 10
2.10.11-8 ..... Revision 10

Chapter 3

3-i ..... Revision 10
3-ii ..... Revision 10
3-iii ..... Revision 10
3-iv ..... Revision STC-02F
3.1-1 ..... Revision 10
3.1-2 ..... Revision 10
3.1-3 ..... Revision 10
3.1-4 ..... Revision 10
3.1-5 ..... Revision STC-02F
3.1-6 ..... Revision 10
3.1-7 ..... Revision 10
3.1-8 ..... Revision 10
3.2-1 ..... Revision 10
3.2-2 ..... Revision 10
3.2-3 ..... Revision STC-02F
3.2-4 ..... Revision 10
3.2-5 ..... Revision STC-02F
3.2-6 ..... Revision 10
3.2-7 ..... Revision 10
3.2-8 ..... Revision 10
3.2-9 ..... Revision 10
3.2-10 ..... Revision 5
3.2-11 ..... Revision 5
3.2-12 ..... Revision 5
3.2-13 ..... Revision 5
3.2-14 ..... Revision 5
3.2-15 ..... Revision STC-02F

List of Effective Pages (Continued)

3.2-16 ..... Revision 10
3.2-17 ..... Revision 10
3.2-18 ..... Revision STC-02F
3.3-1 ..... Revision 10
3.3-2 ..... Revision STC-02F
3.3-3 ..... Revision 10
3.3-4 ..... Revision 10
3.3-5 ..... Revision 10
3.3-6 ..... Revision 10
3.4-1 ..... Revision 10
3.4-2 ..... Revision 10
3.4-3 ..... Revision 10
3.4-4 ..... Revision 10
3.4-5 ..... Revision STC-02F
3.4-6 ..... Revision STC-02F
3.4-7 ..... Revision STC-02F
3.4-8 ..... Revision 10
3.4-9 ..... Revision STC-02F
3.4-10 ..... Revision STC-02F
3.4-11 ..... Revision 10
3.4-12 ..... Revision 10
3.4-13 ..... Revision STC-02F
3.4-14 ..... Revision 10
3.4-15 ..... Revision STC-02F
3.4-16 ..... Revision 10
3.4-17 ..... Revision 10
3.4-18 ..... Revision 10
3.4-19 ..... Revision 10
3.4-20 ..... Revision 10
3.4-21 ..... Revision 10
3.4-22 ..... Revision STC-02F
3.4-23 ..... Revision 10
3.4-24 ..... Revision 10
3.4-25 ..... Revision 10
3.4-26 ..... Revision 10
3.4-27 ..... Revision 10
3.4-28 ..... Revision 10
3.4-29 ..... Revision 10
3.4-30 ..... Revision 10
3.4-31 ..... Revision 10
3.4-32 ..... Revision 10
3.4-33 ..... Revision 10
3.4-34 ..... Revision 10
3.4-35 ..... Revision 10
3.4-36 ..... Revision 10
3.4-37 ..... Revision 10
3.4-38 ..... Revision 10
3.4-39 ..... Revision 10
3.4-40 ..... Revision 10
3.4-41 ..... Revision 10
3.4-42 ..... Revision 10
3.4-43 ..... Revision 10
3.4-44 ..... Revision 10
3.4-45 ..... Revision 10
3.4-46 ..... Revision 10
3.4-47 ..... Revision 10
3.4-48 ..... Revision 10
3.4-49 ..... Revision 10
3.4-50 ..... Revision 10
3.4-51 ..... Revision 10
3.4-52 ..... Revision 10
3.4-53 ..... Revision 10
3.4-54 ..... Revision 10
3.4-55 ..... Revision 10
3.4-56 ..... Revision 10
3.4-57 ..... Revision 10
3.4-58 ..... Revision 10
3.4-59 ..... Revision 10
3.4-60 ..... Revision 10
3.4-61 ..... Revision 10

List of Effective Pages (Continued)

3.4-62 ..... Revision STC-02F
3.4-63 ..... Revision STC-02F
3.4-64 ..... Revision STC-02F
3.4-65 ..... Revision STC-02F
3.4-66 ..... Revision 10
3.5-1 ..... Revision 10
3.5-2 ..... Revision 10
3.5-3 ..... Revision 10
3.5-4 ..... Revision 10
3.5-5 ..... Revision 10
3.5-6 ..... Revision 10
3.5-7 ..... Revision 10
3.5-8 ..... Revision 10
3.5-9 ..... Revision 10
3.5-10 ..... Revision 10
3.5-11 ..... Revision 10
3.5-12 ..... Revision 10
3.5-13 ..... Revision STC-02F

Chapter 4

4-i ..... Revision STC-02F
4-ii ..... Revision STC-01A
4.1-1 ..... Revision STC-02F
4.1-2 ..... Revision STC-02F
4.1-3 ..... Revision STC-02F
4.1-4 ..... Revision STC-01A
4.1-5 ..... Revision STC-01A
4.1-6 ..... Revision STC-02F
4.1-7 ..... Revision STC-01A
4.1-8 ..... Revision STC-01A
4.1-9 ..... Revision STC-01A
4.1-10 ..... Revision STC-01A
4.1-11 ..... Revision STC-01A
4.2-1 ..... Revision STC-02F
4.2-2 ..... Revision STC-02F
4.2-3 ..... Revision STC-02F
4.2-4 ..... Revision STC-02F
4.2-5 ..... Revision STC-02F
4.2-6 ..... Revision STC-02F
4.2-7 ..... Revision STC-01A
4.2-8 ..... Revision STC-02F
4.2-9 ..... Revision STC-01A
4.2-10 ..... Revision STC-01A
4.2-11 ..... Revision STC-01A
4.2-12 ..... Revision STC-02F
4.2-13 ..... Revision STC-01A
4.2-14 ..... Revision STC-01A
4.2-15 ..... Revision STC-01A
4.2-16 ..... Revision STC-01A
4.3-1 ..... Revision STC-02F
4.3-2 ..... Revision STC-02F
4.3-3 ..... Revision STC-02F
4.3-4 ..... Revision STC-02F
4.4-1 ..... Revision 10
4.5-1 ..... Revision 1
4.5-2 ..... Revision 1
4.5-3 ..... Revision 1
4.5-4 ..... Revision 1
4.5-5 ..... Revision 1
4.5-6 ..... Revision 1
4.5-7 ..... Revision 1
4.5-8 ..... Revision 1
4.5-9 ..... Revision 1
4.5-10 ..... Revision 1
4.5-11 ..... Revision 1
4.5-12 ..... Revision 1
4.5-13 ..... Revision 1
4.5-14 ..... Revision STC-02F
4.5-15 ..... Revision 1

List of Effective Pages (Continued)

4.5-16 ..... Revision 1
4.5-17 ..... Revision 1
4.5-18 ..... Revision 1
4.5-19 ..... Revision 1
4.5-20 ..... Revision 1
4.5-21 ..... Revision 1
4.5-22 ..... Revision 1
4.5-23 ..... Revision 1
4.5-24 ..... Revision STC-02F
4.5-25 ..... Revision STC-02F
4.5-26 ..... Revision STC-02F
4.5-27 ..... Revision STC-02F
4.5-28 ..... Revision STC-02F
4.5-29 ..... Revision STC-02F
4.5-30 ..... Revision STC-02F

Chapter 5

5-i ..... Revision STC-02F
5-ii ..... Revision STC-02F
5-iii ..... Revision STC-02F
5-iv ..... Revision STC-02F
5-v ..... Revision STC-02F
5-1 .....Revision STC-01A
5-2 ..... Revision STC-02F
5-3 .....Revision STC-01A
5.1-1 .....Revision STC-01A
5.1-2 ..... Revision STC-02F
5.1-3 ..... Revision STC-02F
5.1-4 .....Revision STC-01A
5.1-5 ..... Revision STC-02F
5.1-6 ..... Revision STC-02F
5.1-7 ..... Revision STC-02F
5.1-8 .....Revision STC-01A
5.1-9 .....Revision STC-01A
5.1-10 .....Revision STC-01A
5.1-11 ..... Revision STC-02F
5.1-12 .....Revision STC-01A
5.1-13 .....Revision STC-01A
5.1-14 .....Revision STC-01A
5.1-15 ..... Revision STC-02F
5.1-16 .....Revision STC-01A
5.1-17 .....Revision STC-01A
5.1-18 .....Revision STC-01A
5.1-19 .....Revision STC-01A
5.2-1 ..... Revision STC-02F
5.2-2 ..... Revision STC-02F
5.2-3 ..... Revision STC-02F
5.2-4 ..... Revision STC-02F
5.2-5 ..... Revision STC-02F
5.2-6 ..... Revision STC-02F
5.2-7 .....Revision STC-01A
5.2-8 .....Revision STC-01A
5.2-9 .....Revision STC-01A
5.2-10 .....Revision STC-01A
5.2-11 .....Revision STC-01A
5.2-12 ..... Revision STC-02F
5.2-13 .....Revision STC-01A
5.2-14 .... Revision STC-02F
5.2-15 .....Revision STC-01A
5.2-16 .....Revision STC-01A
5.2-17 .....Revision STC-01A
5.2-18 .....Revision STC-01A
5.2-19 .....Revision STC-01A
5.2-20 .....Revision STC-01A
5.2-21 .....Revision STC-01A
5.2-22 ..... Revision STC-02F
5.3-1 ..... Revision STC-02F
5.3-2 ..... Revision STC-02F
5.3-3 ..... Revision STC-02F

List of Effective Pages (Continued)

5.3-4 ..... Revision STC-02F
5.3-5 ..... Revision STC-02F
5.3-6 ..... Revision STC-02F
5.3-7 ..... Revision STC-02F
5.3-8 ..... Revision STC-02F
5.3-9 ..... Revision STC-02F
5.3-10 ..... Revision STC-02F
5.3-11 ..... Revision STC-02F
5.3-12 ..... Revision STC-02F
5.3-13 ..... Revision STC-02F
5.3-14 ..... Revision STC-02F
5.3-15 ..... Revision STC-02F
5.3-16 ..... Revision STC-02F
5.3-17 ..... Revision STC-02F
5.3-18 ..... Revision STC-02F
5.3-19 ..... Revision STC-02F
5.3-20 ..... Revision STC-02F
5.3-21 ..... Revision STC-02F
5.4-1 ..... Revision STC-02F
5.4-2 ..... Revision STC-02F
5.4-3 ..... Revision STC-02F
5.4-4 ..... Revision STC-02F
5.4-5 ..... Revision STC-02F
5.4-6 ..... Revision STC-01A
5.4-7 ..... Revision STC-01A
5.4-8 ..... Revision STC-01A
5.4-9 ..... Revision STC-01A
5.4-10 ..... Revision STC-02F
5.4-11 ..... Revision STC-02F
5.4-12 ..... Revision STC-02F
5.4-13 ..... Revision STC-02F
5.4-14 ..... Revision STC-02F
5.4-15 ..... Revision STC-02F
5.4-16 ..... Revision STC-02F
5.4-17 ..... Revision STC-01A
5.4-18 ..... Revision STC-02F
5.4-19 ..... Revision STC-02F
5.5-1 ..... Revision STC-02F
5.5-2 ..... Revision STC-02F
5.5-3 ..... Revision STC-02F
5.5-4 ..... Revision STC-02F
5.5-5 ..... Revision STC-02F
5.5-6 ..... Revision STC-02F
5.5-7 ..... Revision STC-02F
5.5-8 ..... Revision STC-02F
5.5-9 ..... Revision STC-02F
5.5-10 ..... Revision STC-02F
5.5-11 ..... Revision STC-02F
5.5-12 ..... Revision STC-02F
5.5-13 ..... Revision STC-02F
5.5-14 ..... Revision STC-02F
5.5-15 ..... Revision STC-02F
5.5-16 ..... Revision STC-02F
5.5-17 ..... Revision STC-02F
5.5-18 ..... Revision STC-02F
5.5-19 ..... Revision STC-02F
5.5-20 ..... Revision STC-02F
5.5-21 ..... Revision STC-02F
5.5-22 ..... Revision STC-02F
5.5-23 ..... Revision STC-02F
5.5-24 ..... Revision STC-02F
5.5-25 ..... Revision STC-02F
5.5-26 ..... Revision STC-02F
5.5-27 ..... Revision STC-02F
5.5-28 ..... Revision STC-02F
5.5-29 ..... Revision STC-02F
5.5-30 ..... Revision STC-02F
5.5-31 ..... Revision STC-02F
5.5-32 ..... Revision STC-02F
5.5-33 ..... Revision STC-02F

List of Effective Pages (Continued)

5.5-34 ..... Revision STC-02F
5.5-35 ..... Revision STC-02F
5.5-36 ..... Revision STC-02F
5.5-37 ..... Revision STC-02F
5.5-38 ..... Revision STC-02F
5.5-39 ..... Revision STC-02F
5.5-40 ..... Revision STC-02F
5.5-41 ..... Revision STC-02F
5.5-42 ..... Revision STC-02F
5.5-43 ..... Revision STC-02F
5.5-44 ..... Revision STC-02F
5.5-45 ..... Revision STC-02F
5.5-46 ..... Revision STC-02F
5.5-47 ..... Revision STC-02F
5.5-48 ..... Revision STC-02F
5.5-49 ..... Revision STC-02F
5.5-50 ..... Revision STC-02F
5.5-51 ..... Revision STC-02F
5.5-52 ..... Revision STC-02F
5.5-53 ..... Revision STC-02F
5.5-54 ..... Revision STC-02F
5.5-55 ..... Revision STC-02F
5.5-56 ..... Revision STC-02F
5.5-57 ..... Revision STC-02F
5.5-58 ..... Revision STC-02F
5.5-59 ..... Revision STC-02F
5.5-60 ..... Revision STC-02F
5.5-61 ..... Revision STC-02F
5.5-62 ..... Revision STC-02F
5.5-63 ..... Revision STC-02F
5.5-64 ..... Revision STC-02F
5.5-65 ..... Revision STC-02F
5.5-66 ..... Revision STC-02F
5.5-67 ..... Revision STC-02F

Chapter 6

6-i ..... Revision STC-02F
6-ii ..... Revision STC-01A
6-iii ..... Revision STC-01A
6.1-1 ..... Revision STC-02F
6.1-2 ..... Revision STC-02F
6.1-3 ..... Revision STC-02F
6.1-4 ..... Revision STC-02F
6.2-1 ..... Revision STC-01A
6.2-2 ..... Revision 10
6.2-3 ..... Revision 10
6.2-4 ..... Revision STC-01A
6.2-5 ..... Revision 10
6.2-6 ..... Revision 10
6.3-1 ..... Revision STC-01A
6.3-2 ..... Revision STC-02F
6.3-3 ..... Revision STC-02F
6.3-4 ..... Revision 10
6.3-5 ..... Revision 10
6.3-6 ..... Revision 10
6.3-7 ..... Revision 13
6.4-1 ..... Revision STC-02F
6.4-2 ..... Revision STC-02F
6.4-3 ..... Revision STC-02F
6.4-4 ..... Revision STC-02F
6.4-5 ..... Revision STC-02F
6.4-6 ..... Revision STC-02F
6.4-7 ..... Revision STC-02F
6.4-8 ..... Revision STC-02F
6.4-9 ..... Revision STC-02F
6.4-10 ..... Revision STC-02F
6.4-11 ..... Revision STC-02F
6.4-12 ..... Revision STC-02F
6.4-13 ..... Revision STC-02F

List of Effective Pages (Continued)

6.4-14 ..... Revision STC-02F
6.4-15 ..... Revision STC-02F
6.4-16 ..... Revision STC-02F
6.4-17 .....Revision STC-01A
6.4-18 .....Revision STC-01A
6.5-1 ..... Revision 10
6.5-2 ..... Revision 10
6.5-3 ..... Revision 10
6.5-4 ..... Revision 10
6.5-5 ..... Revision 10
6.5-6 ..... Revision 10
6.5-7 ..... Revision 10
6.5-8 .....Revision STC-01A
6.5-9 .....Revision STC-01A
6.5-10 .....Revision STC-01A
6.5-11 .....Revision STC-01A
6.5-12 .....Revision STC-01A
6.5-13 .....Revision STC-01A
6.5-14 .....Revision STC-01A
6.5-15 .....Revision STC-01A
6.5-16 .....Revision STC-01A
6.5-17 .....Revision STC-01A
6.5-18 .....Revision STC-01A
6.5-19 .....Revision STC-01A
6.5-20 .....Revision STC-01A
6.5-21 .....Revision STC-01A
6.5-22 .....Revision STC-01A
6.6-1 ..... Revision 13
6.6-2 ..... Revision 10
6.6-3 ..... Revision 10
6.6-4 ..... Revision 10
6.6-5 ..... Revision 10
6.6-6 ..... Revision 10
6.6-7 ..... Revision 10
6.6-8 ..... Revision 10
6.6-9 ..... Revision 10
6.6-10 ..... Revision 10
6.6-11 ..... Revision 10
6.6-12 ..... Revision 10
6.6-13 ..... Revision 10
6.6-14 ..... Revision 10
6.6-15 ..... Revision 10
6.6-16 ..... Revision 10
6.6-17 ..... Revision 10
6.6-18 ..... Revision 10
6.6-19 ..... Revision 10
6.6-20 ..... Revision 10
6.6-21 ..... Revision 10
6.6-22 ..... Revision 10
6.6-23 ..... Revision 10
6.6-24 ..... Revision 10
6.6-25 ..... Revision 10
6.6-26 ..... Revision 10
6.6-27 ..... Revision 10
6.6-28 ..... Revision 10
6.6-29 ..... Revision 10
6.6-30 ..... Revision 10
6.6-31 ..... Revision 10
6.6-32 ..... Revision 10
6.6-33 ..... Revision 10
6.6-34 ..... Revision 10
6.6-35 ..... Revision 10
6.6-36 ..... Revision 10
6.6-37 ..... Revision 10
6.6-38 ..... Revision 10
6.6-39 ..... Revision 10
6.6-40 ..... Revision 10
6.6-41 ..... Revision 10
6.6-42 ..... Revision 10
6.6-43 ..... Revision 10

List of Effective Pages (Continued)

6.6-44 ..... Revision 10
6.6-45 ..... Revision 10
6.6-46 ..... Revision 10
6.6-47 ..... Revision 10
6.6-48 ..... Revision 10
6.6-49 ..... Revision 10
6.6-50 ..... Revision 10
6.6-51 ..... Revision 10
6.6-52 ..... Revision 10
6.6-53 ..... Revision 10
6.6-54 ..... Revision 10
6.6-55 ..... Revision 10
6.6-56 ..... Revision 10
6.6-57 ..... Revision 10
6.6-58 ..... Revision 10
6.6-59 ..... Revision 10
6.6-60 ..... Revision 10
6.6-61 ..... Revision 10
6.6-62 ..... Revision 10
6.6-63 ..... Revision 10
6.6-64 ..... Revision 10
6.6-65 ..... Revision 10
6.6-66 ..... Revision 10
6.6-67 ..... Revision 10
6.6-68 ..... Revision 10
6.6-69 ..... Revision 10
6.6-70 ..... Revision 10
6.6-71 ..... Revision 10
6.6-72 ..... Revision 10
6.6-73 ..... Revision 10
6.6-74 ..... Revision 10
6.6-75 ..... Revision 10
6.6-76 ..... Revision 10
6.6-77 ..... Revision 10
6.6-78 ..... Revision 10
6.6-79 ..... Revision 10
6.6-80 ..... Revision 10
6.6-81 ..... Revision 10
6.6-82 ..... Revision 10
6.6-83 ..... Revision 10
6.6-84 ..... Revision 10
6.6-85 ..... Revision 10
6.6-86 ..... Revision 10
6.6-87 ..... Revision 10
6.6-88 ..... Revision 10
6.6-89 ..... Revision 10
6.6-90 ..... Revision 10
6.6-91 ..... Revision 10
6.6-92 ..... Revision 10
6.6-93 ..... Revision 10
6.6-94 ..... Revision 10
6.6-95 ..... Revision 10
6.6-96 ..... Revision 10
6.6-97 ..... Revision 10
6.6-98 ..... Revision 10
6.6-99 ..... Revision 10
6.6-100 ..... Revision 10
6.6-101 ..... Revision 10
6.6-102 ..... Revision 10
6.6-103 ..... Revision 10
6.6-104 ..... Revision 10
6.6-105 ..... Revision 10
6.6-106 ..... Revision 10
6.6-107 ..... Revision 10
6.6-108 ..... Revision 10
6.6-109 ..... Revision 10
6.6-110 ..... Revision 10
6.6-111 ..... Revision 10
6.6-112 ..... Revision 10
6.6-113 ..... Revision 10

List of Effective Pages (Continued)

6.6-114 ..... Revision 10
6.6-115 ..... Revision 10
6.6-116 ..... Revision 10
6.6-117 ..... Revision 10
6.6-118 ..... Revision 10
6.6-119 ..... Revision 10
6.6-120 ..... Revision 10
6.6-121 ..... Revision 10
6.6-122 ..... Revision 10
6.6-123 ..... Revision 10
6.6-124 ..... Revision 10
6.6-125 ..... Revision 10
6.6-126 ..... Revision 10
6.6-127 ..... Revision 10
6.6-128 ..... Revision 10
6.6-129 ..... Revision 10
6.6-130 ..... Revision 10
6.6-131 ..... Revision 10
6.6-132 ..... Revision 10
6.6-133 ..... Revision 10
6.6-134 ..... Revision 10
6.6-135 ..... Revision 10
6.6-136 ..... Revision 10
6.6-137 ..... Revision 10
6.6-138 ..... Revision 10
6.6-139 ..... Revision 10
6.6-140 ..... Revision 10
6.6-141 ..... Revision 10
6.6-142 ..... Revision 10
6.6-143 ..... Revision 10
6.6-144 ..... Revision 10
6.6-145 ..... Revision 10
6.6-146 ..... Revision 10
6.6-147 ..... Revision 10
6.6-148 ..... Revision 10
6.6-149 ..... Revision 10
6.6-150 ..... Revision 10
6.6-151 ..... Revision 10
6.6-152 ..... Revision 10
6.6-153 ..... Revision 10
6.6-154 ..... Revision 10
6.6-155 ..... Revision 10
6.6-156 ..... Revision 10
6.6-157 ..... Revision 10
6.6-158 ..... Revision 10
6.6-159 ..... Revision 10
6.6-160 ..... Revision 10
6.6-161 ..... Revision 10
6.6-162 ..... Revision 10
6.6-163 ..... Revision 10
6.6-164 ..... Revision 10
6.6-165 ..... Revision 10
6.6-166 ..... Revision 10
6.6-167 ..... Revision 13
6.6-168 ..... Revision 13
6.6-169 ..... Revision 13
6.6-170 ..... Revision 13
6.6-171 ..... Revision 13
6.6-172 ..... Revision 13
6.6-173 ..... Revision 13
6.6-174 ..... Revision 13
6.6-175 ..... Revision 13
6.6-176 ..... Revision 13
6.6-177 ..... Revision 13
6.6-178 ..... Revision 13
6.6-179 ..... Revision 13
6.6-180 ..... Revision 13
6.6-181 ..... Revision 13
6.6-182 ..... Revision 13
6.6-183 ..... Revision 13

List of Effective Pages (Continued)

6.6-184 ..... Revision 13
6.6-185 ..... Revision 13
6.6-186 ..... Revision 13
6.6-187 ..... Revision 13
6.6-188 ..... Revision 13
6.6-189 ..... Revision 13
6.6-190 ..... Revision 13
6.6-191 ..... Revision 13
6.6-192 ..... Revision 13
6.6-193 ..... Revision 13
6.6-194 ..... Revision 13
6.6-195 ..... Revision 13
6.6-196 ..... Revision STC-01A
6.6-197 ..... Revision STC-01A
6.6-198 ..... Revision STC-01A
6.6-199 ..... Revision STC-01A
6.6-200 ..... Revision STC-01A
6.6-201 ..... Revision STC-01A
6.6-202 ..... Revision STC-01A
6.6-203 ..... Revision STC-01A
6.6-204 ..... Revision STC-01A
6.6-205 ..... Revision STC-01A
6.6-206 ..... Revision STC-01A
6.6-207 ..... Revision STC-01A
6.6-208 ..... Revision STC-01A
6.6-209 ..... Revision STC-01A
6.6-210 ..... Revision STC-01A
6.6-211 ..... Revision STC-01A
6.6-212 ..... Revision STC-01A
6.6-213 ..... Revision STC-01A
6.6-214 ..... Revision STC-01A
6.6-215 ..... Revision STC-01A
6.6-216 ..... Revision STC-01A
6.6-217 ..... Revision STC-01A

Chapter 7

7-i ..... Revision STC-01A
7-ii ..... Revision STC-01A
7-1 ..... Revision STC-01A
7-2 ..... Revision STC-02F
7-3 ..... Revision STC-01A
7.1-1 ..... Revision STC-01A
7.1-2 ..... Revision STC-02F
7.1-3 ..... Revision STC-02F
7.1-4 ..... Revision STC-01A
7.1-5 ..... Revision STC-02F
7.1-6 ..... Revision STC-02F
7.1-7 ..... Revision STC-01A
7.1-8 ..... Revision STC-02F
7.1-9 ..... Revision STC-01A
7.1-10 ..... Revision STC-01A
7.1-11 ..... Revision STC-01A
7.2-1 ..... Revision STC-02F
7.2-2 ..... Revision STC-02F
7.2-3 ..... Revision STC-02F
7.2-4 ..... Revision STC-02F
7.2-5 ..... Revision STC-02F
7.3-1 ..... Revision STC-01A
7.3-2 ..... Revision STC-01A
7.3-3 ..... Revision STC-01A
7.3-4 ..... Revision STC-01A
7.3-5 ..... Revision STC-01A
7.3-6 ..... Revision STC-01A
7.3-7 ..... Revision STC-01A
7.3-8 ..... Revision STC-01A
7.4-1 ..... Revision STC-02F
7.4-2 ..... Revision STC-01A
7.4-3 ..... Revision STC-02F
7.4-4 ..... Revision STC-01A

List of Effective Pages (Continued)

7.5-1 ..... Revision 10

Chapter 8

8-i ..... Revision STC-02F
8-ii ..... Revision STC-01A
8-1 ..... Revision STC-01A
8.1-1 ..... Revision STC-01A
8.1-2 ..... Revision STC-01A
8.1-3 ..... Revision STC-01A
8.1-4 ..... Revision STC-01A
8.1-5 ..... Revision STC-01A
8.1-6 ..... Revision STC-02F
8.1-7 ..... Revision STC-02F
8.1-8 ..... Revision STC-02F
8.1-9 ..... Revision STC-02F
8.1-10 ..... Revision STC-01A
8.1-11 ..... Revision STC-01A
8.1-12 ..... Revision STC-01A
8.1-13 ..... Revision STC-01A
8.1-14 ..... Revision STC-01A
8.1-15 ..... Revision STC-02F
8.1-16 ..... Revision STC-02F
8.1-17 ..... Revision STC-02F
8.1-18 ..... Revision STC-02F
8.1-19 ..... Revision STC-02F
8.1-20 ..... Revision STC-01A
8.2-1 ..... Revision STC-01A
8.2-2 ..... Revision STC-02F
8.2-3 ..... Revision STC-02F
8.2-4 ..... Revision STC-01A
8.2-5 ..... Revision STC-02F
8.3-1 ..... Revision 10
8.4-1 ..... Revision STC-01A
8.4-2 ..... Revision STC-01A
8.4-3 ..... Revision STC-01A
8.4-4 ..... Revision STC-01A
8.4-5 ..... Revision STC-01A
8.4-6 ..... Revision STC-01A
8.4-7 ..... Revision STC-01A
8.4-8 ..... Revision STC-01A
8.4-9 ..... Revision 10

Chapter 9

9-i ..... Revision 7
9.0-1 ..... Revision 7
9.0-2 ..... Revision 10
9.0-3 ..... Revision 10
9.0-4 ..... Revision 10
9.0-5 ..... Revision 10
9.0-6 ..... Revision 10
9.0-7 ..... Revision 10
9.0-8 ..... Revision 10
9.0-9 ..... Revision 10
9.0-10 ..... Revision 10
9.0-11 ..... Revision 10
9.0-12 ..... Revision 10
9.0-13 ..... Revision 12

THIS PAGE INTENTIONALLY LEFT BLANK

Master Table of Contents

Master Table of Contents (Continued)

3.3 Technical Specifications for Components 3.3-1
3.3.1 Radiation Protection Components 3.3-1
3.3.2 Safe Operating Ranges 3.3-2

3.4 Thermal Evaluation for Normal Conditions of Transport 3.4-1
3.4.1 Thermal Models 3.4-1
3.4.2 Maximum Temperatures 3.4-19
3.4.3 Minimum Temperatures 3.4-20
3.4.4 Maximum Internal Pressure 3.4-20
3.4.5 Maximum Thermal Stresses 3.4-32
3.4.6 Summary of NAC-STC Performance for Normal Transport Conditions 3.4-33
3.4.7 Normal Heat-up Transient 3.4-33
3.4.8 Assessment Criteria for the Package Passive Heat Rejection System 3.4-34

3.5 Hypothetical Accident Thermal Evaluation 3.5-1
3.5.1 Thermal Model 3.5-1
3.5.2 Package Conditions and Environment 3.5-3
3.5.3 Package Temperatures 3.5-4
3.5.4 Maximum Internal Pressure 3.5-6
3.5.5 Maximum Thermal Stresses 3.5-8
3.5.6 Evaluation of Package Performance for Hypothetical Accident Thermal Conditions 3.5-8

4.0 CONTAINMENT 4.1-1

4.1 Containment Boundary 4.1-1
4.1.1 Containment Vessel 4.1-2
4.1.2 Containment Penetrations 4.1-2
4.1.3 Seals and Welds 4.1-3
4.1.4 Closure 4.1-4

4.2 Containment Requirements for Normal Conditions of Transport 4.2-1
4.2.1 Containment of Radioactive Material 4.2-2
4.2.2 Pressurization of Containment Vessel 4.2-2
4.2.3 Containment Criterion for Normal Conditions of Transport 4.2-4

Master Table of Contents (Continued)

4.3 Containment Requirements for Hypothetical Accident Conditions 4.3-1
4.3.1 Fission Gas Products 4.3-1
4.3.2 Containment of Radioactive Material 4.3-2
4.3.3 Calculation of Allowable Leak Rate 4.3-2
4.3.4 Containment Criterion for Accident Conditions 4.3-3

4.4 Special Requirements 4.4-1

4.5 Appendix 4.5-1
4.5.1 Metallic O-Rings 4.5-1
4.5.2 Blended Polytetrafluoroethylene (PTFE) O-Rings 4.5-14
4.5.3 Expansion Foam 4.5-18
4.5.4 Fireblock Protective Coating 4.5-21
4.5.5 Viton O-Rings 4.5-24
4.5.6 Sample Input File 4.5-29

5.0 SHIELDING EVALUATION 5-1

5.1 Discussion and Results 5.1-1
5.1.1 Design Criteria 5.1-1
5.1.2 Design Basis Fuel 5.1-2
5.1.3 Shielding Materials 5.1-4
5.1.4 Results 5.1-4

5.2 Source Specification 5.2-1
5.2.1 Directly Loaded Fuel Source Specification 5.2-1
5.2.2 Yankee Class Fuel and GTCC Waste Source Specification 5.2-4

5.3 Model Specification 5.3-1
5.3.1 Directly Loaded Fuel Model 5.3-1
5.3.2 Yankee-MPC Fuel and GTCC Waste Models 5.3-4

5.4 Shielding Evaluation 5.4-1
5.4.1 Computer Code Descriptions and Results 5.4-1

5.5 Sample Input Files 5.5-1
5.5.1 Sample Input Files for Directly Loaded Fuel 5.5-1

Master Table of Contents (Continued)

6.0 CRITICALITY EVALUATION 6.1-1

6.1 Discussion and Results 6.1-1
- 6.1.1 Directly Loaded Fuel 6.1-1
- 6.1.2 Canistered Fuel 6.1-2

6.2 Package Fuel Loading 6.2-1

6.3 Criticality Model Specification 6.3-1
- 6.3.1 Calculational Methodology 6.3-1
- 6.3.2 Description of Calculational Models 6.3-1
- 6.3.3 Package Regional Densities 6.3-2

6.4 Criticality Calculation 6.4-1
- 6.4.1 Fuel Loading Optimization 6.4-2
- 6.4.2 Criticality Results for Directly Loaded, Uncanistered Fuel 6.4-2
- 6.4.3 Criticality Results for Canistered Yankee Class Fuel 6.4-8

6.5 Critical Benchmark Experiments 6.5-1
- 6.5.1 Benchmark Experiments and Applicability 6.5-3
- 6.5.2 Results of Benchmark Calculations 6.5-4
- 6.5.3 Comparison of NAC Method to NUREG/CR-6361 ..... 6.5-6

6.6 Appendix 6.6-1

7.0 OPERATING PROCEDURES 7-1

7.1 Outline of Procedures for Receipt and Loading the Cask 7.1-1
- 7.1.1 Receiving Inspection 7.1-1
- 7.1.2 Preparation of Cask for Loading 7.1-1
- 7.1.3 Loading the NAC-STC Cask 7.1-5

7.2 Preparation for Transport 7.2-1
- 7.2.1 Preparation for Transport (without Interim Storage) 7.2-1
- 7.2.2 Preparation for Transport (after Long-Term Storage) 7.2-2

7.3 Outline of Procedures for Unloading the Cask 7.3-1
- 7.3.1 Receiving Inspection 7.3-1

Master Table of Contents (Continued)

7.3.2 Preparation of NAC-STC Cask for Unloading 7.3-1
7.3.3 Unloading the NAC-STC Cask 7.3-4
7.3.4 Preparation of Empty Cask for Transport 7.3-7

7.4 Leak Test Requirements and Procedures 7.4-1
7.4.1 Containment System Verification Leak Test Procedures 7.4-1
7.4.2 Leak Testing for Transport After Long-Term Storage 7.4-2
7.4.3 Leak Testing for Transport without Interim Storage 7.4-3
7.4.4 Corrective Action 7.4-4

7.5 Railcar Design and Certification Requirements 7.5-1
7.5.1 Railcar and Tie-Down Design Requirements 7.5-1
7.5.2 Railcar Tie-Down Design Loadings 7.5-1
7.5.3 Railcar and Tie-Down Certification 7.5-1

8.0 ACCEPTANCE TESTS AND MAINTENANCE PROGRAM 8-1

8.1 Fabrication Requirements and Acceptance Tests 8.1-1
8.1.1 Weld Procedures, Examination, and Acceptance 8.1-1
8.1.2 Structural and Pressure Tests 8.1-3
8.1.3 Leak Tests 8.1-6
8.1.4 Component Tests 8.1-8
8.1.5 Tests for Shielding Integrity 8.1-10
8.1.6 Thermal Test 8.1-13
8.1.7 Neutron Absorber Tests 8.1-15
8.1.8 Transportable Storage Canister 8.1-18

8.2 Maintenance Program 8.2-1
8.2.1 Structural and Pressure Tests of the Cask 8.2-1
8.2.2 Leak Tests 8.2-2
8.2.3 Subsystems Maintenance 8.2-3
8.2.4 Valves, Rupture Disks and Gaskets on the Containment Vessel 8.2-3
8.2.5 Shielding 8.2-3
8.2.6 Miscellaneous 8.2-4
8.2.7 Maintenance Program Schedule 8.2-4

8.3 Quick-Disconnect Valves 8.3-1

Chapter 1

List of Drawings

423-800, sheets 1-2	Rev 9	Cask Assembly, NAC-STC Cask
423-802, sheets 1-6	Rev 15	Cask Body, NAC-STC Cask
423-803, sheets 1-2	Rev 4	Lid Assembly - Inner, NAC-STC Cask
423-804, sheets 1-3	Rev 3	Details - Inner Lid, NAC-STC Cask
423-805, sheets 1-2	Rev 4	Lid Assembly - Outer, NAC-STC Cask
423-806	Rev 4	Port Coverplate Assy - Inner Lid, NAC-STC Cask
423-807, sheets 1-2	Rev 1	Assembly, Port Cover, NAC-STC Cask
423-209	Rev 0	Impact Limiter Assy - Upper
423-210	Rev 0	Impact Limiter Assy - Lower
423-811, sheets 1-2	Rev 5	Details, NAC-STC Cask
423-812	Rev 2	Nameplates, NAC-STC Cask
423-870	Rev 2	Fuel Basket Assy - PWR, 26 Element, NAC-STC Cask
423-871	Rev 1	Bottom Weldment - Fuel Basket, PWR, 26 Element, NAC-STC Cask
423-872	Rev 6	Top Weldment - Fuel Basket, PWR, 26 Element, NAC-STC Cask
423-873	Rev 1	Support Disk and Misc Basket Details, PWR, 26 Element, NAC-STC Cask
423-874	Rev 2	Heat Transfer Disk - Fuel Basket, PWR, 26 Element, NAC-STC Cask
423-875, sheets 1-2	Rev 4	Tube, NAC-STC Cask
423-900	Rev 3	Package Assembly, Transportation, NAC-STC Cask
423-901	Rev 2	Transportation Package, Concept, NAC-STC Cask
455-800, sheets 1-2	Rev 2	Assembly, Transport Cask, MPC-Yankee
455-801, sheets 1-2	Rev 1	Assembly, Transport Cask, NAC-MPC
455-820	Rev 1	Spacers, Transport Cask, MPC-Yankee
455-870	Rev 3	Canister Shell, MPC-Yankee
455-871, sheets 1-2	Rev 3	Details, Canister, MPC-Yankee
455-872, sheets 1-2	Rev 8	Assembly, Transportable Storage Canister (TSC), MPC-Yankee
455-873	Rev 2	Assembly, Drain Tube, Canister, MPC-Yankee
455-881, sheets 1-3	Rev 5	PWR Fuel Tube, MPC-Yankee
455-887, sheets 1-3	Rev 1	Basket Assembly, 24 GTCC Container MPC-Yankee

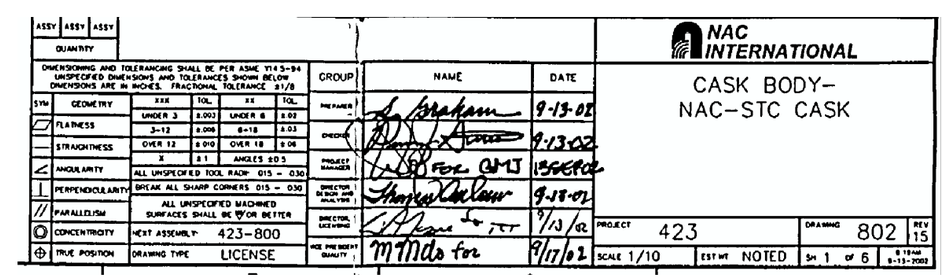
List of Drawings (Continued)

455-888, sheets 1-2	Rev 4	Assembly, Transportable Storage Canister (TSC), 24 GTCC Container, MPC-Yankee
455-891, sheets 1-2	Rev 1	Bottom Weldment, Fuel Basket, MPC-Yankee
455-892, sheets 1-2	Rev 2	Top Weldment, Fuel Basket, MPC-Yankee
455-893	Rev 3	Support Disk and Misc. Basket Details, MPC-Yankee
455-894	Rev 1	Heat Transfer Disk, Fuel Basket, MPC-Yankee
455-895, sheets 1-2	Rev 4	Fuel Basket Assembly, MPC-Yankee

Yankee Class Reconfigured Fuel Assembly Drawings

YR-00-060	Rev 1	Yankee - Class Reconfigured Fuel Assembly
YR-00-061	Rev 1	Yankee - Class Reconfigured Fuel Assembly Shell Weldment
YR-00-062	Rev 1	Yankee - Class Reconfigured Fuel Assembly Top End Fitting Assembly
YR-00-063	Rev 1	Yankee - Class Reconfigured Fuel Assembly Bottom End Fitting Assy
YR-00-064	Rev 1	Yankee - Class Reconfigured Fuel Assembly Nozzle Bolt and Alignment Pin
YR-00-065	Rev 1	Yankee - Class Reconfigured Fuel Assembly Fuel Basket Assembly
YR-00-066	Rev 1	Yankee - Class Reconfigured Fuel Assembly Fuel Tube Assembly

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION



ASSY	ASSY	ASSY
QUANTITY		

DIMENSIONING AND TOLERANCING SHALL BE PER ASME Y14.5-94
UNSPECIFIED DIMENSIONS AND TOLERANCES SHOWN BELOW
DIMENSIONS ARE IN INCHES. FRACTIONAL TOLERANCE ±1/8

SYM	GEOMETRY	XXX	TOL	XX	TOL
	FLATNESS	UNDER 3	±.003	UNDER 6	±.02
		3-12	±.006	6-18	±.03
	STRAIGHTNESS	OVER 12	±.010	OVER 18	±.06
	ANGULARITY	X	±1	ANGLES ±0.5	
		ALL UNSPECIFIED TOOL RADII .015 - .030			
	PERPENDICULARITY	BREAK ALL SHARP CORNERS .015 - .030			
	PARALLELISM	ALL UNSPECIFIED MACHINED SURFACES SHALL BE 125 OR BETTER			
	CONCENTRICITY	NEXT ASSEMBLY: 423-800			
	TRUE POSITION	DRAWING TYPE LICENSE			

GROUP	NAME	DATE
PREPARER	L. Graham	9-13-02
CHECKER	[illegible]	9-13-02
PROJECT MANAGER	[illegible] for CMJ	13 SEP 02
DIRECTOR DESIGN AND ANALYSIS	[illegible]	9-13-02
DIRECTOR LICENSING	[illegible] for TTT	9/13/02
VICE PRESIDENT QUALITY	MTNdo for	9/17/02

NAC INTERNATIONAL

CASK BODY-
NAC-STC CASK

PROJECT	423	DRAWING	802	REV 15
SCALE 1/10	EST WT NOTED	SH 1 OF 6	8:19AM 9-13-2002	

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

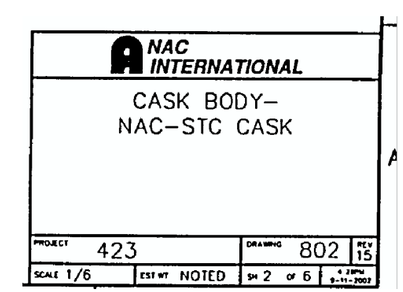


FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

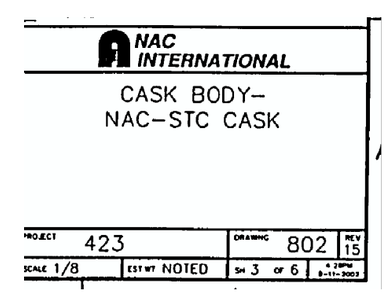


FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

NAC INTERNATIONAL			
CASK BODY– NAC–STC CASK			
PROJECT 423		DRAWING 802	REV 15
SCALE 1/6	EST WT NOTED	SH 4 OF 6	4:38PM 8-11-2003

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

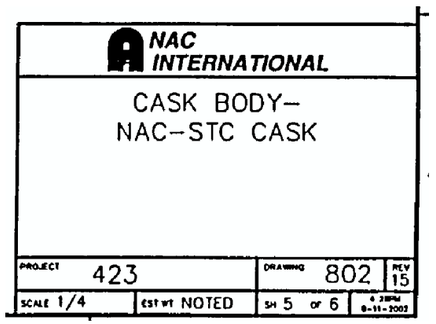


FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

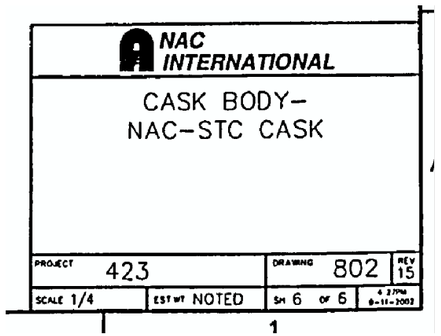


FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

ASSY	ASSY	ASSY
QUANTITY		

DIMENSIONING AND TOLERANCING SHALL BE PER ASME Y14.5-94
UNSPECIFIED DIMENSIONS AND TOLERANCES SHOWN BELOW
DIMENSIONS ARE IN INCHES. FRACTIONAL TOLERANCE ±1/8

SYM	GEOMETRY	XXX	TOL.	XX	TOL.
		UNDER 3	±.003	UNDER 6	±.02
	FLATNESS	3-12	±.005	6-18	±.03
	STRAIGHTNESS	OVER 12	±.010	OVER 18	±.06
		X	±1	ANGLES ±0°3'	
∠	ANGULARITY	ALL UNSPECIFIED TOOL RADII .015 - .030			
⊥	PERPENDICULARITY	BREAK ALL SHARP CORNERS .015 - .030			
//	PARALLELISM	ALL UNSPECIFIED MACHINED SURFACES SHALL BE 125 OR BETTER			
◎	CONCENTRICITY	NEXT ASSEMBLY: 423-800			
⊕	TRUE POSITION	DRAWING TYPE	LICENSE		

GROUP	NAME	DATE
PREPARER	L. Graham	9-11-02
CHECKER	[illegible]	9-11-02
PROJECT MANAGER	[illegible]	11 SEP 02
DIRECTOR DESIGN AND ANALYSIS	[illegible]	9-13-02
DIRECTOR LICENSING	[illegible] for TCT	9/13/02
VICE PRESIDENT QUALITY	[illegible]	9/17/02

NAC INTERNATIONAL

LID ASSEMBLY-
INNER,
NAC-STC CASK

PROJECT	423	DRAWING	803	REV 4
SCALE 1/6	EST WT NOTED	SH 1 OF 2	8:23AM 9-11-2002	

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

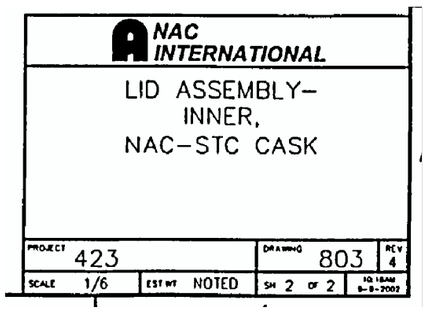
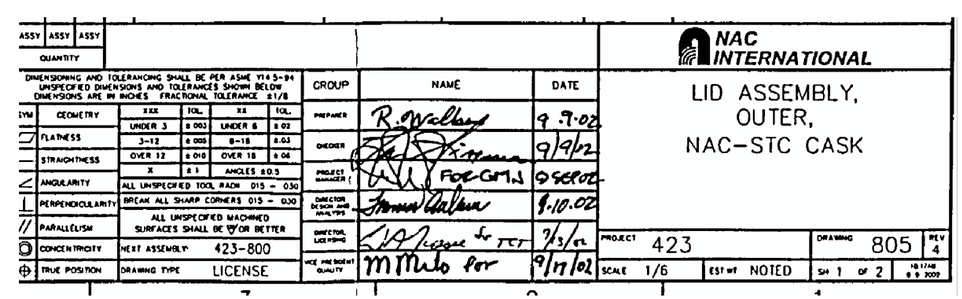


FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION



ASSY	ASSY	ASSY
QUANTITY		

DIMENSIONING AND TOLERANCING SHALL BE PER ASME Y14.5-94
UNSPECIFIED DIMENSIONS AND TOLERANCES SHOWN BELOW
DIMENSIONS ARE IN INCHES FRACTIONAL TOLERANCE ±1/8

SYM	GEOMETRY	XXX	TOL.	XX	TOL.
	FLATNESS	UNDER 3	±.003	UNDER 6	±.02
		3-12	±.005	6-18	±.03
	STRAIGHTNESS	OVER 12	±.010	OVER 18	±.04
		X	±1	ANGLES ±0.5	
∠	ANGULARITY	ALL UNSPECIFIED TOOL RADII .015 - .030			
⊥	PERPENDICULARITY	BREAK ALL SHARP CORNERS .015 - .030			
//	PARALLELISM	ALL UNSPECIFIED MACHINED SURFACES SHALL BE 125 OR BETTER			
◎	CONCENTRICITY	NEXT ASSEMBLY: 423-800			
⊕	TRUE POSITION	DRAWING TYPE LICENSE			

GROUP	NAME	DATE
PREPARER	R. Walker	9.9.02
CHECKER	[illegible]	9/9/02
PROJECT MANAGER	[illegible] FOR GMW	9 SEP 02
DIRECTOR DESIGN AND ANALYSIS	[illegible]	9.10.02
DIRECTOR, LICENSING	[illegible] for TCT	9/13/02
VICE PRESIDENT QUALITY	M Muto for	9/17/02

NAC INTERNATIONAL

LID ASSEMBLY,
OUTER,
NAC-STC CASK

PROJECT	423	DRAWING	805	REV 4
SCALE	1/6	EST WT NOTED	SH 1 OF 2	10:17:46 9 9 2002

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

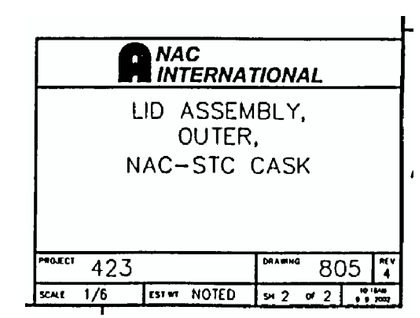
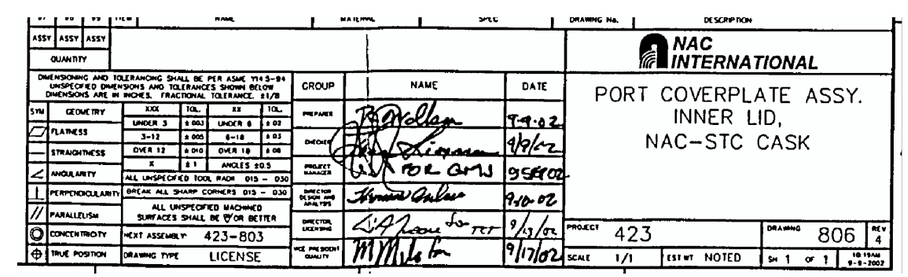


FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION



ASSY	ASSY	ASSY	ITEM	NAME	MATERIAL	SPEC	DRAWING No.	DESCRIPTION
QUANTITY								

DIMENSIONING AND TOLERANCING SHALL BE PER ASME Y14.5-94
UNSPECIFIED DIMENSIONS AND TOLERANCES SHOWN BELOW
DIMENSIONS ARE IN INCHES. FRACTIONAL TOLERANCE. ±1/8

SYM	GEOMETRY	XXX	TOL.	XX	TOL.
	FLATNESS	UNDER 3	±.003	UNDER 6	±.02
		3-12	±.005	6-18	±.03
	STRAIGHTNESS	OVER 12	±.010	OVER 18	±.06
		X	±.1	ANGLES ±0.5	
∠	ANGULARITY	ALL UNSPECIFIED TOOL RADII .015 - .030			
⊥	PERPENDICULARITY	BREAK ALL SHARP CORNERS .015 - .030			
//	PARALLELISM	ALL UNSPECIFIED MACHINED SURFACES SHALL BE 125 OR BETTER			
◎	CONCENTRICITY	NEXT ASSEMBLY 423-803			
⊕	TRUE POSITION	DRAWING TYPE LICENSE			

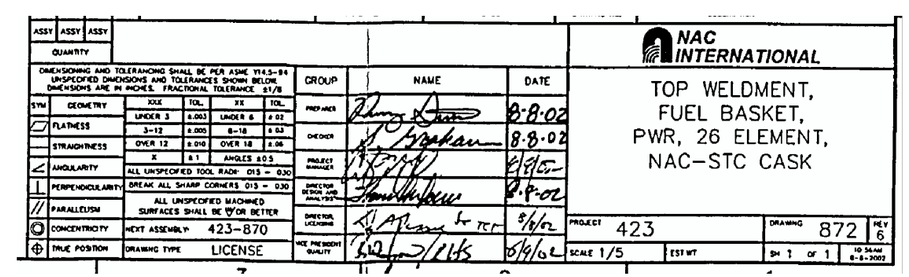
GROUP	NAME	DATE
PREPARER	R. Wallace	9-9-02
CHECKER	[illegible]	9/9/02
PROJECT MANAGER	[illegible] FOR GMW	9-9-02
DIRECTOR DESIGN AND ANALYSIS	[illegible]	9-10-02
DIRECTOR, LICENSING	[illegible] for TET	9/13/02
VICE PRESIDENT QUALITY	[illegible]	9/17/02

NAC INTERNATIONAL

PORT COVERPLATE ASSY.
INNER LID,
NAC-STC CASK

PROJECT	423	DRAWING	806	REV 4
SCALE 1/1	EST WT NOTED	SH 1 OF 1	10:19AM 9-9-2002	

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION



ASSY	ASSY	ASSY
QUANTITY		

DIMENSIONING AND TOLERANCING SHALL BE PER ASME Y14.5-94
UNSPECIFIED DIMENSIONS AND TOLERANCES SHOWN BELOW.
DIMENSIONS ARE IN INCHES. FRACTIONAL TOLERANCE ±1/8

SYM	GEOMETRY	XXX	TOL.	XX	TOL.
	FLATNESS	UNDER 3	±.003	UNDER 6	±.02
		3-12	±.005	6-18	±.03
	STRAIGHTNESS	OVER 12	±.010	OVER 18	±.06
∠	ANGULARITY	X	±.1	ANGLES ±0.5	
⊥	PERPENDICULARITY	ALL UNSPECIFIED TOOL RADII .015 – .030			
//	PARALLELISM	BREAK ALL SHARP CORNERS .015 – .030			
◎	CONCENTRICITY	ALL UNSPECIFIED MACHINED SURFACES SHALL BE 125 OR BETTER			
⊕	TRUE POSITION	NEXT ASSEMBLY 423-870			
		DRAWING TYPE LICENSE			

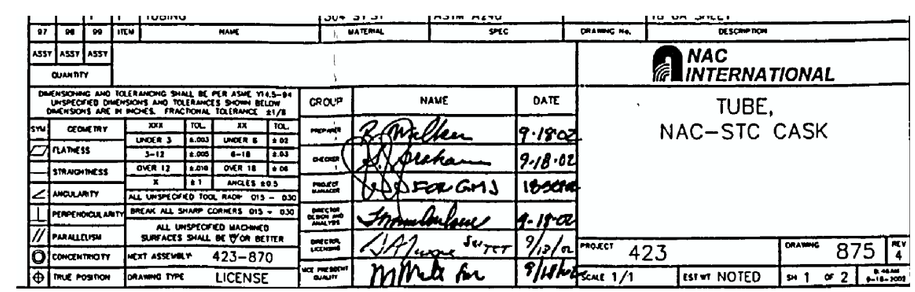
GROUP	NAME	DATE
PREPARER	[illegible]	8-8-02
CHECKER	[illegible]	8-8-02
PROJECT MANAGER	[illegible]	8/8/02
DIRECTOR DESIGN AND ANALYSIS	[illegible]	8-8-02
DIRECTOR LICENSING	[illegible] for TCP	8/8/02
VICE PRESIDENT QUALITY	[illegible]	8/8/02

NAC INTERNATIONAL

TOP WELDMENT,
FUEL BASKET,
PWR, 26 ELEMENT,
NAC-STC CASK

PROJECT 423		DRAWING 872	REV 6
SCALE 1/5	EST WT	SH 1 OF 1	10 54 AM 8-8-2002

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION



97	98	99	ITEM	NAME	MATERIAL	SPEC	DRAWING No.	DESCRIPTION
ASSY	ASSY	ASSY						
QUANTITY								

NAC INTERNATIONAL

DIMENSIONING AND TOLERANCING SHALL BE PER ASME Y14.5-94
UNSPECIFIED DIMENSIONS AND TOLERANCES SHOWN BELOW
DIMENSIONS ARE IN INCHES. FRACTIONAL TOLERANCE ±1/8

SYM	GEOMETRY	XXX	TOL.	XX	TOL.
	FLATNESS	UNDER 3	±.003	UNDER 6	±.02
		3-12	±.005	6-18	±.03
	STRAIGHTNESS	OVER 12	±.010	OVER 18	±.06
		X	±1	ANGLES ±0.5	
	ANGULARITY	ALL UNSPECIFIED TOOL RADII .015 - .030			
	PERPENDICULARITY	BREAK ALL SHARP CORNERS .015 - .030			
	PARALLELISM	ALL UNSPECIFIED MACHINED SURFACES SHALL BE ▽ OR BETTER			
	CONCENTRICITY	NEXT ASSEMBLY 423-870			
	TRUE POSITION	DRAWING TYPE LICENSE			

GROUP	NAME	DATE
PREPARER	R. Walker	9-18-02
CHECKER	D. Graham	9-18-02
PROJECT MANAGER	FOR GMJ	18-SEP-02
DIRECTOR DESIGN AND ANALYSIS	[illegible]	9-18-02
DIRECTOR, LICENSING	[illegible] SEE TEL	9/13/02
VICE PRESIDENT QUALITY	[illegible] for	9/18/02

TUBE,
NAC-STC CASK

PROJECT 423	DRAWING 875	REV 4
SCALE 1/1	EST WT NOTED	SH 1 OF 2

FIGURE WITHHELD AS SENSITIVE UNCLASSIFIED INFORMATION

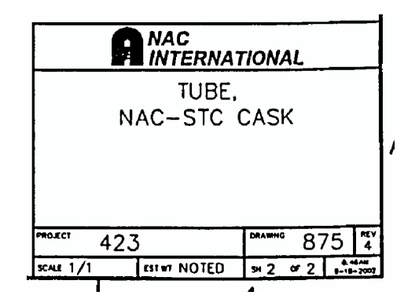


Table 1-1 Terminology (continued)

NS-4-FR	A solid, synthetic polymer consisting of a borated hydrogenous material, which results in neutron absorption capabilities similar to borated water.
Lifting Trunnions	Four, high-strength stainless steel components welded to the top forging that are used in pairs for lifting and handling the cask.
Top Forging	
- Interlid Port	A penetration in the top forging that is used as (1) a drain for the interlid region and (2) a pressure test port for the outer lid seal.
- Pressure Port	A penetration in the top forging that houses a pressure transducer, which may be used to monitor the pressure in the interlid region during storage.
- Port Cover Assembly	Includes the port cover body, spacer, retainer, bolts and o-rings.
- Pressure Transducer	An instrument for measurement of pressure in a confined space.
- O-Ring	An o-ring seals the interfaces between separate cask components. O-rings may be elastomer, polymer or metallic.
- PTFE	A blended polytetrafluoroethylene (PTFE) o-ring material used as a sealing component between metallic surfaces.
- Viton®	A fluorcarbon rubber O-ring material used as a sealing component between metallic surfaces.

Table 1-1 Terminology (continued)

- Interseal	Refers to the region between pairs of o-rings.
Bottom Inner Forging	The cup-shaped component that forms the bottom of the NAC-STC cavity.
Bottom Outer Forging	The ring-shaped component that forms the bottom outer region of the NAC-STC.
Bottom Plate	The plate welded to the bottom outer forging, which forms the bottom of the cask. The bottom plate encloses the neutron shielding material in the bottom of the cask.
Rotation Trunnion Recesses	Two stainless steel blocks, each provided with a deep machined groove suitable to accept the rear cask support. These recesses are welded onto the outer shell near the bottom of the cask.
Cask Cavity	The volume of space within the containment boundary.
Transportable Storage Canister (Canister)	The stainless steel cylindrical shell, bottom end plate, shield lid, and structural lid that holds the canistered fuel basket or Greater Than Class C Waste.
Canister Spacer	Aluminum honeycomb structures that position the canister in the NAC-STC cavity during transport. The honeycomb material is encased in a shell constructed of 6061-T6 aluminum alloy.

Table 1-1 Terminology (continued)

Fuel Basket	The structure located in the cask cavity or transportable storage canister to support the fuel assemblies.
- Support Disk	A circular stainless steel plate with square holes machined in a symmetrical pattern. The support disk is the primary lateral load-bearing component of the basket. Each square hole in the support disk is a location for a fuel tube.
- Heat Transfer Disk	A circular aluminum plate with square holes machined in a symmetrical pattern. The heat transfer disk enhances heat transfer in the fuel basket. Each square hole in the heat transfer disk is a location for a fuel tube.
- Fuel Tube	A stainless steel tube having a square cross-section. There are two Fuel Tube configurations. The standard Fuel Tube has BORAL or TalBor neutron absorber material on the four exterior surfaces and has different dimensions for the directly loaded and canistered fuel baskets. The enlarged Fuel Tube, used in the canistered fuel basket, has a larger interior cross-section and does not have neutron absorber material on the exterior surfaces.
- Threaded Rod	Aligns and supports the support disks and heat transfer disks in the fuel basket in the cask cavity.
- Spacer Nut	Installed on the threaded rod between the support disks to properly position and provide axial support for the support disks and heat transfer disks in the fuel basket in the cask cavity.
- Tie Rod	Aligns the support disks and heat transfer disks in the fuel basket structure located in the NAC-STC cask cavity or in the transportable storage canister.
- Split Spacer	Installed on the tie rod between the support disks to properly position and provide axial support for the support disks and the heat transfer disks.

Table 1-1 Terminology (continued)

Outer Lid	A secondary containment closure that is bolted to the top forging during transport.
- Outer Lid Bolts	Retain the outer lid.
Inner Lid	The primary containment closure for transport, located directly on top of the cask cavity inside the top forging.
- Drain Port	Located in the inner lid to permit draining of the cask cavity.
- Vent Port	Located in the inner lid to aid in draining and backfilling the cask cavity.
- Port Coverplates	The sealed covers that protect the vent and drain ports.
- Interseal Test Port	The test port between pairs of o-rings that permits testing of the containment seal. The test port is closed by a threaded plug with a metallic o-ring.
- Inner Lid Bolts	Retain the inner lid.
Quick-Disconnect	The quick-disconnect valved nipple used in the vent, drain, interlid, and inner lid interseal test port to close off the port. The drain port quick-disconnect may be valved or unvalved.
Interlid Region	The space between the inner and outer lids.
Transport Configuration	The transport cask configuration using either metallic or non-metallic O-ring seals in the cask containment boundary.
Storage Configuration	The transport cask configuration using metallic o-ring seals in the cask containment boundary.

1.1 Introduction

The NAC-STC is designed to transport spent fuel assemblies or Greater Than Class C (GTCC) waste safely. The fuel assemblies may be sealed in a transportable storage canister (canistered) or placed directly into a fuel basket installed in the cask cavity (uncanistered). In the canistered configuration, the NAC-STC can transport up to 36 Yankee Class fuel assemblies, depending on the mix of assembly types within the canister. The design basis fuels for the directly loaded configuration are the Framatome-Cogema 17 x 17 and Westinghouse 17 x 17 or 15 x 15 PWR fuel assemblies. These fuels bound smaller array Westinghouse and similar Babcock & Wilcox and Combustion Engineering PWR fuel assemblies. Up to 24 containers of GTCC waste may be sealed in a transportable storage canister. The NAC-STC, when loaded, has a maximum design weight of 250,000 pounds. The NAC-STC provides a radioactive material containment boundary for maximum safety during the handling and transport operations required for spent-fuel shipment. The general configuration of the NAC-STC and the major cask dimensions are shown in Figure 1.1-1.

The NAC-STC cask may be transported after loading with or without a period of interim storage. The structural components of the transport containment boundary are the:

(1) Inner shell center section and upper and lower inner shell rings (transition sections);

(2) Bottom inner forging; and,

(3) Top forging.

The closure components of the containment boundary for transport without interim storage after loading are the:

(1) Inner lid and inner lid o-ring;
(2) Vent port coverplate and the coverplate inner o-ring; and,
(3) Drain port coverplate and the coverplate inner o-ring.

As described in the following sections, the o-rings may be either metallic or non-metallic.

The closure components of the containment boundary for transport after an extended period of storage are the:

(1) Inner lid and inner lid outer metallic o-ring;
(2) Inner lid interseal test port threaded plug with metallic o-ring;
(3) Vent port coverplate and the coverplate outer metallic o-ring;

(4) Vent port coverplate interseal test hole threaded plug with metallic o-ring;
(5) Drain port coverplate and the coverplate outer metallic o-ring; and,
(6) Drain port coverplate interseal test hole threaded plug with metallic o-ring.

Metallic o-rings are required for the storage configuration and are qualified for transport prior to shipment in accordance with the operating procedure.

The transportable storage canister provides the secondary containment boundary for transport of fuel within the canister that is classified as damaged, as required by 10 CFR 71.63.

The NAC-STC is designed to meet 10 CFR 71 and IAEA Safety Series No. ST-1 licensing requirements for spent fuel transport packages. The transport licensing requirements include providing safe containment during the handling and transport of spent nuclear fuel. Certain design features of the NAC-STC that have been included for the sole purpose of satisfying storage licensing requirements also provide added safety for transport conditions. The design features of the NAC-STC include: inner and outer lids, redundant seals at each containment boundary penetration, cavity penetrations located in the inner lid, and a puncture-resistant outer shell and outer lid.

This Safety Analysis Report is written for transport cask licensing only. Design features related to storage cask licensing are included for clarity and for the ease of review.

The NAC-STC closure design provides dual lids for transport and storage operations, as well as protection of the vent and drain ports that are located in the inner lid. This design permits performance of a periodic verification leak test on the containment seals prior to transport following extended storage. Both the inner and outer lids are installed during transport and storage.

The inner lid and its o-rings are the major removable components in the primary containment boundary. Two concentric o-rings are used to seal the inner lid to the cask cavity flange. An o-ring test port connects to the annulus between the two o-rings to permit leak testing.

The vent and drain port coverplates, which protect the vent and drain ports located in the inner lid, are also part of the primary containment boundary of the cask. Each coverplate is sealed by two concentric o-rings.

As described in Section 4.1, the inner o-rings of the inner lid and two coverplates are the containment boundary for contents (either directly loaded fuel or a loaded transportable storage canister) that is loaded for transport without interim site storage. The outer o-rings of these components are the containment boundary for directly loaded fuel that is to be transported after an extended period of storage.

The inner lid and coverplate o-rings may be either metallic or non-metallic as shown in the License Drawings. However, metallic o-rings must be used when the NAC-STC is directly loaded for long-term storage. The metallic o-rings provide long-term sealing capability in an elevated temperature and radiation environment.

The outer lid provides a sealed secondary closure for transport and storage operations using a single o-ring. The o-ring may be either metallic or non-metallic. The outer lid protects the inner lid and the vent and drain ports from external puncture events.

There are two penetrations in the top forging: an interlid port, which serves primarily as a drain for the interlid region, and a pressure port, which may house a transducer that monitors the pressure in the interlid region during storage. During transport, the pressure port is closed by a threaded plug. The pressure port plug is covered by the transport port coverplate. The interlid and pressure port penetrations in the top forging are protected by SA-705, Type 630, 17-4 precipitation-hardened (PH) stainless steel port covers with two piston-type blended polytetrafluoroethylene (PTFE) o-rings.

The body of the NAC-STC is a smooth right-circular cylinder of multiwall construction, consisting of stainless steel inner and outer shells separated by lead gamma radiation shielding, which is poured in place. The center section of the inner shell is fabricated from Type 304 stainless steel. At each end of the inner shell center section, inner shell rings fabricated from Type XM-19 stainless steel provide the transition to the bottom inner forging and the top forging. The outer shell is also fabricated from Type 304 stainless steel. The inner and outer shells are welded to the Type 304 stainless steel top forging, which is a ring that is machined to mate with the inner and outer lids. The inner and outer shells are also welded to the Type 304 stainless steel bottom inner and outer forgings, respectively. The cask bottom consists of the two forgings and a plate with neutron shield material sandwiched between the bottom inner forging and the bottom plate. Neutron shield material is also placed in an annulus that surrounds the cask outer shell along the length of the cask cavity. The neutron shielding material is a solid synthetic polymer (NS-4-FR). The neutron shield annulus is enclosed by a Type 304 stainless steel shell

and by end plates that are welded to the outer shell. Two pressure relief valves are provided in the bottom of the neutron shield annulus to relieve pressure in the neutron shield annulus due to a severe thermal accident condition (fire). Neutron shielding is also provided on the top of the cask by a layer of NS-4-FR enclosed in the inner lid.

Redundant lifting capability for the NAC-STC is provided by four lifting trunnions welded to the top forging at 90-degree intervals. Rotation trunnion recesses are located on the outer shell near the bottom of the cask to permit the NAC-STC to be rotated to the horizontal position and to provide longitudinal tiedown restraint in the aft direction. A Type 304 stainless steel shear ring is provided at the top end of the radial neutron shield to supply longitudinal restraint when the cask is positioned horizontally for transport in the front support structure.

For fuel assemblies loaded directly into the NAC-STC, a stainless steel basket locates and supports the 26 PWR fuel assemblies in the cask cavity. The basket design utilizes a series of high-strength stainless steel support disks to support the fuel assemblies in stainless steel tubes, which include BORAL or TalBor neutron absorber sheets (0.02 g/cm^2 ^{10}B minimum). Aluminum heat transfer disks are provided to enhance the thermal performance of the package. The heat transfer disks are also supported by the stainless steel basket.

For the canistered configuration, two aluminum honeycomb spacers, placed one above the canister and one below, locate the canister in the cask cavity so that the location of the Center of Gravity (CG) of the packaging is the same as it is for the uncanistered fuel packaging. The aluminum honeycomb is enclosed in an 6061-T6 aluminum alloy shell. The canister shell, bottom and welded shield and structural lids are fabricated from stainless steel. The canister contains a stainless steel basket that locates and supports up to 36 Yankee Class fuel assemblies.

The canister may contain one or more Reconfigured Fuel Assemblies as shown in Figure 1.2-2. The Reconfigured Fuel Assembly is designed to contain up to 64 Yankee Class fuel rods, or portions, thereof, which are classified as failed, and to maintain the geometric positions of the rods.

The total number of full length rods that can be placed in the Reconfigured Fuel Assembly is less than that in a standard Yankee Class fuel assembly (64 rods versus 256 rods). Consequently, the effects of a Reconfigured Fuel Assembly placed in a canister (e.g., criticality, weight, thermal output, source term) are significantly less than the effects of a design basis (standard) Yankee Class fuel assembly.

Radial gamma radiation shielding for the NAC-STC is provided by the inner shell, the outer shell, and the 3.7-inch thickness of American Society of Testing Materials (ASTM) B29 Chemical Copper Lead located in the annulus between the inner and outer shells. The lead also serves as an elastic support for the outer shell during a puncture event and for the inner shell during a side impact event.

Radial neutron shielding for the NAC-STC is provided by NS-4-FR, which is a solid synthetic polymer originally developed by BISCO Products, Inc. and is now supplied by the Japan Atomic Power Company and its licensees. This solid neutron shielding material is selected to eliminate leakage and maintenance problems and to alleviate other concerns attendant with using a liquid neutron shield. NS-4-FR has a high-hydrogen content to provide for neutron attenuation, is doped with boron to minimize the number of secondary gammas generated, is stable at elevated temperature service, and is fire retardant. A 5.5-inch-thick layer of NS-4-FR is installed in the annulus formed by the outer shell, the 0.236-inch (6 mm)-thick neutron shield shell, and the 0.472-inch (12 mm)-thick neutron shield end plates.

The inner shell, inner shell rings, top forging, bottom inner forging, and the inner lid establish a cask cavity that is 165.0 inches long and 71.0 inches in diameter.

The calculated weight of the cask body is 174,975 pounds. The overall length is 193.0 inches. The maximum outside diameter is 99.0 inches across the corners of the neutron shield shell.

1.2.1.2.2 Inner Lid and Bolts

The inner lid and its o-rings are the principal installed components of the NAC-STC containment boundary. The o-rings may be either metallic or non-metallic, depending on cask use. The inner lid is 9.0 inches thick, 79.0 inches in diameter, and is fabricated from Type 304 stainless steel. The top portion of the inner lid is a 2.0-inch-thick, 67.5-inch-diameter layer of NS-4-FR neutron shielding material enclosed by a 1.0-inch-thick, Type 304 stainless steel coverplate that is welded in place. The 42 inner lid bolts are 1 1/2 - 8 UN socket head cap screws fabricated from SB-637, Grade N07718 nickel alloy steel bolt material. This bolt material has a coefficient of thermal expansion that is very similar to that of the Type 304 stainless steel inner lid and top forging and, thus, alleviates differential thermal expansion effects.

The inner lid is recessed to a depth of 11.8 inches into the top forging to provide clearance for the outer lid. The inner lid bolt holes are located on a ledge machined into the inner lid, so that the

bolt heads are below the top surface of the lid. The top surface of the inner lid has threaded holes for the attachment of a lid-lifting device. The bottom of the inner lid is sealed to the top forging of the cask body by two o-rings. The o-rings may be either metallic or non-metallic, depending on the cask use. Metallic o-rings are used for storage and for transport following storage. Either metallic or non-metallic o-rings may be used for transport without interim storage after loading. The outer metallic o-ring provides the primary containment seal for transport after storage, while the inner o-ring (either metallic or non-metallic) provides the primary containment seal for transport without interim storage after loading. An interseal test port is provided and is equipped with a 1/4-inch quick-disconnect valved nipple to allow leak testing of the inner lid o-rings. The interseal test port plug is part of the containment boundary for transport after a period of storage. As shown on Drawing 423-804, the o-ring grooves on the underside of the inner lid are either square to accommodate metallic o-rings or have a truncated triangular shape to accommodate Viton o-rings.

Three ports are recessed into the inner lid: the vent port, the drain port, and the interseal test port. These ports are described in detail in Section 1.2.1.2.4.

1.2.1.2.3 Outer Lid and Bolts

The outer lid, bolts and o-ring, when bolted to the top forging, provide a sealed secondary closure. The outer lid is 5.25 inches thick in the central region, 86.7 inches in diameter, and is fabricated from SA-705, Type 630, H1150, 17-4 PH stainless steel. The 36 outer lid bolts are 1 - 8 UNC socket head cap screws fabricated from SA-564, Type 630, H1150, 17-4 PH stainless steel. The bolt material is identical to that of the outer lid, alleviating differential thermal expansion effects.

The outer lid is bolted to the top forging of the NAC-STC. The lid bolt holes are countersunk into the lid so that the bolt heads are below the top surface of the lid. The bottom surface of the outer lid is sealed to the top forging by one o-ring, which is replaced prior to transport. The o-ring may be either metallic or non-metallic. The interlid port, located in the top forging, is used to test the seal of the o-ring in the outer lid. The top surface of the outer lid has threaded holes for the attachment of a lid-lifting device and for the attachment of the upper transport impact limiter. As shown on Drawing 423-805, the o-ring groove on the underside of the outer lid is either square to accommodate a metallic o-ring or has a truncated triangular shape to accommodate a Viton o-ring.

1.2.1.2.4 Ports and Port Covers

The NAC-STC design includes five ports: three in the inner lid and two in the top forging. The vent, drain and interseal test ports are recessed in the inner lid and provide access to the cask containment. Recessed in the top forging are two noncontainment ports, the interlid port for interlid region drainage and outer lid o-ring leak testing, and the pressure port, which is provided for monitoring of the pressure in the interlid region during storage.

The vent port is a 1.0-inch diameter penetration through the inner lid and is closed by a quick-disconnect valved nipple (quick disconnect). The quick disconnect is not considered to be a containment barrier. The vent port is used to access the cask cavity following the fuel loading to drain, dry, leak test and backfill it with inert gas prior to transport. The vent port coverplate uses a two o-ring design, similar to the inner lid. The o-rings may be either metallic or non-metallic, depending on the cask use. Metallic o-rings are used for storage and for transport following storage. Either metallic or non-metallic o-rings may be used for transport without interim storage after loading. The outer metallic o-ring provides the primary containment seal for transport after storage, while the inner o-ring (either metallic or non-metallic) provides the primary containment seal for transport without interim storage after loading.

The drain port is a 1.0-inch-diameter penetration through the inner lid that is used to fill and drain the cask cavity. The drain port is also closed by a quick disconnect, which is not considered to be a containment barrier. Similar to the vent port, the drain port coverplate uses a two o-ring design. The o-rings may be either metallic or non-metallic, depending on the cask use. Metallic o-rings are used for storage and for transport following storage. Either metallic or non-metallic o-rings may be used for transport without interim storage after loading. The outer metallic o-ring provides the primary containment seal for transport after storage, while the inner o-ring (either metallic or non-metallic) provides the primary containment seal for transport without interim storage after loading. Alignment marks on the top surface of the inner lid and the top forging assist in aligning the drain port in the lid and the drain tube in the cask cavity. The interseal test port is also closed by a quick disconnect, which is not considered to be a containment barrier. The interseal test port containment is a threaded plug with a metallic o-ring.

The pressure port, located in the top forging, houses the transducer that monitors the pressure in the interlid region during storage. The pressure transducer is removed during transport. The interlid

port penetrates the top forging into the region between the inner and the outer lids and serves as a drain for the interlid region and as a port to pressurize the interlid region for seal testing purposes. The interlid port is closed by a quick disconnect. The basic geometry of the interlid and pressure ports and port covers is identical. Each port has a 4.5-inch-diameter opening that is a minimum of 1.1 inches deep. Concentric with the port opening is a 2.93-inch-diameter bore. This bore acts as a lead-in to the 2.875–inch-diameter bore that serves as the sealing surface for the two piston-type blended polytetrafluoroethylene (PTFE) o-rings in the port cover.

Both of the port covers are fabricated from SA-705, Type 630, H1150, 17-4 PH stainless steel. The port covers resemble a cup shape and have the geometrical appearance of a thick round end plate with a cylindrical body. The end plate of the port cover is 4.5 inches in diameter and 1.0 inch thick. The three 3/8 – 16 UNC port cover bolts, which are fabricated from SA-193, Grade B6, Type 410 stainless steel, are countersunk flush with the top of the port cover. There are two piston-type PTFE o-rings on the cylindrical body of the port covers with a seal test port between the o-rings. A retainer is bolted to the open end of the cylindrical body of the port cover to retain the o-rings and the spacer between them after assembly. The port cover design permits the thick end plate to absorb an impact, while any deflection of the end plate results in the o-rings sliding in the bore of the port with the seal maintained.

The basic geometry of the vent port and coverplate, and the drain port and coverplate, are identical to each other. Each port has a 6.53-inch diameter opening in the inner lid that is 1.8 inches deep. Concentric with the port opening is a 2.9-inch deep, 3.25-inch diameter bore that houses the 1.0-inch diameter quick disconnect. As shown in Drawing 423-806, the 1.0-inch thick vent and drain port coverplates are fabricated from SA-240, Type 304 stainless steel. When installed, the port coverplates are recessed 0.8 inch below the top surface of the inner lid. The vent and drain port coverplates are sealed to the inner lid by the metallic o-rings on the bottom face of each port coverplate. The four 1/2 - 13 UNC port coverplate bolts are fabricated from SA-193, Grade B6, Type 410 stainless steel. The bolt holes are countersunk so that the bolt heads are flush with the top of the port coverplate.

1.2.1.2.5 Lifting Trunnions and Rotation Trunnion Recesses

The NAC-STC has four lifting trunnions that are fabricated from SA-705, Type 630, H1150, 17-4 PH stainless steel and are welded into 2.0-inch deep recesses in the top forging at 90-degree intervals around the cask circumference. Only two diametrically opposite lifting trunnions are required to lift the NAC-STC. The basic diameter of the lifting trunnions is 5.5 inches and the

load-bearing width is 2.5 inches. The trunnions are machined to create a 0.38-inch thick end flange, which acts as a safety stop to ensure proper engagement and to prevent inadvertent disengagement of the lifting yoke.

There are two rotation trunnion recesses located near the bottom end of the NAC-STC. The rotation trunnion recesses are located approximately 18 inches above the bottom of the cask in line with two of the lifting trunnion, but 3.0 inches offset from the cask centerline to ensure that rotation of the cask occurs in the proper direction. Each recess is fabricated from SA-705, Type 630, 17-4 PH stainless steel and is groove-welded to the bottom outer forging. The recess is 6.0 inches square and 4.13 inches deep, with a full radius at the top of the recess that engages with the rotation support. The neutron shield shell is cut out to accommodate the rotation trunnion recesses.

1.2.1.2.6 Transport Impact Limiters

The NAC-STC is equipped with removable, cup-shaped impact limiters that are bolted over each end of the cask to ensure that the design impact loads for the cask are not exceeded for any of the defined normal operation or accident drop conditions. The NAC-STC transport impact limiters consist of redwood and balsa wood completely enclosed in a stainless steel shell. The upper impact limiter has cutouts in its inside diameter for clearance with the lifting trunnions. The impact limiters absorb the energy of a cask drop by crushing the redwood and balsa wood. The force required to crush the impact limiter is determined by (1) the amount and location of the redwood and of the balsa wood and (2) the grain direction of the redwood and the balsa wood. The upper and lower impact limiters are bolted over each end of the cask body by 16 equally spaced attachment rods and nuts. The impact limiters are 124 inches in outside diameter, 44.0 inches deep, and overlap the ends of the cask by 12.0 inches. The detailed impact limiter design and analysis are presented in Section 2.6.7.4.

1.2.1.2.7 Directly Loaded Fuel Basket

The NAC-STC has three fuel basket configurations and one GTCC waste configuration. The first fuel basket configuration is for directly loaded fuel. The directly loaded basket is described in this section. The remaining configurations are used within the transportable storage canister. The canister fuel basket and the GTCC waste basket are described in Section 1.2.1.2.8. The directly loaded basket and the canister basket are both constructed of stainless steel with

aluminum heat transfer disks and are of similar design. The GTCC waste configuration is also used within the transportable storage canister and is constructed of stainless steel.

The NAC-STC design includes a directly loaded PWR fuel basket constructed of stainless steel. The fuel basket design is a right-circular cylinder configuration with standard fuel tubes (Drawing 423-870) laterally supported by a series of support disks, which are retained by square spacer nuts on threaded rods at six locations. The nuts are torqued at installation to provide a solid load path in compression between the support disks. The support disks are 0.5-inch thick, 70.86-inch diameter 17-4 PH stainless steel disks spaced 4.87 inches center-to-center with square holes for the fuel tubes. The top end weldment and the bottom end weldment are fabricated from Type 304 stainless steel, are geometrically similar to the support disks, and are 1.0-inch thick. The threaded rods have a 1-5/8 – 8 UN thread diameter and are fabricated from Type 17-4 PH stainless steel. The nuts are 2.5-inch square bars that are also fabricated from Type 17-4 PH stainless steel. The fuel tubes are fabricated from Type 304 stainless steel and provide support for the encased neutron absorber sheet on each of the four sides. The neutron absorber provides criticality control in the basket. No structural credit is assumed for the stainless steel tubes as a contributor to the total structural strength of the basket and support of the fuel assemblies.

The NAC-STC directly loaded fuel basket accommodates 26 PWR fuel assemblies in an aligned configuration in 8.78-inch inside dimension square fuel tubes, which have 0.142-inch thick walls. The fuel tubes are supported in the basket assembly between the top and bottom weldment plates. The hole in the top weldment is 8.75 inches square. The hole in the bottom weldment is 8.65 inch square. The basket design traps the fuel tube between the top and bottom weldment preventing axial movement of the fuel tube. The minimum width of the support disk webs between the fuel tubes is 1.5 inches, but two webs have a width of 3.3 inches.

Twenty Type 6061-T651 aluminum alloy heat transfer disks, 0.625-inches thick, 70.65 inches in diameter, are supported by the threaded rods and spacer nuts, which also support and locate the stainless steel support disks. These aluminum disks are located at the center of the axial spacing between the stainless steel support disks and are sized to eliminate contact with the cask inner shell and basket threaded rods as a result of differential thermal expansion.

The NAC-STC has been designed to facilitate filling with water and subsequent draining. A 1.0-inch rounded notch is located at the bottom of each fuel tube, ensuring that there will be free flow between the inner tube regions and the disk regions. Water will naturally fill and drain between the basket disks and the cask body. Water will also flow between the disks in the gap between

each of the tubes and the disk that surrounds it. Each of the disks also has four 1-inch diameter holes to supplement the flow of water between the disks. Also, to facilitate flow to the drain line, the bottom plate is positioned by supports 1.5 inches above the bottom of the cask. These design features have been provided to ensure that there is a free flow of water in the cask basket that results in even filling and draining of the cask.

1.2.1.2.8 Transportable Storage Canister

The transportable storage canister consists of four (4) principle components. These are the canister, canister basket, shield lid and structural lid. The canister consists of an annular right-circular shell closed at one end by a bottom plate. The bottom plate is 1.0-inch thick Type 304L stainless steel. The shell is constructed of 5/8-inch rolled Type 304L stainless steel plate. The edges of the rolled plates are joined with full penetration welds. The bottom plate is attached to the shell by also using a full penetration weld. The canister shell is constructed in accordance with ASME Code Section III, Subsection NB. The inside and outside diameter of the canister are 69.39 inches and 70.64 inches, respectively. The inside depth is 121.5 inches. The overall external length of the canister is 122.5 inches.

After loading, the canister is closed by a shield lid and structural lid, each welded to the canister shell. Both the shield lid and structural lid welds are examined in accordance with the ASME Code Section V.

The shield lid is a 5-inch thick Type 304L stainless steel plate. It is joined to the canister shell using a partial penetration weld. The shield lid contains the drain and fill penetrations and provides gamma radiation protection to operators for the draining, drying and inerting operations attendant to sealing the canister. After the shield lid is welded in place, the shield lid weld is leak tested in accordance with ANSI N14.5-1997 to ensure that the required leaktightness is achieved.

The structural lid is a 3-inch-thick Type 304L stainless steel plate. It is attached to the canister shell with a partial penetration weld. Removable lifting fixtures threaded in the structural lid are used to lift the loaded canister.

1.2.1.2.8.1 Canister Fuel Basket

The canister fuel basket is used to position up to 36 Yankee Class fuel assemblies within the canister and to maintain geometry control of the fuel during all of the transport (and storage)

conditions. The canister fuel basket is similar in design to the directly loaded fuel basket. It differs primarily in its principle dimensions. As shown in Table 1.2-2, there are minor weight variations between Yankee Class fuel assembly types. Fuel assembly types may be mixed within the canister basket, provided that the contents weight limit of 30,600 pounds is not exceeded. Mixing fuel types within the weight limit can result in a basket containing 36 fuel assemblies, whereas loading a basket with only Westinghouse fuel would result in the basket containing 34 assemblies.

The fuel basket design is a right-circular cylinder with square fuel tubes laterally supported by a series of support disks, which are retained by split spacers on tie rods at eight locations. The split spacers are installed to provide a solid load path in compression between the support disks. The support disks are 0.5-inch-thick, 68.98-inch-diameter 17-4 PH stainless steel disks spaced 3.91 inches center-to-center with square holes for the fuel tubes. The top end disk (top weldment) and the bottom end disk (bottom weldment) are fabricated from Type 304 stainless steel. They are geometrically similar to the support disks and are 0.5-inch thick. The tie rods have a 1-1/8-inch diameter and are fabricated from Type 304 stainless steel.

Fourteen (14) Type 6061-T651 aluminum alloy heat transfer disks, 0.5-inches thick and 68.87 inches in diameter, are supported by the tie rods and split spacers, which also support and locate the stainless steel support disks. These aluminum disks are located at the center of the axial spacing between the stainless steel support disks and are sized to preclude contact with the cask inner shell and basket tie rods as a result of differential thermal expansion.

There are two basket configurations and two fuel tube configurations. Both fuel tube configurations are fabricated from 18 gauge Type 304 stainless steel sheet. The first, the standard fuel tube configuration (Drawing 455-881, Assembly 99), has a square interior cross-section of 7.8 inches and is encased with neutron absorber sheets on all four outside surfaces of the fuel tube. The second, the enlarged fuel tube configuration (Drawing 455-881, Assembly 98 "Oversized Tube Assembly"), has a square interior cross-section of 8.0 inches, but does not have exterior neutron absorber sheets on the sides. These larger cross-section fuel tubes can accommodate fuel assemblies that exhibit slight physical effects (e.g., twist, bow) that could preclude loading in the smaller cross-section standard fuel tubes. The enlarged fuel tubes are restricted to the four corner positions of the basket as shown in Figure 6.3-3. No structural credit is assumed for the stainless steel tubes as a contributor to the total structural strength of the basket and support of the fuel assemblies.

The canister basket configurations accommodate either 36 standard fuel tubes, or 32 standard fuel tubes and four enlarged fuel tubes at the four basket corner positions. To permit full access to the enlarged fuel tubes, the corner positions of the top and bottom weldments used in the enlarged fuel tube basket configuration are also enlarged. Since the enlarged fuel tube and the standard fuel tube with neutron absorber have approximately the same external dimensions, the support disks and heat transfer disks used in the two basket configurations are identical.

The neutron absorber encased on the standard fuel tubes assists in providing criticality control in the basket. However, the minimal interaction of fuel in the corner positions with the fuel in the other basket positions eliminates the need for the neutron absorber in these corner positions. As shown in Section 6.4.3, there is only a minimal change in system reactivity associated with the enlarged fuel tubes. Similarly, the changes in shielding and thermal performance are minimal and not significant. Since the net weight of the enlarged fuel tube is 20 pounds less, the structural evaluation of the standard fuel tube bounds that of the enlarged fuel tube.

The canistered fuel basket accommodates fuel assemblies in an aligned configuration in the square fuel tubes. The fuel tubes are supported in the basket assembly between the top and bottom weldment plates. The hole in the top weldment used with the standard fuel tube is 7.78 inches square, but is 7.97 inches square for the enlarged fuel tube (Drawing 455-881). The hole in the bottom weldment used with the standard fuel tube is 6.0 inches square, and is 6.2 inches square for the enlarged fuel tube (Drawing 455-892). The top of both fuel tube configurations has a flange surface, which extends to 8.7 inches square (Drawing 455-881). The basket design traps the fuel tube between the top and bottom weldments, preventing axial movement of the fuel tubes. The minimum width of the support disk webs between the fuel tubes is 0.75 inches.

The canistered fuel basket has been designed to facilitate filling with water and subsequent draining. A 1.0-inch-diameter rounded notch is located at the bottom of each fuel tube, ensuring that there will be free flow between the inner tube regions and the disk regions. In addition, water will also flow between the disks in the gap between each of the tubes. Each of the disks has three (3) 1.25-inch-diameter holes to facilitate water flow between disks. Also, to facilitate flow to the drain line, the bottom plate is positioned by supports 1.5 inches above the bottom of the cask. These design features have been provided to ensure that there is a free flow of water in the cask basket that results in even filling and draining of the cask.

1.2.1.2.8.2 Canister GTCC Waste Basket

The canister GTCC waste basket positions and supports up to 24 Yankee Class GTCC waste containers. The basket is a modified tube and disk design. The maximum loaded weight of a GTCC waste container is 514 pounds, so the maximum content weight is 12,340 pounds for 24 containers.

The GTCC waste basket is a right-circular cylinder with square tubes laterally supported by a series of eight support disks. The support disks are 1.0-inch-thick, 68.98 inches diameter, Type 304 stainless steel disks that are spaced 15.60 inches center-to-center. The support disks are open in the center region to accommodate the twenty-four 8.32-inch square tubes. The tubes are supported full length by 2.5-inch-thick support walls all around the center region. The support disks are retained in position by welding to the support walls of the basket. The basket accommodates GTCC waste containers in an aligned configuration in 7.82-inch-square inside dimension Type 304 stainless steel tubes, which have 0.25-inch-thick walls.

1.2.1.2.8.3 Canister Transport Spacers

The fuel or GTCC waste canister is located in the NAC-STC cavity by two aluminum honeycomb spacers. One spacer is installed below the canister and one above. The aluminum honeycomb is an engineered material having well-defined load-bearing and crush characteristics established by design and fabrication. The two spacers have different lengths and are not interchangeable. The aluminum honeycomb is encased within a thin 6061-T6 aluminum alloy skin that precludes the entry of incidental water, contamination and foreign materials into the honeycomb structure. The spacers support the canister in all of the normal operations, but may deform during hypothetical accident events.

The bottom spacer is nominally 14 inches high and 69.0 inches in diameter. The top spacer is 28 inches high and 70.6 inches in diameter. Removable lifting lugs are used to install and remove the spacers.

1.2.1.2.8.4 Reconfigured Fuel Assembly

The reconfigured fuel assembly is designed to confine Yankee Class fuel rods, or portions thereof, which are classified as failed fuel, and to maintain the geometric configuration of those fuel rods. The assembly can accept up to 64-full length fuel rods in an eight by eight array of

Table 1.2-1 Design Characteristics of the NAC-STC (continued)

Design Characteristic	Dimension[1]	Material
Outer Lid		
- Body Thickness	5.25	Type 17-4 PH Stainless Steel
- Bolts (36)	1 - 8 UNC	SA-564, Type 630 17-4PH Stainless Steel
Inner Lid Port Coverplates		
- Body Thickness	1.00	Type 304 Stainless Steel
- Bolts (4)	1/2 - 13 UNC	SA-193, Grade B6, Type 410, Stainless Steel
Port Cover		
- Body Thickness	1.01	Type 17-4 PH Stainless Steel
- Bolts (3)	3/8 - 16 UNC	SA-193, GR B6, Type 410 Stainless Steel
Canister Spacers		
- Top Spacer	28.0 x 70.6 (dia)	Aluminum Honeycomb with 6061-T6 Aluminum Outer Shell
- Bottom Spacer	14.0 x 68.9 (dia)	Aluminum Honeycomb with 6061-T6 Aluminum Outer Shell

[1] Dimension in inches unless otherwise noted.

Table 1.2-1 Design Characteristics of the NAC-STC (continued)

Design Characteristics	Dimension[1]	Material
Fuel Basket (Directly Loaded)		
- End Weldments (Plate)	1.0 x 70.86 dia.	Type 304 Stainless Steel
- Support Disks	0.5 x 70.86 dia.	Type 17-4 PH Stainless Steel
- Heat Transfer Disks	0.625 x 70.65 dia.	Type 6061-T651 aluminum alloy
- Fuel Tube (standard)	8.78 x 8.78 (inside dim.) x 0.048 wall	Type 304 Stainless Steel encasing neutron absorber
- Spacer Nuts	2.5 Square	Type 17-4 PH Stainless Steel
- Threaded Rod (6)	1-5/8 - 8 UN	Type 17-4 PH Stainless Steel
Canister GTCC Basket		
- Support Walls	2.5 x 111.3	Type 304 Stainless Steel
- Support Disks	1.0 x 68.98 dia.	Type 304 Stainless Steel
- Tube	8.32 x 8.32 (inside dim.) x 0.25 wall	Type 304 Stainless Steel

[1] Dimensions in inches unless otherwise noted.

Table 1.2-1 Design Characteristics of the NAC-STC (continued)

Design Characteristics	Dimension[1]	Material
Canister Fuel Basket		
- End Weldments	0.5 x 68.98 dia.	Type 304 Stainless Steel
- Support Disks	0.5 x 69.15 dia.	Type 17-4 PH Stainless Steel
- Heat Transfer Disks	0.5 x 68.87 dia.	Type 6061-T651 Aluminum Alloy
- Fuel Tube		
- Standard	7.8 x 7.8 (inside dim.) x 0.048 wall	Type 304 Stainless Steel encasing neutron absorber
-Enlarged	8.0 x 8.0 (inside dim.) x 0.048 wall	Type 304 Stainless Steel without neutron absorber
- Spacers	2.5 dia.	Type 304 Stainless Steel
- Tie Rods (8)	1-1/8 dia.	Type 304 Stainless Steel
Seals (O-Rings) for Storage Configuration		
- Inner Lid		
- Inner	0.25 dia. x 72.251 dia.	Type 321 Stainless Steel
- Outer	0.25 dia. x 73.497 dia.	Type 321 Stainless Steel
- Port Coverplates		
- Inner	0.125 dia. x 3.875 dia.	Type 321 Stainless Steel
- Outer	0.125 dia. x 4.500 dia.	Type 321 Stainless Steel
- Outer Lid	0.250 dia. x 82.060 dia.	Type 321 Stainless Steel
- Port Covers		
- Primary	0.103 dia. x 2.675 dia.	PTFE
- Secondary	0.103 dia. x 2.675 dia.	PTFE

[1] Dimensions in inches unless otherwise noted.

Table 1.2-1 Design Characteristics of the NAC-STC (continued)

Design Characteristics	Dimension[1]	Material
Seals (O-Rings) for Immediate Transport Configuration		
- Inner Lid		
- Inner	0.25 dia. x 72.251 dia.	Viton or Type 321 Stainless Steel
- Outer	0.25 dia. x 73.497 dia.	Viton or Type 321 Stainless Steel
- Port Coverplates	0.125 dia. x 3.875 dia.	Viton or Type 321 Stainless Steel
- Inner	0.125 dia. x 4.500 dia.	Viton or Type 321 Stainless Steel
- Outer	0.250 dia. x 82.060 dia.	Viton or Type 321 Stainless Steel
- Outer Lid		
- Port Covers		
- Primary	0.103 dia. x 2.675 dia.	PTFE
- Secondary	0.103 dia. x 2.675 dia.	PTFE

[1] Dimensions in inches unless otherwise noted.

Table 1.2-2 NAC-STC Directly Loaded Fuel Characteristics

Parameter	Westinghouse PWR Fuel		Framatome-Cogema	
	17 x 17	15 x 15	17 x 17	17 x 17 Ref.[4]
Maximum Number of Assemblies	26	26	26	26
Maximum Assembly Weight, lbs[1]	1467	1440	1463	1472
Maximum Assembly Length, in	160	160	162	162
Active Fuel Length, in	144	144	144	144.25
Fuel Rod Cladding	Zircaloy-4	Zircaloy-4	Zirconium Alloy	Zirconium Alloy
Maximum Uranium, kgU	464	465	464	464
Maximum Initial ^{235}U, wt %	Note 2	Note 2	Note 2	Note 2
Minimum Initial ^{235}U, wt %	Note 3	Note 3	Note 3	Note 3
Maximum Burnup, MWD/MTU	45,000	45,000	45,000	45,000
Maximum Assembly Decay Heat, kW	0.85	0.85	0.85	0.85
Maximum Cask Decay Heat, kW	22.1	22.1	22.1	22.1
Minimum Cool Time, yr	Note 3	Note 3	Note 3	Note 3

1 Actual assembly weights are provided for information only. A conservative weight is used for analysis. These assemblies are the design basis fuel assemblies for the structural, thermal and shielding evaluations. The fuel used for the criticality evaluation is the Westinghouse 17x17OFA. Physical properties for the OFA assembly are provided in Table 6.2-1.
2 Based on criticality analysis. Maximum initial enrichment is variable between 4.2 and 4.5 wt % ^{235}U.
3 Minimum initial enrichment and cool time are based on a fuel loading table, shown in Table 5.4-5.
4 Similar to the Framatome-Cogema 17 x 17, except with expanded fuel characteristics.

Table 1.2-3 NAC-STC Yankee-MPC Canistered Fuel Characteristics

	Yankee Class Fuel[1,4]				
Parameter	**United Nuclear Type A**	**Combustion[2] Type A**	**Westinghouse Type B**	**Exxon Type A**	**Yankee RFA**
Maximum Number of Assemblies	36	36	34	36	36
Maximum Assembly Weight, lbs	850	850	900	850	850
Maximum Assembly Length, in	111.25	111.79	111.25	111.56	111.79
Active Fuel Length, in	91	91	92	91	91
Fuel Rod Cladding	Zircaloy	Zircaloy	Stainless Steel	Zircaloy	Zircaloy
Maximum Uranium, kgU	245.6	239.4	286.9	239.4	70.0
Maximum Initial ^{235}U, wt %	4.0	3.9	4.94	4.0	4.0
Minimum Initial ^{235}U, wt %	4.0	3.7[2]	4.94	3.5	3.5
Maximum Burnup, MWD/MTU	32,000	36,000	32,000	36,000	36,000
Maximum Assembly Decay Heat, kW	0.272	0.347	0.273	0.331	0.097
Maximum Cask Decay Heat, kW	9.8	12.5	9.3	11.9[3]	3.5
Minimum Cool Time, yr	11.0	8.1	19.0	9.0[3]	8.0

1 The Yankee Class Fuel includes United Nuclear Type A and Type B, Combustion Engineering Type A and Type B, Exxon-ANF Type A and Type B and Westinghouse Type A and Type B. The United Nuclear Type A is the most reactive assembly and is used as the design basis fuel for criticality analyses. The Combustion Type A is the design basis fuel for shielding and thermal evaluations. The Westinghouse Type B fuel is the design basis fuel for structural weight considerations. The Yankee Class design basis fuels bound a Yankee Class Reconfigured Fuel Assembly.

2 The NAC-STC can also accommodate canistered Combustion Engineering 3.5 wt % enriched fuel having a minimum cool time of 7 years and a burnup of 32,000 MWD/MTU.

3 The limit corresponds to Exxon assemblies with Zircaloy in-core hardware. Exxon assemblies with steel in-core hardware are limited by a minimum cool time of 16 years and a maximum decay heat of 9.7 kW.

4 The maximum number of mixed Type Yankee Class fuel assemblies is limited to 36 or to 30,600 lbs, total loaded assembly weight.

Chapter 2

2.1 Structural Design

2.1.1 Discussion

The NAC-STC is a cylindrical, multiwall cask designed to safely transport up to 26 design basis PWR fuel assemblies, or up to 36 Yankee Class fuel assemblies, or 24 containers of Greater Than Class C waste. As described in Section 2.6.14, Reconfigured Fuel Assemblies containing failed fuel rods may be substituted for standard Yankee Class fuel assemblies in a canister containing spent fuel. The primary components of the NAC-STC are: (1) the cask body—inner shell, outer shell, lead shell, and bottom; (2) the inner lid, bolts, and o-rings; (3) the outer lid, bolts, and o-ring; (4) the port covers, port coverplates, bolts, and o-rings; (5) the neutron shield; (6) the trunnions; (7) the transport impact limiters—upper and lower; and (8) the fuel basket. The NAC-STC primary containment boundary for storage and transport after storage consists of: (1) inner shell center section and upper and lower inner shell rings (transition sections); (2) bottom inner forging; (3) top forging; (4) inner lid and inner lid outer metallic o-ring; (5) inner lid interseal test port and its threaded plug with metallic o-ring; (6) vent port coverplate and vent port coverplate outer metallic o-ring; (7) vent port coverplate interseal test threaded plug with metallic o-ring; (8) drain port coverplate and drain port coverplate outer metallic o-ring; and (9) drain port coverplate interseal test threaded plug with metallic o-ring. The primary containment boundary for transport immediately after loading consists of: (1) inner shell center section and upper and lower inner shell rings (transition sections); (2) bottom inner forging; (3) top forging; (4) inner lid and inner o-ring; (5) vent port coverplate and vent port coverplate inner o-ring; and (6) drain port coverplate and drain port coverplate inner o-ring. For transport without interim storage after loading, either metallic or non-metallic o-rings may be used in the containment boundary. A detailed discussion of the containment boundary is presented in Chapter 4. As described in Section 7.1.3, for loading of the NAC-STC for immediate shipment, the containment boundary for the inner lid and drain port coverplate are the inner metallic o-rings, rather than the outer o-rings and interseal test plugs. The geometry and the materials of fabrication of the cask components are described in Section 1.2.1 and are shown on the license drawings presented in Section 1.3.2.

The NAC-STC is designed to satisfy the requirements of 10 CFR 71 for the transport of radioactive materials (and the requirements of 10 CFR 72 for the storage of radioactive materials) and the requirements of IAEA Safety Series No. ST-1. The cask body holds and protects the cask cavity contents for the normal conditions of transport, as well as for the hypothetical accident conditions. The lead located between the inner and outer shells provides

the primary gamma radiation shielding for the cask in the radial direction. The cask bottom connects the inner and outer shells, providing for the bottom end closure, as well as both gamma and neutron radiation shielding in the axial direction.

The inner lid, bolts, and o-rings are the primary closure components of the NAC-STC for transport conditions. The outer lid and o-ring provide a secondary closure boundary.

The vent port and the drain port are located in the inner lid and are each protected by a port coverplate. The primary containment boundary at the vent port and at the drain port is the port coverplate and its o-rings. The o-ring is located in the bottom surface of the port coverplate. A second o-ring is also located in the bottom surface of the port coverplate, inside of, and concentric with, the primary containment, outer o-ring.

The forty-two 1 1/2 - 8 UN inner lid bolts are preloaded by an installation torque to restrain rotation of the edge of the inner lid and to maintain a containment seal for the critical load condition. This condition is a uniformly distributed pressure resulting from the impact of the basket and cavity contents on the inner surface during a top end or top corner impact. The critical design load condition for the inner lid bolts, as listed in Table 2.7.1.6.2, Section 2.7.1.6, is a 55 g top corner impact (10 CFR 71 Hypothetical Accident Condition). The critical design load condition for the inner lid is the top end impact, Section 2716.

The outer lid is bolted to the top forging by the thirty-six 1 - 8 UNC outer lid bolts, which are installed to a specified torque. The torque provides a total bolt preload that exceeds the maximum applied bolt load for the critical load condition, preventing any lid and o-ring movement that might result in a loss of secondary seal integrity. The critical design load condition for the outer lid bolts, as listed in Table 2.7.1.6-4, Section 2.7.1.6, is a 49.7 g side impact (10 CFR 71 Hypothetical Accident Condition). The critical design load condition for the outer lid is the pin puncture accident condition. The NAC-STC outer lid bolts are loaded by the interlid region pressure, the o-ring compression force, and by either the impact limiter crush force during a top end or top corner impact, or by a concentrated center load during a pin puncture impact. The outer lid seal is provided by an o-ring, which is tested by pressurizing the interlid region.

In addition to the main closure, the secondary closure boundary of the NAC-STC also includes the two ports located in the top forging—the interlid port and the pressure port. Each of these ports is protected and sealed by a recessed, bolted port cover with two piston-type (bore seal)

September 2002

Revision STC-02F

NAC-STC

NAC Storage Transport Cask

SAFETY ANALYSIS REPORT

Volume 2 of 2

Docket No. 71-9235

NAC INTERNATIONAL

Atlanta Corporate Headquarters 3930 East Jones Bridge Road, Norcross, Georgia 30092 USA
Phone 770-447 1144 Fax 770-447-1797, www nacintl com

List of Effective Pages

List of Effective Pages

Master Table of Contents

i .....Revision STC-01A
ii .....Revision STC-01A
iii .....Revision 10
iv .....Revision 11
v.....Revision 10
vi .....Revision 10
vii .....Revision 12
viii .....Revision 12
ix .....Revision 10
x .....Revision STC-02F
xi .....Revision STC-02F
xii .....Revision STC-02F
xiii .....Revision STC-01A

Chapter 1

1-i .....Revision STC-01A
1-ii.....Revision STC-01A
1-iii.....Revision STC-02F
1-iv .....Revision STC-02F
1-1 .....Revision STC-01A
1-2 .....Revision STC-01A
1-3 .....Revision STC-02F
1-4 .....Revision STC-01A
1-5 .....Revision STC-02F
1-6 .....Revision STC-02F
1-7 .....Revision STC-01A
1.1-1 .....Revision STC-02F
1.1-2 .....Revision STC-01A
1.1-3 .....Revision STC-02F
1.1-4 .....Revision STC-02F
1.1-5 .....Revision STC-01A
1.1-6 .....Revision STC-01A
1.2-1 .....Revision STC-01A
1.2-2 .....Revision STC-01A
1.2-3 .....Revision STC-01A
1.2-4 .....Revision STC-01A
1.2-5 .....Revision STC-02F
1.2-6 .....Revision STC-02F
1.2-7 .....Revision STC-02F
1.2-8 .....Revision STC-01A
1.2-9 .....Revision STC-01A
1.2-10 .....Revision STC-02F
1.2-11 .....Revision STC-01A
1.2-12 .....Revision STC-02F
1.2-13 .....Revision STC-02F
1.2-14 .....Revision STC-01A
1.2-15 .....Revision STC-01A
1.2-16 .....Revision STC-01A
1.2-17 .....Revision STC-01A
1.2-18 .....Revision STC-01A
1.2-19 .....Revision STC-01A
1.2-20 .....Revision 10
1.2-21 .....Revision 10
1.2-22 .....Revision 10
1.2-23 .....Revision STC-01A
1.2-24 .....Revision STC-01A
1.2-25 .....Revision STC-01A
1.2-26 .....Revision STC-02F
1.2-27 .....Revision STC-02F
1.2-28 .....Revision STC-02F
1.2-29 .....Revision STC-02F
1.2-30 .....Revision STC-01A
1.2-31 .....Revision STC-01A
1.3-1 .....Revision 10

41 License Drawings

List of Effective Pages (Continued)

Chapter 2

2-i ..... Revision STC-01A
2-ii ..... Revision STC-01A
2-iii ..... Revision 12
2-iv ..... Revision 12
2-v ..... Revision 12
2-vi ..... Revision 12
2-vii ..... Revision 12
2-viii ..... Revision 12
2-ix ..... Revision STC-01A
2-x ..... Revision 12
2-xi ..... Revision 12
2-xii ..... Revision 12
2-xiii ..... Revision 12
2-xiv ..... Revision 12
2-xv ..... Revision 12
2-xvi ..... Revision 12
2-xvii ..... Revision 12
2-xviii ..... Revision 12
2-xix ..... Revision 12
2-xx ..... Revision 12
2-xxi ..... Revision STC-01A
2-xxii ..... Revision 12
2-xxiii ..... Revision 12
2-xxiv ..... Revision 12
2-xxv ..... Revision 12
2-xxvi ..... Revision 12
2-xxvii ..... Revision 12
2-xxviii ..... Revision 12
2-xxix ..... Revision 12
2-xxx ..... Revision 12
2-xxxi ..... Revision 12
2-xxxii ..... Revision 12
2-xxxiii ..... Revision 12
2-xxxiv ..... Revision 12
2-xxxv ..... Revision 12
2-xxxvi ..... Revision 12
2-xxxvii ..... Revision 12
2-xxxviii ..... Revision 12
2-xxxix ..... Revision 12
2-xl ..... Revision 12
2-xli ..... Revision 12
2-xlii ..... Revision 12
2-xliii ..... Revision 12
2-xliv ..... Revision 12
2-xlv ..... Revision 12
2-xlvi ..... Revision 12
2.0-1 ..... Revision 10
2.1.1-1 ..... Revision STC-02F
2.1.1-2 ..... Revision STC-01A
2.1.1-3 ..... Revision STC-01A
2.1.1-4 ..... Revision STC-01A
2.1.2-1 ..... Revision 1
2.1.2-2 ..... Revision STC-01A
2.1.2-3 ..... Revision 10
2.1.2-4 ..... Revision 10
2.1.2-5 ..... Revision 10
2.1.3-1 ..... Revision 10
2.1.3-2 ..... Revision 10
2.1.3-3 ..... Revision 10
2.1.3-4 ..... Revision 10
2.1.3-5 ..... Revision 10
2.1.3-6 ..... Revision 10
2.1.3-7 ..... Revision 10
2.1.3-8 ..... Revision 10
2.1.3-9 ..... Revision 10
2.1.3-10 ..... Revision 10
2.1.3-11 ..... Revision 10
2.1.3-12 ..... Revision 10
2.1.3-13 ..... Revision 10

List of Effective Pages (Continued)

2.1.3-14 ..... Revision 10
2.1.3-15 ..... Revision 10
2.1.3-16 ..... Revision 10
2.2.0-1 ..... Revision STC-01A
2.2.0-2 ..... Revision STC-01A
2.2.0-3 ..... Revision STC-01A
2.2.0-4 ..... Revision STC-01A
2.3.1-1 ..... Revision STC-01A
2.3.1-2 ..... Revision 10
2.3.2-1 ..... Revision 10
2.3.2-2 ..... Revision STC-01A
2.3.2-3 ..... Revision 10
2.3.2-4 ..... Revision STC-01A
2.3.2-5 ..... Revision 10
2.3.3-1 ..... Revision 2
2.3.3-2 ..... Revision 10
2.3.4-1 ..... Revision 1
2.3.4-2 ..... Revision 2
2.3.4-3 ..... Revision 2
2.3.5-1 ..... Revision 10
2.3.5-2 ..... Revision 2
2.3.6-1 ..... Revision STC-01A
2.3.6-2 ..... Revision STC-01A
2.3.6-3 ..... Revision 1
2.3.6-4 ..... Revision STC-01A
2.3.6-5 ..... Revision 1
2.3.7-1 ..... Revision 10
2.4-1 ..... Revision 10
2.4.1-1 ..... Revision 10
2.4.2-1 ..... Revision 10
2.4.3-1 ..... Revision 1
2.4.4-1 ..... Revision 10
2.4.4-2 ..... Revision 10
2.4.4-3 ..... Revision 10
2.4.4-4 ..... Revision 10
2.4.4-5 ..... Revision 10
2.4.4-6 ..... Revision 10
2.4.4-7 ..... Revision 10
2.4.4-8 ..... Revision 10
2.4.4-9 ..... Revision STC-01A
2.4.5-1 ..... Revision 1
2.4.6-1 ..... Revision 1
2.5.1-1 ..... Revision 1
2.5.1-2 ..... Revision 2
2.5.1-3 ..... Revision 1
2.5.1-4 ..... Revision 10
2.5.1-5 ..... Revision 10
2.5.1-6 ..... Revision 1
2.5.1-7 ..... Revision 10
2.5.1-8 ..... Revision 10
2.5.1-9 ..... Revision 10
2.5.1-10 ..... Revision 10
2.5.1-11 ..... Revision 10
2.5.1-12 ..... Revision 1
2.5.1-13 ..... Revision 1
2.5.1-14 ..... Revision 10
2.5.1-15 ..... Revision 10
2.5.1-16 ..... Revision STC-01A
2.5.1-17 ..... Revision 1
2.5.1-18 ..... Revision 1
2.5.1-19 ..... Revision 1
2.5.1-20 ..... Revision STC-01A
2.5.1-21 ..... Revision 1
2.5.1-22 ..... Revision 10
2.5.1-23 ..... Revision 10
2.5.1-24 ..... Revision 10
2.5.1-25 ..... Revision 10
2.5.1-26 ..... Revision 10
2.5.1-27 ..... Revision 10
2.5.1-28 ..... Revision 10

List of Effective Pages (Continued)

2.5.1-29 ..... Revision 10
2.5.1-30 ..... Revision 10
2.5.1-31 ..... Revision 10
2.5.1-32 ..... Revision 10
2.5.1-33 ..... Revision 10
2.5.2-1 ..... Revision 1
2.5.2-2 ..... Revision 1
2.5.2-3 ..... Revision 1
2.5.2-4 ..... Revision 1
2.5.2-5 ..... Revision 1
2.5.2-6 ..... Revision 1
2.5.2-7 ..... Revision 1
2.5.2-8 ..... Revision 1
2.5.2-9 ..... Revision 1
2.5.2-10 ..... Revision 1
2.5.2-11 ..... Revision 1
2.5.2-12 ..... Revision 1
2.5.2-13 ..... Revision 2
2.5.2-14 ..... Revision 2
2.5.2-15 ..... Revision 2
2.5.2-16 ..... Revision 2
2.5.2-17 ..... Revision 2
2.5.2-18 ..... Revision 2
2.5.2-19 ..... Revision 2
2.5.2-20 ..... Revision 2
2.5.2-21 ..... Revision 2
2.5.2-22 ..... Revision 10
2.5.2-23 ..... Revision 10
2.5.2-24 ..... Revision 10
2.5.2-25 ..... Revision 10
2.5.2-26 ..... Revision 10
2.5.2-27 ..... Revision 2
2.5.2-28 ..... Revision 2
2.5.2-29 ..... Revision 2
2.6-1 ..... Revision 10
2.6-2 ..... Revision 10
2.6.1.0-1 ..... Revision 1
2.6.1.0-2 ..... Revision 10
2.6.1.0-3 ..... Revision 10
2.6.1.0-4 ..... Revision 10
2.6.1.0-5 ..... Revision 2
2.6.1.0-6 ..... Revision 10
2.6.2.0-1 ..... Revision 10
2.6.2.0-2 ..... Revision 10
2.6.2.0-3 ..... Revision 10
2.6.2.0-4 ..... Revision 10
2.6.2.0-5 ..... Revision 10
2.6.2.0-6 ..... Revision 10
2.6.3.0-1 ..... Revision 10
2.6.4.0-1 ..... Revision 1
2.6.5.0-1 ..... Revision 10
2.6.5.0-2 ..... Revision 10
2.6.5.0-3 ..... Revision 10
2.6.6.0-1 ..... Revision 1
2.6.7.0-1 ..... Revision 1
2.6.7.1-1 ..... Revision 10
2.6.7.1-2 ..... Revision 10
2.6.7.1-3 ..... Revision 10
2.6.7.1-4 ..... Revision 10
2.6.7.1-5 ..... Revision 10
2.6.7.1-6 ..... Revision 10
2.6.7.1-7 ..... Revision 10
2.6.7.1-8 ..... Revision 10
2.6.7.1-9 ..... Revision 10
2.6.7.2-1 ..... Revision 10
2.6.7.2-2 ..... Revision 10
2.6.7.2-3 ..... Revision 10
2.6.7.2-4 ..... Revision 10
2.6.7.2-5 ..... Revision 10
2.6.7.2-6 ..... Revision 10

List of Effective Pages (Continued)

2.6.7.2-7 ..... Revision 10
2.6.7.2-8 ..... Revision 10
2.6.7.2-9 ..... Revision 10
2.6.7.2-10 ..... Revision 10
2.6.7.2-11 ..... Revision 10
2.6.7.2-12 ..... Revision 10
2.6.7.2-13 ..... Revision 10
2.6.7.2-14 ..... Revision 10
2.6.7.3-1 ..... Revision 10
2.6.7.3-2 ..... Revision 10
2.6.7.3-3 ..... Revision 10
2.6.7.3-4 ..... Revision 10
2.6.7.3-5 ..... Revision 10
2.6.7.3-6 ..... Revision 10
2.6.7.3-7 ..... Revision 10
2.6.7.3-8 ..... Revision 10
2.6.7.3-9 ..... Revision 10
2.6.7.3-10 ..... Revision 10
2.6.7.3-11 ..... Revision 10
2.6.7.4-1 ..... Revision 10
2.6.7.4-2 ..... Revision 10
2.6.7.4-3 ..... Revision 10
2.6.7.4-4 ..... Revision 10
2.6.7.4-5 ..... Revision 10
2.6.7.4-6 ..... Revision 10
2.6.7.4-7 ..... Revision 10
2.6.7.4-8 ..... Revision 10
2.6.7.4-9 ..... Revision 10
2.6.7.4-10 ..... Revision 10
2.6.7.4-11 ..... Revision 10
2.6.7.4-12 ..... Revision 10
2.6.7.4-13 ..... Revision 10
2.6.7.4-14 ..... Revision 10
2.6.7.4-15 ..... Revision 10
2.6.7.4-16 ..... Revision 10
2.6.7.4-17 ..... Revision 10
2.6.7.4-18 ..... Revision 10
2.6.7.4-19 ..... Revision 10
2.6.7.4-20 ..... Revision 10
2.6.7.4-21 ..... Revision 10
2.6.7.4-22 ..... Revision 10
2.6.7.4-23 ..... Revision 2
2.6.7.4-24 ..... Revision 2
2.6.7.4-25 ..... Revision 2
2.6.7.4-26 ..... Revision 2
2.6.7.4-27 ..... Revision 2
2.6.7.4-28 ..... Revision 2
2.6.7.4-29 ..... Revision 2
2.6.7.4-30 ..... Revision 2
2.6.7.4-31 ..... Revision 3
2.6.7.4-32 ..... Revision 2
2.6.7.4-33 ..... Revision 2
2.6.7.4-34 ..... Revision 2
2.6.7.4-35 ..... Revision 2
2.6.7.4-36 ..... Revision 2
2.6.7.4-37 ..... Revision 2
2.6.7.4-38 ..... Revision 2
2.6.7.4-39 ..... Revision 2
2.6.7.4-40 ..... Revision 2
2.6.7.5-1 ..... Revision STC-01A
2.6.7.5-2 ..... Revision 10
2.6.7.5-3 ..... Revision STC-01A
2.6.7.5-4 ..... Revision STC-01A
2.6.7.5-5 ..... Revision 10
2.6.7.5-6 ..... Revision 10
2.6.7.5-7 ..... Revision 10
2.6.7.5-8 ..... Revision 10
2.6.7.5-9 ..... Revision 10
2.6.7.5-10 ..... Revision 10
2.6.7.5-11 ..... Revision STC-01A

List of Effective Pages (Continued)

2.6.7.5-12 ..... Revision 10
2.6.7.5-13 ..... Revision 10
2.6.7.5-14 ..... Revision 10
2.6.7.5-15 ..... Revision 10
2.6.7.5-16 ..... Revision 10
2.6.7.5-17 ..... Revision 10
2.6.7.5-18 ..... Revision 10
2.6.7.6-1 ..... Revision 7
2.6.7.6-2 ..... Revision 10
2.6.7.6-3 ..... Revision 1
2.6.7.6-4 ..... Revision 1
2.6.7.6-5 ..... Revision 1
2.6.7.6-6 ..... Revision 7
2.6.7.6-7 ..... Revision 7
2.6.7.6-8 ..... Revision 7
2.6.7.6-9 ..... Revision 7
2.6.7.6-10 ..... Revision 10
2.6.7.6-11 ..... Revision 7
2.6.7.6-12 ..... Revision 7
2.6.7.6-13 ..... Revision 7
2.6.7.6-14 ..... Revision 7
2.6.7.6-15 ..... Revision 7
2.6.7.6-16 ..... Revision 7
2.6.7.6-17 ..... Revision 7
2.6.7.7-1 ..... Revision 1
2.6.7.7-2 ..... Revision 1
2.6.7.7-3 ..... Revision 1
2.6.7.7-4 ..... Revision 1
2.6.7.7-5 ..... Revision 1
2.6.8.0-1 ..... Revision 1
2.6.9.0-1 ..... Revision 1
2.6.10.0-1 ..... Revision 1
2.6.10.1-1 ..... Revision 1
2.6.10.2-1 ..... Revision 1
2.6.10.2-2 ..... Revision 1
2.6.10.2-3 ..... Revision 1
2.6.10.2-4 ..... Revision 1
2.6.10.3-1 ..... Revision 1
2.6.10.3-2 ..... Revision 2
2.6.10.3-3 ..... Revision 1
2.6.10.3-4 ..... Revision 1
2.6.10.3-5 ..... Revision 1
2.6.10.3-6 ..... Revision 1
2.6.10.3-7 ..... Revision 1
2.6.11.0-1 ..... Revision 2
2.6.11.0-2 ..... Revision 2
2.6.11.1-1 ..... Revision 2
2.6.11.1-2 ..... Revision 2
2.6.11.1-3 ..... Revision 2
2.6.11.1-4 ..... Revision 2
2.6.11.2-1 ..... Revision 2
2.6.11.2-2 ..... Revision 2
2.6.11.2-3 ..... Revision 2
2.6.11.2-4 ..... Revision 2
2.6.11.2-5 ..... Revision 2
2.6.11.2-6 ..... Revision 2
2.6.11.2-7 ..... Revision 2
2.6.11.2-8 ..... Revision 2
2.6.11.2-9 ..... Revision 2
2.6.11.2-10 ..... Revision 2
2.6.11.2-11 ..... Revision 2
2.6.11.2-12 ..... Revision 2
2.6.11.3-1 ..... Revision 2
2.6.12.0-1 ..... Revision 10
2.6.12.0-2 ..... Revision 10
2.6.12.0-3 ..... Revision 10
2.6.12.0-4 ..... Revision 10
2.6.12.0-5 ..... Revision 10
2.6.12.1-1 ..... Revision 10
2.6.12.2-1 ..... Revision 10

List of Effective Pages (Continued)

2.6.12.2-2 ..... Revision 10
2.6.12.2-3 ..... Revision 10
2.6.12.2-4 ..... Revision 10
2.6.12.2-5 ..... Revision 10
2.6.12.2-6 ..... Revision 10
2.6.12.3-1 ..... Revision 10
2.6.12.3-2 ..... Revision 10
2.6.12.3-3 ..... Revision 10
2.6.12.3-4 ..... Revision 10
2.6.12.3-5 ..... Revision 10
2.6.12.3-6 ..... Revision 10
2.6.12.3-7 ..... Revision 10
2.6.12.4-1 ..... Revision 10
2.6.12.4-2 ..... Revision 10
2.6.12.4-3 ..... Revision 10
2.6.12.5-1 ..... Revision 10
2.6.12.5-2 ..... Revision 10
2.6.12.5-3 ..... Revision 10
2.6.12.6-1 ..... Revision STC-01A
2.6.12.6-2 ..... Revision 10
2.6.12.7-1 ..... Revision 10
2.6.12.7-2 ..... Revision 10
2.6.12.7-3 ..... Revision 10
2.6.12.7-4 ..... Revision 10
2.6.12.7-5 ..... Revision 10
2.6.12.7-6 ..... Revision 10
2.6.12.7-7 ..... Revision 10
2.6.12.7-8 ..... Revision 10
2.6.12.7-9 ..... Revision 10
2.6.12.7-10 ..... Revision 10
2.6.12.7-11 ..... Revision 10
2.6.12.7-12 ..... Revision 10
2.6.12.7-13 ..... Revision 10
2.6.12.7-14 ..... Revision 10
2.6.12.7-15 ..... Revision 10
2.6.12.7-16 ..... Revision 10
2.6.12.7-17 ..... Revision 10
2.6.12.7-18 ..... Revision 10
2.6.12.7-19 ..... Revision 10
2.6.12.7-20 ..... Revision 10
2.6.12.7-21 ..... Revision 10
2.6.12.7-22 ..... Revision 10
2.6.12.8-1 ..... Revision 10
2.6.12.8-2 ..... Revision 10
2.6.12.9-1 ..... Revision 10
2.6.12.9-2 ..... Revision 10
2.6.12.9-3 ..... Revision 10
2.6.12.9-4 ..... Revision 10
2.6.12.9-5 ..... Revision 10
2.6.12.9-6 ..... Revision 10
2.6.12.9-7 ..... Revision 10
2.6.12.9-8 ..... Revision 10
2.6.12.9-9 ..... Revision 10
2.6.12.9-10 ..... Revision 10
2.6.12.9-11 ..... Revision 10
2.6.12.10-1 ..... Revision 10
2.6.12.11-1 ..... Revision 10
2.6.12.12-1 ..... Revision 10
2.6.12.13-1 ..... Revision 10
2.6.12.13-2 ..... Revision 10
2.6.12.13-3 ..... Revision 10
2.6.12.13-4 ..... Revision 10
2.6.13-1 ..... Revision 10
2.6.13-2 ..... Revision 10
2.6.13-3 ..... Revision 10
2.6.13.1-1 ..... Revision 11
2.6.13.1-2 ..... Revision 11
2.6.13.2-1 ..... Revision 10
2.6.13.2-2 ..... Revision 10
2.6.13.2-3 ..... Revision 10

List of Effective Pages (Continued)

2.6.13.2-4 ..... Revision 10
2.6.13.2-5 ..... Revision 10
2.6.13.2-6 ..... Revision 10
2.6.13.2-7 ..... Revision 10
2.6.13.3-1 ..... Revision 10
2.6.13.3-2 ..... Revision 10
2.6.13.3-3 ..... Revision 10
2.6.13.3-4 ..... Revision 10
2.6.13.4-1 ..... Revision 11
2.6.13.4-2 ..... Revision 11
2.6.13.4-3 ..... Revision 11
2.6.13.4-4 ..... Revision 11
2.6.13.4-5 ..... Revision 11
2.6.13.5-1 ..... Revision 10
2.6.13.5-2 ..... Revision 11
2.6.13.6-1 ..... Revision 10
2.6.13.6-2 ..... Revision 11
2.6.13.7-1 ..... Revision 10
2.6.13.7-2 ..... Revision 11
2.6.13.8-1 ..... Revision 10
2.6.13.9-1 ..... Revision 11
2.6.13.10-1 ..... Revision 10
2.6.13.11-1 ..... Revision 10
2.6.13.11-2 ..... Revision 10
2.6.13.11-3 ..... Revision 10
2.6.13.12-1 ..... Revision 11
2.6.13.12-2 ..... Revision 11
2.6.14-1 ..... Revision 10
2.6.14-2 ..... Revision 10
2.6.14-3 ..... Revision 10
2.6.14-4 ..... Revision 10
2.6.14-5 ..... Revision 10
2.6.14-6 ..... Revision 10
2.6.14-7 ..... Revision 10
2.6.14-8 ..... Revision 10
2.6.14-9 ..... Revision 10
2.6.14-10 ..... Revision 10
2.6.14-11 ..... Revision 10
2.6.14-12 ..... Revision 10
2.6.14-13 ..... Revision 10
2.6.14-14 ..... Revision 10
2.6.14-15 ..... Revision 10
2.6.14-16 ..... Revision 10
2.6.14-17 ..... Revision 10
2.6.14-18 ..... Revision 10
2.6.14-19 ..... Revision 10
2.6.14-20 ..... Revision 10
2.6.14-21 ..... Revision 10
2.6.14-22 ..... Revision 10
2.6.14-23 ..... Revision 10
2.6.14-24 ..... Revision 10
2.6.14-25 ..... Revision 10
2.6.14-26 ..... Revision 10
2.6.14-27 ..... Revision 10
2.6.14-28 ..... Revision 10
2.6.14-29 ..... Revision 10
2.6.14-30 ..... Revision 10
2.6.14-31 ..... Revision 10
2.6.14-32 ..... Revision 10
2.6.14-33 ..... Revision 10
2.6.14-34 ..... Revision 10
2.6.14-35 ..... Revision 10
2.6.14-36 ..... Revision 10
2.6.14-37 ..... Revision 10
2.6.14-38 ..... Revision 10
2.6.14-39 ..... Revision 10
2.6.14-40 ..... Revision 10
2.6.14-41 ..... Revision 10
2.6.14-42 ..... Revision 10
2.6.14-43 ..... Revision 10

List of Effective Pages (Continued)

2.6.14-44 ..... Revision 10
2.6.14-45 ..... Revision 10
2.6.14-46 ..... Revision 10
2.6.14-47 ..... Revision 10
2.6.14-48 ..... Revision 10
2.6.14-49 ..... Revision 10
2.6.14-50 ..... Revision 10
2.6.14-51 ..... Revision 10
2.6.14-52 ..... Revision 10
2.6.14-53 ..... Revision 10
2.6.14-54 ..... Revision 10
2.6.14-55 ..... Revision 10
2.6.14-56 ..... Revision 10
2.6.14-57 ..... Revision 10
2.6.14-58 ..... Revision 10
2.6.14-59 ..... Revision 10
2.6.14-60 ..... Revision 10
2.6.14-61 ..... Revision 10
2.6.14-62 ..... Revision 10
2.6.14-63 ..... Revision 10
2.6.14-64 ..... Revision 10
2.6.15-1 ..... Revision 10
2.6.15-2 ..... Revision 10
2.6.15-3 ..... Revision 10
2.6.16-1 ..... Revision 10
2.6.16-2 ..... Revision 10
2.6.16-3 ..... Revision 10
2.6.16-4 ..... Revision 10
2.6.16-5 ..... Revision 10
2.6.16-6 ..... Revision 10
2.6.16-7 ..... Revision 10
2.6.16-8 ..... Revision 10
2.7-1 ..... Revision 10
2.7-2 ..... Revision 10
2.7.1-1 ..... Revision 10
2.7.1-2 ..... Revision 10
2.7.1.1-1 ..... Revision 10
2.7.1.1-2 ..... Revision 10
2.7.1.1-3 ..... Revision 10
2.7.1.1-4 ..... Revision 10
2.7.1.1-5 ..... Revision 10
2.7.1.1-6 ..... Revision 10
2.7.1.1-7 ..... Revision 10
2.7.1.2-1 ..... Revision 10
2.7.1.2-2 ..... Revision 10
2.7.1.2-3 ..... Revision 10
2.7.1.2-4 ..... Revision 10
2.7.1.2-5 ..... Revision 10
2.7.1.2-6 ..... Revision 1
2.7.1.2-7 ..... Revision 10
2.7.1.2-8 ..... Revision 2
2.7.1.2-9 ..... Revision 10
2.7.1.2-10 ..... Revision 10
2.7.1.3-1 ..... Revision 10
2.7.1.3-2 ..... Revision 10
2.7.1.3-3 ..... Revision 10
2.7.1.3-4 ..... Revision 10
2.7.1.3-5 ..... Revision 10
2.7.1.3-6 ..... Revision 10
2.7.1.3-7 ..... Revision 10
2.7.1.3-8 ..... Revision 10
2.7.1.3-9 ..... Revision 10
2.7.1.4-1. ..... Revision 10
2.7.1.4-2 ..... Revision 1
2.7.1.4-3 ..... Revision 10
2.7.1.4-4 ..... Revision 10
2.7.1.4-5 ..... Revision 10
2.7.1.4-6 ..... Revision 10
2.7.1.4-7 ..... Revision 1
2.7.1.4-8 ..... Revision 1

List of Effective Pages (Continued)

2.7.1.4-9 ..... Revision 10
2.7.1.4-10 ..... Revision 1
2.7.1.4-11 ..... Revision 10
2.7.1.4-12 ..... Revision 10
2.7.1.5-1 ..... Revision 10
2.7.1.5-2 ..... Revision 10
2.7.1.5-3 ..... Revision 10
2.7.1.6-1 ..... Revision 2
2.7.1.6-2 ..... Revision 2
2.7.1.6-3 ..... Revision 10
2.7.1.6-4 ..... Revision 10
2.7.1.6-5 ..... Revision 10
2.7.1.6-6 ..... Revision STC-01A
2.7.1.6-7 ..... Revision 10
2.7.1.6-8 ..... Revision 10
2.7.1.6-9 ..... Revision 10
2.7.1.6-10 ..... Revision 1
2.7.1.6-11 ..... Revision 1
2.7.1.6-12 ..... Revision 1
2.7.1.6-13 ..... Revision 2
2.7.1.6-14 ..... Revision 2
2.7.1.6-15 ..... Revision 10
2.7.1.6-16 ..... Revision 10
2.7.1.6-17 ..... Revision 10
2.7.1.6-18 ..... Revision 10
2.7.2-1 ..... Revision 10
2.7.2.1-1 ..... Revision 1
2.7.2.1-2 ..... Revision 2
2.7.2.1-3 ..... Revision 1
2.7.2.1-4 ..... Revision 1
2.7.2.2-1 ..... Revision 2
2.7.2.2-2 ..... Revision 2
2.7.2.2-3 ..... Revision 1
2.7.2.2-4 ..... Revision 1
2.7.2.2-5 ..... Revision STC-01A
2.7.2.2-6 ..... Revision 1
2.7.2.3-1 ..... Revision 1
2.7.2.3-2 ..... Revision 1
2.7.2.3-3 ..... Revision 1
2.7.2.3-4 ..... Revision 2
2.7.2.3-5 ..... Revision 2
2.7.2.3-6 ..... Revision 1
2.7.2.3-7 ..... Revision 1
2.7.2.4-1 ..... Revision 1
2.7.2.4-2 ..... Revision 1
2.7.2.4-3 ..... Revision 1
2.7.2.4-4 ..... Revision 1
2.7.2.4-5 ..... Revision 1
2.7.2.4-6 ..... Revision 1
2.7.2.4-7 ..... Revision 1
2.7.2.5-1 ..... Revision 1
2.7.2.6-1 ..... Revision 1
2.7.3.1-1 ..... Revision 10
2.7.3.2-1 ..... Revision 10
2.7.3.2-2 ..... Revision 10
2.7.3.2-3 ..... Revision 10
2.7.3.2-4 ..... Revision 10
2.7.3.2-5 ..... Revision 10
2.7.3.2-6 ..... Revision 10
2.7.3.3-1 ..... Revision 1
2.7.3.3-2 ..... Revision 10
2.7.3.3-3 ..... Revision 10
2.7.3.4-1 ..... Revision 10
2.7.3.4-2 ..... Revision 1
2.7.3.5-1 ..... Revision 1
2.7.3.6-1 ..... Revision 1
2.7.4-1 ..... Revision 10
2.7.5-1 ..... Revision 10
2.7.6-1 ..... Revision 10
2.7.7-1 ..... Revision 10

List of Effective Pages (Continued)

2.7.7-2 ..... Revision 10
2.7.7-3 ..... Revision 10
2.7.7-4 ..... Revision 10
2.7.8-1 ..... Revision 10
2.7.8-2 ..... Revision 10
2.7.8-3 ..... Revision 10
2.7.8-4 ..... Revision 10
2.7.8.1-1 ..... Revision 10
2.7.8.1-2 ..... Revision 2
2.7.8.1-3 ..... Revision 10
2.7.8.1-4 ..... Revision 2
2.7.8.1-5 ..... Revision 2
2.7.8.1-6 ..... Revision 10
2.7.8.1-7 ..... Revision STC-01A
2.7.8.1-8 ..... Revision 10
2.7.8.1-9 ..... Revision 10
2.7.8.1-10 ..... Revision 2
2.7.8.1-11 ..... Revision 2
2.7.8.1-12 ..... Revision 2
2.7.8.1-13 ..... Revision 2
2.7.8.1-14 ..... Revision 2
2.7.8.1-15 ..... Revision 2
2.7.8.1-16 ..... Revision 2
2.7.8.1-17 ..... Revision 2
2.7.8.1-18 ..... Revision 2
2.7.8.1-19 ..... Revision 2
2.7.8.1-20 ..... Revision 2
2.7.8.1-21 ..... Revision 2
2.7.8.1-22 ..... Revision 2
2.7.8.1-23 ..... Revision 2
2.7.8.1-24 ..... Revision 2
2.7.8.1-25 ..... Revision 2
2.7.8.1-26 ..... Revision 2
2.7.8.1-27 ..... Revision 2
2.7.8.1-28 ..... Revision 2
2.7.8.1-29 ..... Revision 2
2.7.8.1-30 ..... Revision 2
2.7.8.1-31 ..... Revision 2
2.7.8.1-32 ..... Revision 2
2.7.8.1-33 ..... Revision 2
2.7.8.1-34 ..... Revision 2
2.7.8.1-35 ..... Revision 2
2.7.8.1-36 ..... Revision 2
2.7.8.1-37 ..... Revision 2
2.7.8.1-38 ..... Revision 2
2.7.8.1-39 ..... Revision 2
2.7.8.1-40 ..... Revision 2
2.7.8.1-41 ..... Revision 2
2.7.8.1-42 ..... Revision 2
2.7.8.1-43 ..... Revision 2
2.7.8.2-1 ..... Revision STC-01A
2.7.8.2-2 ..... Revision STC-01A
2.7.8.3-1 ..... Revision 2
2.7.8.3-2 ..... Revision 2
2.7.8.3-3 ..... Revision 2
2.7.8.3-4 ..... Revision 2
2.7.8.3-5 ..... Revision 2
2.7.8.3-6 ..... Revision 2
2.7.8.3-7 ..... Revision STC-01A
2.7.8.3-8 ..... Revision STC-01A
2.7.8.3-9 ..... Revision 10
2.7.8.3-10 ..... Revision 2
2.7.8.3-11 ..... Revision 2
2.7.8.3-12 ..... Revision 2
2.7.8.3-13 ..... Revision 2
2.7.8.4-1 ..... Revision 2
2.7.8.4-2 ..... Revision 10
2.7.8.4-3 ..... Revision 5
2.7.8.4-4 ..... Revision 5
2.7.8.4-5 ..... Revision 5

List of Effective Pages (Continued)

2.7.8.4-6 ..... Revision 5
2.7.8.4-7 ..... Revision 10
2.7.8.4-8 ..... Revision 5
2.7.8.4-9 ..... Revision 5
2.7.8.4-10 ..... Revision 5
2.7.8.5-1 ..... Revision 3
2.7.9-1 ..... Revision 10
2.7.9-2 ..... Revision 10
2.7.9-3 ..... Revision 10
2.7.9-4 ..... Revision 10
2.7.9-5 ..... Revision 10
2.7.9-6 ..... Revision 10
2.7.9-7 ..... Revision 10
2.7.9-8 ..... Revision 10
2.7.9-9 ..... Revision 10
2.7.9-10 ..... Revision 10
2.7.9-11 ..... Revision 10
2.7.9-12 ..... Revision 10
2.7.9-13 ..... Revision 10
2.7.9-14 ..... Revision 10
2.7.9-15 ..... Revision 10
2.7.9-16 ..... Revision 10
2.7.9-17 ..... Revision 10
2.7.9-18 ..... Revision 10
2.7.9-19 ..... Revision 10
2.7.9-20 ..... Revision 10
2.7.9-21 ..... Revision 10
2.7.9-22 ..... Revision 10
2.7.9-23 ..... Revision 10
2.7.9-24 ..... Revision 10
2.7.9-25 ..... Revision 10
2.7.9-26 ..... Revision 10
2.7.9-27 ..... Revision 10
2.7.9-28 ..... Revision 10
2.7.9-29 ..... Revision 10
2.7.9-30 ..... Revision 10
2.7.9-31 ..... Revision 12
2.7.9-32 ..... Revision 10
2.7.9-33 ..... Revision 10
2.7.9-34 ..... Revision 10
2.7.9-35 ..... Revision 10
2.7.9-36 ..... Revision 10
2.7.9-37 ..... Revision 10
2.7.10-1 ..... Revision 10
2.7.10-2 ..... Revision 10
2.7.10-3 ..... Revision 10
2.7.10-4 ..... Revision 10
2.7.10-5 ..... Revision 10
2.7.10-6 ..... Revision 10
2.7.10-7 ..... Revision 10
2.7.10-8 ..... Revision 10
2.7.10-9 ..... Revision 10
2.7.11-1 ..... Revision 10
2.7.11-2 ..... Revision 10
2.7.11-3 ..... Revision 11
2.7.11-4 ..... Revision 10
2.7.11-5 ..... Revision 11
2.7.11-6 ..... Revision 11
2.7.11-7 ..... Revision 11
2.7.11-8 ..... Revision 11
2.7.11-9 ..... Revision 10
2.7.11-10 ..... Revision 11
2.7.11-11 ..... Revision 12
2.7.11-12 ..... Revision 12
2.7.11-13 ..... Revision 12
2.7.11-14 ..... Revision 12
2.7.11-15 ..... Revision 12
2.7.11-16 ..... Revision 12
2.8.0-1 ..... Revision 1
2.9-1 ..... Revision 12

List of Effective Pages (Continued)

2.9-2 ..... Revision 12
2.9-3 ..... Revision 12
2.9-4 ..... Revision 12
2.9-5 ..... Revision 12
2.9-6 ..... Revision 12
2.9-7 ..... Revision 12
2.9-8 ..... Revision 12
2.9-9 ..... Revision 12
2.10.1-1 ..... Revision 10
2.10.1-2 ..... Revision 10
2.10.1-3 ..... Revision 1
2.10.2-1 ..... Revision 10
2.10.2-2 ..... Revision 1
2.10.2-3 ..... Revision 1
2.10.2-4 ..... Revision 2
2.10.2-5 ..... Revision 10
2.10.2-6 ..... Revision 1
2.10.2-7 ..... Revision 1
2.10.2-8 ..... Revision 1
2.10.2-9 ..... Revision 1
2.10.2-10 ..... Revision 1
2.10.2-11 ..... Revision 1
2.10.2-12 ..... Revision 10
2.10.2-13 ..... Revision 10
2.10.2-14 ..... Revision 10
2.10.2-15 ..... Revision 10
2.10.2-16 ..... Revision 10
2.10.2-17 ..... Revision 10
2.10.2-18 ..... Revision 10
2.10.2-19 ..... Revision 10
2.10.2-20 ..... Revision 10
2.10.2-21 ..... Revision 10
2.10.2-22 ..... Revision 10
2.10.2-23 ..... Revision 10
2.10.2-24 ..... Revision 10
2.10.2-25 ..... Revision 10
2.10.2-26 ..... Revision 10
2.10.2-27 ..... Revision 10
2.10.2-28 ..... Revision 10
2.10.2-29 ..... Revision 1
2.10.2-30 ..... Revision 1
2.10.2-31 ..... Revision 1
2.10.2-32 ..... Revision 2
2.10.2-33 ..... Revision 1
2.10.2-34 ..... Revision 1
2.10.2-35 ..... Revision 1
2.10.2-36 ..... Revision 1
2.10.2-37 ..... Revision 1
2.10.2-38 ..... Revision 1
2.10.2-39 ..... Revision 1
2.10.2-40 ..... Revision 1
2.10.2-41 ..... Revision 1
2.10.2-42 ..... Revision 1
2.10.2-43 ..... Revision 1
2.10.2-44 ..... Revision 1
2.10.2-45 ..... Revision 1
2.10.2-46 ..... Revision 1
2.10.2-47 ..... Revision 1
2.10.2-48 ..... Revision 1
2.10.2-49 ..... Revision 1
2.10.2-50 ..... Revision 1
2.10.2-51 ..... Revision 1
2.10.2-52 ..... Revision 1
2.10.2-53 ..... Revision 1
2.10.2-54 ..... Revision 1
2.10.2-55 ..... Revision 1
2.10.2-56 ..... Revision 1
2.10.2-57 ..... Revision 1
2.10.2-58 ..... Revision 1
2.10.2-59 ..... Revision 1

List of Effective Pages (Continued)

2.10.2-60 ..... Revision 1
2.10.2-61 ..... Revision 1
2.10.2-62 ..... Revision 1
2.10.2-63 ..... Revision 1
2.10.2-64 ..... Revision 1
2.10.2-65 ..... Revision 1
2.10.2-66 ..... Revision 1
2.10.2-67 ..... Revision 1
2.10.2-68 ..... Revision 1
2.10.2-69 ..... Revision 1
2.10.2-70 ..... Revision 1
2.10.2-71 ..... Revision 1
2.10.2-72 ..... Revision 1
2.10.2-73 ..... Revision 1
2.10.2-74 ..... Revision 1
2.10.2-75 ..... Revision 1
2.10.2-76 ..... Revision 2
2.10.2-77 ..... Revision 1
2.10.2-78 ..... Revision 1
2.10.2-79 ..... Revision 1
2.10.2-80 ..... Revision 1
2.10.2-81 ..... Revision 1
2.10.2-82 ..... Revision 1
2.10.2-83 ..... Revision 1
2.10.2-84 ..... Revision 1
2.10.2-85 ..... Revision 1
2.10.2-86 ..... Revision 1
2.10.2-87 ..... Revision 1
2.10.2-88 ..... Revision 1
2.10.2-89 ..... Revision 1
2.10.2-90 ..... Revision 1
2.10.2-91 ..... Revision 1
2.10.2-92 ..... Revision 1
2.10.2-93 ..... Revision 1
2.10.2-94 ..... Revision 1
2.10.3-1 ..... Revision 1
2.10.4-1 ..... Revision 10
2.10.4-2 ..... Revision 1
2.10.4-3 ..... Revision 1
2.10.4-4 ..... Revision 1
2.10.4-5 ..... Revision 1
2.10.4-6. ..... Revision 1
2.10.4-7. ..... Revision 1
2.10.4-8. ..... Revision 1
2.10.4-9 ..... Revision 1
2.10.4-10 ..... Revision 1
2.10.4-11 ..... Revision 1
2.10.4-12 ..... Revision 1
2.10.4-13 ..... Revision 1
2.10.4-14 ..... Revision 1
2.10.4-15 ..... Revision 1
2.10.4-16 ..... Revision 1
2.10.4-17 ..... Revision 1
2.10.4-18 ..... Revision 1
2.10.4-19 ..... Revision 1
2.10.4-20 ..... Revision 1
2.10.4-21 ..... Revision 1
2.10.4-22 ..... Revision 1
2.10.4-23 ..... Revision 1
2.10.4-24 ..... Revision 1
2.10.4-25 ..... Revision 1
2.10.4-26 ..... Revision 1
2.10.4-27 ..... Revision 1
2.10.4-28 ..... Revision 1
2.10.4-29 ..... Revision 1
2.10.4-30 ..... Revision 1
2.10.4-31 ..... Revision 1
2.10.4-32 ..... Revision 1
2.10.4-33 ..... Revision 1
2.10.4-34 ..... Revision 1

List of Effective Pages (Continued)

2.10.4-35 ..... Revision 1
2.10.4-36 ..... Revision 1
2.10.4-37 ..... Revision 1
2.10.4-38 ..... Revision 1
2.10.4-39 ..... Revision 1
2.10.4-40 ..... Revision 1
2.10.4-41 ..... Revision 1
2.10.4-42 ..... Revision 1
2.10.4-43 ..... Revision 1
2.10.4-44 ..... Revision 1
2.10.4-45 ..... Revision 1
2.10.4-46 ..... Revision 1
2.10.4-47 ..... Revision 1
2.10.4-48 ..... Revision 1
2.10.4-49 ..... Revision 1
2.10.4-50 ..... Revision 1
2.10.4-51 ..... Revision 1
2.10.4-52 ..... Revision 1
2.10.4-53 ..... Revision 1
2.10.4-54 ..... Revision 1
2.10.4-55 ..... Revision 1
2.10.4-56 ..... Revision 1
2.10.4-57 ..... Revision 1
2.10.4-58 ..... Revision 1
2.10.4-59 ..... Revision 1
2.10.4-60 ..... Revision 1
2.10.4-61 ..... Revision 1
2.10.4-62 ..... Revision 1
2.10.4-63 ..... Revision 1
2.10.4-64 ..... Revision 1
2.10.4-65 ..... Revision 1
2.10.4-66 ..... Revision 1
2.10.4-67 ..... Revision 1
2.10.4-68 ..... Revision 1
2.10.4-69 ..... Revision 1
2.10.4-70 ..... Revision 1
2.10.4-71 ..... Revision 1
2.10.4-72 ..... Revision 1
2.10.4-73 ..... Revision 1
2.10.4-74 ..... Revision 1
2.10.4-75 ..... Revision 1
2.10.4-76 ..... Revision 1
2.10.4-77 ..... Revision 1
2.10.4-78 ..... Revision 1
2.10.4-79 ..... Revision 1
2.10.4-80 ..... Revision 1
2.10.4-81 ..... Revision 1
2.10.4-82 ..... Revision 1
2.10.4-83 ..... Revision 1
2.10.4-84 ..... Revision 1
2.10.4-85 ..... Revision 2
2.10.4-86 ..... Revision 2
2.10.4-87 ..... Revision 2
2.10.4-88 ..... Revision 1
2.10.4-89 ..... Revision 1
2.10.4-90 ..... Revision 1
2.10.4-91 ..... Revision 1
2.10.4-92 ..... Revision 1
2.10.4-93 ..... Revision 1
2.10.4-94 ..... Revision 1
2.10.4-95 ..... Revision 1
2.10.4-96 ..... Revision 1
2.10.4-97 ..... Revision 2
2.10.4-98 ..... Revision 2
2.10.4-99 ..... Revision 2
2.10.4-100 ..... Revision 1
2.10.4-101 ..... Revision 1
2.10.4-102 ..... Revision 1
2.10.4-103 ..... Revision 1
2.10.4-104 ..... Revision 1

List of Effective Pages (Continued)

2.10.4-105 ..... Revision 1
2.10.4-106 ..... Revision 1
2.10.4-107 ..... Revision 1
2.10.4-108 ..... Revision 1
2.10.4-109 ..... Revision 1
2.10.4-110 ..... Revision 1
2.10.4-111 ..... Revision 2
2.10.4-112 ..... Revision 2
2.10.4-113 ..... Revision 2
2.10.4-114 ..... Revision 2
2.10.4-115 ..... Revision 2
2.10.4-116 ..... Revision 2
2.10.4-117 ..... Revision 2
2.10.4-118 ..... Revision 2
2.10.4-119 ..... Revision 2
2.10.4-120 ..... Revision 1
2.10.4-121 ..... Revision 1
2.10.4-122 ..... Revision 1
2.10.4-123 ..... Revision 1
2.10.4-124 ..... Revision 1
2.10.4-125 ..... Revision 1
2.10.4-126 ..... Revision 1
2.10.4-127 ..... Revision 1
2.10.4-128 ..... Revision 1
2.10.4-129 ..... Revision 1
2.10.4-130 ..... Revision 1
2.10.4-131 ..... Revision 2
2.10.4-132 ..... Revision 2
2.10.4-133 ..... Revision 2
2.10.4-134 ..... Revision 2
2.10.4-135 ..... Revision 2
2.10.4-136 ..... Revision 2
2.10.4-137 ..... Revision 2
2.10.4-138 ..... Revision 2
2.10.4-139 ..... Revision 2
2.10.4-140 ..... Revision 1
2.10.4-141 ..... Revision 1
2.10.4-142 ..... Revision 2
2.10.4-143 ..... Revision 1
2.10.4-144 ..... Revision 1
2.10.4-145 ..... Revision 1
2.10.4-146 ..... Revision 1
2.10.4-147 ..... Revision 1
2.10.4-148 ..... Revision 1
2.10.4-149 ..... Revision 2
2.10.4-150 ..... Revision 2
2.10.4-151 ..... Revision 2
2.10.4-152 ..... Revision 1
2.10.4-153 ..... Revision 1
2.10.4-154 ..... Revision 1
2.10.4-155 ..... Revision 1
2.10.4-156 ..... Revision 1
2.10.4-157 ..... Revision 1
2.10.4-158 ..... Revision 10
2.10.4-159 ..... Revision 1
2.10.4-160 ..... Revision 1
2.10.4-161 ..... Revision 1
2.10.4-162 ..... Revision 1
2.10.4-163 ..... Revision 1
2.10.4-164 ..... Revision 1
2.10.4-165 ..... Revision 1
2.10.4-166 ..... Revision 1
2.10.4-167 ..... Revision 1
2.10.4-168 ..... Revision 1
2.10.4-169 ..... Revision 1
2.10.4-170 ..... Revision 1
2.10.4-171 ..... Revision 1
2.10.4-172 ..... Revision 2
2.10.4-173 ..... Revision 2
2.10.4-174 ..... Revision 2

List of Effective Pages (Continued)

2.10.4-175 ..... Revision 1
2.10.4-176 ..... Revision 1
2.10.4-177 ..... Revision 1
2.10.4-178 ..... Revision 1
2.10.4-179 ..... Revision 1
2.10.4-180 ..... Revision 1
2.10.4-181 ..... Revision 1
2.10.4-182 ..... Revision 1
2.10.4-183 ..... Revision 1
2.10.4-184 ..... Revision 1
2.10.4-185 ..... Revision 10
2.10.4-186 ..... Revision 1
2.10.4-187 ..... Revision 1
2.10.4-188 ..... Revision 1
2.10.4-189 ..... Revision 1
2.10.4-190 ..... Revision 2
2.10.4-191 ..... Revision 2
2.10.4-192 ..... Revision 2
2.10.4-193 ..... Revision 1
2.10.4-194 ..... Revision 1
2.10.4-195 ..... Revision 1
2.10.4-196 ..... Revision 1
2.10.4-197 ..... Revision 1
2.10.4-198 ..... Revision 1
2.10.4-199 ..... Revision 1
2.10.4-200 ..... Revision 1
2.10.4-201 ..... Revision 1
2.10.4-202 ..... Revision 1
2.10.4-203 ..... Revision 1
2.10.4-204 ..... Revision 1
2.10.4-205 ..... Revision 2
2.10.4-206 ..... Revision 2
2.10.4-207 ..... Revision 2
2.10.4-208 ..... Revision 2
2.10.4-209 ..... Revision 2
2.10.4-210 ..... Revision 2
2.10.4-211 ..... Revision 1
2.10.4-212 ..... Revision 1
2.10.4-213 ..... Revision 1
2.10.4-214 ..... Revision 1
2.10.4-215 ..... Revision 1
2.10.4-216 ..... Revision 1
2.10.4-217 ..... Revision 2
2.10.4-218 ..... Revision 2
2.10.4-219 ..... Revision 2
2.10.4-220 ..... Revision 2
2.10.4-221 ..... Revision 2
2.10.4-222 ..... Revision 2
2.10.4-223 ..... Revision 1
2.10.4-224 ..... Revision 1
2.10.4-225 ..... Revision 1
2.10.4-226 ..... Revision 1
2.10.4-227 ..... Revision 1
2.10.4-228 ..... Revision 2
2.10.4-229 ..... Revision 2
2.10.4-230 ..... Revision 1
2.10.4-231 ..... Revision 1
2.10.4-232 ..... Revision 1
2.10.4-233 ..... Revision 1
2.10.4-234 ..... Revision 1
2.10.4-235 ..... Revision 1
2.10.4-236 ..... Revision 1
2.10.4-237 ..... Revision 1
2.10.4-238 ..... Revision 1
2.10.4-239 ..... Revision 1
2.10.4-240 ..... Revision 1
2.10.4-241 ..... Revision 2
2.10.4-242 ..... Revision 2
2.10.4-243 ..... Revision 1
2.10.4-244 ..... Revision 1

List of Effective Pages (Continued)

2.10.4-245 ..... Revision 1
2.10.4-246 ..... Revision 1
2.10.4-247 ..... Revision 1
2.10.4-248 ..... Revision 1
2.10.4-249 ..... Revision 1
2.10.4-250 ..... Revision 1
2.10.4-251 ..... Revision 1
2.10.4-252 ..... Revision 1
2.10.4-253 ..... Revision 1
2.10.4-254 ..... Revision 2
2.10.4-255 ..... Revision 2
2.10.4-256 ..... Revision 1
2.10.4-257 ..... Revision 1
2.10.4-258 ..... Revision 10
2.10.4-259 ..... Revision 1
2.10.4-260 ..... Revision 1
2.10.4-261 ..... Revision 2
2.10.4-262 ..... Revision 1
2.10.4-263 ..... Revision 1
2.10.4-264 ..... Revision 1
2.10.4-265 ..... Revision 1
2.10.4-266 ..... Revision 1
2.10.4-267 ..... Revision 2
2.10.4-268 ..... Revision 2
2.10.4-269 ..... Revision 1
2.10.4-270 ..... Revision 1
2.10.4-271 ..... Revision 1
2.10.4-272 ..... Revision 1
2.10.4-273 ..... Revision 1
2.10.4-274 ..... Revision 2
2.10.4-275 ..... Revision 2
2.10.4-276 ..... Revision 1
2.10.4-277 ..... Revision 1
2.10.4-278 ..... Revision 1
2.10.4-279 ..... Revision 1
2.10.4-280 ..... Revision 1
2.10.4-281 ..... Revision 2
2.10.4-282 ..... Revision 2
2.10.4-283 ..... Revision 1
2.10.4-284 ..... Revision 1
2.10.4-285 ..... Revision 1
2.10.4-286 ..... Revision 1
2.10.4-287 ..... Revision 1
2.10.4-288 ..... Revision 1
2.10.5-1 ..... Revision 10
2.10.5-2 ..... Revision 10
2.10.5-3 ..... Revision 1
2.10.5-4 ..... Revision 1
2.10.5-5 ..... Revision 1
2.10.5-6 ..... Revision 1
2.10.5-7 ..... Revision 10
2.10.5-8 ..... Revision 10
2.10.5-9 ..... Revision 10
2.10.5-10 ..... Revision 10
2.10.5-11 ..... Revision 10
2.10.5-12 ..... Revision 10
2.10.5-13 ..... Revision 10
2.10.5-14 ..... Revision 10
2.10.5-15 ..... Revision 10
2.10.5-16 ..... Revision 10
2.10.5-17 ..... Revision 10
2.10.5-18 ..... Revision 10
2.10.5-19 ..... Revision 10
2.10.5-20 ..... Revision 10
2.10.5-21 ..... Revision 10
2.10.5-22 ..... Revision 10
2.10.6-1 ..... Revision 10
2.10.6-2 ..... Revision 10
2.10.6-3 ..... Revision 10
2.10.6-4 ..... Revision 2

List of Effective Pages (Continued)

2.10.6-5 ..... Revision 2
2.10.6-6 ..... Revision 2
2.10.6-7 ..... Revision 2
2.10.6-8 ..... Revision 2
2.10.6-9 ..... Revision 2
2.10.6-10 ..... Revision 2
2.10.6-11 ..... Revision 2
2.10.6-12 ..... Revision 2
2.10.6-13 ..... Revision 2
2.10.6-14 ..... Revision 2
2.10.6-15 ..... Revision 2
2.10.6-16 ..... Revision 2
2.10.6-17 ..... Revision 2
2.10.6-18 ..... Revision 2
2.10.6-19 ..... Revision 2
2.10.6-20 ..... Revision 2
2.10.6-21 ..... Revision 2
2.10.6-22 ..... Revision 2
2.10.6-23 ..... Revision 2
2.10.6-24 ..... Revision 2
2.10.6-25 ..... Revision 2
2.10.6-26 ..... Revision 2
2.10.6-27 ..... Revision 2
2.10.6-28 ..... Revision 2
2.10.6-29 ..... Revision 2
2.10.6-30 ..... Revision 2
2.10.6-31 ..... Revision 2
2.10.6-32 ..... Revision 2
2.10.6-33 ..... Revision 2
2.10.6-34 ..... Revision 2
2.10.6-35 ..... Revision 2
2.10.6-36 ..... Revision 2
2.10.6-37 ..... Revision 2
2.10.6-38 ..... Revision 2
2.10.6-39 ..... Revision 2
2.10.6-40 ..... Revision 2
2.10.6-41 ..... Revision 2
2.10.6-42 ..... Revision 2

13 drawings

2.10.6-43 ..... Revision 2
2.10.6-44 ..... Revision 2
2.10.6-45 ..... Revision 2
2.10.6-46 ..... Revision 2
2.10.6-47 ..... Revision 2
2.10.6-48 ..... Revision 2
2.10.6-49 ..... Revision 2
2.10.6-50 ..... Revision 2
2.10.6-51 ..... Revision 2
2.10.6-52 ..... Revision 2
2.10.6-53 ..... Revision 2
2.10.6-54 ..... Revision 2
2.10.6-55 ..... Revision 2
2.10.6-56 ..... Revision 2
2.10.6-57 ..... Revision 2
2.10.6-58 ..... Revision 2
2.10.6-59 ..... Revision 2
2.10.6-60 ..... Revision 2
2.10.6-61 ..... Revision 2
2.10.6-62 ..... Revision 2
2.10.6-63 ..... Revision 2
2.10.6-64 ..... Revision 2
2.10.6-65 ..... Revision 2
2.10.6-66 ..... Revision 2
2.10.6-67 ..... Revision 2
2.10.6-68 ..... Revision 2
2.10.6-69 ..... Revision 2
2.10.6-70 ..... Revision 2
2.10.6-71 ..... Revision 2

List of Effective Pages (Continued)

2.10.6-72 ..... Revision 2
2.10.6-73 ..... Revision 2
2.10.6-74 ..... Revision 2
2.10.6-75 ..... Revision 2
2.10.6-76 ..... Revision 2
2.10.6-77 ..... Revision 2
2.10.6-78 ..... Revision 2
2.10.6-79 ..... Revision 2
2.10.6-80 ..... Revision 2
2.10.6-81 ..... Revision 2
2.10.6-82 ..... Revision 2
2.10.6-83 ..... Revision 2
2.10.6-84 ..... Revision 2
2.10.6-85 ..... Revision 2
2.10.6-86 ..... Revision 2
2.10.6-87 ..... Revision 2
2.10.6-88 ..... Revision 2
2.10.6-89 ..... Revision 2
2.10.6-90 ..... Revision 2
2.10.6-91 ..... Revision 2
2.10.6-92 ..... Revision 2
2.10.6-93 ..... Revision 2
2.10.6-94 ..... Revision 2
2.10.7-1 ..... Revision 10
2.10.7-2 ..... Revision 2
2.10.7-3 ..... Revision 10
2.10.7-4 ..... Revision 2
2.10.7-5 ..... Revision 2
2.10.7-6 ..... Revision 10
2.10.7-7 ..... Revision 10
2.10.7-8 ..... Revision 10
2.10.7-9 ..... Revision 2
2.10.7-10 ..... Revision 2
2.10.7-11 ..... Revision 2
2.10.7-12 ..... Revision 2
2.10.7-13 ..... Revision 2
2.10.7-14 ..... Revision 10
2.10.7-15 ..... Revision 2
2.10.7-16 ..... Revision 2
2.10.7-17 ..... Revision 2
2.10.7-18 ..... Revision 2
2.10.7-19 ..... Revision 2
2.10.7-20 ..... Revision 2
2.10.7-21 ..... Revision 2
2.10.7-22 ..... Revision 2
2.10.7-23 ..... Revision 2
2.10.7-24 ..... Revision 2
2.10.7-25 ..... Revision 2
2.10.7-26 ..... Revision 2
2.10.7-27 ..... Revision 2
2.10.7-28 ..... Revision 2
2.10.7-29 ..... Revision 2
2.10.8-1 ..... Revision 10
2.10.8-2 ..... Revision 10
2.10.8-3 ..... Revision 10
2.10.8-4 ..... Revision 10
2.10.8-5 ..... Revision 10
2.10.8-6 ..... Revision 10
2.10.8-7 ..... Revision 10
2.10.8-8 ..... Revision 10
2.10.8-9 ..... Revision 10
2.10.8-10 ..... Revision 10
2.10.8-11 ..... Revision 10
2.10.8-12 ..... Revision 10
2.10.8-13 ..... Revision 10
2.10.8-14 ..... Revision 10
2.10.8-15 ..... Revision 10
2.10.8-16 ..... Revision 10
2.10.8-17 ..... Revision 10
2.10.8-18 ..... Revision 10

List of Effective Pages (Continued)

2.10.8-19 ..... Revision 10
2.10.8-20 ..... Revision 10
2.10.8-21 ..... Revision 10
2.10.8-22 ..... Revision 10
2.10.8-23 ..... Revision 10
2.10.8-24 ..... Revision 10
2.10.8-25 ..... Revision 10
2.10.8-26 ..... Revision 10
2.10.8-27 ..... Revision 10
2.10.9-1 ..... Revision 10
2.10.9-2 ..... Revision 2
2.10.9-3 ..... Revision 1
2.10.9-4 ..... Revision 1
2.10.9-5 ..... Revision 1
2.10.9-6 ..... Revision 1
2.10.9-7 ..... Revision 1
2.10.9-8 ..... Revision 1
2.10.9-9 ..... Revision 1
2.10.9-10 ..... Revision 1
2.10.9-11 ..... Revision 1
2.10.9-12 ..... Revision 1
2.10.10-1 ..... Revision 10
2.10.10-2 ..... Revision 2
2.10.10-3 ..... Revision 2
2.10.10-4 ..... Revision 2
2.10.10-5 ..... Revision 2
2.10.10-6 ..... Revision 2
2.10.10-7 ..... Revision 2
2.10.10-8 ..... Revision 2
2.10.10-9 ..... Revision 2
2.10.10-10 ..... Revision 10
2.10.10-11 ..... Revision 10
2.10.11-1 ..... Revision 10
2.10.11-2 ..... Revision 10
2.10.11-3 ..... Revision 10
2.10.11-4 ..... Revision 10
2.10.11-5 ..... Revision 10
2.10.11-6 ..... Revision 10
2.10.11-7 ..... Revision 10
2.10.11-8 ..... Revision 10

Chapter 3

3-i ..... Revision 10
3-ii ..... Revision 10
3-iii ..... Revision 10
3-iv ..... Revision STC-02F
3.1-1 ..... Revision 10
3.1-2 ..... Revision 10
3.1-3 ..... Revision 10
3.1-4 ..... Revision 10
3.1-5 ..... Revision STC-02F
3.1-6 ..... Revision 10
3.1-7 ..... Revision 10
3.1-8 ..... Revision 10
3.2-1 ..... Revision 10
3.2-2 ..... Revision 10
3.2-3 ..... Revision STC-02F
3.2-4 ..... Revision 10
3.2-5 ..... Revision STC-02F
3.2-6 ..... Revision 10
3.2-7 ..... Revision 10
3.2-8 ..... Revision 10
3.2-9 ..... Revision 10
3.2-10 ..... Revision 5
3.2-11 ..... Revision 5
3.2-12 ..... Revision 5
3.2-13 ..... Revision 5
3.2-14 ..... Revision 5
3.2-15 ..... Revision STC-02F

List of Effective Pages (Continued)

3.2-16 ..... Revision 10
3.2-17 ..... Revision 10
3.2-18 ..... Revision STC-02F
3.3-1 ..... Revision 10
3.3-2 ..... Revision STC-02F
3.3-3 ..... Revision 10
3.3-4 ..... Revision 10
3.3-5 ..... Revision 10
3.3-6 ..... Revision 10
3.4-1 ..... Revision 10
3.4-2 ..... Revision 10
3.4-3 ..... Revision 10
3.4-4 ..... Revision 10
3.4-5 ..... Revision STC-02F
3.4-6 ..... Revision STC-02F
3.4-7 ..... Revision STC-02F
3.4-8 ..... Revision 10
3.4-9 ..... Revision STC-02F
3.4-10 ..... Revision STC-02F
3.4-11 ..... Revision 10
3.4-12 ..... Revision 10
3.4-13 ..... Revision STC-02F
3.4-14 ..... Revision 10
3.4-15 ..... Revision STC-02F
3.4-16 ..... Revision 10
3.4-17 ..... Revision 10
3.4-18 ..... Revision 10
3.4-19 ..... Revision 10
3.4-20 ..... Revision 10
3.4-21 ..... Revision 10
3.4-22 ..... Revision STC-02F
3.4-23 ..... Revision 10
3.4-24 ..... Revision 10
3.4-25 ..... Revision 10
3.4-26 ..... Revision 10
3.4-27 ..... Revision 10
3.4-28 ..... Revision 10
3.4-29 ..... Revision 10
3.4-30 ..... Revision 10
3.4-31 ..... Revision 10
3.4-32 ..... Revision 10
3.4-33 ..... Revision 10
3.4-34 ..... Revision 10
3.4-35 ..... Revision 10
3.4-36 ..... Revision 10
3.4-37 ..... Revision 10
3.4-38 ..... Revision 10
3.4-39 ..... Revision 10
3.4-40 ..... Revision 10
3.4-41 ..... Revision 10
3.4-42 ..... Revision 10
3.4-43 ..... Revision 10
3.4-44 ..... Revision 10
3.4-45 ..... Revision 10
3.4-46 ..... Revision 10
3.4-47 ..... Revision 10
3.4-48 ..... Revision 10
3.4-49 ..... Revision 10
3.4-50 ..... Revision 10
3.4-51 ..... Revision 10
3.4-52 ..... Revision 10
3.4-53 ..... Revision 10
3.4-54 ..... Revision 10
3.4-55 ..... Revision 10
3.4-56 ..... Revision 10
3.4-57 ..... Revision 10
3.4-58 ..... Revision 10
3.4-59 ..... Revision 10
3.4-60 ..... Revision 10
3.4-61 ..... Revision 10

List of Effective Pages (Continued)

3.4-62 ..... Revision STC-02F
3.4-63 ..... Revision STC-02F
3.4-64 ..... Revision STC-02F
3.4-65 ..... Revision STC-02F
3.4-66 ..... Revision 10
3.5-1 ..... Revision 10
3.5-2 ..... Revision 10
3.5-3 ..... Revision 10
3.5-4 ..... Revision 10
3.5-5 ..... Revision 10
3.5-6 ..... Revision 10
3.5-7 ..... Revision 10
3.5-8 ..... Revision 10
3.5-9 ..... Revision 10
3.5-10 ..... Revision 10
3.5-11 ..... Revision 10
3.5-12 ..... Revision 10
3.5-13 ..... Revision STC-02F

Chapter 4

4-i ..... Revision STC-02F
4-ii ..... Revision STC-01A
4.1-1 ..... Revision STC-02F
4.1-2 ..... Revision STC-02F
4.1-3 ..... Revision STC-02F
4.1-4 ..... Revision STC-01A
4.1-5 ..... Revision STC-01A
4.1-6 ..... Revision STC-02F
4.1-7 ..... Revision STC-01A
4.1-8 ..... Revision STC-01A
4.1-9 ..... Revision STC-01A
4.1-10 ..... Revision STC-01A
4.1-11 ..... Revision STC-01A
4.2-1 ..... Revision STC-02F
4.2-2 ..... Revision STC-02F
4.2-3 ..... Revision STC-02F
4.2-4 ..... Revision STC-02F
4.2-5 ..... Revision STC-02F
4.2-6 ..... Revision STC-02F
4.2-7 ..... Revision STC-01A
4.2-8 ..... Revision STC-02F
4.2-9 ..... Revision STC-01A
4.2-10 ..... Revision STC-01A
4.2-11 ..... Revision STC-01A
4.2-12 ..... Revision STC-02F
4.2-13 ..... Revision STC-01A
4.2-14 ..... Revision STC-01A
4.2-15 ..... Revision STC-01A
4.2-16 ..... Revision STC-01A
4.3-1 ..... Revision STC-02F
4.3-2 ..... Revision STC-02F
4.3-3 ..... Revision STC-02F
4.3-4 ..... Revision STC-02F
4.4-1 ..... Revision 10
4.5-1 ..... Revision 1
4.5-2 ..... Revision 1
4.5-3 ..... Revision 1
4.5-4 ..... Revision 1
4.5-5 ..... Revision 1
4.5-6 ..... Revision 1
4.5-7 ..... Revision 1
4.5-8 ..... Revision 1
4.5-9 ..... Revision 1
4.5-10 ..... Revision 1
4.5-11 ..... Revision 1
4.5-12 ..... Revision 1
4.5-13 ..... Revision 1
4.5-14 ..... Revision STC-02F
4.5-15 ..... Revision 1

List of Effective Pages (Continued)

4.5-16 ..... Revision 1
4.5-17 ..... Revision 1
4.5-18 ..... Revision 1
4.5-19 ..... Revision 1
4.5-20 ..... Revision 1
4.5-21 ..... Revision 1
4.5-22 ..... Revision 1
4.5-23 ..... Revision 1
4.5-24 ..... Revision STC-02F
4.5-25 ..... Revision STC-02F
4.5-26 ..... Revision STC-02F
4.5-27 ..... Revision STC-02F
4.5-28 ..... Revision STC-02F
4.5-29 ..... Revision STC-02F
4.5-30 ..... Revision STC-02F

Chapter 5

5-i ..... Revision STC-02F
5-ii ..... Revision STC-02F
5-iii ..... Revision STC-02F
5-iv ..... Revision STC-02F
5-v ..... Revision STC-02F
5-1 ..... Revision STC-01A
5-2 ..... Revision STC-02F
5-3 ..... Revision STC-01A
5.1-1 ..... Revision STC-01A
5.1-2 ..... Revision STC-02F
5.1-3 ..... Revision STC-02F
5.1-4 ..... Revision STC-01A
5.1-5 ..... Revision STC-02F
5.1-6 ..... Revision STC-02F
5.1-7 ..... Revision STC-02F
5.1-8 ..... Revision STC-01A
5.1-9 ..... Revision STC-01A
5.1-10 ..... Revision STC-01A
5.1-11 ..... Revision STC-02F
5.1-12 ..... Revision STC-01A
5.1-13 ..... Revision STC-01A
5.1-14 ..... Revision STC-01A
5.1-15 ..... Revision STC-02F
5.1-16 ..... Revision STC-01A
5.1-17 ..... Revision STC-01A
5.1-18 ..... Revision STC-01A
5.1-19 ..... Revision STC-01A
5.2-1 ..... Revision STC-02F
5.2-2 ..... Revision STC-02F
5.2-3 ..... Revision STC-02F
5.2-4 ..... Revision STC-02F
5.2-5 ..... Revision STC-02F
5.2-6 ..... Revision STC-02F
5.2-7 ..... Revision STC-01A
5.2-8 ..... Revision STC-01A
5.2-9 ..... Revision STC-01A
5.2-10 ..... Revision STC-01A
5.2-11 ..... Revision STC-01A
5.2-12 ..... Revision STC-02F
5.2-13 ..... Revision STC-01A
5.2-14 ..... Revision STC-02F
5.2-15 ..... Revision STC-01A
5.2-16 ..... Revision STC-01A
5.2-17 ..... Revision STC-01A
5.2-18 ..... Revision STC-01A
5.2-19 ..... Revision STC-01A
5.2-20 ..... Revision STC-01A
5.2-21 ..... Revision STC-01A
5.2-22 ..... Revision STC-02F
5.3-1 ..... Revision STC-02F
5.3-2 ..... Revision STC-02F
5.3-3 ..... Revision STC-02F

List of Effective Pages (Continued)

5.3-4 ..... Revision STC-02F
5.3-5 ..... Revision STC-02F
5.3-6 ..... Revision STC-02F
5.3-7 ..... Revision STC-02F
5.3-8 ..... Revision STC-02F
5.3-9 ..... Revision STC-02F
5.3-10 ..... Revision STC-02F
5.3-11 ..... Revision STC-02F
5.3-12 ..... Revision STC-02F
5.3-13 ..... Revision STC-02F
5.3-14 ..... Revision STC-02F
5.3-15 ..... Revision STC-02F
5.3-16 ..... Revision STC-02F
5.3-17 ..... Revision STC-02F
5.3-18 ..... Revision STC-02F
5.3-19 ..... Revision STC-02F
5.3-20 ..... Revision STC-02F
5.3-21 ..... Revision STC-02F
5.4-1 ..... Revision STC-02F
5.4-2 ..... Revision STC-02F
5.4-3 ..... Revision STC-02F
5.4-4 ..... Revision STC-02F
5.4-5 ..... Revision STC-02F
5.4-6 ..... Revision STC-01A
5.4-7 ..... Revision STC-01A
5.4-8 ..... Revision STC-01A
5.4-9 ..... Revision STC-01A
5.4-10 ..... Revision STC-02F
5.4-11 ..... Revision STC-02F
5.4-12 ..... Revision STC-02F
5.4-13 ..... Revision STC-02F
5.4-14 ..... Revision STC-02F
5.4-15 ..... Revision STC-02F
5.4-16 ..... Revision STC-02F
5.4-17 ..... Revision STC-01A
5.4-18 ..... Revision STC-02F
5.4-19 ..... Revision STC-02F
5.5-1 ..... Revision STC-02F
5.5-2 ..... Revision STC-02F
5.5-3 ..... Revision STC-02F
5.5-4 ..... Revision STC-02F
5.5-5 ..... Revision STC-02F
5.5-6 ..... Revision STC-02F
5.5-7 ..... Revision STC-02F
5.5-8 ..... Revision STC-02F
5.5-9 ..... Revision STC-02F
5.5-10 ..... Revision STC-02F
5.5-11 ..... Revision STC-02F
5.5-12 ..... Revision STC-02F
5.5-13 ..... Revision STC-02F
5.5-14 ..... Revision STC-02F
5.5-15 ..... Revision STC-02F
5.5-16 ..... Revision STC-02F
5.5-17 ..... Revision STC-02F
5.5-18 ..... Revision STC-02F
5.5-19 ..... Revision STC-02F
5.5-20 ..... Revision STC-02F
5.5-21 ..... Revision STC-02F
5.5-22 ..... Revision STC-02F
5.5-23 ..... Revision STC-02F
5.5-24 ..... Revision STC-02F
5.5-25 ..... Revision STC-02F
5.5-26 ..... Revision STC-02F
5.5-27 ..... Revision STC-02F
5.5-28 ..... Revision STC-02F
5.5-29 ..... Revision STC-02F
5.5-30 ..... Revision STC-02F
5.5-31 ..... Revision STC-02F
5.5-32 ..... Revision STC-02F
5.5-33 ..... Revision STC-02F

List of Effective Pages (Continued)

5.5-34 ..... Revision STC-02F
5.5-35 ..... Revision STC-02F
5.5-36 ..... Revision STC-02F
5.5-37 ..... Revision STC-02F
5.5-38 ..... Revision STC-02F
5.5-39 ..... Revision STC-02F
5.5-40 ..... Revision STC-02F
5.5-41 ..... Revision STC-02F
5.5-42 ..... Revision STC-02F
5.5-43 ..... Revision STC-02F
5.5-44 ..... Revision STC-02F
5.5-45 ..... Revision STC-02F
5.5-46 ..... Revision STC-02F
5.5-47 ..... Revision STC-02F
5.5-48 ..... Revision STC-02F
5.5-49 ..... Revision STC-02F
5.5-50 ..... Revision STC-02F
5.5-51 ..... Revision STC-02F
5.5-52 ..... Revision STC-02F
5.5-53 ..... Revision STC-02F
5.5-54 ..... Revision STC-02F
5.5-55 ..... Revision STC-02F
5.5-56 ..... Revision STC-02F
5.5-57 ..... Revision STC-02F
5.5-58 ..... Revision STC-02F
5.5-59 ..... Revision STC-02F
5.5-60 ..... Revision STC-02F
5.5-61 ..... Revision STC-02F
5.5-62 ..... Revision STC-02F
5.5-63 ..... Revision STC-02F
5.5-64 ..... Revision STC-02F
5.5-65 ..... Revision STC-02F
5.5-66 ..... Revision STC-02F
5.5-67 ..... Revision STC-02F

Chapter 6

6-i ..... Revision STC-02F
6-ii ..... Revision STC-01A
6-iii ..... Revision STC-01A
6.1-1 ..... Revision STC-02F
6.1-2 ..... Revision STC-02F
6.1-3 ..... Revision STC-02F
6.1-4 ..... Revision STC-02F
6.2-1 ..... Revision STC-01A
6.2-2 ..... Revision 10
6.2-3 ..... Revision 10
6.2-4 ..... Revision STC-01A
6.2-5 ..... Revision 10
6.2-6 ..... Revision 10
6.3-1 ..... Revision STC-01A
6.3-2 ..... Revision STC-02F
6.3-3 ..... Revision STC-02F
6.3-4 ..... Revision 10
6.3-5 ..... Revision 10
6.3-6 ..... Revision 10
6.3-7 ..... Revision 13
6.4-1 ..... Revision STC-02F
6.4-2 ..... Revision STC-02F
6.4-3 ..... Revision STC-02F
6.4-4 ..... Revision STC-02F
6.4-5 ..... Revision STC-02F
6.4-6 ..... Revision STC-02F
6.4-7 ..... Revision STC-02F
6.4-8 ..... Revision STC-02F
6.4-9 ..... Revision STC-02F
6.4-10 ..... Revision STC-02F
6.4-11 ..... Revision STC-02F
6.4-12 ..... Revision STC-02F
6.4-13 ..... Revision STC-02F

List of Effective Pages (Continued)

6.4-14 ..... Revision STC-02F
6.4-15 ..... Revision STC-02F
6.4-16 ..... Revision STC-02F
6.4-17 .....Revision STC-01A
6.4-18 .....Revision STC-01A
6.5-1 ..... Revision 10
6.5-2 ..... Revision 10
6.5-3 ..... Revision 10
6.5-4 ..... Revision 10
6.5-5 ..... Revision 10
6.5-6 ..... Revision 10
6.5-7 ..... Revision 10
6.5-8 .....Revision STC-01A
6.5-9 .....Revision STC-01A
6.5-10 .....Revision STC-01A
6.5-11 .....Revision STC-01A
6.5-12 .....Revision STC-01A
6.5-13 .....Revision STC-01A
6.5-14 .....Revision STC-01A
6.5-15 .....Revision STC-01A
6.5-16 .....Revision STC-01A
6.5-17 .....Revision STC-01A
6.5-18 .....Revision STC-01A
6.5-19 .....Revision STC-01A
6.5-20 .....Revision STC-01A
6.5-21 .....Revision STC-01A
6.5-22 .....Revision STC-01A
6.6-1 ..... Revision 13
6.6-2 ..... Revision 10
6.6-3 ..... Revision 10
6.6-4 ..... Revision 10
6.6-5 ..... Revision 10
6.6-6 ..... Revision 10
6.6-7 ..... Revision 10
6.6-8 ..... Revision 10
6.6-9 ..... Revision 10
6.6-10 ..... Revision 10
6.6-11 ..... Revision 10
6.6-12 ..... Revision 10
6.6-13 ..... Revision 10
6.6-14 ..... Revision 10
6.6-15 ..... Revision 10
6.6-16 ..... Revision 10
6.6-17 ..... Revision 10
6.6-18 ..... Revision 10
6.6-19 ..... Revision 10
6.6-20 ..... Revision 10
6.6-21 ..... Revision 10
6.6-22 ..... Revision 10
6.6-23 ..... Revision 10
6.6-24 ..... Revision 10
6.6-25 ..... Revision 10
6.6-26 ..... Revision 10
6.6-27 ..... Revision 10
6.6-28 ..... Revision 10
6.6-29 ..... Revision 10
6.6-30 ..... Revision 10
6.6-31 ..... Revision 10
6.6-32 ..... Revision 10
6.6-33 ..... Revision 10
6.6-34 ..... Revision 10
6.6-35 ..... Revision 10
6.6-36 ..... Revision 10
6.6-37 ..... Revision 10
6.6-38 ..... Revision 10
6.6-39 ..... Revision 10
6.6-40 ..... Revision 10
6.6-41 ..... Revision 10
6.6-42 ..... Revision 10
6.6-43 ..... Revision 10

List of Effective Pages (Continued)

6.6-44 ..... Revision 10
6.6-45 ..... Revision 10
6.6-46 ..... Revision 10
6.6-47 ..... Revision 10
6.6-48 ..... Revision 10
6.6-49 ..... Revision 10
6.6-50 ..... Revision 10
6.6-51 ..... Revision 10
6.6-52 ..... Revision 10
6.6-53 ..... Revision 10
6.6-54 ..... Revision 10
6.6-55 ..... Revision 10
6.6-56 ..... Revision 10
6.6-57 ..... Revision 10
6.6-58 ..... Revision 10
6.6-59 ..... Revision 10
6.6-60 ..... Revision 10
6.6-61 ..... Revision 10
6.6-62 ..... Revision 10
6.6-63 ..... Revision 10
6.6-64 ..... Revision 10
6.6-65 ..... Revision 10
6.6-66 ..... Revision 10
6.6-67 ..... Revision 10
6.6-68 ..... Revision 10
6.6-69 ..... Revision 10
6.6-70 ..... Revision 10
6.6-71 ..... Revision 10
6.6-72 ..... Revision 10
6.6-73 ..... Revision 10
6.6-74 ..... Revision 10
6.6-75 ..... Revision 10
6.6-76 ..... Revision 10
6.6-77 ..... Revision 10
6.6-78 ..... Revision 10
6.6-79 ..... Revision 10
6.6-80 ..... Revision 10
6.6-81 ..... Revision 10
6.6-82 ..... Revision 10
6.6-83 ..... Revision 10
6.6-84 ..... Revision 10
6.6-85 ..... Revision 10
6.6-86 ..... Revision 10
6.6-87 ..... Revision 10
6.6-88 ..... Revision 10
6.6-89 ..... Revision 10
6.6-90 ..... Revision 10
6.6-91 ..... Revision 10
6.6-92 ..... Revision 10
6.6-93 ..... Revision 10
6.6-94 ..... Revision 10
6.6-95 ..... Revision 10
6.6-96 ..... Revision 10
6.6-97 ..... Revision 10
6.6-98 ..... Revision 10
6.6-99 ..... Revision 10
6.6-100 ..... Revision 10
6.6-101 ..... Revision 10
6.6-102 ..... Revision 10
6.6-103 ..... Revision 10
6.6-104 ..... Revision 10
6.6-105 ..... Revision 10
6.6-106 ..... Revision 10
6.6-107 ..... Revision 10
6.6-108 ..... Revision 10
6.6-109 ..... Revision 10
6.6-110 ..... Revision 10
6.6-111 ..... Revision 10
6.6-112 ..... Revision 10
6.6-113 ..... Revision 10

List of Effective Pages (Continued)

6.6-114 ..... Revision 10
6.6-115 ..... Revision 10
6.6-116 ..... Revision 10
6.6-117 ..... Revision 10
6.6-118 ..... Revision 10
6.6-119 ..... Revision 10
6.6-120 ..... Revision 10
6.6-121 ..... Revision 10
6.6-122 ..... Revision 10
6.6-123 ..... Revision 10
6.6-124 ..... Revision 10
6.6-125 ..... Revision 10
6.6-126 ..... Revision 10
6.6-127 ..... Revision 10
6.6-128 ..... Revision 10
6.6-129 ..... Revision 10
6.6-130 ..... Revision 10
6.6-131 ..... Revision 10
6.6-132 ..... Revision 10
6.6-133 ..... Revision 10
6.6-134 ..... Revision 10
6.6-135 ..... Revision 10
6.6-136 ..... Revision 10
6.6-137 ..... Revision 10
6.6-138 ..... Revision 10
6.6-139 ..... Revision 10
6.6-140 ..... Revision 10
6.6-141 ..... Revision 10
6.6-142 ..... Revision 10
6.6-143 ..... Revision 10
6.6-144 ..... Revision 10
6.6-145 ..... Revision 10
6.6-146 ..... Revision 10
6.6-147 ..... Revision 10
6.6-148 ..... Revision 10
6.6-149 ..... Revision 10
6.6-150 ..... Revision 10
6.6-151 ..... Revision 10
6.6-152 ..... Revision 10
6.6-153 ..... Revision 10
6.6-154 ..... Revision 10
6.6-155 ..... Revision 10
6.6-156 ..... Revision 10
6.6-157 ..... Revision 10
6.6-158 ..... Revision 10
6.6-159 ..... Revision 10
6.6-160 ..... Revision 10
6.6-161 ..... Revision 10
6.6-162 ..... Revision 10
6.6-163 ..... Revision 10
6.6-164 ..... Revision 10
6.6-165 ..... Revision 10
6.6-166 ..... Revision 10
6.6-167 ..... Revision 13
6.6-168 ..... Revision 13
6.6-169 ..... Revision 13
6.6-170 ..... Revision 13
6.6-171 ..... Revision 13
6.6-172 ..... Revision 13
6.6-173 ..... Revision 13
6.6-174 ..... Revision 13
6.6-175 ..... Revision 13
6.6-176 ..... Revision 13
6.6-177 ..... Revision 13
6.6-178 ..... Revision 13
6.6-179 ..... Revision 13
6.6-180 ..... Revision 13
6.6-181 ..... Revision 13
6.6-182 ..... Revision 13
6.6-183 ..... Revision 13

List of Effective Pages (Continued)

6.6-184 ..... Revision 13
6.6-185 ..... Revision 13
6.6-186 ..... Revision 13
6.6-187 ..... Revision 13
6.6-188 ..... Revision 13
6.6-189 ..... Revision 13
6.6-190 ..... Revision 13
6.6-191 ..... Revision 13
6.6-192 ..... Revision 13
6.6-193 ..... Revision 13
6.6-194 ..... Revision 13
6.6-195 ..... Revision 13
6.6-196 .....Revision STC-01A
6.6-197 .....Revision STC-01A
6.6-198 .....Revision STC-01A
6.6-199 .....Revision STC-01A
6.6-200 .....Revision STC-01A
6.6-201 .....Revision STC-01A
6.6-202 .....Revision STC-01A
6.6-203 .....Revision STC-01A
6.6-204 .....Revision STC-01A
6.6-205 .....Revision STC-01A
6.6-206 .....Revision STC-01A
6.6-207 .....Revision STC-01A
6.6-208 .....Revision STC-01A
6.6-209 .....Revision STC-01A
6.6-210 .....Revision STC-01A
6.6-211 .....Revision STC-01A
6.6-212 .....Revision STC-01A
6.6-213 .....Revision STC-01A
6.6-214 .....Revision STC-01A
6.6-215 .....Revision STC-01A
6.6-216 .....Revision STC-01A
6.6-217 .....Revision STC-01A

Chapter 7

7-i .....Revision STC-01A
7-ii .....Revision STC-01A
7-1 .....Revision STC-01A
7-2 ..... Revision STC-02F
7-3 .....Revision STC-01A
7.1-1 .....Revision STC-01A
7.1-2 ..... Revision STC-02F
7.1-3 ..... Revision STC-02F
7.1-4 .....Revision STC-01A
7.1-5 ..... Revision STC-02F
7.1-6 ..... Revision STC-02F
7.1-7 .....Revision STC-01A
7.1-8 ..... Revision STC-02F
7.1-9 .....Revision STC-01A
7.1-10 .....Revision STC-01A
7.1-11 .....Revision STC-01A
7.2-1 ..... Revision STC-02F
7.2-2 ..... Revision STC-02F
7.2-3 ..... Revision STC-02F
7.2-4 ..... Revision STC-02F
7.2-5 ..... Revision STC-02F
7.3-1 .....Revision STC-01A
7.3-2 .....Revision STC-01A
7.3-3 .....Revision STC-01A
7.3-4 .....Revision STC-01A
7.3-5 .....Revision STC-01A
7.3-6 .....Revision STC-01A
7.3-7 .....Revision STC-01A
7.3-8 .....Revision STC-01A
7.4-1 ..... Revision STC-02F
7.4-2 .....Revision STC-01A
7.4-3 ..... Revision STC-02F
7.4-4 .....Revision STC-01A

List of Effective Pages (Continued)

7.5-1 ..... Revision 10

Chapter 8

8-i ..... Revision STC-02F
8-ii ..... Revision STC-01A
8-1 ..... Revision STC-01A
8.1-1 ..... Revision STC-01A
8.1-2 ..... Revision STC-01A
8.1-3 ..... Revision STC-01A
8.1-4 ..... Revision STC-01A
8.1-5 ..... Revision STC-01A
8.1-6 ..... Revision STC-02F
8.1-7 ..... Revision STC-02F
8.1-8 ..... Revision STC-02F
8.1-9 ..... Revision STC-02F
8.1-10 ..... Revision STC-01A
8.1-11 ..... Revision STC-01A
8.1-12 ..... Revision STC-01A
8.1-13 ..... Revision STC-01A
8.1-14 ..... Revision STC-01A
8.1-15 ..... Revision STC-02F
8.1-16 ..... Revision STC-02F
8.1-17 ..... Revision STC-02F
8.1-18 ..... Revision STC-02F
8.1-19 ..... Revision STC-02F
8.1-20 ..... Revision STC-01A
8.2-1 ..... Revision STC-01A
8.2-2 ..... Revision STC-02F
8.2-3 ..... Revision STC-02F
8.2-4 ..... Revision STC-01A
8.2-5 ..... Revision STC-02F
8.3-1 ..... Revision 10
8.4-1 ..... Revision STC-01A
8.4-2 ..... Revision STC-01A
8.4-3 ..... Revision STC-01A
8.4-4 ..... Revision STC-01A
8.4-5 ..... Revision STC-01A
8.4-6 ..... Revision STC-01A
8.4-7 ..... Revision STC-01A
8.4-8 ..... Revision STC-01A
8.4-9 ..... Revision 10

Chapter 9

9-i ..... Revision 7
9.0-1 ..... Revision 7
9.0-2 ..... Revision 10
9.0-3 ..... Revision 10
9.0-4 ..... Revision 10
9.0-5 ..... Revision 10
9.0-6 ..... Revision 10
9.0-7 ..... Revision 10
9.0-8 ..... Revision 10
9.0-9 ..... Revision 10
9.0-10 ..... Revision 10
9.0-11 ..... Revision 10
9.0-12 ..... Revision 10
9.0-13 ..... Revision 12

THIS PAGE INTENTIONALLY LEFT BLANK

Master Table of Contents

Master Table of Contents (Continued)

3.3 Technical Specifications for Components 3.3-1
3.3.1 Radiation Protection Components 3.3-1
3.3.2 Safe Operating Ranges 3.3-2

3.4 Thermal Evaluation for Normal Conditions of Transport 3.4-1
3.4.1 Thermal Models 3.4-1
3.4.2 Maximum Temperatures 3.4-19
3.4.3 Minimum Temperatures 3.4-20
3.4.4 Maximum Internal Pressure 3.4-20
3.4.5 Maximum Thermal Stresses 3.4-32
3.4.6 Summary of NAC-STC Performance for Normal Transport Conditions 3.4-33
3.4.7 Normal Heat-up Transient 3.4-33
3.4.8 Assessment Criteria for the Package Passive Heat Rejection System 3.4-34

3.5 Hypothetical Accident Thermal Evaluation 3.5-1
3.5.1 Thermal Model 3.5-1
3.5.2 Package Conditions and Environment 3.5-3
3.5.3 Package Temperatures 3.5-4
3.5.4 Maximum Internal Pressure 3.5-6
3.5.5 Maximum Thermal Stresses 3.5-8
3.5.6 Evaluation of Package Performance for Hypothetical Accident Thermal Conditions 3.5-8

4.0 CONTAINMENT 4.1-1

4.1 Containment Boundary 4.1-1
4.1.1 Containment Vessel 4.1-2
4.1.2 Containment Penetrations 4.1-2
4.1.3 Seals and Welds 4.1-3
4.1.4 Closure 4.1-4

4.2 Containment Requirements for Normal Conditions of Transport 4.2-1
4.2.1 Containment of Radioactive Material 4.2-2
4.2.2 Pressurization of Containment Vessel 4.2-2
4.2.3 Containment Criterion for Normal Conditions of Transport 4.2-4

Master Table of Contents (Continued)

4.3 Containment Requirements for Hypothetical Accident Conditions 4.3-1
4.3.1 Fission Gas Products 4.3-1
4.3.2 Containment of Radioactive Material 4.3-2
4.3.3 Calculation of Allowable Leak Rate 4.3-2
4.3.4 Containment Criterion for Accident Conditions 4.3-3

4.4 Special Requirements 4.4-1

4.5 Appendix 4.5-1
4.5.1 Metallic O-Rings 4.5-1
4.5.2 Blended Polytetrafluoroethylene (PTFE) O-Rings 4.5-14
4.5.3 Expansion Foam 4.5-18
4.5.4 Fireblock Protective Coating 4.5-21
4.5.5 Viton O-Rings 4.5-24
4.5.6 Sample Input File 4.5-29

5.0 SHIELDING EVALUATION 5-1

5.1 Discussion and Results 5.1-1
5.1.1 Design Criteria 5.1-1
5.1.2 Design Basis Fuel 5.1-2
5.1.3 Shielding Materials 5.1-4
5.1.4 Results 5.1-4

5.2 Source Specification 5.2-1
5.2.1 Directly Loaded Fuel Source Specification 5.2-1
5.2.2 Yankee Class Fuel and GTCC Waste Source Specification 5.2-4

5.3 Model Specification 5.3-1
5.3.1 Directly Loaded Fuel Model 5.3-1
5.3.2 Yankee-MPC Fuel and GTCC Waste Models 5.3-4

5.4 Shielding Evaluation 5.4-1
5.4.1 Computer Code Descriptions and Results 5.4-1

5.5 Sample Input Files 5.5-1
5.5.1 Sample Input Files for Directly Loaded Fuel 5.5-1

Master Table of Contents (Continued)

6.0 CRITICALITY EVALUATION 6.1-1

6.1 Discussion and Results 6.1-1
6.1.1 Directly Loaded Fuel 6.1-1
6.1.2 Canistered Fuel 6.1-2

6.2 Package Fuel Loading 6.2-1

6.3 Criticality Model Specification 6.3-1
6.3.1 Calculational Methodology 6.3-1
6.3.2 Description of Calculational Models 6.3-1
6.3.3 Package Regional Densities 6.3-2

6.4 Criticality Calculation 6.4-1
6.4.1 Fuel Loading Optimization 6.4-2
6.4.2 Criticality Results for Directly Loaded, Uncanistered Fuel 6.4-2
6.4.3 Criticality Results for Canistered Yankee Class Fuel 6.4-8

6.5 Critical Benchmark Experiments 6.5-1
6.5.1 Benchmark Experiments and Applicability 6.5-3
6.5.2 Results of Benchmark Calculations 6.5-4
6.5.3 Comparison of NAC Method to NUREG/CR-6361 ..... 6.5-6

6.6 Appendix 6.6-1

7.0 OPERATING PROCEDURES 7-1

7.1 Outline of Procedures for Receipt and Loading the Cask 7.1-1
7.1.1 Receiving Inspection 7.1-1
7.1.2 Preparation of Cask for Loading 7.1-1
7.1.3 Loading the NAC-STC Cask 7.1-5

7.2 Preparation for Transport 7.2-1
7.2.1 Preparation for Transport (without Interim Storage) 7.2-1
7.2.2 Preparation for Transport (after Long-Term Storage) 7.2-2

7.3 Outline of Procedures for Unloading the Cask 7.3-1
7.3.1 Receiving Inspection 7.3-1

Master Table of Contents (Continued)

7.3.2 Preparation of NAC-STC Cask for Unloading 7.3-1
7.3.3 Unloading the NAC-STC Cask 7.3-4
7.3.4 Preparation of Empty Cask for Transport 7.3-7

7.4 Leak Test Requirements and Procedures 7.4-1
7.4.1 Containment System Verification Leak Test Procedures 7.4-1
7.4.2 Leak Testing for Transport After Long-Term Storage 7.4-2
7.4.3 Leak Testing for Transport without Interim Storage 7.4-3
7.4.4 Corrective Action 7.4-4

7.5 Railcar Design and Certification Requirements 7.5-1
7.5.1 Railcar and Tie-Down Design Requirements 7.5-1
7.5.2 Railcar Tie-Down Design Loadings 7.5-1
7.5.3 Railcar and Tie-Down Certification 7.5-1

8.0 ACCEPTANCE TESTS AND MAINTENANCE PROGRAM 8-1

8.1 Fabrication Requirements and Acceptance Tests 8.1-1
8.1.1 Weld Procedures, Examination, and Acceptance 8.1-1
8.1.2 Structural and Pressure Tests 8.1-3
8.1.3 Leak Tests 8.1-6
8.1.4 Component Tests 8.1-8
8.1.5 Tests for Shielding Integrity 8.1-10
8.1.6 Thermal Test 8.1-13
8.1.7 Neutron Absorber Tests 8.1-15
8.1.8 Transportable Storage Canister 8.1-18

8.2 Maintenance Program 8.2-1
8.2.1 Structural and Pressure Tests of the Cask 8.2-1
8.2.2 Leak Tests 8.2-2
8.2.3 Subsystems Maintenance 8.2-3
8.2.4 Valves, Rupture Disks and Gaskets on the Containment Vessel 8.2-3
8.2.5 Shielding 8.2-3
8.2.6 Miscellaneous 8.2-4
8.2.7 Maintenance Program Schedule 8.2-4

8.3 Quick-Disconnect Valves 8.3-1

Chapter 3

List of Figures (continued)

Figure 3.4-14 Directly Loaded Fuel Basket Temperature Distribution for the Aluminum Heat Transfer Disk with Air 3.4-51
Figure 3.4-15 Isometric View of Quarter Symmetry Heat-up Transient Model for Directly Loaded Fuel 3.4-52
Figure 3.4-16 Heat-up Transient Thermal Response of the Directly Loaded Basket Aluminum Disk 3.4-53
Figure 3.4-17 Heat-up Transient Average Temperature Response for Directly Loaded Fuel Basket Aluminum Disk and Inner Shell Wall 3.4-54
Figure 3.4-18 Heat-up Transient Thermal Response for the Directly Loaded Fuel Basket Steel Support Disk 3.4-55
Figure 3.4-19 Heat-up Transient Average Temperature Response for the Directly Loaded Fuel Basket Steel Support Disk and Inner Shell Wall 3.4-56
Figure 3.4-20 Three-Dimensional ANSYS Model for Canistered Fuel 3.4-57
Figure 3.4-21 Design Basis Yankee Class Canistered Fuel Assembly Axial Power Distribution 3.4-58
Figure 3.4-22 Fuel Assembly Model for Canistered Fuel 3.4-59
Figure 3.4-23 Fuel Tube Model for Canistered Fuel 3.4-60
Figure 3.4-24 Two Dimensional Reconfigured Fuel Assembly Model 3.4-61
Figure 3.5-1 NAC-STC Hypothetical Accident Conditions ANSYS Model for Directly Loaded Fuel 3.5-9
Figure 3.5-2 Hypothetical Accident Conditions Temperature History for the Directly Loaded Basket 3.5-10

List of Tables

Table3.1-0 Thermal Analysis Bounding Conditions - Normal Transport Conditions 3.1-8
Table 3.2-1 Thermal Properties of Solid Neutron Shield (NS-4-FR) 3.2-8
Table 3.2-2 Thermal Properties of Stainless Steel 3.2-9
Table 3.2-3 Thermal Properties of Chemical Lead 3.2-10
Table 3.2-4 Thermal Properties of Type 6061 Aluminum Alloy 3.2-11
Table 3.2-5 Thermal Properties of Helium 3.2-12
Table 3.2-6 Thermal Properties of Dry Air 3.2-13
Table 3.2-7 Thermal Properties of Copper 3.2-14
Table 3.2-8 Thermal Properties of B_4C 3.2-15
Table 3.2-9 Thermal Properties of Zircaloy and Zircaloy-4 Cladding 3.2-16
Table 3.2-10 Thermal Properties of Fuel (UO_2) 3.2-17
Table 3.2-11 Thermal Properties of BORAL and TalBor Sheet 3.2-18
Table 3.4-1 Maximum Component Temperatures - Normal Transport Conditions, Maximum Decay Heat, Maximum Ambient Temperature - Directly Loaded and Canistered Configurations 3.4-62
Table 3.4-2 Maximum Component Temperatures - Normal Transport Conditions, Maximum Decay Heat, Minimum Ambient Temperature - Directly Loaded and Canistered Configurations 3.4-63
Table 3.4-3 Maximum Component Temperatures - Normal Transport Conditions, Maximum Decay Heat, Low Ambient for Directly Loaded Fuel 3.4-64
Table 3.4-4 NAC-STC Thermal Performance Summary For Normal Conditions of Transport 3.4-65
Table 3.4-5 Maximum Cask Component Temperatures 3.4-66
Table 3.5-1 Maximum Component Temperatures - Hypothetical Accident Conditions Fire Transient 3.5-13

A second model determines the effective conductivity of the fuel, which is a detailed two-dimensional thermal model of the fuel assembly. The model includes the fuel pellets, cladding and gas (considered to be helium) between fuel rods and gas occupying the gap between the fuel pellets and cladding. Modes of heat transfer modeled include conduction and radiation between individual fuel rods for the steady state condition.

In the three dimensional model, the fuel tube, including the neutron absorber sheet and its cladding, is also modeled using effective conductivity. The effective conductivity is determined by a two dimensional thermal model. The model includes the fuel tube, the neutron absorber sheet, helium gaps on both sides of the neutron absorber sheet and a helium gap between the stainless steel cladding for neutron absorber and the support disk or heat transfer disk.

Classical analysis is used to calculate temperatures during the hypothetical accident condition fire transient for the various components of the fuel, canister basket, canister, and cask. The methodology is described in Section 3.5.1.1.

The transportable storage canister may contain one or more Reconfigured Fuel Assemblies. A two-dimensional finite element model is generated using the ANSYS program to determine the temperature distribution of the Reconfigured Fuel Assembly. The model comprises the fuel rods, fuel tubes, the shell casing (the square tube with the same external dimensions as an intact fuel assembly) and the gas (helium) occupying the gap between fuel rod and tube, the space between fuel tubes and the gap between shell casing and the fuel assembly tube.

3.1.3 Canistered Greater Than Class C Waste

Greater than Class C (GTCC) waste may be transported in the transportable storage canister. GTCC waste is comprised of reactor core components placed inside of containers having the same geometry as the design basis Yankee Class fuel assemblies. The GTCC waste containers are installed in a basket that can accommodate up to 24 waste containers.

The thermal output of the GTCC waste is 2.9 kilowatts. Component temperatures for the GTCC waste basket are conservatively calculated using a thermal resistance model. The calculated temperatures are then used to determine the material properties in the structural analysis of the GTCC basket.

The thermal output of the GTCC waste (2.9 kW) is significantly less than the design basis thermal load for directly loaded fuel and for canistered fuel. Consequently, the temperatures produced in the cask by the design basis fuel bound the temperature effects on the NAC-STC cask body and the canister due to the GTCC waste.

Gap location	Gap (inches)	Approximate characteristic length (inches)
Gap between the fuel tube and the fuel assembly	0.112	9.2 slot length
Gap within the fuel tube between the neutron absorber and the exterior steel plate	0.005	9.2 slot length
Gap between the basket and the inner shell	0.065	222 inches circumference of basket
Gap between the lead gamma shield and the outer shell	0.045	>222 inches circumference at gap

The total heat transfer can be expressed as the sum of the radiation and the conduction processes.

$$Q_t = q_r + q_k$$

where q_r is specified above for the radiation heat transfer and q_k, which is the heat transfer by conduction is expressed as:

$$q_k = \frac{KA}{g}(T_i - T_j)$$

where:

g = gap distance (between the two surfaces defined by node i and node j)
K = conductivity of the gas in the gap

By combining the two expressions (for q_k and q_r) and factoring out the term $A(T_i - T_j)/g$,

$$Q_t = [g\sigma\varepsilon F(T_i^2 + T_j^2)(T_i+T_j) + K][A(T_i - T_j)/g]$$

or

$$Q_t = K_{eff}A(T_i - T_j)/g$$

where:

$$K_{eff} = g\sigma\varepsilon F(T_i^2 + T_j^2)(T_i+T_j) + K$$

The material conductivity used in the analysis for the elements comprising the gap includes the heat transfer by both conduction and radiation. Since the gap is small compared to the disk thickness, the form factor (F) is taken to be unity.

3.2.2.4 Radiation from the Top of the Directly Loaded Basket

The radiation from the top of the basket to the inner lid is modeled with radiation links that transfer heat based on

$$q_r = \sigma\varepsilon AF(T_i^4 - T_j^4)$$

where the area A corresponds to the radiating area of the top basket disk and the emissivity corresponds to the basket material.

3.2.2.5 Radiation from the Top of the Transportable Storage Canister

Based on the radiation heat transfer equation shown in Section 3.2.2.4, the radiation heat transfer at the locations listed below is modeled using radiation link elements in the cask three-dimensional model.

1. From top of the fuel region to bottom surface of the canister lid.
2. From bottom of the fuel region to the top surface of the canister bottom plate.
3. From exterior surfaces of the fuel tubes to the inner surface of the canister shell

3.2.2.6 Radiation Across Gaps Within the Cask Containing Canistered Fuel

The gaps represented in the cask model are small compared to the surfaces separated by the gap.

Gap location	Gap (inches)	Approximate Characteristic Length (inches)
Gap between the fuel tube and the fuel assembly	0.111	8.254 slot length
Gap within the fuel tube between the neutron absorber and the exterior steel plate, and between the neutron absorber and the tube	0.003	8.254 slot length
Gap between the support disk and the canister shell	0.205	216 inches circumference of support disk
Gap between the canister and inner shell	0.18	220 inches circumference of of the canister
Gap between the lead gamma shield and the inner shell	0.015	>220 inches circumference at gap
Gap between exterior surface of the fuel tube and the inside surface of slots in support disk or heat transfer disk	0.079	8.254 in slot length
Gap between heat transfer disk and canister shell	0.345	216 inch circumference of disk
Gap between top of canister and bottom of top spacer	0.125	71 inch of cavity diameter
Gap between canister bottom plate and top of bottom spacer	0.125	71 inch of cavity diameter

The total heat transfer is calculated in the same manner as shown in Section 3.2.2.3. As is the case for the directly loaded fuel basket, the material conductivity used for the elements comprising the gap includes the heat transfer by both conduction and radiation. Since the gap is small compared to the surfaces separated by the gap, the form factor (F) is taken to be unity.

3.2.3 Convective Properties

Each surface where convection operates has a convective heat transfer coefficient, h_c. There are several surfaces to be considered. Surfaces vary by shape and orientation. Only the cylindrical surface of the cask takes part in the heat removal process as the ends of the cask are thermally

"insulated" from the environmental ambient thermal sink by the impact limiters. The formula and the reference for the necessary convective material properties used to calculate h_c are given in the following sections.

3.2.3.1 Horizontal Cylindrical Surfaces

The cask body surface is represented by a horizontal cylinder in air. From "Standard Handbook for Mechanical Engineers" (Baumeister), the heat transfer coefficient, h_c, is:

$$h_c = 0.19\ \Delta T^{0.33}\ \text{BTU/hr-ft}^2\text{-°F, for } D^3\Delta T > 100$$

where:

ΔT = temperature difference between the surface and the air, °F
D = cylinder diameter, ft

For D = 8.1833 ft and ΔT > 100°F, the value of $D^3\Delta T$ > 54,800, significantly larger than 100. The expression can be converted into

$$h_c = 0.00132\ \Delta T^{0.33}\ \text{Btu/hr-in}^2\text{-°F}$$

3.2.4 Neutron Shield (NS-4-FR) Thermal Conductivity

Material properties for NS-4-FR, Table 3.2-1, have been experimentally determined by BISCO Products, Inc., the developer of the material. NS-4-FR is now supplied by Genden Engineering Services and Construction Company. Thermal expansion was determined for fresh material, but the influence of thermal aging or thermal cycling of NS-4-FR was not evaluated. In order to assess the influence of the NS-4-FR thermal conductivity with respect to temperatures developed within the cask for the design bases heat load, a conservative three (3) dimensional, quarter-symmetry heat transfer analysis has been performed with the neutron shield material replaced by air. The results of the analysis show that temperatures inside the cask increase a maximum of 26°F. Figure 3.2-1 graphically presents the radial temperature gradient from the center of the basket to the surface of the neutron shield shell outer surface. The increase of 26°F in any of the cask components is insignificant relative to structural considerations, and to the temperature limits of the temperature-dependent components. Therefore, the design of the NAC-STC is not adversely influenced by a change in the NS-4-FR thermal conductivity due to thermal aging or cycling.

Table 3.2-8 Thermal Properties of B_4C

Property (units)/ Temperature	Value			
	212°F	392°F	572°F	752°F
Conductivity[1] (Btu/hr-in-°F)	3.19	3.14	3.04	2.83
Emissivity[2]	0.5			

[1] Manufacturer's data, Brooks & Perkins for BORAL.

[2] Chapman, For pressed graphite, emissivity is reported to be 0.98 at 480°F. A value of 0.5 is used on the property.

Table 3.2-9 Thermal Properties of Zircaloy and Zircaloy-4 Cladding

Property (units)/ Temperature	Value			
	392°F	**572°F**	**752°F**	**932°F**
Conductivity[1] (Btu/hr-in-°F)	0.69	0.73	0.80	0.87
Emissivity[2]	0.75			

[1] NUREG/CR-0497

[2] Minimum value of emissivity for a cladding surface of uranium oxide

Table 3.2-10 Thermal Properties of Fuel (UO_2)

Property (units)/ Temperature	Value			
	100°F	440°F	570°F	793°F
Conductivity[1] (Btu/hr-in-°F)	0.29	0.29	0.27	0.19

[1] NUREG/CR-0497. The lower bound of temperatures is 500°K (440°F). Since the conductivity decreases as the temperature increases, using the same value (0.29) for the 100°F entry is conservative.

Table 3.2-11 Thermal Properties of BORAL and TalBor Sheet

Property (units)/ Temperature	Value	
	100°F	500°F
Conductivity (Btu/hr-in-°F)		
BORAL[1]		
Aluminum Clad	7.805	8.976
Core Matrix	4.136	3.698
TalBor[2]	6.79	7.80
Emissivity[3]	0.15	0.15

1 AAR Advanced Structures, Standard Specification for BORAL

2 Talon Composites, TalBor 1100 27 w% B_4C Material Specification

3 The emissivity of the aluminum clad of the BORAL sheet ranges from 0.10 to 0.19 based on the BORAL Specification. An average value of 0.15 is used. TalBor has the same emissivity range and average, per the TalBor Material Specification.

3.3 Technical Specifications for Components

The heat rejection capability of the NAC-STC is the result of passive heat transfer within the cask and from the cask surface. Heat is transferred from the fuel assemblies to the fuel basket tubes, and through the tubes and steel support disks and aluminum heat transfer disks to the fuel basket surface, by conduction, convection and radiation. The steel support disks are considered to be the structural member, and the aluminum heat transfer disks are supported by the steel structure and were added to enhance the heat rejection capacity of the basket. Heat is transferred from the basket surface to the cavity wall, or from the basket surface to the canister wall, and then to the cavity wall, primarily by conduction and radiation. Heat is then transferred by conduction through the cask wall to the inside of the neutron shield. For the gap considered to be present between the lead and the outer shell or inner shell, radiation is also considered to be active. There are 24 explosively bonded copper/stainless steel heat transfer fins. The stainless steel portion of the fin is primarily a structural member supporting the neutron shield and the copper is explosively bonded to it to aid in heat transfer through the neutron shield. The solid neutron shield region that covers the majority of the length of the cask transfers the heat by conduction to the shield tank surface. Because of the presence of the impact limiters, no heat is transferred to the environment through the ends of the cask. From the radial surfaces, heat is rejected to the environment by radiation and convection. The NAC-STC heat rejection components are analyzed for normal transport conditions in Section 3.4 and for hypothetical accident conditions in Section 3.5.

3.3.1 Radiation Protection Components

Radiation protection is provided by the NAC-STC gamma and neutron shielding. The primary gamma radiation shielding components are the materials used in fabricating the multiwall body, the end forgings of the cask body, the inner lid and the outer lid. The multiwall body consists of the cast lead enclosed between the inner and outer stainless steel shells. The lead is cast in place between the cylindrical cask body shells. Neutron shielding is provided by a radial solid neutron shield and 2-inch thick disks in the bottom of the cask and the inner lid. The neutron shields are borated to suppress secondary gamma generation. The capture of neutrons by many materials produces a secondary gamma ray that must also be shielded; however, when boron-10 absorbs a neutron, an alpha particle is emitted that is stopped locally. Thus, the secondary gamma dose rate is minimized. The radiation protection components are analyzed for normal transport conditions in Section 3.4 and for hypothetical accident event conditions in Section 3.5.

3.3.2 Safe Operating Ranges

There are four major components that must be maintained within their safe operating temperature ranges; the o-rings in the inner lid and inner lid port coverplate, the lead gamma shield, the NS-4-FR solid neutron shield, and the aluminum heat transfer disks.

The safe operating ranges for the o-rings, lead gamma shield, solid neutron shield and aluminum heat transfer disks are:

Component	Safe Operating Range
Lead gamma shield	- 40°F to + 600°F
Radial NS-4-FR neutron shield	- 40°F to + 300°F
Aluminum Heat Transfer Disks	- 40°F to + 600°F
PTFE O-Rings	- 40°F to + 735°F
Metallic o-rings	- 40°F to + 500°F
Viton o-rings	- 40°F to + 400°F

The safe operating range of the o-rings is obtained from the technical information presented in Section 4.5, and ensures that the contents are contained within the cask and are not released to the atmosphere due to thermal failure of the o-rings. As shown in the Viton o-ring technical information, a temperature of +400°F for continuous service is acceptable in the accident condition. The analyses of Sections 3.4 and 3.5 show that the temperatures of the o-rings are maintained within the safe operating range during normal transport and hypothetical accident conditions.

The safe operating range of the lead gamma shield is based on preventing the lead from reaching its melting point of 620°F (Baumeister). To preclude localized lead temperatures from exceeding their safe operating range, FPC (fireblock silicone foam) is used to insulate the lead from the high temperatures that occur during the 10 CFR 71 hypothetical fire accident. The fire accident analysis in Section 3.5 shows that the lead temperature is maintained in its safe operating range even without the presence of the FPC. This foam is included for extra assurance of safety. A 0.125-inch layer of the material is located around the top and bottom corners of the lead gamma shield above and below the coverage provided by the radial neutron shield.

The maximum operating temperature limit of the NS-4-FR solid neutron shield material to ensure sufficient neutron shielding capacity was determined by the product developer to be 338°F, as shown in Figure 3.3-1. Test 2 of Figure 3.3-1 was conducted to evaluate the long-term stability of the NS-4-FR material at high temperatures. The test results were based on placing a

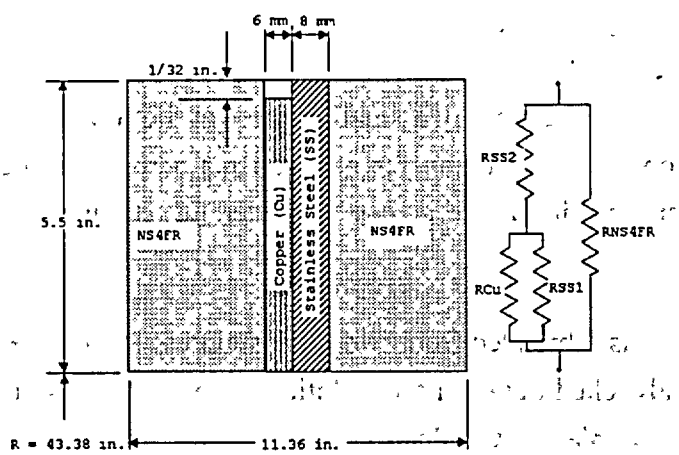
3.4.1.1.1.2 Multiwall Body

The thermal model of the body represents the three concentric shells--the inner stainless steel shell, the lead shielding and the outer stainless steel shell--which make up the cask body. A typical cross section is shown in Figure 3.4-3. A 0.045-inch gap is calculated for the radial lead region between the outer shell and the lead. This is based on the lead and surrounding stainless steel heating up from 70°F to 620°F during the lead pour and, then, cooling to approximately 250°F when the cask is loaded with the design basis heat load. Due to the different thermal expansion coefficients between the stainless steel and lead, a gap may be formed during the lead pour operation. The gap is placed between the lead and the outer stainless steel shell in the normal condition ANSYS models to create the maximum temperatures in the lead. Radiation and conduction modes of heat transfer are effective across this gap and have been included by the method described in Section 3.2.2.3.

3.4.1.1.1.3 Radial Neutron Shield

A synthetic borated solid material used to absorb neutrons covers most of the outer shell. Twenty-four 0.55-inch (14 mm) thick copper/stainless steel heat transfer fins are equally distributed radially on the outer shell. The fins are 0.315-inch (8 mm) thick stainless steel plate explosively bonded to 0.236-inch (6 mm) thick copper plate. The stainless steel neutron shield shell is 0.472 inches (12 mm) thick on the top and bottom, and 0.236 inches (6 mm) thick elsewhere. The neutron shield shell is exposed to the ambient conditions on the outer surface.

The thermal conductivity of the neutron shield region was determined by modeling the neutron shield region discretely. The neutron shield can be broken down into 24 sectors, each with a fin at the center. A single sector was analyzed to define an effective coefficient for thermal conductivity using slab geometry and an electrical resistance analogy. The sector and its associated electrical circuit modeling are shown in the following diagram.



Since the copper is slightly shorter than the steel, the resistor model considers a parallel SS1/Cu combination $R_{SS1/Cu}$ in series with a second SS resistance, R_{SS2}. This resistance combination is then in parallel with the resistance for NS4FR layer (R_{NS4FR}).

Resistors in parallel and series combine as:

$$R_{eff} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}, \text{ parallel; } R_{eff} = R_1 + R_2, \text{ series.}$$

The individual resistances are equal to $R_{eff} = \frac{L}{kA}$, where *k* is the normal conductivity and *A* is the area. Applying these relationships to the neutron-shield sector gives:

$$R_{eff} = \frac{1}{\frac{1}{R_{SS/Cu}} + \frac{1}{R_{NS4FR}}},$$

where $R_{SS/Cu}$ is given by:

$$R_{SS/Cu} = \frac{1}{\frac{1}{R_{SS_1}} + \frac{1}{R_{Cu}}} + R_{SS_2}.$$

The effective thermal conductivity is given by $k_{eff} = \frac{L}{R_{eff}A}$, and is calculated to be 0.39 Btu/hr-in-°F.

An effective conductivity of 0.339 Btu/hr-in-°F is conservatively used for the radial neutron shield in the cask body model for normal transport conditions.

3.4.1.1.1.4 Top and Bottom Ends

The inner and outer lids, separated by a small gap are at the top end of the cask. Radiation and conduction are the operative heat transfer mechanisms across this lid gap. To conservatively determine the temperature difference across the outer lid, conduction is the only heat transfer mechanism considered.

The bottom of the cask is fabricated from two thick stainless steel plates with a plate of NS-4-FR neutron absorber sandwiched between them. Intimate contact is assumed between the NS-4-FR and the stainless steel plates. Conduction is the only operating heat transfer mechanism considered through the bottom of the cask.

No heat transfer occurs between the ends of the cask and the environment due to the presence of the impact limiters. The impact limiters essentially insulate the ends of the cask from the temperatures in the environment, due to both the low thermal conductivity and the thickness of the wood in the limiter.

3.4.1.1.2 180 Degree Section Three-Dimensional Cask Model for the Directly Loaded NAC-STC

To simulate the cask basket resting on the inner shell during transportation, a half symmetry finite element model is constructed. This model, shown in Figures 3.4-6 through 3.4-8, consisted of a 180-degree section of the cross section with a length of 4.86 inches and containing an aluminum heat transfer disk and a steel disk. The cross section of the basket, the multiwall body and shields in this 180-degree section, is identical to the cross section of the quarter symmetry model described in Section 3.4.1.1.1 Whereas the three-dimensional quarter symmetry model simulated the axial heat transfer, the three-dimensional 180-degree section model ignores axial heat transfer and defines the top and bottom axial surfaces as adiabatic.

The orientation of the basket in the cask shown in Figure 3.4-8 corresponds to the orientation of the basket during transport.

To simulate contact of the basket with the inner shell, the basket model is shifted towards one side of the cavity (see Figure 3.4-8). The length of contact was centered about the plane of symmetry and extended for an angle of 45 degrees. The gap varied from zero (contact) to a maximum value of 0.13 inches at the top. In addition, the fuel assemblies are treated as resting on the fuel tubes. Material properties used in the quarter symmetry model in Section 3.4.1.1.1 are incorporated into this model.

The volumetric heat generation rate corresponded to 0.935 kilowatts per fuel assembly, which includes a peaking factor of 1.1 applied to the design value of 0.85 kilowatts per assembly. The solar insolance shown in Table 3.1-1 is applied to the surface of the model and the ambient temperature is taken to be 100°F.

The steady state analysis of the 180-degree section model using the transport conditions provided the maximum temperatures for the following components:

aluminum heat transfer disks	inner shell	radial neutron shield
steel support disks	lead shield	maximum surface temperature
fuel tubes	outer shell	

3.4.1.1.3 Fuel Assembly Model

3.4.1.1.3.1 Fuel Assembly Description

The detailed analysis of the fuel assembly is used to determine the effective conductivity of a homogenized model of a fuel assembly as well as to determine the maximum fuel rod cladding temperature.

A quarter symmetry model of the fuel assembly is constructed using ANSYS 4.4, which is shown in Figures 3.4-9 and 3.4-10. The dimensions for the pins are for the directly loaded design basis fuel (Table 5.1-2). The material properties for the fuel and cladding are listed in Tables 3.2-9 and 3.2-10. In this model, the fuel rod is treated as being homogenized. The properties for the air and helium are shown in Tables 3.2-5 and 3.2-6. The material properties account for the conductivity through the cavity gas (either air or helium). The pin to pin radiation is governed by the expression in Section 3.2.2 and modeled via radiation links (STIF31). This element, which is modeled from pin surface to pin surface, requires emissivity and a form factor. The emissivity is taken from experimental data for Zircaloy tubes. Form factor determination is accomplished via a utility (AUX12) in ANSYS which performs a radiation view factor (form factor) calculation. The results from AUX12 are used in the steady state analysis of the model of the fuel assembly.

To simulate the fuel load, uniform volumetric heat generation is applied to the elements representing the fuel and the total heat load of the model corresponds to 0.85 kilowatts per assembly.

3.4.1.1.3.2 Determination of Effective Fuel Conductivity

A two step procedure is used to determine the effective conductivity for the fuel.

Using the fuel assembly model, a uniform temperature is applied to the exterior of the model (see Figure 3.4-9) in conjunction with the volumetric heat generation. From this analysis, the maximum temperature located at the center of the fuel assembly is determined. This is at the corner of the model, which represents the center of the entire fuel assembly.

A Sandia National Laboratory Report (SAND90-2406) defines an expression to determine the maximum temperature of a square cross section of an isotropic homogeneous fuel with a uniform

volumetric heat generation. At the boundary of this square cross section, the temperature is constrained to be uniform. The expression for the maximum temperature is given by

$$T_c = T_e + 0.29468 \frac{Qa^2}{K_{eff}}$$

where:

T_c = the temperature at the center of the fuel (°F)
T_e = the temperature applied at the exterior of the fuel (°F)
Q = volumetric heat generation rate (Btu/hr-in^3)
a = half length of the square cross section of the fuel (inch)
K_{eff} = effective thermal conductivity for the isotropic homogeneous fuel material (Btu/hr-in-°F)

Using the maximum temperature, located at the center of the fuel, from the detailed fuel assembly model, the above expression is used to determine the K_{eff} for an isotropic homogeneous representation of the fuel assembly. The conductivities calculated were 0.05 BTU/hr-in-°F for helium and 0.03 BTU/hr-in-°F in air at a temperature of 600°F. The constant values are used in both the quarter model (Section 3.4.1.1.1) and the 180-degree section model (Section 3.4.1.1.2) for the fuel assembly.

Two analyses and K_{eff} determinations are performed; a K_{eff} corresponding to air in the cavity in which the fuel assembly model used air and a K_{eff} for helium in the cavity in which the fuel assembly model used helium as the cavity gas.

3.4.1.1.3.3 Determination of Maximum Fuel Clad Temperature

Two models are needed to determine the cask maximum fuel rod cladding temperature. The two models are:

1. 180-degree section model of the cask body - ANSYS, 3-D Model (Section 3.4.1.1.2)

2. Detailed two-dimensional model of the fuel assembly.

The three-dimensional ANSYS model from Section 3.4.1.1.2 is used to determine the maximum fuel tube temperature, which is applied to the exterior of the fuel assembly model. Since the cavity gas can be air or helium, two separate analyses are performed. For the case of the air in the cavity, the maximum fuel tube temperature from the transport condition using air in the cavity is used as the exterior boundary condition for the fuel assembly model. The fuel assembly model used the same material properties as the three-dimensional model with air in the cavity. For the helium in the cavity, the analyses are repeated but using the properties for helium in the cavity for both models.

3.4.1.2 Analytical Model for Canistered Fuel

The thermal analysis for the canistered design basis fuel uses three finite element ANSYS models. A three-dimensional model ("three dimensional canister model") is employed to evaluate the cask in a horizontal position with the canister basket in contact with the canister which is, in turn, in contact with the cask inner shell. The model is comprised of the fuel assemblies, fuel tubes, stainless steel support disks, aluminum heat transfer disks, the canister shell, lids and bottom plate, the aluminum honeycomb spacers at the top and bottom of the canister, the NAC-STC inner shell, lead, outer shell, neutron shield and neutron shield shell. The fuel regions and the fuel tubes with BORAL neutron absorber sheets in the three-dimensional model are modeled using effective conductivities (BORAL is used in the thermal model since BORAL has a lower effective conductivity than TalBor and therefore bounds TalBor). The effective conductivity of the fuel is determined by a second model ("fuel model), which is a detailed two-dimensional thermal model of the fuel assembly. The model includes the fuel pellets, cladding and gas (considered to be helium) occupying the gap between the fuel pellets and cladding. A third model ("fuel tube model") is used to determine the effective conductivities of the tube wall and BORAL neutron absorber sheet. These models are described in Sections 3.4.1.2.1 through 3.4.1.2.3.

The thermal analysis for the Reconfigured Fuel Assembly uses the two dimensional reconfigured fuel model. The model is described in Section 3.4.1.2.4. A classical thermal analysis is performed for the Greater Than Class C waste canister using a thermal resistor model, as described in Section 3.4.1.2.5.

The fuel regions (inside tubes) are modeled as homogenous regions with effective conductivities, determined by the 2-D Fuel Model as described in Section 3.4.1.2.2. The center slot of the basket contains is modeled as helium since it contains no fuel. The fuel assembly tube and the neutron absorber sheet, including helium gaps on both sides of the neutron absorber sheet and the gap between the stainless steel cladding for the neutron absorber and disk are modeled as one element thick with effective conductivities, as established using the 2-D Tube Model shown in Section 3.4.1.2.3. Conductivity for the aluminum honeycomb spacers is calculated to be 0.24 Btu/hr-in-°F (Hexcel) through the spacer from the canister to the ends of the NAC-STC, but is conservatively considered to be that of helium across the spacer parallel to the ends of the canister.

The neutron shield of the NAC-STC, consisting of NS-4-FR, steel and copper fins, is also modeled with effective conductivities. The radial conductivity (0.339 Btu/hr-in-°F) is obtained from Section 3.4.1.1.1.3. The effective conductivity in the cask longitudinal direction is 0.403 Btu/hr-in-°F, calculated based on area ratio. Conductivity of the neutron shield material, NS-4-FR (0.031 Btu/hr-in-°F) is used as the conductivity in the circumferential direction.

In the model, radiation heat transfer is considered from the top of the fuel region to the bottom surface of the canister lid, from the bottom of the fuel region to the top surface of the canister bottom plate, and from exterior surfaces of the fuel tubes to the inner surface of the canister shell. This radiation is modeled using LINK31 radiation elements. Radiation across gaps in the model described in Section 3.2.2.5 are accounted for using the effective conductivities for the gas in the gap using the method described in Section 3.2.2.3.

Radiation at the neutron shield shell surface to ambient is combined with the convection effect using the method described in Section 3.2.2.2. The convection heat transfer coefficient is calculated based on the formula as shown in Section 3.2.3.1. Effective emissivities are used for all radiation calculations, with the form factor taken to be unity. Effective emissivity is computed using the following formula (Kreith) based on corresponding material emissivities:

$$\epsilon_{eff} = 1/\,(1/\epsilon_1 + 1/\epsilon_2 - 1)$$

Radiation between the exterior surfaces of the fuel assembly tubes and the radiation between the stainless steel support disk and the aluminum heat transfer disk are conservatively ignored in this model.

Solar insolance is applied to the neutron shield shell surface for the "Heat" case (Ambient temperature = 100°F) in accordance with 10 CFR 71. Heat flux equal to 0.150 Btu/hr-in^2 is used at the neutron shield shell surface based on the 1475 Btu/hr-in^2 heat flux for a curved surface (Section 3.4.1.1.1).

Volumetric heat generation (Btu/hr-in^3) is applied to the active fuel region based on a total heat load of 12.5 kW, an active fuel length of 91 inches and an axial power as shown in Figure 3.4-21. The axial power distribution curve is discussed in Section 5.2.3.

3.4.1.2.2 Fuel Model

The effective conductivity of the fuel is determined by a second model, which is a detailed two-dimensional thermal model of the fuel assembly. The model includes the fuel pellets, cladding, gas between fuel rods and gas (considered to be helium) occupying the gap between the fuel pellets and cladding. Modes of heat transfer modeled include conduction and radiation between individual fuel rods for the steady state condition. The model is shown in Figure 3.4-22.

ANSYS PLANE55 conduction elements and LINK31 radiation elements are used in the model, which includes a total of 240 fuel rods. Each fuel rod consists of the pellet, zircaloy cladding, and a gap between the pellet and clad. The gas in the gap between the pellet and clad, as well as the gas between fuel rods, is considered to be helium. Radiation elements are defined between rods and from rods to the boundary of the model (inside surface of fuel tube). Radiation effect at the gaps between the pellet and clad is conservatively ignored. Effective emissivities are determined using the formula shown in Section 3.4.1.2.1.

The effective conductivity for the fuel is determined using the method described in Section 3.4.1.1.3.2. Volumetric heat generation (Btu/hr-in^3) based on the design heat load of 12.5 kW is applied to the pellets. The temperature at the boundary of the model is constrained to be uniform. The effective conductivity is determined based on the heat generated and the temperature difference between the center and the edge of the model. The temperature-dependent effective properties as shown below are established by using different boundary temperatures. The effective conductivity in the axial direction of the fuel assembly is calculated based on the material area ratio.

Temperature (°F)	k_{xx}	k_{yy}	k_{zz}
125	0.0171	0.0171	0.169
321	0.0208	0.0208	0.156
517	0.0267	0.0267	0.145
713	0.0335	0.0335	0.142
911	0.0409	0.0409	0.144

1. x and y axes are in-plane of the model, z is in the cask axial direction.
2. The temperatures associated with each row of properties is the average temperature of the fuel assembly determined by each analysis.

3.4.1.2.3 Fuel Tube Model

The purpose of the two dimensional fuel tube model is to determine the effective conductivity of the fuel tube and neutron absorber sheet, which is used in the three-dimensional canister model. As shown in Figure 3.4-23, this model includes the fuel tube, a BORAL sheet (including the core matrix sandwiched by aluminum claddings as the bounding heat transfer case for a neutron absorber material), helium gaps on both sides of the BORAL sheet and helium gap between the stainless steel cladding for BORAL sheet and the support disk or heat transfer disk.

ANSYS PLANE55 conduction elements and LINK31 radiation elements are used to construct the model. The model consists of eight layers of conduction elements and six radiation elements that are defined at the helium gaps (two per gap). The thickness of the model (x-direction) is the distance measured from the inside dimension of the fuel tube to the inside dimension of the slot in the support disk (assuming the fuel tube is located at the center of the disk slot). The tolerance of the BORAL sheet thickness, 0.003 inch, is used as gap size for both sides of the BORAL sheet. The height of the model is defined as the same dimension as the thickness of the model.

Heat flux is applied at the left side of the model and the temperature at the right boundary of the model is constrained. The heat flux is determined based on the design heat load of 12.5 kW. The maximum temperature of the model (at left boundary) and the temperature difference (ΔT) across the model are calculated by ANSYS. The effective conductivity is determined using the following formula:

$$q = k\,(A/L)\,\Delta T$$

or

$$k = q\ L / A\,\Delta T$$

where:

q = heat rate (Btu/hr)
A= area (in^2)
L= length of model (in)
ΔT = Temperature difference across the model (°F)
k = effective conductivity (Btu/hr-in-°F)

The temperature-dependent conductivity (k) is determined by varying the temperature constraints at one boundary of the model and re-solving for the heat rate (q) and temperature difference. The effective conductivity for the parallel path are calculated based on area ratio of material.

3.4.1.2.4 Two Dimensional Reconfigured Fuel Assembly Model

The two-dimensional Reconfigured Fuel Assembly model is generated to calculate the temperature distribution of the hottest cross-section (1 inch long in the cask axial direction) of the Reconfigured Fuel Assembly (RFA). Because of symmetry, the model considers one-fourth of a cross-section of the RFA. The model is shown in Figure 3.4-24. ANSYS 'PLANE55' conduction elements and "LINK31" radiation elements are used in the model. The model includes a total of 16 fuel rods, 16 fuel tubes, the shell casing (the square tube with the same external dimensions as an intact fuel assembly) and the cover gas (considered to be Helium). Each fuel rod is located inside a stainless steel fuel tube. The fuel rod, which consists of the zircaloy clad, the fuel pellet (UO_2) and a small gap between the clad and fuel pellet, is modeled as a solid rod with the thermal conductivity of the UO_2. This is conservative since the conductivity of UO_2 is less than that of the zircaloy and the main interest of the fuel rod is the cladding temperature. The gas between the fuel rod and the fuel tube, the gas between fuel tubes and the gas outside of the shell casing are considered to be helium.

As shown in Figure 3.4-24, radiation elements are defined between tubes and from tubes to the inner surface of the shell casing. A form factor of 1 is used for the radiation elements. Effective emissivity is computed using the following formula (Keith) based on corresponding material emissivities:

3.4.4.1 Maximum Internal Pressure for Directly Loaded Fuel

The calculation of the maximum operating pressure for the NAC-STC directly loaded fuel configuration assumes 26 typical Westinghouse 17 x 17 PWR fuel assemblies, using an assumed maximum burnup of 45,000 MWD/MTU which would result in the highest fission product gas volumes in the fuel rod and 100 percent fuel rod failure. Calculation of the NAC-STC cavity maximum operating pressure utilizes the gas volume of the cavity, the temperature of the cavity gases and the volume of gases released by the fuel to the cavity. The characteristics of the Westinghouse 17 x 17 fuel assembly pertinent to this analysis are:

Fuel Rod Outer Diameter	0.374 in
Fuel Rods/Fuel Assembly	264 (25 guide tubes ignored)
Fuel Pellet Diameter	0.3225 in
Fuel Rod Clad Outer Diameter	0.374 in
Fuel Rod Clad Inner Diameter	0.329 in
Fuel Rod Length	151.6 in
Active Fuel Length	144.0 in
Plenum Volume	1.25 in^3
Fill Pressure (at manufacture, 20°C)	500 psig
End Fitting Volume/Assembly	97.6 in^3
Grid Spacer Volume/Assembly	43.2 in^3
Cask Cavity Inner Diameter	71.0 in
Cask Cavity Length	165.0 in
Cask Cavity Volume	653,267 in^3

Basket Characteristics:

Basket Outer Diameter	70.86 in
Support Disk (31 disks)	0.5 inch thick, 26 openings 9.234 in square
Heat Transfer Disk (20 disks)	0.625 inch thick, 26 openings 9.204 in square
Basket Upper Weldment (1 disk)	1.0 inch thick, 26 openings 8.75 in square
Basket Lower Weldment (1 disk)	1.0 inch thick, 26 openings 8.65 in square
Fuel Tube Outer Dimensions	9.064 inch square

Fuel Tube Inner Dimension	8.78 in square
Number of Tubes	26
Length of Fuel Tubes	155.2 in
Volume of Other Components (Threaded rods, spacer nuts, etc.)	6523 in^3

V_d = Volume of basket (not including tubes)

$$= [(31)(0.5)][(\pi/4)(70.86)^2 - 26(9.234)^2] + [(20)(0.625)][(\pi/4)(70.86)^2 - 26(9.204)^2] + [(1)(1.0)][(\pi/4)(70.86)^2 - 26(8.78)^2] + [(1)(1.0)][(\pi/4)(70.86)^2 - 26(8.65)^2] + 6523$$

$$= 58{,}986 \text{ in}^3$$

V_{st} = Volume of stainless steel/neutron absorber sheet

$$= 26[(9.064)^2 - (8.78)^2]155.2$$

$$= 20{,}449 \text{ in}$$

V_b = Total basket volume

$$= V_d + V_{st}$$

$$= 79{,}435 \text{ in}^3$$

V_f = Volume of fuel assemblies

$$= [26][(\pi/4)(0.374)^2 - (0.329)^2][(151.6)(289)] + [26][(\pi/4)(0.3225)^2(144.0)(264)] + [26][97.6] + [26][43.2]$$

$$= 112{,}704 \text{ in}^3$$

V_{gv} = Free gas volume in cask cavity

$$= V_{ct} - V_b - V_f$$

$$= 461{,}128 \text{ in}^3$$

V_{fg} = Fuel free gas volume

$$= 26(1.25)\left(\frac{514.7}{14.7}\right)(264)$$

Figure 3.4-24 Two Dimensional Reconfigured Fuel Assembly Model

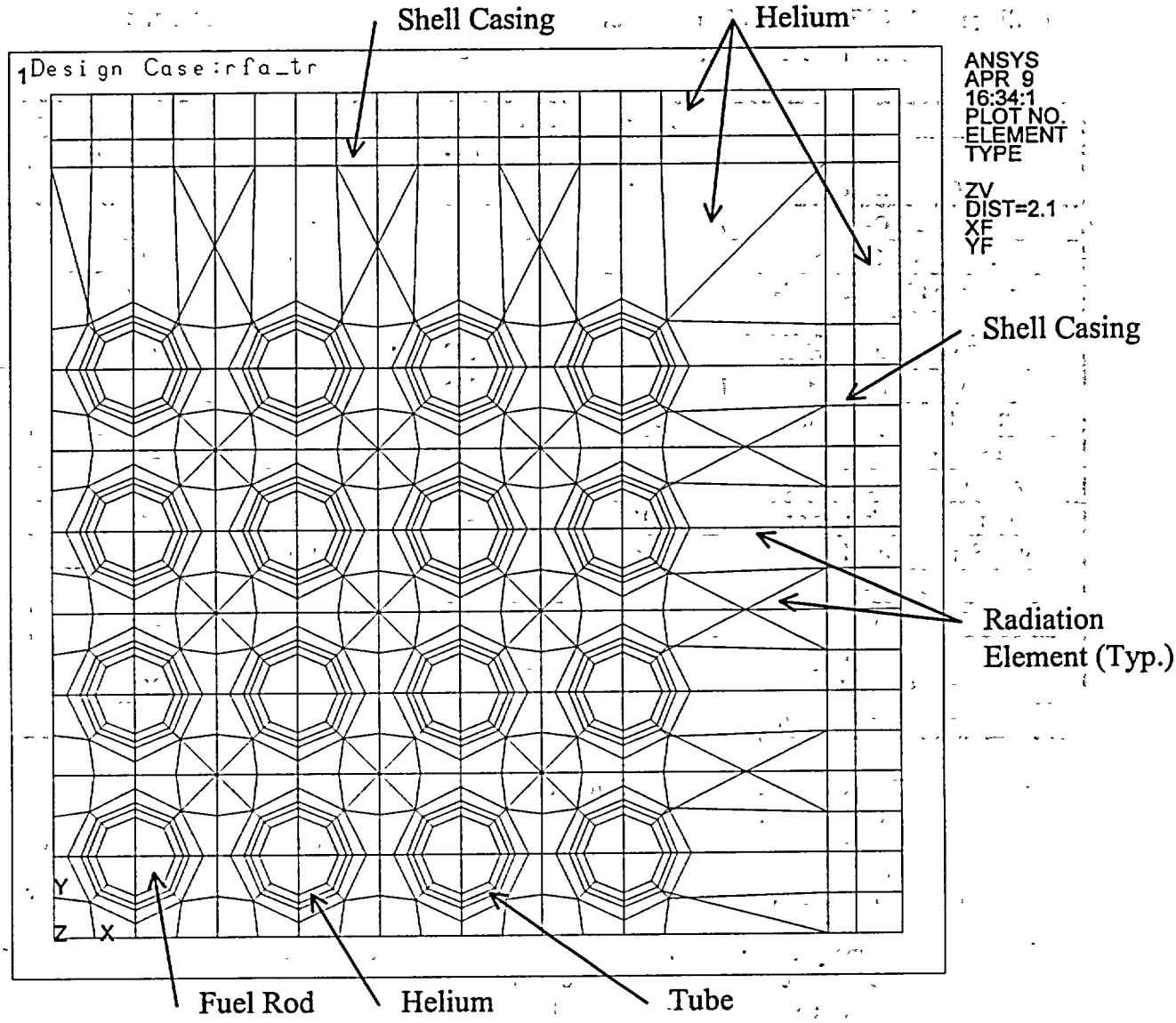


Table 3.4-1 Maximum Component Temperatures - Normal Transport Conditions, Maximum Decay Heat, Maximum Ambient Temperature - Directly Loaded and Canistered Configurations

Conditions: 100°F Ambient Temperature, Full Solar Insolation Decay Heat Load: 22.1 kW for Uncanistered Fuel; 12.5 kW for Canistered Fuel

	Directly Loaded (Uncanistered) Fuel			Canistered Fuel	
Component	Air (°F)	Cavity Gas Helium (°F)	Note	Cavity Gas Helium (°F)	Note
Outer Lid O-Ring	178	176	(1)	176	(4) (6)
Port Cover O-Rings	211	210	(1)	210	(4) (9)
Inner Lid and Port Cover Plate O-Rings	190	189	(1)	189	(4) (7) (8)
Cask Radial Outer Surface	241	243	(2)	243	(5)
Top Neutron Shield	181	175	(1)	175	(4)
Radial Neutron Shield	284	285	(2)	270	(5)
Lead Gamma Shield	314	315	(2)	281	(5)
Aluminum Disk Exterior	338	337	(2)	---	---
Aluminum Disk Interior	491	487	(2)	536	(5)
Steel Support Disk Exterior	356	344	(2)	---	---
Steel Support Disk Interior	498	495	(2)	539	(5)
Canister Shell	---	---	---	338	(5)
Canister Lid	---	---	---	209	(5)
Canister Bottom Plate	---	---	---	255	(5)
Maximum Fuel Rod Cladding	588 (309°C)	544 (284°C)		575	(5)

Notes:
(1) Temperatures are determined from the analysis of the three dimensional quarter symmetry model of the entire cask.
(2) Temperatures are determined from the analysis of the three dimensional 180-degree section model of the entire cask.
(3) Temperatures are determined from the analysis of the two dimensional detailed model of the fuel assembly.
(4) Component not explicitly modeled in the 3-D model for canistered fuel. Temperature results from the helium case of the directly loaded fuel used (conservative).
(5) Temperatures are determined from the 3-D model for canistered fuel.
(6) Outer lid o-rings are Viton.
(7) Inner lid o-rings are Viton or metallic.
(8) Port cover plate o-rings are Viton or metallic.
(9) Port cover o-rings are PTFE.

Table 3.4-2 Maximum Component Temperatures - Normal Transport Conditions, Maximum Decay Heat, Minimum Ambient Temperature - Directly Loaded and Canistered Configurations

Conditions: -40°F Ambient Temperature, 22.1 kW Decay Heat Load, 12.5 kW for Canistered Fuel, No Insolation

Component	Directly Loaded Fuel Temperature (°F)	Canistered Fuel Temperature (°F)	Notes
Outer Lid O-Ring	125	125	(1) (2) (4)
Inner Lid and Inner Lid Port Cover Plate O-Rings	125	125	(2) (5) (6)
Port Cover O-Rings	129	129	(2) (7)
Cask Radial Outer Surface	144	116	(2) (3)
Top Neutron Shield	131	131	(2)
Radial Neutron Shield	181	142	(3)
Lead Gamma Shield	215	154	(3)
Fuel Basket Exterior	256	---	(3)
Maximum Basket Web	399	431	(3)
Canister Shell	---	215	(3)
Canister Lid	--	71	(3)
Canister Bottom Plate	---	121	(3)
Maximum Fuel Rod Cladding	488	473	(3)

1. Component not explicitly modeled in the 3-D model for canistered fuel. Temperatures from the directly loaded fuel are conservatively used.
2. Temperatures are determined from the 3-D model for canistered fuel.
3. Basket and fuel rod cladding temperatures are defined by adding the gradient result between the lead gamma shield and point of interest obtained from the 3-D finite element analysis with air in the cavity (Table 3.4-1).
4. Outer lid o-rings are Viton.
5. Inner lid o-rings are Viton or metallic.
6. Port cover plate o-rings are Viton or metallic.
7. Port cover o-rings are PTFE.

Table 3.4-3 Maximum Component Temperatures - Normal Transport Conditions, Maximum Decay Heat, Low Ambient, for Directly Loaded Fuel

Conditions:-20°F Ambient Temperature 22.1 kW Decay Heat Load No Insolance

Component	Temperature (°F)
Outer Lid O-Ring	161
Inner Lid and Port Cover Plate O-Rings	165
Port Cover O-Rings	165
Cask Radial Outer Surface	173
Top Neutron Shield	168
Radial Neutron Shield	211
Lead Gamma Shield	245
Fuel Basket Exterior[1]	286
Maximum Basket Web[1]	429
Maximum Fuel Rod Cladding[1]	518

[1] Basket and fuel rod cladding temperatures are defined by adding the gradient result between the lead gamma shield and point of interest obtained from the 3-D finite element analysis with air in the cavity (Table 3.4-1).

Table 3.4-4 NAC-STC Thermal Performance Summary for Normal Conditions of Transport

	Uncanistered Fuel	Canistered Fuel	Criterion
Maximum Fuel Rod Cladding Temperature	309°C	302°C	<380°C—Uncanistered <340°C—Canistered
Component	**Component Temperature Range**	**Component Temperature Range**	**Component Safe Operating Temperature Range**
Metallic O-Rings	-40 to 190°F	-40 to 190°F	-40 to 500°F
Viton O-Rings	-40 to 190°F	-40 to 190°F	-40 to 400°F
PTFE O-Rings	-40 to 211°F	-40 to 211°F	-40 to 650°F
Radial NS-4-FR Neutron Shield	-40 to 285°F	-40 to 270°F	-40 to 300°F
Lead Gamma Shield	-40 to 315°F	-40 to 281°F	-40 to 600°F
Aluminum Heat Transfer Disk	-40 to 491°F	-40 to 536°F	-40 to 600°F

1. The safe operating range extends to 735 °F. However, a temperature of 650 °F is conservatively applied. See Certified Test Report D9-3362-1, Applied Technical Services, Inc., Marietta, GA, February 8, 1989.

Table 3.4-5 Maximum Cask Component Temperatures

Directly Loaded (Uncanistered) Fuel			Canistered Fuel			
Component ID	Component Description	Air (°F)	Cavity Gas Helium (°F)	Note	Cavity Gas Helium (°F)	Note
1	Bottom Plate	350	333	(1)	333	(3)
2	Bottom Forging	417	393	(1)	393	(3)
3	Transition Shell	300	300	(1)	300	(3)
4	Inner Shell	331	331	(2)	311	(4)
5	Outer Shell	292	293	(2)	276	(4)
6	Top Forging	211	210	(1)	210	(3)
7	Inner Lid	223	210	(1)	210	(3)
8	Outer Lid	178	176	(1)	176	(3)
9	Inner Lid Bolt	190	189	(1)	189	(3)
10	Outer Lid Bolt	178	176	(1)	176	(3)

Notes:
(1) Temperatures are determined from the analysis of the three-dimensional quarter symmetry model of the entire cask.
(2) Temperatures are determined from the analysis of the three-dimensional 180-degree section model of the entire cask.
(3) Component not explicitly modeled in the 3-D model for canistered fuel. Temperature results from the helium case of the directly loaded fuel used (conservatively).
(4) Temperatures are determined from the 3-D model for canistered fuel.

Table 3.5-1 Maximum Component Temperatures - Hypothetical Accident Conditions Fire Transient

Conditions: 30 minute, 1475°F Fire 22.1 kW decay heat for Directly Loaded Fuel 12.5 kW decay heat for Canistered Fuel

Component	Temperature (°F)	Time (hours)	Allowable Temperature (°F)
Inner Lid Bolt[1]	335[2]	0.9	--
Metallic O-Rings[1]	314	1.1	500
Viton O-Rings[1]	314	1.1	400
Cask Radial Outer Surface[1]	1347	0.5	--
Radial Neutron Shield[1,3]	--	--	--
Lead Gamma Shield[1]	455	3.6	600
Support Disk Interior			
Directly Loaded Fuel	639[2]		
Canistered Fuel	713[2]		
Heat Transfer Disk Interior			
Directly Loaded Fuel	632		800
Canistered Fuel	710		800
Maximum Fuel Rod Cladding			
Directly Loaded Fuel	729		1058
Canistered Fuel	749		806

1 The maximum temperature is based on the decay heat value of 22.1 kW for Directly Loaded Fuel.

2 The maximum temperature is used to determine the allowable stress in the structural analyses.

3 For conservatism, the radial neutron shield is assumed to be lost at the end of the fire. The axial neutron shields are not components important to safety as discussed in Section 3.3.2.

THIS PAGE INTENTIONALLY LEFT BLANK