

July 23, 2003

Alan S. Hanson  
President and Chief Executive Officer  
Transnuclear, Inc.  
Four Skyline Drive  
Hawthorne, NY 10532-2176

SUBJECT: NRC INSPECTION REPORT NO. 72-1029/2003-202

Dear Mr. Hanson:

This refers to the inspection conducted on June 16 through 19, 2003, at the facilities of Kie-Con in Antioch, California. Kie-Con is a fabrication contractor for Transnuclear, Inc. (TN), fabricating concrete components of the Advanced Standardized NUHOMS cask storage system to be used at Southern California Edison's San Onofre Nuclear Generating Station. The inspection was conducted to determine if fabrication activities were performed in accordance with the requirements of 10 CFR Parts 21 and 72, the applicable Certificate of Compliance and Safety Analysis Report, and TN's NRC-approved quality assurance program. The inspection focused on the findings of the NRC inspection performed at Kie-Con in November 2002, and reported in NRC Inspection Report 72-1029/2002-201 dated December 26, 2002. The enclosed report presents the results of this inspection.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/NRC/ADAMS/index.html> (the Public Electronic Reading Room).

Sincerely,

/RA/  
Robert J. Lewis, Section Chief  
Transportation and Storage Safety and  
Inspection Section  
Spent Fuel Project Office  
Office of Nuclear Material Safety  
and Safeguards

Docket No. 72-1029

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**U.S. NUCLEAR REGULATORY COMMISSION**  
**Office of Nuclear Material Safety and Safeguards**  
**Spent Fuel Project Office**

**Inspection Report**

Docket: 72-1029

Report: 72-1029/2003-202

Certificate Holder: Transnuclear, Inc.  
Four Skyline Drive  
Hawthorne, NY 10532-2176

Fabricator: Kie-Con  
3551 Wilbur Avenue  
Antioch, CA 94509

Date: June 16-19, 2003

Inspection Team: F. Jacobs, Team Leader, SFPO  
P. Narbut, SFPO

Approved by: Robert J. Lewis, Section Chief  
Transportation and Storage Safety  
and Inspection Section  
Spent Fuel Project Office, NMSS

ENCLOSURE 1

## **EXECUTIVE SUMMARY**

### **NRC Inspection Report 72-1029/2003-202**

On June 16-19, 2003, the U.S. Nuclear Regulatory Commission (NRC) performed an announced team inspection of Transnuclear, Inc. (TN), at the facilities of TN's fabrication contractor, Kie-Con, in Antioch, California. Kie-Con was fabricating concrete components of the Advanced Standardized NUHOMS cask storage system to be used at Southern California Edison's (SCE's) San Onofre Nuclear Generating Station (SONGS). The team inspected fabrication activities to determine if they were executed in accordance with the requirements of 10 CFR Parts 21 and 72, the applicable Certificate of Compliance (CoC) and Safety Analysis Report (SAR), and TN's NRC-approved quality assurance (QA) program. The inspection focused on the findings and observations of the NRC inspection performed at Kie-Con in November 2002, and reported in NRC Inspection Report 72-1029/2002-201 dated December 26, 2002. In that inspection, the team observed weaknesses in the Kie-Con QA program and had concerns about the adequacy of TN and SCE oversight of the fabrications activities.

In this inspection, the team observed an overall improvement in quality assurance and fabrication activities since the November 2002 inspection. TN had increased their engineering and QA participation in fabrication oversight activities, and SCE had established a full-time representative at Kie-Con. While the team noted changes and some improvement in the Kie-Con QA program, strong oversight was still required. TN issued a Stop Work Order on April 3, 2003, due primarily to significant deficiencies in concrete surface conditions on Advanced Horizontal Storage Module (AHSM) base units and inadequate process control in concrete repair activities. The Stop Work Order was lifted in three stages from April 16 through May 8, 2003. Changes to fabrication processes and personnel following the Stop Work Order appeared to have improved the quality of the concrete components.

The team concluded that, overall, the concrete fabrication activities were being adequately performed and met regulatory requirements. The fabrication activities were being adequately overseen by TN and SCE. The team considered that continuation of the detailed oversight by TN was necessary because Kie-Con did not yet have a sufficiently strong QA program.

## **INSPECTION PROCEDURES USED**

60852, "ISFSI Component Fabrication by Outside Fabricators"  
NUREG/CR 6314, "Quality Assurance Inspections for Shipping and Storage Containers"

## **PERSONS CONTACTED**

The team held an entrance meeting with TN on June 16, 2003, to present the scope and objectives of the NRC inspection. On June 19, 2003, the team held an exit meeting with TN to present the preliminary results of the inspection. The individuals present at the entrance and exit meetings are listed below in Table 1.

Table 1  
Entrance and Exit Meetings Attendance

NAME	TITLE	AFFILIATION	ENTRANCE	EXIT
Frank Jacobs	Team Leader	NRC	X	X
Paul Narbut	Senior Inspector	NRC	X	X
Paul Coughlin	Engineer, QA	SCE	X	
Danny Czapski	QA/QC Representative	SCE	X	
Jorge Morales	Manager, Dry Fuel Storage	SCE	X	X
Joseph Smith	Site Representative	SCE	X	X
Tony Chen	QA Manager	TN	X	X
Usama Farradj	Project Manager	TN	X	X
William Gallo	Senior Vice President	TN		X
Maisoon Khasim	QA Engineer	TN	X	X
Charles Lombardi	AHSM Project Engineer	TN	X	X
Ian McInnes	Project Engineer	TN	X	X
George Zamry	Site Representative	TN	X	X
Ramani Ayakannu	Chief Engineer	Kie-Con	X	X
Mark Davidson	Project Superintendent	Kie-Con	X	X
Dan Griffin	Plant Superintendent	Kie-Con	X	X
Allen Kung	Area Manager	Kie-Con		X
Morsli Mokhtari	QA Inspector	Kie-Con	X	X
Rajasegaran Ponniah	Project Manager	Kie-Con	X	X
Jon Re	Production Manager	Kie-Con	X	
Shekhar Vaddepally	QA Manager	Kie-Con	X	X

**LIST OF ACRONYMS USED**

ACI	American Concrete Institute
AHSM	Advanced Horizontal Storage Module
ASTM	American Society for Testing and Materials
BC	Base center unit of AHSM
BE	Base end unit of AHSM
CAR	Corrective Action Report
CoC	Certificate of Compliance
EWRR	Right rear end wall of AHSM
NCR	Nonconformance Report
NRC	U.S. Nuclear Regulatory Commission
NUHOMS	Nutec Horizontal Modular Storage
QA	Quality Assurance
QC	Quality Control
SAR	Safety Analysis Report
SCE	Southern California Edison
SFPO	Spent Fuel Project Office
SONGS	San Onofre Nuclear Generating Station
SW	Stop Work Order
TN	Transnuclear, Inc.

**REPORT DETAILS****1. Inspection Scope**

The team examined fabrication activities at Kie-Con to determine if they were performed in accordance with the requirements of 10 CFR Parts 21 and 72, the CoC, the SAR, and TN's NRC-approved QA program. The team reviewed documentation, interviewed personnel, and observed fabrication activities and facilities. The inspection focused on the findings and observations of the NRC inspection performed at Kie-Con in November 2002, and reported in NRC Inspection Report 72-1029/2002-201 dated December 26, 2002. In that inspection, the team observed weaknesses in the Kie-Con QA program and had concerns about the adequacy of TN and SCE oversight of the fabrication activities.

**2. Findings and Observations****2.1 Corrective Actions**

The inspector reviewed selected corrective actions and nonconformance reports. Kie-Con had issued 93 Nonconformance Reports (NCRs) for the TN project. TN had issued 41 NCRs, 20 Corrective Action Reports (CARs), and one Stop Work Order.

TN CAR F-03-006 indicated that a TN hold point for a concrete repair for Base End Unit #1 (BE-1) was bypassed by Kie-Con. CAR F-03-013 indicated that significant surface conditions,

including but not limited to voids and honeycombed areas, had been identified on all four base units cast to date. CAR F-03-014 stated that significant conditions had been identified in various Kie-Con NCRs and TN CARS regarding concrete placement and consolidation, surface finish, and repairs, and that corrective action taken had not been timely or effective in some cases. CAR F-03-014 required that a Stop Work Order be issued stopping all concrete pour of base units and all concrete repair work on AHSM components, and recommended that all known issues, including NCRs and CARS, be summarized.

Stop Work Order SW 03-01 was issued to Kie-Con on April 3, 2003, citing the inadequate process control in repair activities as documented in CAR F-03-006R1 and the significant surface conditions as documented in CAR F-03-013. The corrective actions taken in response to the Stop Work Order included the development by Kie-Con engineering of concrete consolidation plans for the first and second pours of the base unit, with review and concurrence by TN. Kie-Con provided training on the consolidation plans to the foreman, quality control (QC) inspector, and crew. Corrective actions for the repair activities included development and incorporation into the Kie-Con project quality plan of concrete defect definitions and the associated repair process. The repair process/procedure was written in English and Spanish to enhance communication to the repair crew, and training was provided. A postpour inspection was implemented to identify and document all areas of repair prior to any patching and sack rubbing. Some additional actions resulting from the review of known issues included the designation by Kie-Con of a dedicated superintendent for the TN project concrete pour, the hiring of experienced iron workers for reinforcing bar (rebar) work, and an adjustment to the slump range for base unit concrete. The Stop Work Order was lifted in three stages from April 16 to May 8, 2003.

The corrective actions resulting from the Stop Work Order appeared to have improved the quality of the concrete components, but a significant number of nonconformances were still being observed and documented. Timeliness and quality of Kie-Con nonconformance reports had been addressed by both TN and SCE, and appeared to have improved since early fabrication. However, the inspectors observed TN oversight coaching the Kie-Con QC inspector regarding the documenting of discrepancies found during QC inspections. The team concluded that continued strong oversight by TN was necessary to ensure that nonconformances are identified and properly documented and that corrective actions are effective.

## 2.2 Training and Certification

The team reviewed records and interviewed personnel to determine if individuals performing quality-related activities were trained and certified where required. The November 2002 inspection found that Kie-Con personnel performing testing activities had appropriate American Concrete Institute (ACI) certifications for those activities.

The Kie-Con QA manager assumed his position at the beginning of April. He had a strong technical background, but limited QA experience and training. The TN QA manager had been providing guidance to the Kie-Con QA manager.

The Kie-Con QC inspector assumed his position last November. He had limited QC experience but had been receiving on-the-job training with appropriate oversight from the TN site representative. Since March, he had been allowed to perform independent inspections. The inspectors observed that the Kie-Con QC inspector still required oversight and instruction by the TN site representative to perform some of his tasks. However, per TN, the QC inspector had become proficient in many of the tasks.

The Kie-Con foreman, craft personnel, and QC inspector had been trained on the new procedures for concrete consolidation developed as a corrective action for the Stop Work Order. Also, the repair personnel had been trained on the new concrete repair procedure written in both English and Spanish. After the inspector noted that there was no document providing clear training needs and requirements for Kie-Con personnel positions, Kie-Con developed a list of positions associated with various documents and evolutions to ensure appropriate personnel are trained on new and revised plans and procedures applicable to their positions or functions.

The inspectors noted that since the November inspection, improvements had been made in the training of personnel and in the use of experienced and dedicated craft personnel. However, the Kie-Con QA manager had recently been changed, and the incumbent again had limited previous QA experience and training. The QC inspector had been receiving on-the-job training since last November and had achieved certain proficiencies, but still had limited overall QA experience. The team concluded that continued strong oversight by TN was necessary for activities affecting quality.

### 2.3 Fabrication

The team examined records, reviewed procedures, interviewed personnel, and observed fabrication to determine if the AHSM components were being fabricated in accordance with approved implementing procedures and fabrication specifications. In particular, the inspectors observed form preparation, rebar installation, concrete mix design, testing, and placement. The inspectors also observed postplacement activities including postplacement inspection, component rigging, and concrete cylinder break testing. Also, the inspectors examined other completed wall, end, base, and roof units awaiting shipment.

TN informed the inspectors that the first base unit, BE-1, which had been examined in November 2002 and found to have significant rock pockets and voids, had been repaired and delivered to SCE at SONGS. TN explained that difficulties had been encountered with the follow-on base units, a difficult shape. The second unit, BC-1, was placed after the forms had been modified to add vents and the concrete mix specifications had been changed. BC-1 also required repair. BC-2 was placed with further modifications (more vents) and required repair. BC-3 was placed and had sufficient problems that Kie-Con scrapped it. Per TN, the concrete for BC-3 was stiffer than the preceding units and hampered placement. BC-3A, the replacement for BC-3, had additional vents added and was satisfactory. BC-4 and BC-5 were satisfactory. TN representatives stated that they believed the fabrication process was currently adequate, but had plans to perform batch plant major maintenance to enhance batch consistency. In the interim, TN has required Kie-Con to do fresh concrete tests for slump and



unit weight for each batch. TN stated they intended to continue to test each batch until they had confidence in consistent batch production.

The inspector noted that Kie-Con was repairing some embedments that had been placed in the wrong location in units BC-2 and BC-3. The embedments had been removed by core drilling and were in process of being replaced. Although this represented errors that should have been caught, the crew and oversight personnel seemed to have learned from the experience, and specific verifications had been added to the work plan for those embedments.

Kie-Con had hired experienced ironworkers to install the rebar in the forms. Consequently, the quality of the work was noticeably improved, rebar structures were rigid and well-tied, and rebar chairs were adequately placed and tied. TN representatives stated that prior to all placements they intended to continue with a second independent TN inspection of rebar and forms following the Kie-Con primary inspection.

The inspectors observed the placement of concrete for the right rear end wall, EWRR-1. The placement was well-coordinated, including a prejob briefing for all personnel and a briefing in Spanish for the laborers working the vibrators. The placement was overseen by TN and SCE oversight personnel. Each concrete batch was tested for slump and unit weight. Air entrainment was also measured for information, although not required. TN representatives had removed the air entrainment requirement because of inconsistent results. Apparently, the air entrainment admixture and the water reducing admixture reacted to cause some of the entrained air to be lost. However, since air entraining is important for concrete freeze thaw protection, the absence of entrained air for the storage vaults at San Onofre, in a mild climate, was not a concern. TN representatives noted that for other locations, in harsher climates, air entrainment would likely be required.

The inspector noted that platform scale used for unit weight measurement for the end wall placement on June 18 had been calibrated on June 13, but the calibration was not witnessed by TN as required by the Kie-Con Project Quality Plan. Kie-Con immediately removed the scale from service and wrote NCR 096 for TN to evaluate acceptability of the unit weight measurements.

On the day following concrete placement for the end wall, the inspector observed the 24-hour cylinder break tests confirming the concrete had achieved sufficient strength for form removal. When the end wall forms were removed, the inspectors observed that, except for very minor and expected bug holes, the concrete outer surfaces showed good consolidation. The end wall is a simple rectangular block shape and good consolidation is considerably easier than in the base unit.

The inspector reviewed the test certifications on file at Kie-Con for the batch plant. The records reviewed included tests for aggregates, for example friables (ASTM C 142), lightweight particles (ASTM C 123), soft fragments (ASTM C 131), reactivity (ASTM C 289), and others. The records were complete and demonstrated concrete materials met specification and code requirements. The inspector also verified concrete cylinder break strengths met specification requirements. The break strengths were very high, more than twice specification requirements.

The inspector noted that the roof shipped June 18 did not have personnel protection caps installed. Specification SCE-01-0114 requires the ends of the roof connection rebars to be capped for personnel protection. This requirement was not a nuclear safety issue but indicated at least one specification requirement had not been complied with. TN wrote CAR 03.030 to review the specification and determine if any other requirements were being overlooked.

The inspectors noted the bilingual concrete repair procedure and the concrete placement and consolidation procedures had no dates or revision numbers. Consequently, future changes, if they occurred would be difficult to control. Kie-Con immediately reissued the procedures with dates, correcting the weakness.

The inspector noted that the material status tags located on components in the yard did not readily indicate material status. The tags used were markups of reject tags and the information entered on the tags was inconsistent. During the inspection, Kie-Con developed a system of color-coded tags with clear labeling that should more clearly indicate material status and support more consistent information entry.

The inspector noted that the rebar material storage area contained some rebar that could not be readily associated with its proper bundle or identification tag. Also, some loose tags were located among the bundles. A list of rebar storage requirements was developed by TN and Kie-Con to improve control of the material.

The inspector noted that Kie-Con had made a change that enhanced its operation. Kie-Con had contracted with an independent concrete testing service to perform much of the concrete testing. The concrete technicians were certified by ACI and were observed to be practiced and proficient in their activities.

## 2.4 Oversight

The inspectors examined the oversight of Kie-Con fabrication and inspection activities to determine if adequate oversight was performed during fabrication activities.

TN maintained a full-time oversight representative on site at Kie-Con. Additionally, TN's project manager and 2 key engineers were spending a minimum total of 20 hours per week on site, and the QA engineer and QA manager were also spending a minimum total of 20 hours per week on site. This was a substantial increase over the amount of TN engineering and QA participation seen during the previous inspection.

SCE had provided a full-time oversight representative since January observing both TN and Kie-Con activities and providing daily reports to SCE QA management. In addition to the daily observations, SCE was performing planned surveillances in accordance with its Source Verification Checklist.

The team noted that TN had applied the additional oversight resources committed in its response to the notice of violation issued in inspection report 72-1029/2002-201. In general, the quality and control of fabrication activities had improved significantly in comparison to the November 2002 inspection. The fabrication oversight activities appeared to be effective in

verifying that the certificate of compliance, fabrication specification, and drawing requirements were met.

### **3. Conclusions**

The team concluded that the concrete fabrication activities for the AHSM vaults for San Onofre were being adequately performed and met regulatory requirements. The fabrication activities were being adequately overseen by TN and SCE. The team considered that continuation of the detailed oversight by TN was necessary because Kie-Con did not yet have a sufficiently strong QA program.

### **4. Exit Meeting**

On June 19, 2003, at the conclusion of the inspection, the team held an exit meeting with TN's management to present the preliminary inspection results. TN's management acknowledged the inspection results presented by the team. SCE and Kie-Con management were also present at the exit meeting.