UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
2443 Warrenville Road, Suite 210
Lisle, IL 60532-4362

November 20, 2013

Mr. Patrick T. Daly
Senior Vice-President
and General Manager
Zion*Solutions*, LLC
101 Shiloh Boulevard
Zion, IL 60099

SUBJECT: NRC INSPECTION REPORT NOS. 05000295/2013012(DNMS); 05000304/2013012(DNMS); 07201037/2012001(DNMS) – ZION NUCLEAR POWER STATION

Dear Mr. Daly:

On November 5, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed its inspection of the independent spent fuel storage installation (ISFSI) construction activities at the permanently shut-down Zion Nuclear Power Station in Zion, Illinois. At the conclusion of the inspection on November 5, 2013, during an exit meeting, the NRC inspectors discussed the preliminary inspection findings with members of your staff. The enclosed report presents the results of this inspection.

The inspection examined the independent spent fuel storage installation pad, and vertical concrete cask design and construction, as it relates to the safe storage of dry fuel and compliance with the Commission's rules, regulations, and the conditions of your license. Specific areas examined during the inspection are identified in the enclosed report. Within these areas, the inspection consisted of selected examinations of procedures and representative records, and interviews with personnel.

The inspection was conducted per NRC Inspection Manual 2690, "Inspection Program for Dry Storage of Spent Reactor Fuel at Independent Spent Fuel Storage Installations and Guidance for Title 10 of the *Code of Federal Regulations* (CFR) Part 71 Transportation Packages," and used Inspection Procedures (IP) 60853 and IP 60856.

Based on the results of these inspections, the inspectors did not identify any violations of NRC requirements.

In accordance with Title 10 of the *Code of Federal Regulations* (CFR) 2.390 of the NRC's "Rules of Practice," a copy of this letter and the enclosed report will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Document Access and Management System (ADAMS), accessible from the NRC's website at http://www.nrc.gov/reading-rm/adams.html.

We will gladly discuss any questions you may have regarding this inspection.

Sincerely,

/RA/

Robert J. Orlikowski, Chief
Materials Control, ISFSI, and
Decommissioning Branch
Division of Nuclear Materials Safety

Docket Nos. 050-00295; 050-00304; 072-01037
License Nos. DPR-39; DPR-48

Enclosure:
Inspection Report Nos. 05000295/2013012;
05000304/2013012; 07201037/2012001

cc w/encl: Patrick Thurman, Zion*Solutions,* LLC
Gary Bouchard, Zion*Solutions*, LLC
Alan Parker, Energy*Solutions*
John Christian, Energy*Solutions*
Russ Workman, Energy*Solutions*

cc w/o encl: Zion Distribution Service List

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DISTRIBUTION w/encl:
Bruce Watson
John Hickman
Patrick Louden
Ann Marie Stone
Harral Logaras
Alan Barker
Patricia Buckley
Carol Ariano
Linda Linn
Tammy Tomczak
Paul Pelke
MCID Branch

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos.:	050-00295; 050-00304; 072-01037
License Nos.:	DPR-39; DPR-48
Report Nos.:	05000295/2013012(DNMS) 05000304/2013012(DNMS) 07201037/2012001(DNMS)
Licensee:	Zion*Solutions*, LLC
Facility:	Zion Nuclear Power Station (permanently shut-down)
Location:	101 Shiloh Boulevard Zion, IL 60099
Dates:	Onsite Inspection on June 12, October 29 through November 1, November 14, November 15, December 14, 2012; in-office review through November 5, 2013
NRC Inspector:	Matthew C. Learn, Reactor Engineer Vijay L. Meghani, Reactor Inspector
Approved by:	Robert J. Orlikowski, Chief Materials Control, ISFSI, and Decommissioning Branch Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

Zion Nuclear Power Station,
NRC Inspection Report 05000295/2013012; 05000304/2013012;
07201037/2012001

The purpose of the inspection was to evaluate the design and construction of a new Independent Spent Fuel Storage Installation (ISFSI) storage pad and Vertical Concrete Casks (VCC), at the Zion Nuclear Power Station, to ensure compliance with regulations and design specifications.

Site Characterization and Design of the Independent Spent Fuel Storage Installation Pad

- The licensee's soil and ISFSI pad engineering design evaluations were performed in accordance with the Certificate of Compliance, Title 10 of the *Code of Federal Regulations* (CFR) Part 72 requirements, and applicable industry standards. *(Section 1.1)*

ISFSI Pad and VCC Construction

- The licensee's site characterization and soil compaction activities were performed in accordance with specifications, design drawings, and industry standards. (Section 2.1)

- The inspectors concluded that the construction activities for the ISFSI concrete storage pad complied with specifications contained in the licensee's approved engineering change package, design drawings, civil construction specifications, work orders, and applicable industry standards. The licensee provided justifications for any discrepancies which were verified with the designer of the pad. (Section 2.2)

- The inspectors concluded that the construction activities for the VCC complied with specifications contained in the licensee's vendors, design drawings, civil construction specifications, work orders, and applicable industry standards. The licensee provided justifications for any discrepancies. (Section 2.3)

Report Details

1.0 Review of 10 CFR 72.212(b) Evaluations, Appendix A, Review of Independent Spent Fuel Storage Installation Storage Pad Design (60856)

1.1 Site Characterization and Design of the Independent Spent Fuel Storage Installation Pad

a. Inspection Scope

The inspectors evaluated the licensee's soil and independent spent fuel storage installation (ISFSI) pad engineering design evaluations for an ISFSI pad to verify the licensee's compliance with the Certificate of Compliance, Title 10 *Code of Federal Regulations* (CFR) Part 72 requirements, and industry standards. Title 10 CFR 72.212(b)(5)(ii) requires that licensees perform written evaluations, before use which establish that cask storage pads and areas have been designed to adequately support the static and dynamic loads of the stored casks, considering potential amplification of earthquakes through soil-structure interaction, and soil liquefaction potential or other soil instability due to vibratory ground motion.

b. Observations and Findings

The licensee is utilizing the NAC MAGNASTOR dry cask storage system. Two separate three foot thick reinforced concrete pads are provided, each one capable of supporting 36 Vertical Concrete Casks (VCC) in a 4 x 9 array. Each pad is 68 feet wide and 148 feet long. The licensee designed and constructed the ISFSI pad as an important to safety category C structure. A 35 feet wide x 148 feet long, 18 inch thick concrete apron area is located between the two pads. The concrete pads were installed on top of a five to seven feet granular fill above the existing grade.

Soil Analysis and Soil Liquefaction Analysis

The inspectors reviewed licensee calculations documenting the engineering properties and design soil profile of the ISFSI site based on geotechnical data obtained from soil borings. The design subsurface profiles were developed based on more than 20 borings, some of which extended to depths of more than 100 feet and into the bed rock. The ground water was found at approximately seven to eight feet below the top of the pads. Properties of soil layers were determined and documented in calculation ZION001-CALC-004. Inspectors also reviewed licensee's evaluation of soil liquefaction potential and soil stability in the pad areas. The liquefaction evaluation performed in accordance with RG 1.198 included screening level assessment, quantitative assessment of liquefaction factor of safety using the Standard Penetration Test (SPT), and quantitative assessment of seismically induced ground settlement. The slope stability evaluations generally indicated a factor of safety of two. Synthetic geo-grid soil reinforcement was installed as recommended in the evaluation for certain areas where the lower safety factors between 1.6 and 1.8 were found. Inspectors noted that the soil bearing capacity and the total and differential settlement were evaluated in calculation ZION001-CALC-007. The lowest factor of safety against bearing capacity was found to be 7.5. The total and differential settlements under static loads were found to be less than an inch.

Seismic Soil Structure Analysis and ISFSI Pad Structural Analysis

The inspectors reviewed the licensee's seismic analysis evaluation to determine if the site's safe shutdown earthquake accelerations were correctly considered at the ISFSI site. The Licensee developed acceleration time histories from the seismic spectra provided in the Decommissioning Safety Analysis Report (DSAR) in accordance with the requirements of NRC Standard Review Plan 3.7.1. These time histories and the ISFSI site soil profiles (best estimate, lower bound, and upper bound) were used to develop the strain compatible properties for use in the soil structure analysis. The Soil Structure Interaction (SSI) analysis determined the maximum accelerations at the base and at the center of gravity of the storage casks. The SSI analysis considered eight different loading configurations to account for various partial and full loading conditions and also addressed three sets of soil properties (including the best estimate, upper bound and lower bound) for each loading configuration. The analysis also verified adequate safety factors against cask sliding and overturning. During review of the SSI analysis ZION001-CALC-018, the inspectors identified that the licensee assumed un-cracked concrete section properties for the pad while the calculated bending moments indicated that the concrete would crack under seismic loads. American Society of Civil Engineers (ASCE) 4-98, which is referenced in the calculation, in Section 3.1.3.1, requires that the concrete sections be modeled as cracked or un-cracked depending on the stress levels due to the most critical seismic load combination. During calculation revision to address the inspector's questions, the licensee made an error in calculation of the cracking moment and incorrectly concluded that the seismic load condition would not exceed the cracking moment. In response to further comments by the inspectors, the licensee again revised the calculation to correct the error. The final revised calculation indicated a reduction in concrete section properties due to the cracking, however, due to the conservatism included in the calculation, the error did not affect the conclusions regarding adequacy of the pad. The inspectors also had a concern regarding mesh size used in the pad finite element model. The inspectors' concern was that the element dimensions used in the analysis may not adequately capture effects of pad flexibility as discussed in the technical paper titled "Influence of ISFSI Design Parameters on the Seismic Response of Dry Storage Casks," by Bjorkman and Moore. NUREG 1536, Section 3.5.1.4.i (3) (g) identifies the importance of pad flexibility considerations and refers to the paper. The licensee in response to the inspector's concern provided additional sensitivity analyses to demonstrate adequacy of the pad SSI.

The inspectors reviewed the licensee's structural evaluation of the ISFSI reinforced concrete pad. The pad was designed in accordance with the requirements of American Concrete Institute (ACI) 318-08, Building Code Requirements for Structural Concrete and, where the ACI 318 is silent, the guidance from ACI 349-06, Code Requirements for Nuclear Safety Related Concrete Structures was used. The specified concrete design strength was 4000 pounds per square inch (psi). Load combinations including static and dynamic loads per the requirements of ACI 349 and Table 3.3 of the NRC NUREG 1536 were used. Seismic accelerations obtained from the SSI analyses were conservatively applied to the casks so as to maximize the applied forces and moment. Eight pad and cask models representing fully loaded and partially loaded pad configurations were analyzed using the finite element method to account for partial and sequential loading of the pad. Settlement effects were also included in the pad analysis.

The inspectors reviewed the licensee's site specific cask tip-over analysis. This analysis was required because the concrete pad and sub-soil parameters at the ISFSI site were

not bounded by the tip-over analysis in the MAGNASTOR cask Final Safety Analysis Report (FSAR). The analysis was performed using the finite element program LS-DYNA using the same methodology as described in the cask FSAR. The initial design documents required the pad concrete 28-day compressive strength to be less than 5000 psi. However, due to the concrete test results indicating strengths exceeding 6000 psi in some cases, the tip-over calculation was revised to address a bounding strength of 7000 psi. The analysis determined that in the event of a tip-over, with the ISFSI site specific soil parameters and the bounding concrete properties, the maximum accelerations at the top of the fuel basket and at the top of the canister would not exceed the FSAR limits.

ISFSI Pad Impact on Flooding Analysis

The top surface of the ISFSI pads are at an elevation of 592.1 feet above mean sea level (MSL) and have been constructed above the probable maximum surge and seiche flood level of 592.05 feet above MSL for the site as discussed in DSAR Section 2.4.5. Therefore, the ISFSI pads are enveloped by the NAC MAGNASTOR design basis. The flood water velocity limit is not applicable in this case because no part of a cask would be submerged during the probable maximum flood.

c. Conclusion

The licensee's soil and ISFSI pad engineering design evaluations were performed in accordance with the Certificate of Compliance, 10 CFR Part 72 requirements, and industry standards.

2.0 Independent Spent Fuel Storage Installation Pad Construction (60853)

2.1 Excavation and Soil Compaction Activities

a. Inspection Scope

The inspectors evaluated the licensee's site characterization for the new ISFSI pad to verify the licensee's compliance with its specifications, design drawings, and industry standards.

b. Observations and Findings

The licensee constructed the reinforced concrete ISFSI storage pads south of the plant switchyard. The licensee graded the site and removed the top several feet of existing soil, ensuring removal of topsoil, organic, and all undesirable material. The licensee performed proof-rolling of the underlying in-situ material to ensure that a suitable sub-grade existed under the pad area. Following receipt of satisfactory compaction results for the sub-grade, the licensee backfilled the area with a minimum of two feet of non-frost susceptible granular base material (gravel/sand) and compacted the fill in accordance with American Society for Testing and Materials (ASTM) D1557.

c. Conclusion

The licensee's site excavation and soil compaction activities were performed in accordance with specifications, design drawings, and industry standards.

2.2 Pad Construction Activities

a. Inspection Scope

The inspectors evaluated whether construction activities for the ISFSI concrete storage pad complied with specifications contained in the licensee's approved design evaluation, design drawings, work orders, and applicable industry standards. The inspectors also reviewed select material, concrete documentation, and personnel certification records.

b. Observations and Findings

The inspectors reviewed ZION001-PS-002, "Project Specification for the ISFSI and FHB Upgrades Cast-in-Place Concrete," Revision 1. ZION-001-PS-002 described the minimum requirements for construction activities related to installation of the ISFSI pad. The inspector reviewed ZS ISFSI – Project Instruction No. 3 Cast-in Place Concrete Construction" Revision 3 which further established cast-in-place concrete construction and material testing requirements for the ISFSI pad.

Placement of Reinforcing Steel

After placement and satisfactory compaction of the engineered fill, the licensee placed a 4-inch mudmat which provided a work surface to facilitate reinforcement bar (rebar) installation and concrete placement. The licensee then installed forms and placed rebar. The licensee's design specification chose to utilize rebar that conformed to either ASTM A615 Grade 60 or ASTM A706 Grade 60 steel.

After placing the rebar and securing the forms for each section, the licensee performed inspections of the rebar and the pad general areas prior to concrete placement. The NRC inspectors reviewed the design drawings and performed an independent walk down of both pads. The pad areas were free of debris and excessive moisture. The rebar was placed in two upper and lower layers joined by U-shaped bars. The licensee placed the correct size of rebar. The inspectors measured the spacing between the rebar and found it to be per the design specifications and industry standards.

Concrete Mix Design

The inspectors reviewed the licensee's concrete mix design to ensure compliance with the applicable codes and standards committed to in the licensee's design.

The inspectors reviewed the licensee's exposure classifications of the ISFSI pad to ensure compliance with the durability requirements of ACI 318-08. The licensee characterized the pad as F1, concrete exposed to freezing and thawing cycles and occasional exposure to moisture; S0, SO_4 < 0.10% by weight in soil and < 150 ppm in water; P0, contact with water where low permeability is not required; and C1, concrete exposed to moisture, but not external sources of chlorides. The inspectors reviewed the licensee's specified strength, water to cement ratio, slump, and air content. The inspectors reviewed the licensee's technical justification for these exposure classifications. The licensee's design contained explicit specifications for both concrete strength and air content that were lower and higher respectively than the durability

requirements of the ACI-318-08 in order to comply with the FSAR cask tip-over analysis strength requirements.

The inspectors reviewed the licensee's selection and testing of mix design components including cement, potable water, fine aggregate, course aggregate, and admixtures. The licensee utilized aggregates that were resistant to the affects of alkali-silicate reactions.

Prior to concrete placement the licensee tested their concrete mixture to ensure it met the specified requirements.

Placement of Concrete for Storage Pad

The storage pad was constructed in accordance with ACI 318-08 and ACI 301-10. The ISFSI pads were constructed in four segments per pad allowing separate continuous placements of concrete. The inspectors observed concrete placement for sections 1 and 4 of the south storage pad.

The inspectors observed that the concrete was transported by conveyor belt and deposited in the areas of placement within the forms. The inspectors noted that the contractor staff maintained careful control of the discharge hose and ensured that concrete had an unrestricted vertical drop to the point of placement to prevent segregation of the aggregate. The contractor used a systematic pattern of vibration to ensure proper consolidation, thereby preventing voids in the concrete slab. The licensee finished the pad with a roller paver screed with paving rollers. The licensee applied a broom finish as required by the design to the pad after placement in order to achieve the appropriate surface friction factor.

The licensee enacted cold weather concrete curing measures when necessary to ensure that concrete minimum temperature was above 50 degrees Fahrenheit during the first seven days of curing. Concrete temperature was measured with the use of surface thermometers and embedded thermocouples when necessary.

Concrete Field Tests

The licensee checked the concrete batch tickets for every truck to confirm that each concrete batch was mixed as specified in the mix design and the mixing time and number of drum revolutions satisfied code requirements to ensure the concrete was suitable for placement. The licensee's contractor obtained concrete samples every 1st and 5th truck and every 100 cubic yards thereafter for each segment to test air content, temperature, weight and slump tests.

In addition to the field tests, the qualified individuals' collected concrete samples in cylinders, a minimum of one set of four cylinders every 1st and 5th truck and every 100 cubic yards thereafter for each segment, for the concrete strength tests. The cylinders were cured and tested after 28 days by an independent laboratory to measure the compressive strength of the concrete.

The inspectors reviewed the 28 day concrete compressive strength test results taken from the storage pad to ensure they met the minimum strength of 4,000 psi and maximum of 5,000 psi as specified by the design requirements. The lower bound

strength limit ensures durability and strength of the ISFSI pad. The upper bound strength limit ensures a ductile enough surface during a postulate non-mechanistic cask tip-over event.

Several 28-day test results exceeded the 6,000 psi maximum strength, these results were provided to NAC for review and justification for acceptance as discussed in Section 1.1.

c. Conclusion

The inspectors concluded that the construction activities for the ISFSI concrete storage pad complied with specifications contained in the licensee's approved design package, design drawings, civil construction specifications, work orders, and applicable industry standards. The licensee provided justifications for any discrepancies which were verified with the designer of the pad.

2.3 Dry Cask Storage System Construction Activities

a. Inspection Scope

The inspectors reviewed the licensee's vendor perform on site construction activities associated with VCC.

b. Observations and Findings

The VCC is the storage overpack for the fuel canister and provides structural support, shielding, protection from environmental conditions, and natural convection cooling of the canister during long-term storage. The concrete cask is a reinforced concrete structure with a carbon steel inner liner. The VCC does not include a confinement barrier, rather the canister housed within the VCC provides a confinement barrier.

VCC fabrication activities were performed by NAC International under contract with Zion*solutions* at the Zion Station between May and August 2012.

During fabrication activities, the NRC performed two site inspections specifically focused on VCC fabrication activities.

Following completion of fabrication activities the NRC inspectors performed two additional walkdowns of VCC condition. The inspectors noted that several casks on the construction pad had hairline cracks (very fine) in their outer surface. The inspectors noted that cask # 21 had the most visible external flaws. Cosmetic repairs were made to the lower portion of these cracks as necessary.

Inspectors reviewed quality control documentation associated with individual VCC fabrication. Specifically inspectors reviewed documentation associated with cask #21. Throughout the fabrication process NAC International performs inspection of fabrication activities important to quality in 630073-P-01, "Vertical Concrete Cask Work Record and Inspection Forms on Zion MAGNASTOR Spent Fuel Storage Project," Revision 0. Step 47 of 630073-P-01 instructs the NAC inspector to inspect for cask concrete surface defects including cracks. Specifically the document instructs that "surface cracks that exceed 0.013 inch in maximum width shall be documented in the comments section of

this form," and "a nonconformance report (NCR) shall be prepared for cracks that exceed 0.040 inches in width…"

630073-P-01 Step 47 includes provision for inspection for both NAC International, and also Zion*solutions.* Zion*solutions* completes an independent review of step 47 through their independent quality assurance program.

Upon completion of fabrication activities the cask is issued a Certificate of Conformance from NAC International to Zion*solutions* that certifies that the cask was designed, fabricated, constructed, tested, and repaired, if needed, in accordance with NAC International QA Program as accepted by the USNRC in conformance with USNRC NUREG/CR-6407. NAC International also certifies that inspection were performed in accordance with 10 CFR 72.236(j) requirements and found satisfactory.

Upon receipt of the fabricated component Zion*solutions* performs a receipt inspection of the cask utilizing ZS-QA-110, "Inspections," Revision 0.

The licensee indicated that all 64 casks had been tested in accordance with their quality program as described above. The construction acceptance testing was performed between August and November 2012, with the final cask acceptance completed on November 8, 2012. The inspectors reviewed the licensee's quality program as described above and determined that the licensee was appropriately incorporating industry standards into procedures to ensure adequate acceptance criteria for concrete condition. Specifically the inspectors noted that the licensee utilized ACI 349.3R-02, "Evaluation of Existing Nuclear Safety Related Concrete Structures" to evaluate VCC concrete cracks.

c. Conclusion

The licensee's vendor performed on site construction activities associated with vertical concrete casks (VCC) at the ISFSI pad in accordance with their design drawings, civil construction specifications, and applicable industry standards. The licensee maintained adequate oversight over contractor activities.

3.0 Exit Meeting Summary

On November 5, 2013, the inspectors conducted an exit meeting to present the results of the inspection.

Attachment: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee and Contractor Employees

*Jack Bailey, ISFSI Senior Licensing Consultant
Bruce Holmgren, Dry Cask Storage Vice President
Richard Netzel, ISFSI Construction Manager
*Brian Wood, Dry Cask Storage Vice President

* Persons present during the November 5, 2013 exit meeting.

INSPECTION PROCEDURES USED

IP 60853	Construction of an Independent Spent Fuel Storage Installation
IP 60856	Review of 10 CFR 72.212 (b) Evaluations, Appendix A, Review of Independent Spent Fuel Storage Installation Storage Pad Design

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened	Type	Summary

None

Closed

None

LIST OF DOCUMENTS REVIEWED

630073-2025; Zion Solution Magnastor VCC Tip-Over Analysis; Revisions 0, 1, 2
630073-R-01; Design Interface and Operational Requirements for the Magnastor System and the Zion Nuclear Power Station ISFSI
Certificate No. 1031; Certificate of Compliance for Spent Fuel Storage Cask, Issued to NAC International; Amendment 2
CR-2012-001312; Calculation Package Internal Reference Error, 12/10/2012
CR-2012-001313; Calculation Package External Reference Error; 12/10/2012
CR-2013-000954; Error in CALC-018 “Zion ISFSI Soil-Structure Interaction analysis of Support Pad; 9/4/2013
DWG ZION001-C-001; ISFSI Project, ISFSI Plot Plan, Civil; Revision 8
DWG ZION001-C-011; ISFSI Project, Basemat and Apron Plan, Civil; Revision 2
DWG ZION001-C-012; ISFSI Project, Basemat and Apron Reinforcing Sections, Civil; Revision 0
DWG ZION001-C-037; ISFSI Project, Sections and Related Details, Civil; Revision 1
Magnastor System FSAR; Docket No. 72-1031; Revision 10B

Meyer Material Company Project Mix Design; October 15, 2012
Project Instruction Number 3 Cast-in-Place Concrete Construction Important to Safety; Revision 3
ZION001-CALC-004; Engineering Properties and Design Subsurface Properties of the Zion ISFSI Site; Revision 0
ZION001-CALC-005; Liquefaction analysis of the Zion ISFSI site; Revision 0
ZION001-CALC-006; Slope Stability Analysis: Zion Nuclear Power Station ISFSI Site; Revision 0
ZION001-CALC-007; Settlement and Bearing Capacity of the Zion ISFSI Pads; Revision 0, 1
ZION001-CALC-017; Zion ISFSI Development of Time Histories; Revision 0
ZION001-CALC-018; Zion ISFSI Soil-Structure Interaction Analysis of Support Pad; Revision 1, 2, 3
ZION001-CALC-019; Zion ISFSI development of Strain Compatible Soil Properties; Revision 0
ZION001-CALC-024; ISFSI Pad; Revision 0
ZION-001-PS-002; Cast-in-Place Concrete; Revision 1
ZION-001-PS-003; Excavation and Backfill; Revision 1
ZION001-RPT-005; Geotechnical Site Investigation and Evaluation; Revision 0
ZS-QA-11-F-1 Nonconformance Report; Criteria for Concrete Strength not Met; April 29, 2013

LIST OF ACRONYMS USED

ACI	American Concrete Institute
ADAMS	Agencywide Documents Access and Management System
ASCE	American Society of Civil Engineering
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
DNMS	Division of Nuclear Materials Safety
DSAR	Decommissioning Safety Analysis Report
FSAR	Final Safety Analysis Report
IP	Inspection Procedure
ISFSI	Independent Spent Fuel Storage Installation
MSL	Mean Sea Level
NCR	Nonconformance Report
NRC	U. S. Nuclear Regulatory Commission
psi	Pounds per Square Inch
SPT	Standard Penetration Test
SSI	Soil Structure Interaction
VCC	Vertical Concrete Cask