ESTABLISHED 1788

JOSEPH OAT CORPORATION
CHEMICAL ENGINEERS & FABRICATORS

January 10, 2001

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Response to Holtec File No, HQP 15.1.3
10 CFR 21 Notification for Discrepant Weight of Spent Fuel Racks
Exelon Byron and Braidwood Plants
Oat Job 2581

Gentlemen,

Joseph Oat has been provided with a copy of Holtec Corporation's 10 CFR 21 Deviation and Noncompliance Evaluation covering High Density Spent Fuel Racks fabricated by Joseph Oat Corporation in the late 1980's for Commonwealth Edison's (now Exelon) Byron and Braidwood plants. This evaluation was prepared, evidently, pursuant to information which Holtec received regarding scale weights of racks which they removed from the Byron plant. The rack weights were ostensibly obtained after they were scrapped into pieces. Based on information presented in Holtec's letter, we assume that they received a contract from Exelon to remove existing racks from the spent fuel pools at Byron and Braidwood.

Upon reviewing Holtec's evaluation, we have noticed some omissions and potentially misleading statements which are germane to the issue whether, in fact, a reportable 10 CFR 21 incident actually exists. We wish to provide information relative to these omissions and misstatements, in order to provide the NRC with a clearer picture of all of the facts.

- Omitted Fact:

  Although Joseph Oat Corporation is the contractor of record with Commonwealth Edison, Joseph Oat subcontracted responsibility for the entire licensing report to Holtec International. Holtec produced the report entitled "Licensing Report on High Density Spent Fuel Racks for Byron Station Units 1 and 2," report number HI-87159, in October of 1987. It was this report on which the issuance of the license was based. Quoting from the report, "The mechanical design and fabrication of the hardware was done by Oat. Seismic/structural analysis, thermal-hydraulic analysis, and other related calculations were performed by Holtec International of Mount Laurel, New Jersey... The mathematical analysis responsibility for this contract was taken over by Holtec International...who prepared the December, 1986 amendment to this licensing report under contract to Oat.

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The analyses performed by Holtec in conjunction with Black and Veatch and S&L demonstrate that acceptable margins of safety exist with respect to appropriate NRC and ASME acceptance criteria."

Table 2.2 of the Licensing Report, entitled Module Data, provides the approximate weights for the modules. The responsibility for the accuracy of this information, and its relevance and applicability to a proper rack analysis clearly rested with Holtec. Ironically, it is this same table which Holtec now relies upon to state a case for a 10 CFR 21 reportable finding against Oat's racks.

- Omitted Fact:

The principal owner of Holtec, International, Krishna Singh, founded his company upon leaving the employ of Joseph Oat Corporation as its Vice President of Engineering for the previous 15 years.. There is no insidious implication here; however, we find it quite curious that the 10 CFR 21 report contains misleading statements such as the following:

1) "To the best of our knowledge, these racks were designed and fabricated by Joseph Oat Corporation of Camden, New Jersey [in] 1987. Since we are not the designer of record, we are unable to determine the actual impact of the weight discrepancy on the analysis."

   Contrary to Holtec's assertion, as stated above, Holtec prepared the licensing report for this contract. We do not understand Holtec's term "designer of record, "but clearly Holtec is intimately familiar with every aspect of the design of these racks. Holtec certainly is in position to determine the actual impact of the weight discrepancy on the analysis, since they prepared and relied upon the weight table and performed the requisite analyses. Also, contrary to their implication, the actual contract was originally obtained by Joseph Oat Corporation, in no small part, due to the hard work and salesmanship of one Dr. Singh, so we find it curious that words such as "to the best of our knowledge" would be used.

2) "We are unable to determine whether the same type of error in rack weight exists at other nuclear plants that may have procured fuel racks from the same supplier."

   Contrary to Holtec's assertion, the deviation in the weights between estimated and actual scale weight may point to a problem in the manner in which Holtec prepared weight calculation estimates and relied on those estimates for their calculations. Although it might be presumptuous of Joseph Oat to suggest that we are unable to determine whether Holtec's error with regard to weights may affect the many racks which *they* have produced and furnished for their customers in the preceding 14 years; nevertheless this is exactly what Holtec suggested in their letter regarding Oat furnished racks. Holtec, because of the past employment history of their principal owner with Joseph Oat, is well aware that each contract which was processed by Oat used a somewhat different design for both Region 1 and Region 2 racks, and that an error on one contract, regardless of it source, could not be logically extrapolated to any other contract.

3) " Since Holtec is not the supplier of the hardware with the defect, the total number and locations where the basic component is in service is unknown to us."… "While we are not the supplier of the affected racks, the design and licensing of spent fuel racks is a core business for Holtec International."

Contrary to the statement's implication, Holtec provided the licensing report for these racks; a fact which they do not reveal in their Notification. The Holtec licensing report lists every rack in each of the Byron and Braidwood pools, the number of storage locations in each rack, and the complete pool layout. Their statements are obviously fallacious.

The racks in question at Byron and Braidwood, after many years of successful service, are being removed from the fuel pool by Holtec. There can be no 10 CFR 21 related issue with racks which are no longer in service. In addition, the information presented by Holtec implying that there may be other Joseph Oat racks somewhere out there in service on which the weight was incorrectly calculated has absolutely no substantiating evidence. Perhaps the answer lies in Holtec's statement which appears immediately after their reminder of their principal line of business. "We recommend that, for any plant having *similar vintage racks* (italics ours) from the same supplier currently in service, the licensing basis analyses be re-performed with the corrected weight to confirm whether the results continue to be valid for those installed racks." The suggestion by Holtec that a licensing report for Commonwealth Edison's Byron and Braidwood racks *prepared by Holtec* which was based on estimated weights they admit may have been deficient should be used as a reason to question nebulously defined "similar vintage racks" produced by Holtec's owner's previous employer lacks credibility and logic, and may even be self-serving. Since Holtec is intimately familiar with *every* rack contract ever undertaken by Oat, they are well aware that each design was different. The rack size, the metal thicknesses, the cell size as determined by the fuel type, the supports, and most other aspects of the racks changed each time we received a new contract. Oat cannot say with certainty whether the estimated theoretical weights were calculated correctly or not on racks which were fabricated between 12 and 20 years ago without weighing them; however neither could Holtec imply with good conscience that they weren't (or whether the weights on the many rack contracts they themselves supplied were calculated correctly).

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Therefore, in summary, Joseph Oat Corporation questions the validity and legitimacy of Holtec's 10 CFR 21 Notification. We believe it was ill-conceived and unjustified. The "independent 10 CFR 21 Evaluation" performed by Steve Soler (a Holtec employee), evidently a relative of Alan Soler, Dr. Singh's partner, lacks any reference to the critical facts presented herein, provides no evidence of the existence of a defect as defined by the Regulation, and thus produces an erroneous conclusion. Whereas there may be no question that weight is an important element of analysis, this fact alone is insufficient to cast question on racks whose estimated weights vs. actual weights cannot even be determined. This is especially true when one considers that the licensing report prepared for racks in question was prepared by Holtec, not Joseph Oat, and that each individual Joseph Oat rack contract was unique in its design, size, and scope. (The Commonwealth Edison contract was one of two contracts on which Oat subcontracted the responsibility for the licensing effort to Holtec, including seismic, thermal hydraulic and other calculations. Oat performed a total of approximately 8 or 9 contracts with similar scope.)

If Dr. Singh has any specific awareness that, while he was Vice President of Engineering at Joseph Oat, he contributed to the miscalculation of rack weights on any other rack contract at Joseph Oat then he should make that statement. If he does not have this knowledge, then there is no reason to believe that any other rack contract is affected. A weight estimate, whether prepared by Holtec or Oat, is simply an estimate based on the theoretical weight of the sum of the components parts. There is no greater likelihood for an error on a rack weight than on any other piece of equipment. The fact that it was later discovered that Holtec erred in its weight estimate for the Byron-Braidwood Region 1 racks, of which there were 4 in each pool, cannot be extrapolated. to any other rack. In fact, the evidence shows that the weights were correctly calculated for each of the 19 Region II racks in each pool on this contract.

We trust the above information will be useful in resolving this matter.

Sincerely,

Ron Kaplan
President - Operations

enclosure: Excerpt from Holtec design report

HOLTEC INTERNATIONAL

LICENSING REPORT ON HIGH DENSITY SPENT FUEL RACKS

FOR BYRON STATION UNITS 1 and 2

JOSEPH OAT CORPORATION P.O. 22227
JOB J-2481
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HOLTEC INTERNATIONAL PROJECT 61100

by

K.P. Singh
Holtec International

HI-87159

HOLTEC INTERNATIONAL

HI-87159 *

REVIEW AND CERTIFICATION LOG

LICENSING REPORT ON HIGH DENSITY SPENT FUEL RACKS FOR
BYRON STATION UNITS 1 and 2

REVISION BLOCK				
ISSUE NO.	AUTHOR & DATE	REVIEWER & DATE	QA MANAGER & DATE	APPROVED* BY & DATE
ORIGINAL ISSUE	SINGH 10/13/87	Alan Soler A. SOLER 10/13/87	V. MACIUNAS 10/14/87	SINGH 10/14/87
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*Must be Project Manager or the President.

This document conforms to the requirement of the design specification and the applicable sections of the governing codes.

This document bears the ink stamp of the professional engineer who is certifying this document.

Professional Engineer

SEAL

KRISHNA PAL SINGH

* A previous edition of this document was controlled under Joseph Oat Corporation's Q.A. system and their document ID. Rev. 0 of this report is submitted by Holtec International under Holtec control ID HI-87159.

1.0 INTRODUCTION

This report describes the design, fabrication, and safety analysis of high density spent fuel storage racks manufactured by Joseph Oat Corporation (Oat) for the Byron Station Unit 1 and Unit 2. The plant, which is located two miles east of the Rock River and approximately three miles southwest of Byron in Ogle County, is owned and operated by Commonwealth Edison Company (CECO).

Byron is a two-unit pressurized water reactor (PWR) with a net design capacity of 1120 megawatts electric for each unit. Each of the two reactor cores contains 193 fuel assemblies and is rated to produce 3411 thermal megawatts (MWt). At present, there is one (normal core offload) batch spent fuel assemblies stored in the spent fuel pool. Unit 1 went into commercial operation in September of 1985. Unit 2 went into commercial operation in May, 1987.

The two units share one common spent fuel storage pool which is currently licensed for the storage of 1060 spent fuel assemblies. As shown in Table 1.1, the storage pool would lose full core discharge capability in 1994. The proposed reracking will increase the number of pool storage locations to 2870 (includes six failed fuel locations). Table 1.1 indicates that the new racks will provide adequate storage with full core discharge capability well into the next century (circa 2009). Table 1.1 is based on an estimated 18-month fuel cycle. Current trends toward longer cycles, extended burnup, and higher enrichment would further extend the time span of onsite storage.

The proposed racks are free-standing and self-supporting. The principal construction materials are ASTM A-240, Type 304L stainless steel for the structural members and shapes, and "Boraflex", a patented product of BISCO (a division of Brand, Inc.), for neutron attenuation. Whereas the fixed height support legs employ 304L series austenitic stainless plate and pipe material, the adjustable support legs are constructed from SA351-CF3 and SA217-CA15 casting stock, and for certain support legs 400 series stainless (SA479-410) steel material.

The specifications for design, construction, and quality assurance for the high density spent fuel storage racks were prepared by Sargent & Lundy Engineers (S&L) of Chicago, Illinois. The mechanical design and fabrication of the hardware was done by Oat. Seismic/structural analysis, thermal-hydraulic analysis, and other related calculations were performed by Holtec International of Mount Laurel, New Jersey. S&L provided the seismic response spectra and performed the spent fuel pool structure evaluation. S&L performed the radiation shielding analysis. Southern Science, a division of Black and Veatch, served as a consultant to Oat in the area of criticality analysis. The mathematical analysis responsibility for this contract was taken over by Holtec International of Mount Laurel, New Jersey, who prepared the December, 1986 amendment to this licensing report on behalf of Oat. The analyses performed by Holtec in conjunction with Black and Veatch and S&L demonstrate that acceptable margins of safety exist with respect to appropriate NRC and ASME acceptance criteria. A cost-benefit comparison of several potential spent fuel disposition alternatives indicates that reracking of the Byron pool is the lowest risk and most cost-effective alternative, and that neither the reracking operation nor the increased onsite storage of irradiated material pose an undue hazard to the plant staff or the public.

The following sections provide a synopsis of the design, fabrication, nuclear criticality analysis, thermal/hydraulic analysis, structural analysis, accident analysis, environmental analysis, and cost-benefit appraisal of the high density spent fuel racks. In particular, the integrity of the rack structure under the specified combinations of inertial, seismic, and mechanical loads and thermal gradient per NUREG-0800 is demonstrated.

Also included are descriptions of the rack In-Service Surveillance Program and the Oat Quality Assurance Program. This Quality Assurance Program has been reviewed and found acceptable for engineered fabrication of ASME Section III, Class 1, 2 and 3 and MC Components by both ASME and the NRC.

2.0 GENERAL ARRANGEMENT

The high density spent fuel racks consist of individual cells with 8.85-inch (nominal) square cross-section, each of which accommodates a single Westinghouse PWR fuel assembly or equivalent. A total of 2864 cells and six defective fuel storage cells are arranged in 23 distinct modules of varying sizes in two regions. Region 1 is designed for storage of new fuel assemblies with enrichments up to 4.2 weight percent U-235. Region 1 is also designed to store fuel assemblies with enrichments up to 4.2 weight percent U-235 that have not achieved adequate burnup for Region 2. The Region 2 cells are capable of accommodating fuel assemblies with various initial enrichments which have accumulated minimum burnups within an acceptable bound as depicted in Figure 4.1. Figure 2.1 shows the arrangement of the rack modules in the spent fuel pool.

The high density racks are engineered to achieve the dual objective of maximum protection against structural loadings (arising from ground motion, thermal stresses, etc.) and the maximization of available storage locations. In general, a greater width-to-height aspect ratio provides greater margin against rigid body tipping. Hence, the modules are made as large as possible within the constraints of transportation and site handling capabilities.

As shown in Figure 2.1, there are 23 discrete modules arranged in the fuel pool. Each rack module is equipped (see Figures 2.2a and 2.2b) with girdle bars, one-inch-thick by 3-1/2 inches high. The nominal gap between adjacent modules is two inches. The modules make surface contact between their contiguous walls at the girdle bar locations and thus maintain a specified gap between them. Table 2.1 summarizes the typical physical data for each Region 1 and Region 2 rack. Table 2.2 summarizes other pertinent information on each rack module.

Table 2.1

DESIGN DATA

Region	(Cell Pitch) Nominal in.	Min. B-10 Loading	Flux Trap Gap (nominal) in.
1	10.32 N&S & 10.42 E&W	.020 gm/cm^2	1.16* 1.26
2	9.03**	.010 gm/cm^2	0.0

* The minimum flux trap gap can be .050" less than the nominal gap.

** The minimum pitch can be .050" less than the nominal pitch.

Table 2.2

MODULE DATA

Region	Module Type	Number of Modules	Cells per Module	Module Size	Approximate Weight (lb/module)
I	A1	1	104	13x8	20,800
I	B1-3	3	96	12x8	19,200
II	C1-6	6	168	14x12	26,900
II	D1&3	2	126	14x9	20,150
II	D4	1	113	14x9 -(2x2+3x3)	18,360
II	D2	1	114	14x9-(4x3)	18,250
II	E1	1	112	14x8	17,900
II	F1	1	165	11x15	26,600
II	G1	1	90	10x9	14,700
II	H1	1	56	7x8	8,950
II	J1	1	35+6 failed fuel containers	7x5	10,150
II	K1	1	117	13x9	19,000
II	L1-L2	2	156	13x12	25,200
II	M1	1	98	14x7	16,000