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AN ASSESSMENT OF BOLTING INTEGRITY AT PALO VERDE NUCLEAR GENERATING STATION UNITS 1, 2 AND 3

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1.0 INTRODUCTION AND SUMMARY

1.1 Background

Threaded fasteners are utilized in widespread and varied applications in nuclear power plants. Fasteners are used in vessel internals applications, as pressure boundary closures and as structural fasteners in power plants. They are used in a variety of environments ranging from the high temperature, high pressure primary water nuclear environment to the ambient temperature industrial environment associated with auxiliary equipment remote from the nuclear reactor containment. The performance of fasteners used in nuclear power plants has been excellent, in general. However, the persistent nature of modest numbers of failures in recent years has prompted the industry to examine more closely the potential failure mechanisms associated with threaded fasteners and to provide recommendations regarding actions which may be undertaken to minimize failures. Because of concerns raised in this area, an assessment of bolting integrity at Palo Verde Nuclear Generating Station Units 1, 2 and 3 was performed, as documented in this report.

The problem of fastener failures in nuclear power plants is not a single issue but represents several distinct areas of concern. Issues which must be addressed include: (1) failures of fasteners used in vessel internals such as plenum, thermal shield and core barrel fasteners, (2) failures of primary pressure boundary fasteners due to boric acid wastage or stress corrosion cracking, (3) failures of structural fasteners resulting from stress corrosion cracking, and (4) failures of fasteners due to poor installation practices associated with improper lubrication or improper torquing.

The issue of fastener failures has received widespread attention by the industry, by vendors of fasteners and equipment, by the Electric Power Research Institute (EPRI) and by the Nuclear Regulatory Commission (NRC). Significant attention has been given to the fastener problem in nuclear plants since 1980, when, following the corrosion problems observed at the Fort Calhoun nuclear plant with pressure boundary closures, the NRC issued an Information Notice No. 80-27 on June 11, 1980, to all PWR owners regarding

the potential for boric acid corrosion wastage of pressure boundary bolts. The Institute for Nuclear Power Operations (INPO), following their independent studies of fastener failures issued a Significant Operating Experience Report (SOER-81-12) on June 24, 1981, re-emphasizing the need for careful inspection of all pressure boundary bolts because of the boric acid concerns. In 1982, following the observation of stress corrosion cracking in steam generator manway studs, the NRC issued another Information Notice (No. 82-06) on March 12, 1982, and later on June 2, 1982, the NRC issued an Inspection and Enforcement Bulletin (No. 82-02), regarding the boric acid wastage and stress corrosion cracking concerns associated with pressure boundary closures. Copies of Notice 82-06 and Bulletin 82-02 are attached as Appendix A to this report. Subsequent to the issue of the I&E Bulletin, the NRC identified the fastener failure issue as a generic safety issue affecting all light water reactor types and requiring significant action (Unresolved Safety Issue, B-29). These items illustrate that considerable attention is being directed toward pressure boundary closures, through regulatory channels.

The industry, vendors and EPRI have also been actively addressing the issue of fastener degradation in nuclear power plants. In addition to the SOER issued by INPO in 1981, EPRI has embarked upon research programs which address and scope the problems associated with fasteners for vessel internals as well as the primary pressure boundary cracking concerns. Westinghouse, Combustion Engineering and Babcock and Wilcox Owners Groups have supplemented the EPRI efforts by additional programs directed at resolving the material-environment degradation issues associated with fastener failures at nuclear power plants. The NRC funded a literature search performed by Lawrence Livermore National Laboratory which has identified thresholds for stress corrosion cracking of structural bolts in aqueous environments and in industrial environments.

As a result of the major research efforts underway to identify and eliminate sources of fastener degradation in nuclear power plant application, much is understood about the problem and mitigating actions are readily at hand to reduce or eliminate many of the concerns. For example, the stress corrosion failures of core internals fasteners has spawned research programs which

have resulted in development of better alloys or improved heat treatments which will reduce or eliminate materials susceptibility in this environment. In addition, recommendations have been made regarding materials or heat treatment changes, lubrication and sealant changes, and design modifications to reduce problems associated with boric acid wastage and stress corrosion cracking of pressure boundary and structural fasteners. Research programs are ongoing at EPRI and in utility owners groups to further define limits of applicability of fasteners and margins associated with the use of fasteners in critical component application.

The issue of overtorquing and of undertorquing has similarly received much attention in the nuclear power industry. As a result of structural fastener failures at Prairie Island, at Midland and at Palo Verde nuclear stations, failure analysis studies were undertaken to examine the causes of the failures, determine the extent of the problem and provide remedial actions to mitigate the phenomenon. Major sampling studies were performed at Midland and at Palo Verde on structural bolts. The Midland study consisted of hardness measurements of approximately 6000 structural bolts to determine the population of fasteners which had not met the requirements of the procurement material specification. The survey revealed that while only a small number of fasteners were overly hard (approximately 1%), many were overly soft. This observation illustrated why some fasteners fail immediately during torquing. The overly soft fasteners are overloaded, the overly hard fasteners fail by stress corrosion cracking (or hydrogen embrittlement). A significant study was also performed at Palo Verde examining pretorquing in critical structural fasteners used inside containment. The results of that study are examined in depth in this report and in part form the basis of the report findings.

As stated above, the problem of fastener failures is not a single issue but a combination of issues involving stress corrosion cracking; general corrosion and wastage, and installation concerns. The issues of stress corrosion cracking and general corrosion and wastage have been examined in depth in other studies and continue to be examined in owners groups and in EPRI sponsored programs. The installation concerns have been addressed in other programs and are the focus of this Palo Verde report.

The objective of this study was to examine the reliability of all structural fasteners at the Palo Verde Nuclear Generating Station for the three units under construction. However, due to access limitations and since the vessel internals fasteners are already quality checked within the ASME Section III, class NG component requirements, these fasteners were not included in this study. Likewise, the ASME Section III Class 1 pressure boundary fasteners are pressure leak checked and fall under the subsequent inspection requirements of the NRC Inspection and Enforcement Bulletin 82-02. Therefore, these fasteners were considered to be already checked (or will be checked) as to their structural reliability.

Consequently, the study performed for Palo Verde regarding bolting integrity focused on the structural fasteners used at the power plant. Because of the extensive programs already performed at Palo Verde examining the structural reliability of critical fasteners, this study was able to be performed as an independent review and verification study relying on the vast quantity of previously generated fastener reliability data to provide the data base necessary to this program. It was our observation that the Palo Verde Nuclear Power Station bolting integrity verification efforts performed by the utility and by its prime contractor (Bechtel) represents the most extensive study of its type performed to date for any nuclear power plant. Because of the extensive nature of those previous examinations of bolting integrity, all necessary information was at hand to perform this independent investigation.

By limiting this study to critical structural fasteners at Palo Verde, the specific objective of this study could be defined as a study of overtorquing or undertorquing associated with the installation of structural fasteners at the plant. Associated with these two major issues are the issues of double nutting (using the second nut to prevent loosening of the first nut), the use of acid cleaning with phosphoric or muriatic acid to remove corrosion products from the fasteners, and the use of lubricants in the installation of the fasteners.

Overtorquing of fasteners is generally not an operational concern (Ref. 1, 2 and 3). In fact, the American Institute of Steel Construction (AISC) has no requirement on the maximum preload of fasteners. The requirement is that the

minimum preload be 70% of the minimum specified ultimate tensile strength of the material used. The reason no maximum preload is specified is because a properly installed fastener never experiences a load as high as that experienced during installation. The reasons are as follows. First, the fastener load decreases approximately two to twenty percent (as shown in the calculations later in this report) upon release of the torque wrench or tensioner. Second, thread relaxation (or load redistribution) results in reduction of preload. Compression of the lubricant or dirt also reduces preload. Finally, stress relaxation (or creep) further reduces the preload on a fastener. Consequently, an overtorqued bolt will either fail mechanically by overload during installation or it will operate at a load significantly less than the preload during service. One exception occurs in the case of overly hard bolts. These fasteners can fail by delayed cracking due to stress corrosion or hydrogen embrittlement. In general, for fasteners such as SA-193 grade B7 a hardness of approximately R_C 38 is required before a fastener becomes significantly susceptible to stress corrosion cracking or hydrogen embrittlement, in room temperature moist air. Further, this environmentally assisted cracking usually occurs quickly within hours or days of the initial installation. Any additional potential for stress corrosion due to residue from acid cleaning of bolts would also fall in this category of early failure, if at all. Any retorquing or recheck will obviously uncover such failures.

As observed in the Midland bolting study (and confirmed in the Palo Verde studies to be discussed in this report), the problem of structural fastener strength is typically one of overly soft fasteners, not overly hard fasteners. Consequently, the stress corrosion cracking problem is practically non-existent. The great likelihood is that the fasteners will fail upon installation because of improper heat treatment (overly soft fasteners) or excessive torquing, and not from stress corrosion or hydrogen embrittlement. Therefore, the overtorquing issue of structural fasteners is self-controlling. If the fastener survives installation, and if it does not fail as result of stress corrosion cracking or hydrogen embrittlement, it will not fail as a result of overtorquing.

The problem of fastener undertorquing is a much more subtle phenomenon, difficult to detect and consequently of much greater threat to structural reliability of a component. Undertorquing can result from improperly calibrated equipment, dirty or rusted bolts, improper cleaning, improper lubrication or no lubrication used, improper threads, and human error, among other reasons. The principal result of such undertorquing is the potential reduction in the fatigue resistance and load-bearing capability of the fastener, as will be explained and investigated in this report.

Since the problem is difficult to detect and to eliminate, the major focus of this study was to investigate the likelihood of undertorquing in critical safety significant structural fasteners at Palo Verde and assess the impact of such undertorquing on design margins.

1.2 Summary

The objective of this study was to assess bolting integrity at Palo Verde, Units 1, 2 and 3. Emphasis was focused on structural steel bolting, since reactor coolant pressure boundary bolting, reactor internals bolting, and component support bolting must meet ASME Code Quality Assurance requirements and is also the object of ongoing NRC studies (Appendix A).

Critical structural steel bolting was evaluated with regard to overtorquing, undertorquing, and lubrication and nutting procedures. The results of bolt hardness measurements and torquing surveys previously made at Palo Verde formed an integral part of this evaluation. The study included an examination of Palo Verde, Unit 2 installed bolting and the torque wrench calibration room. Palo Verde Deficiency Evaluation Reports (DER's), specifications and procedures, Certified Material Test Reports (CMTRs) and NRC Construction Assessment Team (CAT) findings relating to bolting were also reviewed.

It was concluded that variation in bolt torque from specified values (American Institute of Steel Construction, AISC) was found in critical friction structural steel bolting during torque checks by Bechtel. This was especially true for Unit 2, where bolting was primarily installed by

calibrated torque wrenches, as compared to the "turn-of-the-nut" approach used at Unit 1 and air impact wrenches used at Unit 3. These deficiencies were corrected during the inspection. A review of other torque check studies on installed fasteners revealed that torque variations are not unusual, due to the major effects of bolt condition, lubrication, connection surface conditions, installation equipment and human error. Because of the difficulty of consistently relating bolt torque to preload, the ASME Code does not explicitly specify bolting preload and the AISC withdrew direct torque control in 1980 (Ref. 1).

The potential impact of these variations in preload, had they not been detected and corrected, was determined by assuming a range of torque/preload relationships (based on experience at Palo Verde) and computing preloads in the bolts. Calculated preloads were used to evaluate overtorquing and under torquing ramifications. Because the bolting hardness at Palo Verde is essentially below the threshold of Rockwell C41 (Ref. 1) for stress corrosion cracking (SCC), shown in Reference 12, overtorquing is not expected to be a problem in this respect. Any potential for SCC due to acid cleaning of bolts would also be mitigated by meeting this hardness threshold. The degree of overtorquing at Palo Verde led to the computed prediction of a certain number of bolt overload failures during torquing, which was indeed the experience. However, these failures are readily discovered and corrected during torquing. It was also computed that the bolt stresses during torquing are generally higher than in service, because of the shear stresses imparted by the torquing operation. In a properly designed joint the bolt stress at installation is the highest stress the bolt will experience and if the bolt does not fail then, and SCC is not a concern, then overtorque will not lead to failure during service (Ref. 1, 2 and 3). It is generally concluded (Ref. 1 and 2) that high preload is beneficial and reduces the excursion in bolt load due to cyclic external loads, as illustrated in this report. Thus, it is concluded that overtorquing is not a problem at Palo Verde.

The effect of undertorquing was evaluated with regard to multiple loose bolts in a connection, and such situations were compared to typical joint design loads and fatigue stress ranges supplied by Bechtel (Ref. 4). Unit 2 had a potential problem in this area had bolt torques not been checked and

corrected, due to a number of connections with multiple loose bolts (shown later in this report); thus prompting a more thorough evaluation of joint design margins. It was found that the typical structural steel joints and equipment anchor bolts were conservatively overdesigned by Bechtel, especially with regard to fatigue vibrations. For the designs studied, the design margins are generally about 1.5 for joint reaction loads (allowable AISC/actual), indicating that approximately 1/3 of the bolts in such a joint could be completely loose. Note that allowable AISC loads also contain additional margins and also that such loose bolts in critical friction connections were corrected. With regard to fatigue, the typical high cycle stress ranges evaluated for Palo Verde were low enough that no bolt preload was required to mitigate fatigue loadings. Thus, it is concluded that there is only a very low probability that loose bolts could cause a problem at Palo Verde. This conclusion is consistent with failure experience at other plants (Appendix A).

The principal double-nutting application at Palo Verde is for ASME component supports, such as pipe U-bolts. These fasteners were installed in accordance with the ASME Code paragraph NF-4725 which requires locking devices to prevent loosening during service. The Bechtel installation specification (Ref. 5 and 6) is in accordance with NF-4725. Since the function of the double-nutting is simply for locking, and not for carrying load by the second nut, the size of the outer nut is not critical. In fact, NF-4725 permits other means of locking, such as drilled and wired nuts and upset threads, which do not involve a second nut. Thus, the double-nutting procedures at Palo Verde are acceptable.

In summary, because of the extensive studies, inspections, corrective actions and inherent joint design margins at Palo Verde, Units 1, 2 and 3, the bolted joint integrity is considered above-average and acceptable for service. The key points are that deficiencies in critical connections were corrected, and that typical Palo Verde bolted connections are conservatively overdesigned.

2.0 PLANT EXAMINATION

In order to become more familiar with specific bolting installation procedures and the plant layout at Palo Verde, a day was spent walking through Unit 2 (considered representative of all three units), observing bolting installations and visiting the Bechtel calibration room.

2.1 Unit 2 Containment

A tour was made of all levels inside containment at Unit 2 to observe bolting. The following observations were made:

- Critical friction fasteners were marked where checked for torque,
- No "finger-loose" bolts were found,
- Double-nutted connections were observed, where both nuts were the same size or the outer one was approximately half the thickness of the first nut,
- "Torque-Seal" markings were used in approximately 50 observed fasteners to indicate nuts checked and not disturbed,
- Air-impact wrench torquing of a connection,
- Torque wrench torquing of a small electrical connection,
- Clean appearance of connection and bolting visible surfaces in all of several thousand observed bolts.

Based on these observations, it appeared that the inspection of critical friction fasteners was thorough, and that bolting workmanship was high quality in its current condition. A very high level of attention, supervision and care was being given to the bolt torquing operations which were observed.

2.2 Calibration Room

The Bechtel calibration room was visited, and the calibration of several torque wrenches was observed. No problems were found with the procedure, and it was being closely followed. Although final calibrations were performed in strict accordance with the procedure, in the case of large wrenches quite a few attempts had to be made to achieve a smooth torquing to the final desired value. This is because of the very high loads on the wrench required to reach the preload torque on large, high-strength, bolts. This could potentially lead to the undertorquing of large bolts when applying torque wrenches for actual installations, where loading can be more awkward. Evaluation of torque-checking data later in this report verifies that large, high-strength bolts installed with torque wrenches were predominantly undertorqued. The AISC (Ref. 7) recognizes variability in the use of torque wrenches and withdrew the recognition of torque control methods on August 14, 1980, except for arbitration of inspection disputes.

3.0 PALO VERDE DOCUMENT REVIEW

Numerous documents relating to bolting at Palo Verde were reviewed for pertinence to the issue of bolting integrity. The most relevant results of this review are considered below.

3.1 NRC CAT Findings

Reference 8 presents the results and responses from an NRC Construction Assessment Team inspection conducted in September of 1983. This inspection raised concerns regarding undertorqued, high-strength structural steel connections. More specifically, a number of loose and undertorqued bolts were found in the Auxiliary and Containment Buildings. This resulted in Bechtel's reinspection of 100% off all accessible critical steel connections in Units 1, 2, and 3, as will be discussed in following sections of this report (Ref. 9).

3.2 Deficiency Evaluation Reports

A large number of Deficiency Evaluation Reports (DERs) were reviewed in order to accumulate bolting data, assess past experience, and determine the current status of bolted connections at Palo Verde. Special attention was given to the following DERs.

- DER 81-14 - A354BD bolt cracking and hardness measurements, resulting in derating installations and hardness testing.
- DER 83-30 - A354BD anchor bolt failure during installation, resulting in reinstallation.
- DER 83-18 - One nut, rather than double-nut for locking on U-bolts, resulting in adding second nut.
- DER 83-15 - A354BD anchor bolt failure during installation, resulting in revised torquing.

- DER 82-61 - Type 410 martensitic stainless steel reactor coolant pump cap screw failures by hydrogen induced SCC, resulting in revised heat treatment.

- DER 83-53 - Missing bolts in Unit 3 containment building embed plates, resulting in 100% inspection of all such accessible bolts.

- DER 84-34 - Loose bolts in safety injection tank keyways, resulting in rework and repair.

- DER 84-32 - Undertorqued bolts in safety injection tank upper seismic supports, resulting in 100% reinspection of all such accessible bolts.

The above list indicates recognition of potential problems in the bolting area, and demonstrates effective identification and resolution of nonconformances, as confirmed by the analyses of this study.

3.3 Specifications and Procedures

The following bolting specifications and procedures were reviewed in detail regarding Palo Verde bolting integrity.

- Bechtel Specification No. 13-PM-204, "Specification for Field Fabrication and Installation of Nuclear Piping Systems for the Arizona Public Service Company Palo Verde Nuclear Generating Station Units 1, 2 and 3", Rev. 13, Feb. 23, 1984.

- AISC Specification for "Structural Joints Using ASTM A325 or A490 Bolts", Aug. 14, 1980.

- Bechtel Procedure No. 201.1, Rev. 20 "Nuclear Pipe Hangers and Supports Installation", April 1984.

- Bechtel Specification No. 13-CM-320, Rev. 9, "Installation Specification of Structural and Miscellaneous Steel, etc.", April 1984.

- Bechtel Procedure No. 7.0, Rev. 20, "Calibration and Control of Construction Measuring and Test Equipment", April 1984.

- Bechtel Procedure No. 14.0, Rev. 19, "Approved Materials for Construction, Nuclear Compatibility", April 1984.

- PVNGS FSAR Section 3.7.3.2, "Determination of Number of Earthquake Cycles", Amendment 4, May 1981.

The above documents contain no apparent deviations from acceptable and reasonable practices.

3.4 CMTRs

Certified Material Test Reports (CMTRs) for close to 50,000 bolts, with nearly 200 bolts tested to represent this sample, were reviewed for tensile yield strength and hardness properties. Purchase dates ranged from 1976 through 1984. Bolting materials included SA-193 Gr. B7, A540-B23, A325, SA-320 Gr. L, SA-564 Gr. 630 and A490. It was found that various combinations of minimum tempering or aging treatments (usually 1100°F), hardness maximums of Rc38, and/or tensile yield strengths of less than 150 Ksi would tend to preclude concerns about SCC for these materials. Grade A354BD bolts are a special case (discussed in DER 81-14 in a preceding section) with specific hardness and loading controls as follow.

3.5 Hardness Studies

Extensive hardness surveys of Palo Verde A354BD studs and bolts are documented in Reference 10, under DER 81-14. The appendices to Reference 10 include failure analyses by Bechtel and reviews and evaluations by Teledyne and by Battelle Pacific Northwest Laboratories. When four of these studs cracked during May and June, 1981, the failure mechanism was identified as SCC which resulted from excessive stud hardness (Ref. 10). Because of the

small test sampling required by the ASTM A354BD specification, a number of nonconforming materials passed undetected. Such materials which failed by SCC had hardness around Rc49, far in excess of the ASTM specification requirement range of Rc33 to 38. Based on recommendations by Bechtel, Teledyne and Battelle, guidelines for reduced short term and long term stress allowables were implemented for fasteners with hardness outside the specification limits. Bolts with hardness exceeding Rc43 were removed by saw-cutting. Those with Rc41 and 42 were simply secured with a hand-tight nut while Bechtel Engineering performed a review of all design calculations utilizing these fasteners. The reduction of long term stresses to below threshold levels for SCC (as a function of hardness) is a reasonable approach, as will be discussed later in this report.

3.6 Torquing Studies

Based on the NRC CAT findings (Ref. 8), Bechtel CIP No. 551.0 (Ref. 9) required 100% reinspection of all accessible critical friction connections. Such critical friction connections were determined by Bechtel (Ref. 8) to be limited to the Containment Buildings for Units 1, 2, and 3.

The results of such extensive measurements offer a unique opportunity to evaluate installation procedures and the effectiveness of various methods (turn-of-nut, torque wrench, and air impact wrench) of applying preload. All of such measured results from Bechtel data are tabulated in Appendix B for Unit 1, from micro-computer output produced in this study. Approximately half of the torque-check results for Unit 2 and for Unit 3 are tabulated similarly in Appendices C and D. Fewer results were tabulated for Units 2 and 3, but they are considered to be representative of the total data base. Most of the results are reported in terms of fraction of nut turn deviations from required torque values, although some measured break-away torque values are also reported.

The key point in these studies is that deficiencies were defined and corrected, within the limitations of the method. However, a thorough independent analysis of the potential impact of these deficiencies, if they had gone undetected, is also considered in the next sections of this report.

Such an evaluation is useful in explaining past experiences of bolt breakage during installation, in extending these results to joints and nuts which were not reinspected, and in assessing the sensitivity of preload to parameters such as torque or friction coefficients.

4.0 OVERTORQUING REVIEW AND EVALUATION

Overtorquing of bolts at Palo Verde is evaluated in terms of the potential failure mechanisms of SCC, overload and fatigue. The measured Palo Verde data base is assessed with respect to these mechanisms and conclusions are reached.

4.1 Potential Failure Mechanisms

Potential failure mechanisms for the Palo Verde structural steel bolting are overload, SCC and fatigue. SCC has been the most frequently observed failure mode among PWR structural steel bolting (Ref. 11). SCC generally results from overly hard and out-of-specification material, high sustained tensile stresses, and an aggressive environment developed from high humidity. High preload and the use of lubricants containing molybdenum disulfide also is suspected to contribute to SCC susceptibility (Ref. 11). It has been shown (Ref. 12) that material below a hardness level of about Rc38 to Rc41 is below the threshold for SCC.

Overload failures during service are very rare, and it is generally concluded (Ref. 1, 2 and 3) that if an overtorqued bolt does not fail during preloading, then it will not fail in service under proper design allowable loadings. This is because the stresses are highest in the bolt during preload, as will also be illustrated in this report.

Fatigue failures in nuclear bolting have likewise been few (Ref. 11) and are much more likely to occur in undertorqued rather than overtorqued bolts. High preloads are recognized (Ref. 1, 2 and 3) as a very effective way of limiting alternating stress ranges and mitigating fatigue, as will also be demonstrated in this report.

4.2 Hardness Threshold for SCC

Figure 4-1 shows the threshold for SCC in low alloy bolting steels, as a function of yield strength (Ref. 12). It can be seen that for yield strengths

below approximately 150 Ksi, the SCC threshold is above 50 ksi$(in)^{1/2}$. This corresponds to a combination of bolt load and defect size which one would not expect to find in service, and consequently SCC is not expected. As seen in Figure 4-2 (Ref. 12), this yield strength level corresponds to a hardness of Rc37 for steels such as 4140 and 4340. Thus, SCC is eliminated as a concern at Palo Verde for materials with hardness less than Rc37 to 38. Reference 12 indicates that hardness as high as Rc41 can be tolerated, since the SCC threshold is still quite high and high stresses would be required to cause a concern. As was previously mentioned, review of CMTRs revealed bolting materials below these thresholds. In the case of DER 81-14, where out-of-spec. A354BD studs showed higher hardnesses, the sustained stresses in these bolts were appropriately decreased to accomodate the slightly lower SCC threshold. Furthermore, as was experienced with DER 81-14, such SCC failures would have most likely already occurred and been detected during subsequent reinspections. Thus, further SCC of structural bolting at Palo Verde is not likely.

4.3 Overload Analysis

The torquing data base in Appendices B, C and D was analyzed quite extensively in order to evaluate effects on bolting preload and fastener integrity. Before discussing these analyses more extensively, however, it is first prudent to briefly review some basic concepts in the loading of bolted connections, as given in References 2 and 3.

Figure 4-3 illustrates the loads in a bolted connection where the terms are defined as:

P = total external load on bolted assembly
F_i = preload on bolt
P_b = portion of P taken by bolt
P_m = portion of P taken by members
F_b = resultant bolt load
F_m = resultant load on members.

The increase in deformation of the bolt, $\Delta\delta_b$, due to P_b is given by the stiffness or spring constant of the bolt and the following equation:

$$\Delta\delta_b = \frac{P_b}{K_b} \qquad (4\text{-}1)$$

Similarly, the decrease in compression of the connected members due to the external load P is given by:

$$\Delta\delta_m = \frac{P_m}{K_m} \qquad (4\text{-}2)$$

Since $\Delta\delta_b$ must equal $\Delta\delta_m$ when the members have not separated, then

$$\frac{P_b}{K_b} = \frac{P_m}{K_m} \qquad (4\text{-}3)$$

Also, since $P = P_b + P_m$, then

$$F_b = P_b + F_i = \frac{K_b P}{K_b + K_m} + F_i \qquad (4\text{-}4)$$

and

$$F_m = \frac{K_m P}{K_b + K_m} - F_i \qquad (4\text{-}5)$$

The above relationships for compression in the fastened members and tension in the bolt, due to preload and external loads, are illustrated in Figure 4-3(b).

The stiffness of the members can be approximated by

$$K_m = \frac{2\pi d^2 E}{\ell} \qquad (4\text{-}6)$$

and in the bolt as

$$K_b = \frac{\pi d^2 E}{4\ell} \qquad (4\text{-}7)$$

where

d = bolt diameter

E = elastic modulus

ℓ = length of the grip

For the bolt and member of approximately the same material (steel), it can be seen that

$$K_m = 8K_b \qquad (4\text{-}8)$$

Now an illustration can be given to show the effectiveness of the preload in reducing the proportion of the external load which is taken by the bolt. Assume a preload bolt stress of 75% of the bolt minimum ultimate tensile strength (UTS), or 75% of 150 Ksi equals 112.5 Ksi, and a working stress of 1/3 UTS, or 50 Ksi. From equation (4-4), when all terms are divided by the bolt stress area, it can be seen that the resultant stress taken by the bolt is only 112.5 plus 50/9, or 118.1 Ksi. This is an extreme example since the working stress is near the maximum permitted by Table 2 of Reference 7.

Thus, in most cases at Palo Verde increases in resultant bolt load due to external loads would be a small fraction of the preload and would have an insignificant effect. An effective analogy is shown in Figure 4-3(c) where a fish-scale is loaded with 150 lb. (preload), blocked at that deformation, and the load removed. For an infinitely stiff block, any subsequently applied loads of less than 150 lb. will have no effect on the movement of the scale.

Furthermore, a certain amount of relaxation of preload stresses in the bolt due to removal of torquing shear stresses in the bolt is demonstrated by the Mohr's circle in Figure 4-4(a), where

σ_x = bolt tensile stress

τ_{xy} = bolt shear stress, due to torquing

σ_1 = maximum normal tensile stress, or principal stress

S_p = proof or yield stress

S_u = ultimate tensile stress

Fracture of the bolt is controlled by σ_1, which is given in Reference 13 (for a uniaxial stress state) as

$$\sigma_1 = \frac{\sigma_x}{2} + \left[\left(\frac{\sigma_x}{2}\right)^2 + \tau_{xy}^2\right]^{1/2} \qquad (4\text{-}9)$$

where

$$\tau_{xy} = \frac{16T}{\pi d^3} \qquad (4\text{-}10)$$

with the torque, T, being a function of the preload, the torque coefficient K, and the bolt diameter

$$T = KF_i d \qquad (4\text{-}11)$$

Figure 4-4(a) illustrates that significant relaxation in the bolt occurs due to removal of torsional (torquing) stresses of preload. Further relaxation occurs due to settling in of dirt and lubricants on threads and due to low temperature stress relaxation (creep).

The preceding concepts demonstrate that if a bolt does not fail during tightening, it should never fail by overload. This will be quantified by analysis of the Palo Verde data base, and will conversely show that a certain number of bolting failures during preload are to be expected. The main point is that overload failures during service are very unlikely for bolted joints.

4.4 Fatigue Analysis

The basis for evaluating fatigue resistance in bolting is illustrated in Figure 4-4(b) for a steel with UTS=100 Ksi (Ref. 2). Basically, the fatigue endurance limit, S_e, is given (Ref. 2) as:

$$S_e = K_a K_b K_e S_{uts} \qquad (4\text{-}12)$$

where

K_a = surface effect (0.73 for finish machined)

K_b = size effect (0.85 for less than 2" dia.)

K_e = thread root effect (0.454)

S_{uts} = ultimate tensile strength

Equation (4-12) reduces to

$$S_e = .141\ S_{uts} \qquad (4\text{-}13)$$

Now an equation for the allowable alternating stress (Goodman Line) in Figure 4-4(b) can be derived as

$$\text{allow. } \sigma_a = 0.141 \left[S_{uts} - \left(\frac{\sigma_{max.} + \sigma_{min}}{2} \right) \right], \qquad (4\text{-}14)$$

and used to evaluate the effects of preload on fatigue life.

Alternating and mean stresses are defined as

$$\sigma_a = \frac{\sigma_{max} - \sigma_{min}}{2} \qquad (4\text{-}15)$$

$$\sigma_m = \frac{\sigma_{max} + \sigma_{min}}{2} \qquad (4\text{-}16)$$

For alternating stresses falling above the Goodman Line in Figure 4-4(b), fatigue failure is predicted in less than 10^6 cycles. For σ_a below the line, fatigue failure is not probable.

The earlier example of preload analysis and overload considerations (Section 4.3), can be extended to include fatigue considerations. From that example, the effect of preload can be seen to significantly reduce the resultant stress on the bolt caused by external loads. For the preload of 112.5 Ksi and a working stress of 50 Ksi the resultant stress on the bolt is 118.1 Ksi. Now

a fatigue stress range of 3 Ksi (σ_a = 1.5 Ksi) will be superimposed on this loading. In this case, σ_{max} = (50 + 1.5)/9 + 112.5 = 118.2 Ksi and σ_{min} = (50 - 1.5)/9 + 112.5 = 117.9 Ksi. Thus, it can be seen that for high preload, the effects of realistic fatigue cycling, even superimposed on a very high working stress, are negligible. Thus, fatigue is not a concern in the case of high preload, or even overtorquing. This is a recognized fact in practice (Ref. 1, 2 and 3).

4.5 Palo Verde Data Base

Although the preceding generic conclusions indicate that overtorquing is not a concern regarding bolt failures in service, a close look was also taken at the specific Palo Verde data base. In so doing, a range of torque coefficients, K, were employed to compute preload. Values of K representing different conditions of bolt lubrication are given in Appendix E and range from 0.11 for lubricated bolts to 0.43 for rusty bolts. A value of K=0.16 represents a bolt used without lubrication, and K=0.20 is the text-book value of torque coefficient (Ref. 3).

The statistical distributions of preload torques and deviations from specified turn-of-the-nut values are given in Tables 4-1 through 4-3 for Units 1, 2 and 3. These statistics represent the data base in Appendices B through C, discussed earlier. It can be seen that a very large number of bolts were sampled. For a typical specified turn-of-the-nut value of 0.5 turn (Ref. 7), it can also be seen that there were a number of deviations from the specified value (nut rotation =0 for cases where specification was met in Tables 4-1 through 4-3). Reference 7 does permit a 30 degree (0.083 turn) leeway in meeting the 0.5 turn requirement; thus such values in excess of 30 degrees were analyzed separately. The samples included both A325 and A490 bolts, and bolt sizes of 7/8", 1" and 1-3/8" diameter.

Distributions of the above results are shown in Figures 4-5 through 4-7 for nut rotation deviations at Units 1, 2 and 3. These figures indicate quite good adherence to the specification at Units 1 and 3, and more frequent deviations at Unit 2. This could be due to the different methods of installation predominantly used at each unit (turn-of-nut at Unit 1, torque

wrench at Unit 2, and air impact wrench at Unit 3). Again, it is only the deviations in nut rotation of greater than 0.1 that are of concern, and all deviations were corrected.

From the standpoint of overtorquing, the torque measurements on Unit 2 are of more interest than turn-of-nut deviations (undertorque). Based on the Unit 2 torque measurements, preloads and bolt stresses were computed. Preloads were also derived from nut rotation measurements from the following equation

$$F_i = \frac{(F_i \text{ spec.})}{0.5} \quad (0.5 - \text{Nut Rotat.}) \qquad (4\text{-}17)$$

The results of these preload calculations are given in Appendices F through J for Units 1, 2 and 3. Frequency distributions for Unit 2 preload stress as a ratio of minimum specified UTS are given in Figures 4-8 through 4-11 for the four torque coefficients previously discussed. A stress ratio of 0.70 is the aim of Reference 7, for preload. It can be seen in these figures that significant deviations exist from the stress ratio of 0.70. A very large effect of assumed K is also seen in Figures 4-8 through 4-11. A K of 0.11 could cause some bolt failures during preload, whereas K=0.43 (rusty bolt) would result in significant undertorquing.

Similar results from other studies (Ref. 1) are shown in Figures 4-12 and 4-13. Figure 4-12 illustrates that significant scatter in preload can occur for a given torque, even under controlled laboratory conditions. Figure 4-13 shows extremely high scatter in preload for reinspected as-installed bolts. In comparison, the results at Palo Verde Unit 2 appear reasonable.

Again, as recognized by Reference 7, torque/preload relationships are quite variable even under the best conditions.

In further considering overload failures, Figure 4-14 shows the ratio of maximum principal stress (including torque shear stresses) to minimum UTS during preload, as a function of K for nut-turn to the specified 0.5 turn. It can be seen that a number of bolts would be expected to fail during preload

(ratio greater than unity), especially for low values of K. This prediction is mitigated by the fact that many bolts have strengths considerably in excess of the minimum specified value. Tempering this prediction is the fact that bolts which do not fail on preload will relax significantly following the removal of torque. Figure 4-15 shows this effect, where the relaxation ranges from approximately 2 to 20% just from the absence of torquing shear stresses, based on the calculations in the Appendices of this report. Adding this effect to other relaxation mechanisms gives confidence that properly designed bolts will not fail by overload in service.

4.6 Overtorquing Conclusions

Overtorquing has been shown to lead to possible bolt failures during preload. However, because of meeting material hardness limits and because 100% of accessible critical friction joints have been checked, it is not a concern during service for Palo Verde structural steel for the most likely mechanisms considered: SCC, overload, and fatigue.

TABLE 4-1

PALO VERDE 1 TORQUE CHECK STATISTICS FOR CRITICAL FRICTION FASTENERS
(UNITS ARE FRACTION OF TURN AND NO. OF NUTS CHECKED)

ALL NUT ROTAT:	NO.	1609.000
	AVG.	0.015
	MAX.	1.083
	STD.	0.058
NON-ZERO NUT ROTAT:	NO.	268.000
	AVG.	0.092
	MIN.	0.016
	MAX.	1.083
	STD.	0.114
> 30 DEG. NUT ROTAT:	NO.	59.000
	AVG.	0.255
	MIN.	0.104
	MAX.	1.083
	STD.	0.155

BOLT GRADE	NO.
A325	958.000
A490	651.000

BOLT SIZE	NO.
0.875	1070.000
1.000	41.000
1.375	498.000

TABLE 4-2

PALO VERDE 2 TORQUE CHECK STATISTICS FOR CRITICAL FRICTION FASTENERS
(UNITS ARE FRACTION OF TURN FOR NUT ROTATION AND FT-LB. FOR TORQUE, AND NO. OF NUTS CHECKED)

	ALL NUT ROTAT:	NO.	636.000	ALL NUT TORQUE: (1.375 IN)	NO.	106.000
		AVG.	0.078		AVG.	697.406
		MAX.	1.333		MAX.	2550.000
		STD.	0.186		MIN.	150.000
NON-ZERO	NUT ROTAT:	NO.	220.000		STD.	434.604
		AVG.	0.227			
		MAX.	1.333			
		STD.	0.258			
>30 DEG.	NUT ROTAT:	NO.	103.000			
		AVG.	0.421			
		MIN.	0.125			
		STD.	0.267			

BOLT GRADE A325	NO. 427.000
BOLT GRADE A490	315.000
BOLT SIZE 0.875	581.000
BOLT SIZE 1.000	23.000
BOLT SIZE 1.375	138.000

TABLE 4-3

PALO VERDE 3 TORQUE CHECK STATISTICS FOR CRITICAL FRICTION FASTENERS
(UNITS ARE FRACTION OF TURN FOR NUT ROTATION AND FT-LB. FOR TORQUE, AND NO. OF NUTS CHECKED)

ALL NUT ROTAT:	NO.	504.000	ALL NUT TORQUE:	NO.	120.000
	AVG.	0.009		AVG.	2385.000
	MAX.	0.500		MAX.	2385.000
	STD.	0.043		STD.	0.000
NON-ZERO NUT ROTAT:	NO.	47.000	>30 DEG. NUT ROTAT:	NO.	11.000
	AVG.	0.096		AVG.	0.261
	MAX.	0.500		MIN.	0.167
	STD.	0.107		STD.	0.107

BOLT GRADE	NO.	SIZE(IN)	NO.
A325	410.000	0.875	487.000
BOLT GRADE		SIZE(IN)	NO.
A490	214.000	1.000	17.000
		SIZE(IN)	NO.
		1.375	120.000

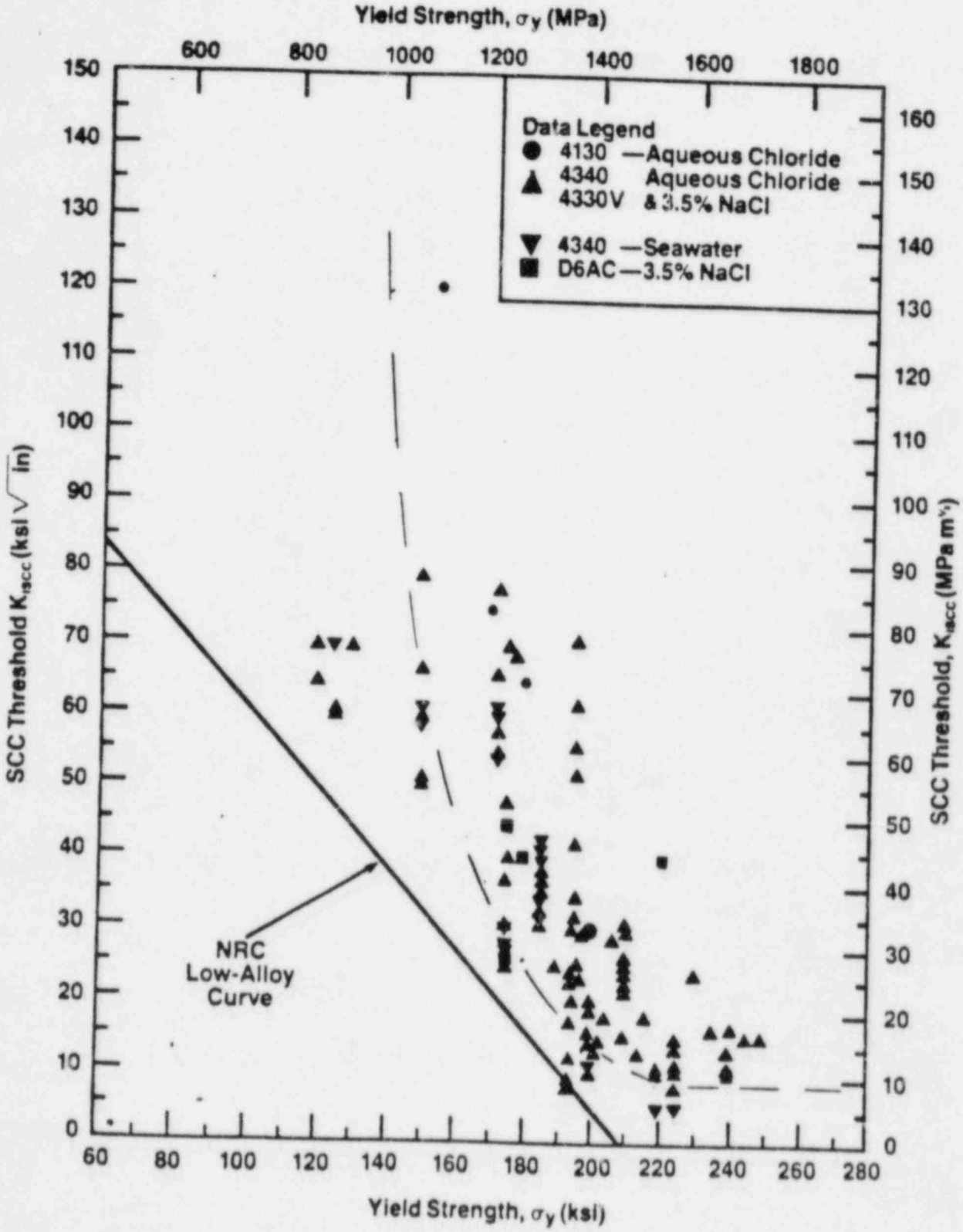


Figure 4-1. SCC Threshold Data for Bolting Steels in Aqueous Chloride Solutions (Ref. 12)

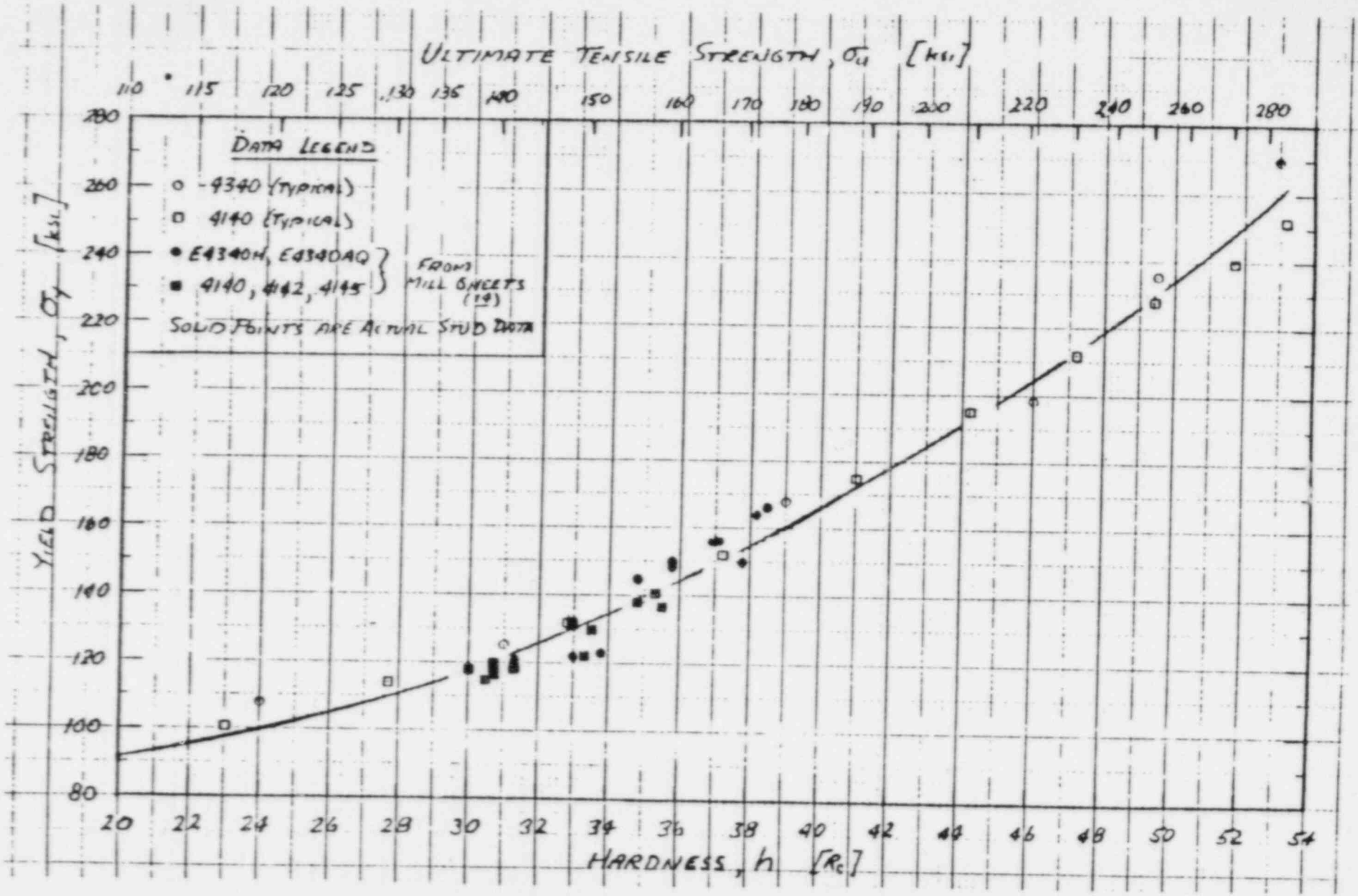
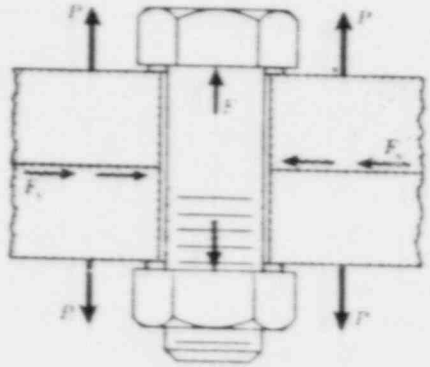
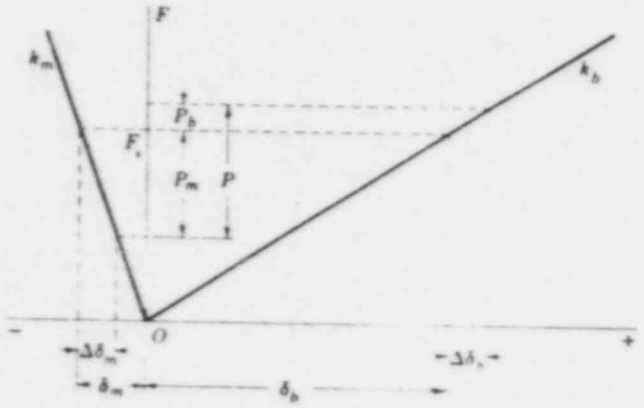


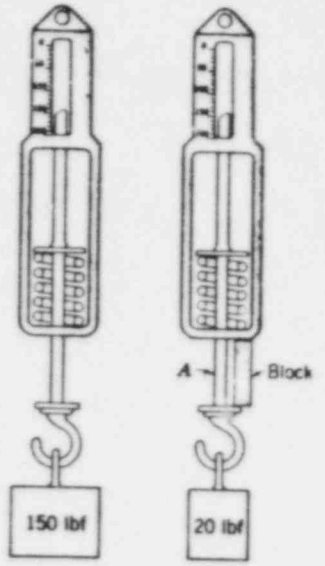
Figure 4-2. Yield Strength as a Function of Hardness for 4340 and 41XX Bolting Steels (Ref. 12)



a) Loads in a bolted connection

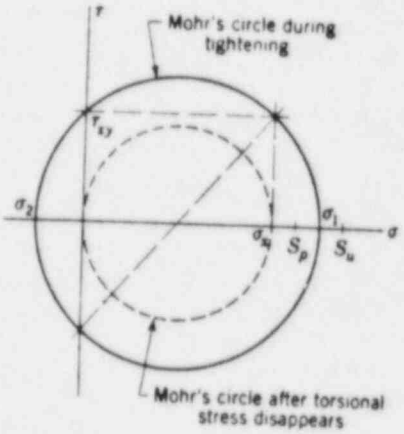


b) Load-deflection diagram for bolt (b) and member (m)

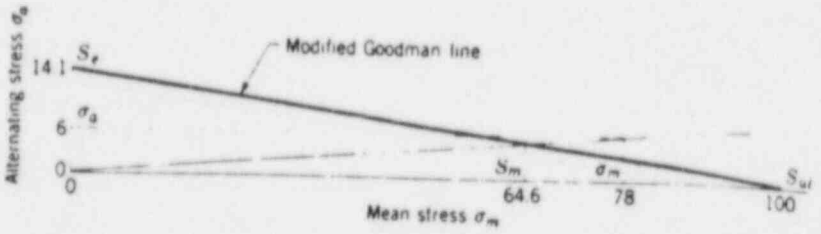


c) Fish-scale analogy of preload effect in a bolted joint

Figure 4-3. Basic Concepts in the Loading of Bolted Connections (Ref. 2)



a) Mohr's circle for a bolt, showing the torquing effect (shear stress τ_{xy})



b) Modified Goodman diagram showing the mean stress effect on allowable alternating stress in fatigue

Figure 4-4. Illustration of Loading Effects in Bolted Connections (Ref. 2)

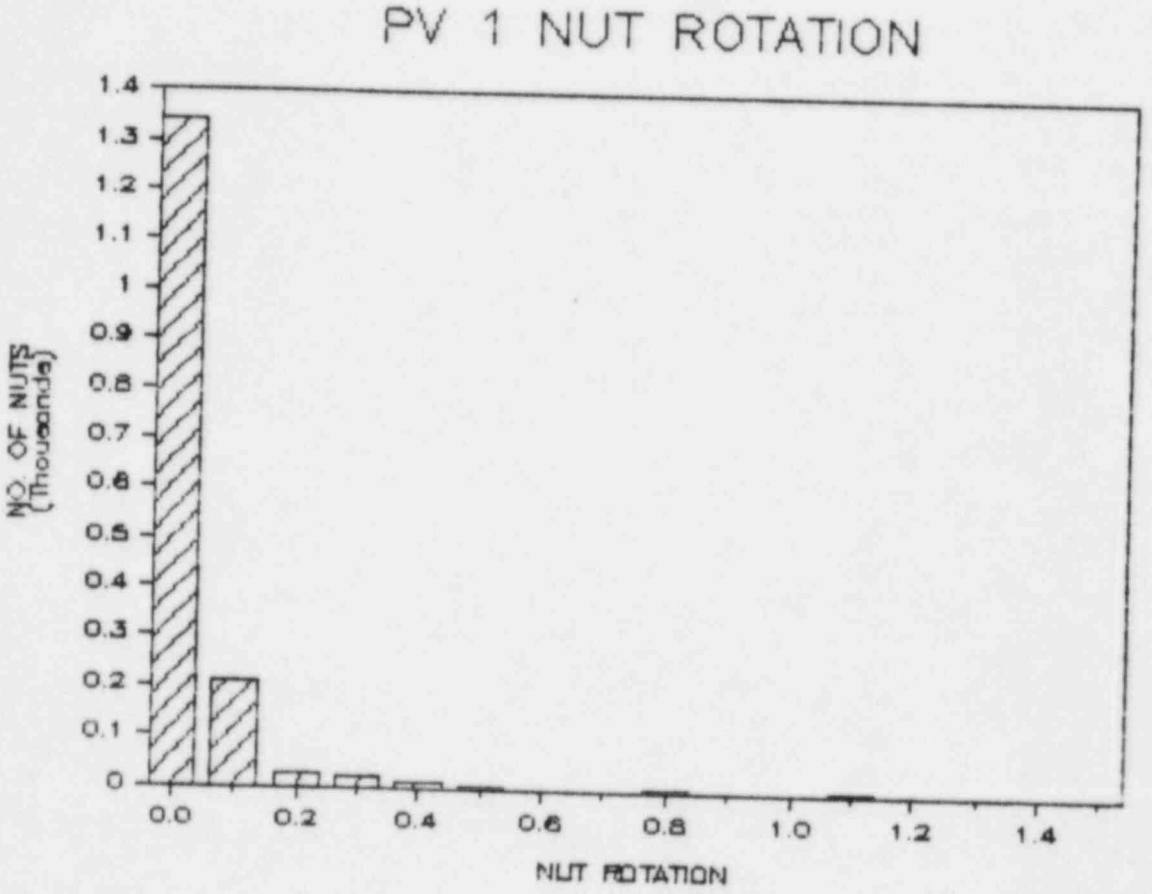


Figure 4-5. Distribution of Measured Nut Rotation Deviations from Requirements for Palo Verde 1

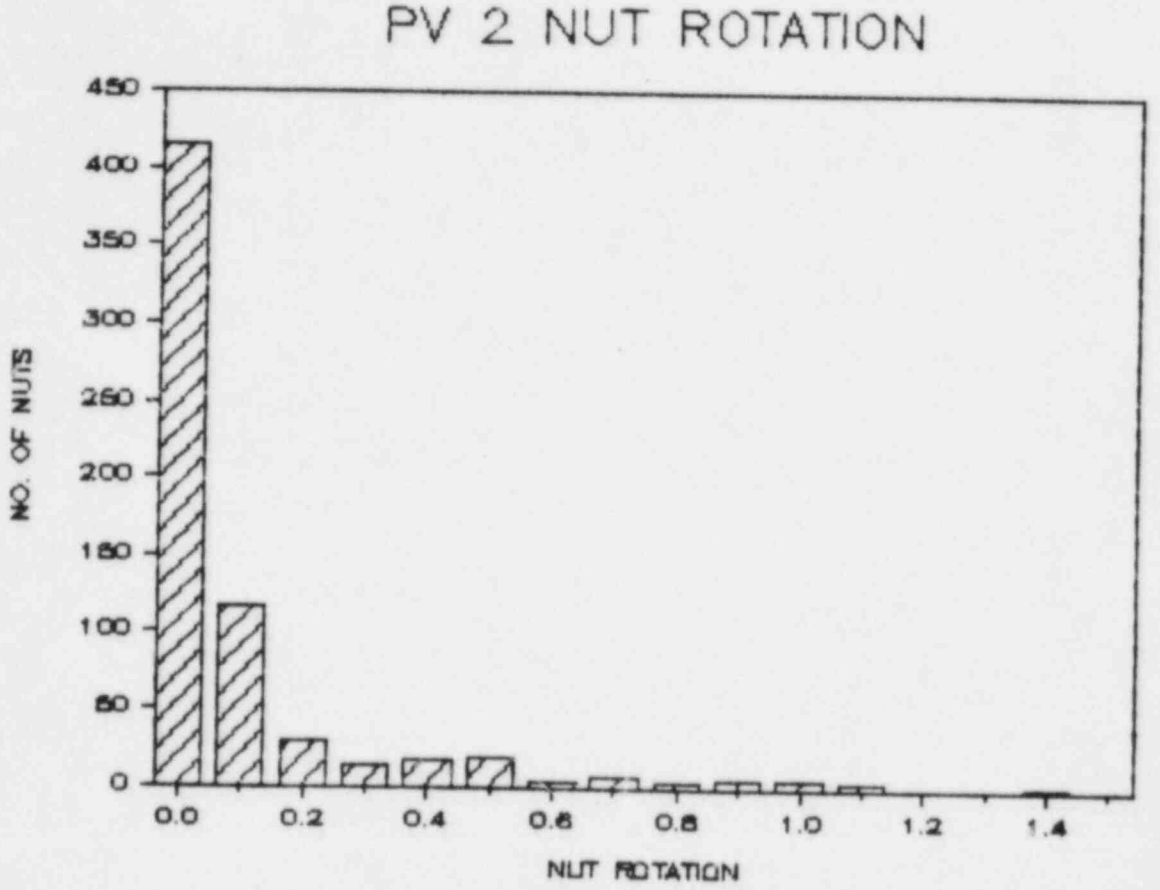


Figure 4-6. Distribution of Measured Nut Rotation Deviations from Requirements for Palo Verde 2

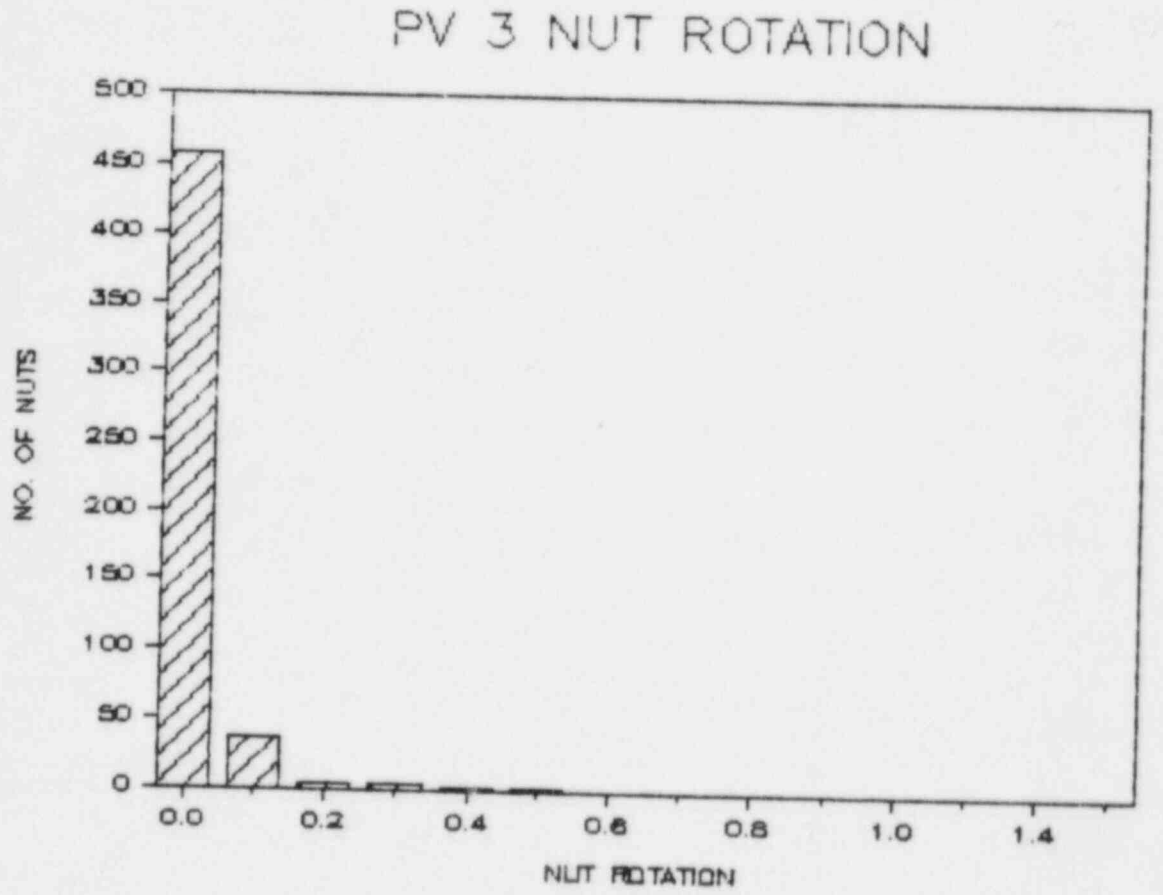


Figure 4-7. Distribution of Measured Nut Rotation Deviations from Requirements for Palo Verde 3

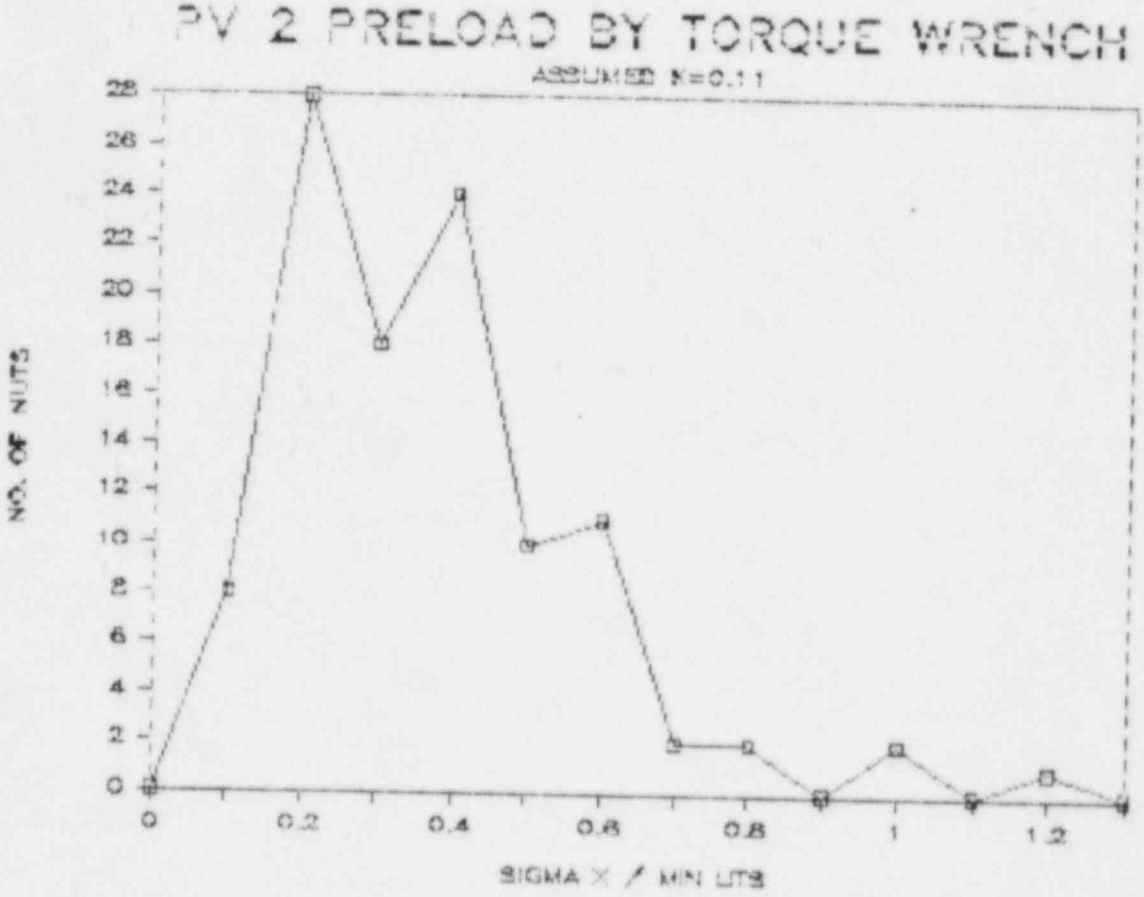


Figure 4-8. Distribution of Calculated Preload Stress/Min. UTS for K = 0.11 at Palo Verde 2

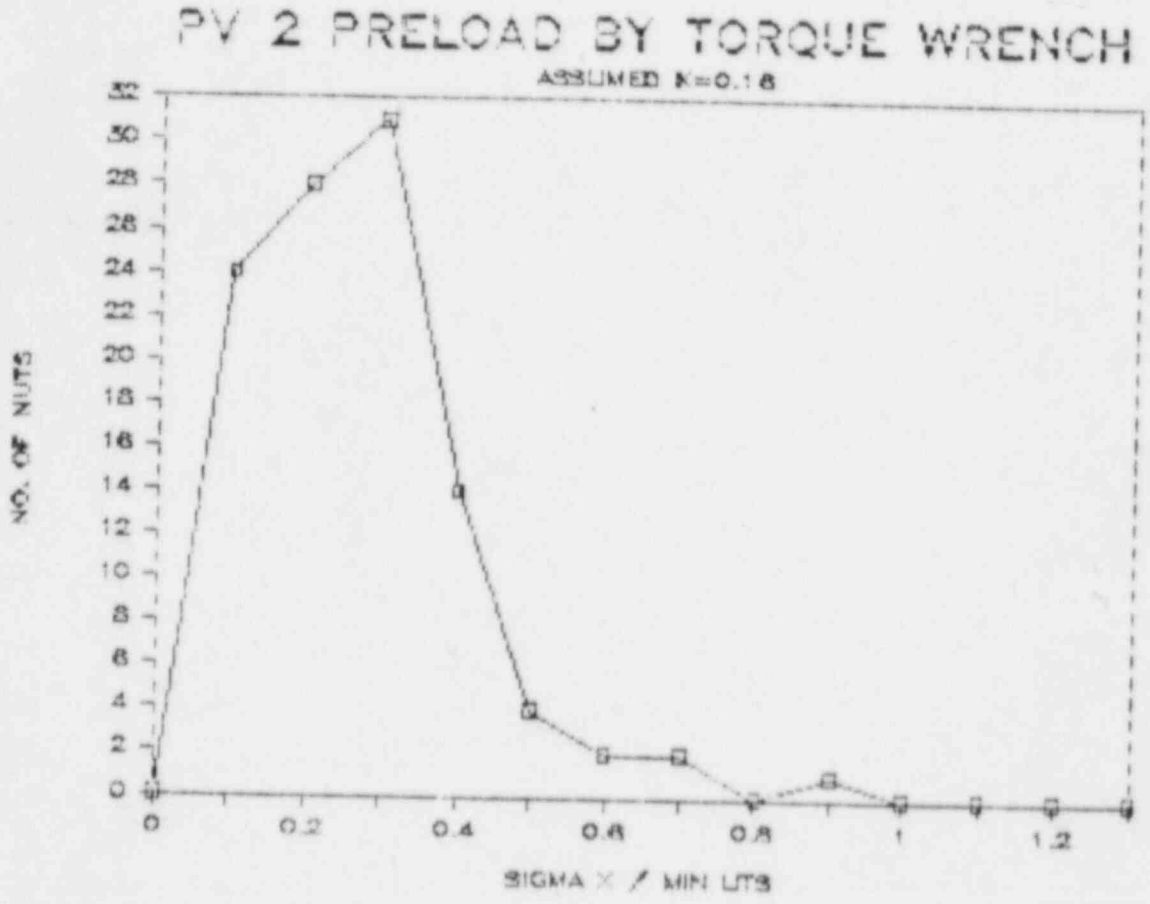


Figure 4-9. Distribution of Calculated Preload Stress/Min. UTS for K = 0.16 at Palo Verde 2

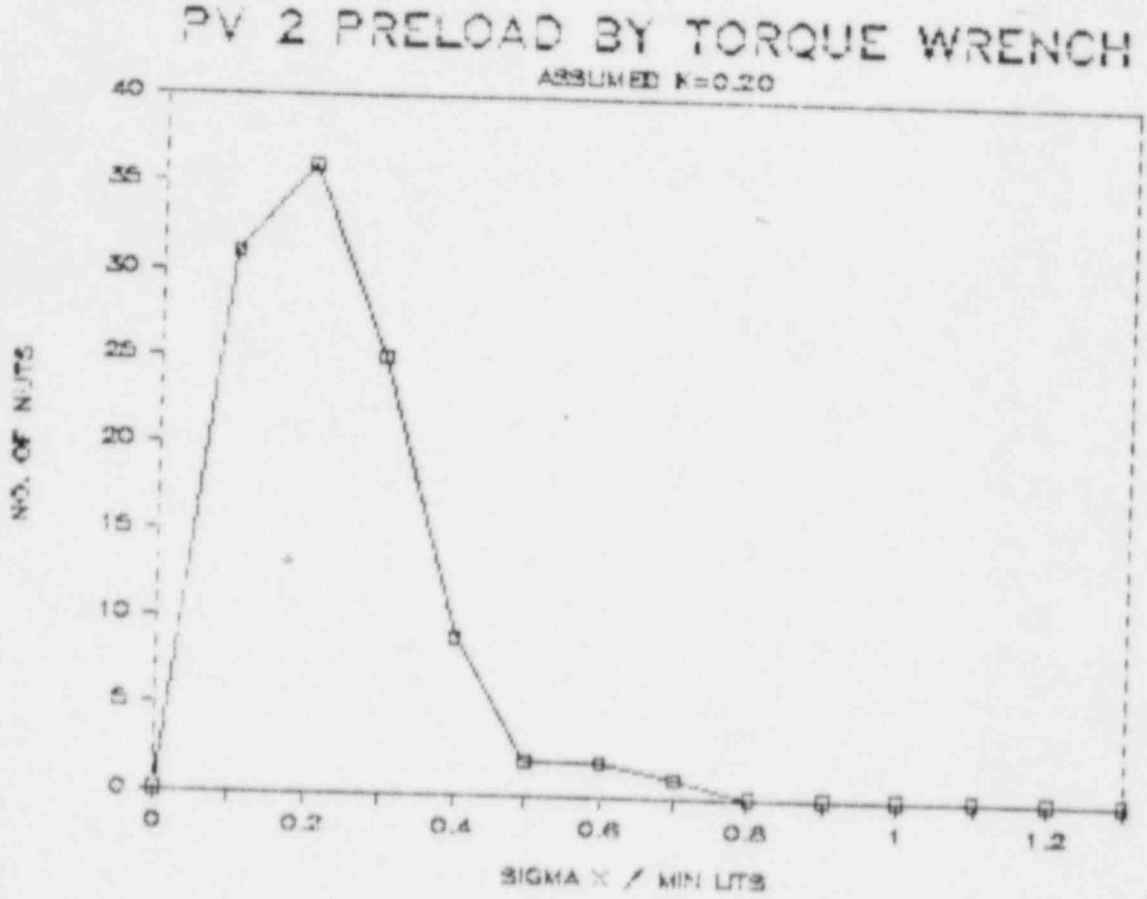


Figure 4-10. Distribution of Calculated Preload Stress/Min. UTS for K = 0.20 at Palo Verde 2

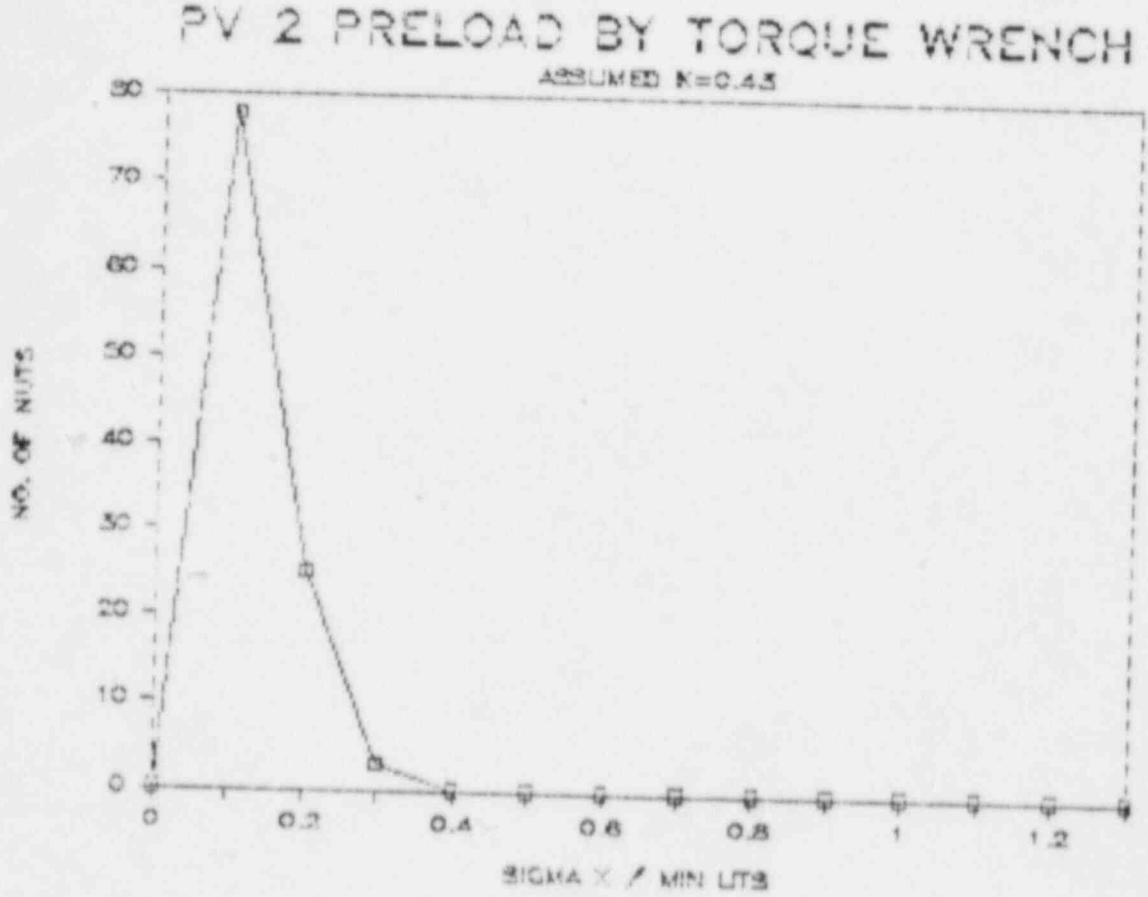


Figure 4-11. Distribution of Calculated Preload Stress/Min. UTS for K = 0.43 at Palo Verde 2

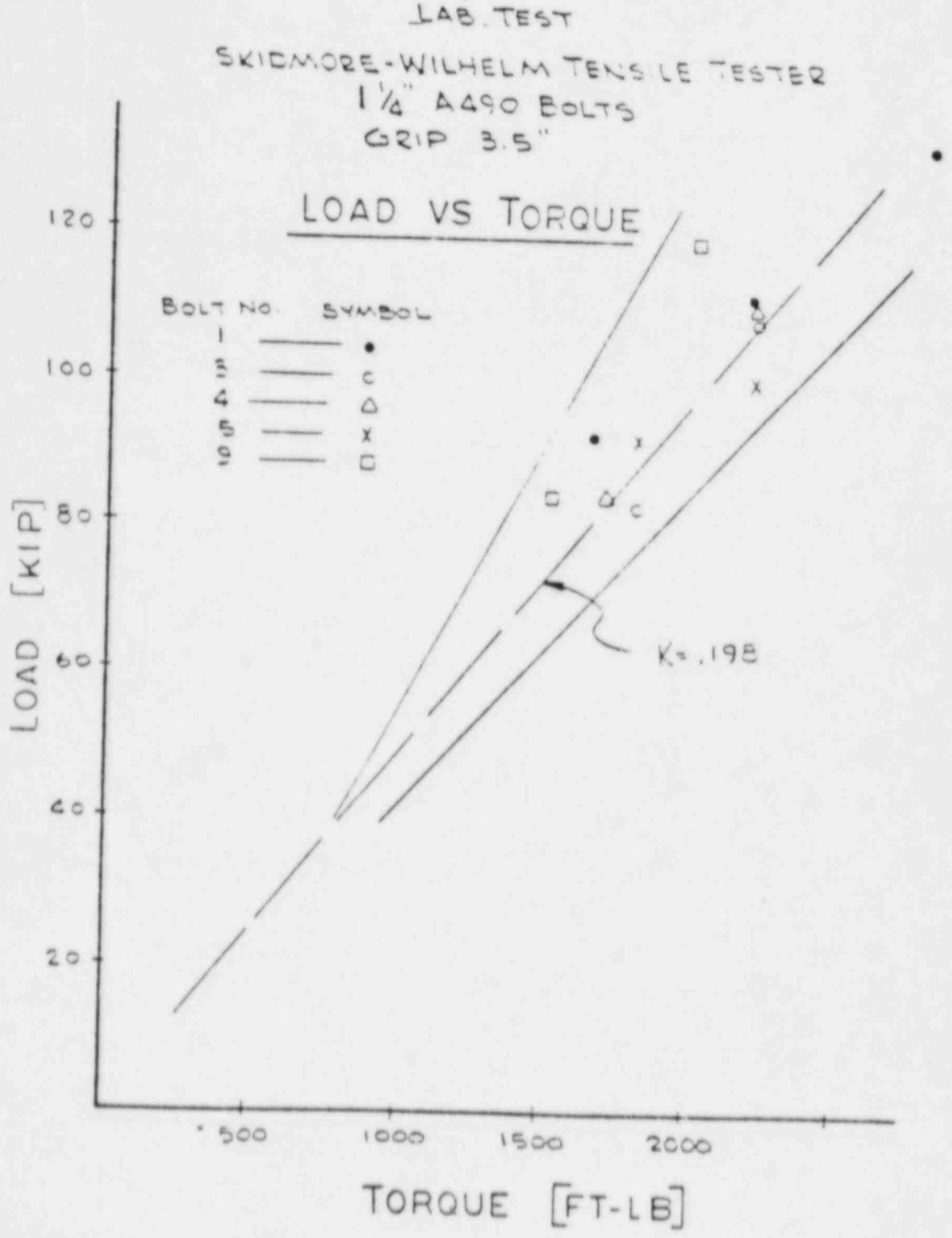


Figure 4-12. Example of Load Vs. Torque Variation Under Controlled Laboratory Conditions from Another Study (Ref. 1)

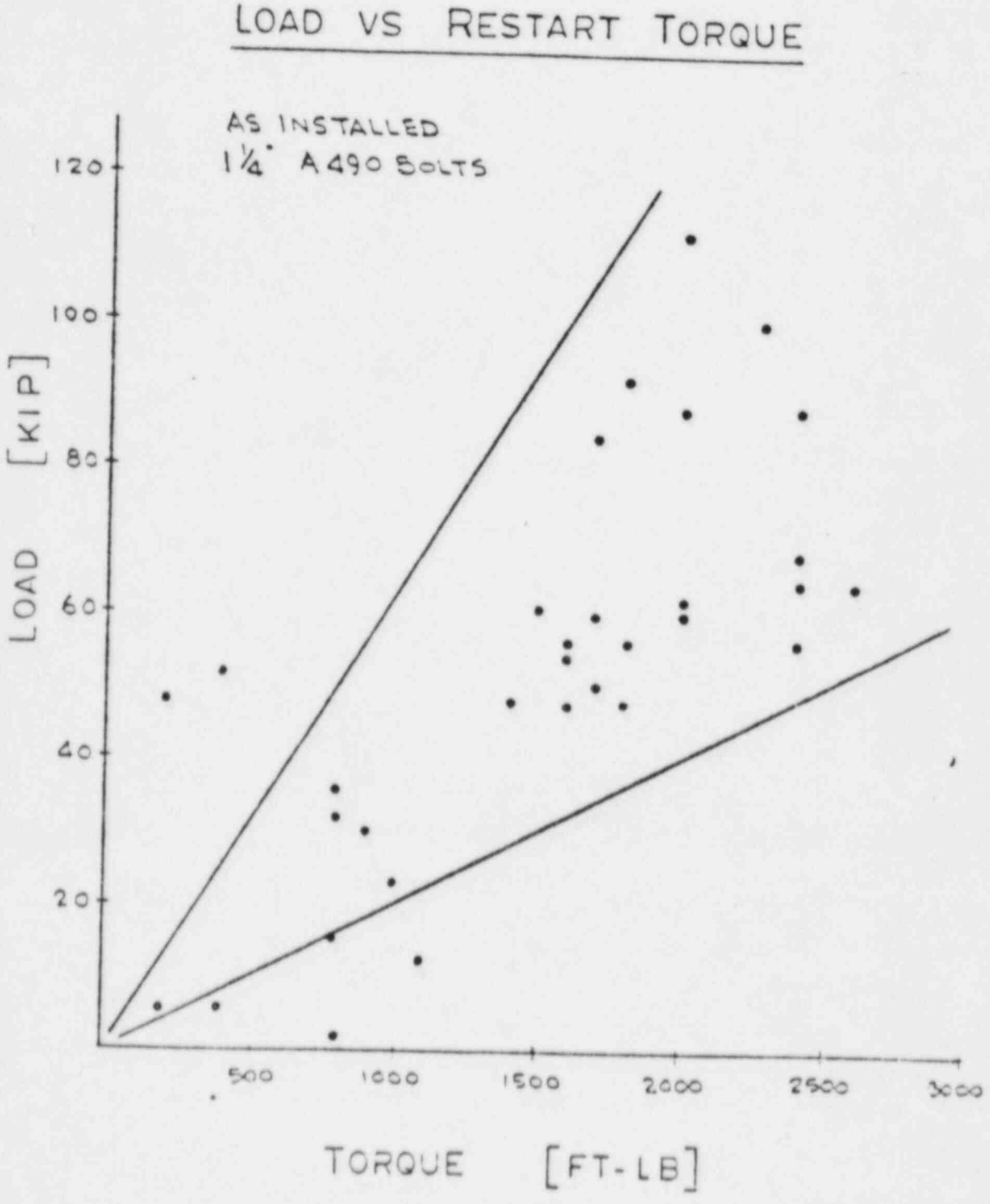


Figure 4-13. Example of Load Vs. Restart Torque Measured on Field-Installed Bolts from Another Study (Ref. 1)

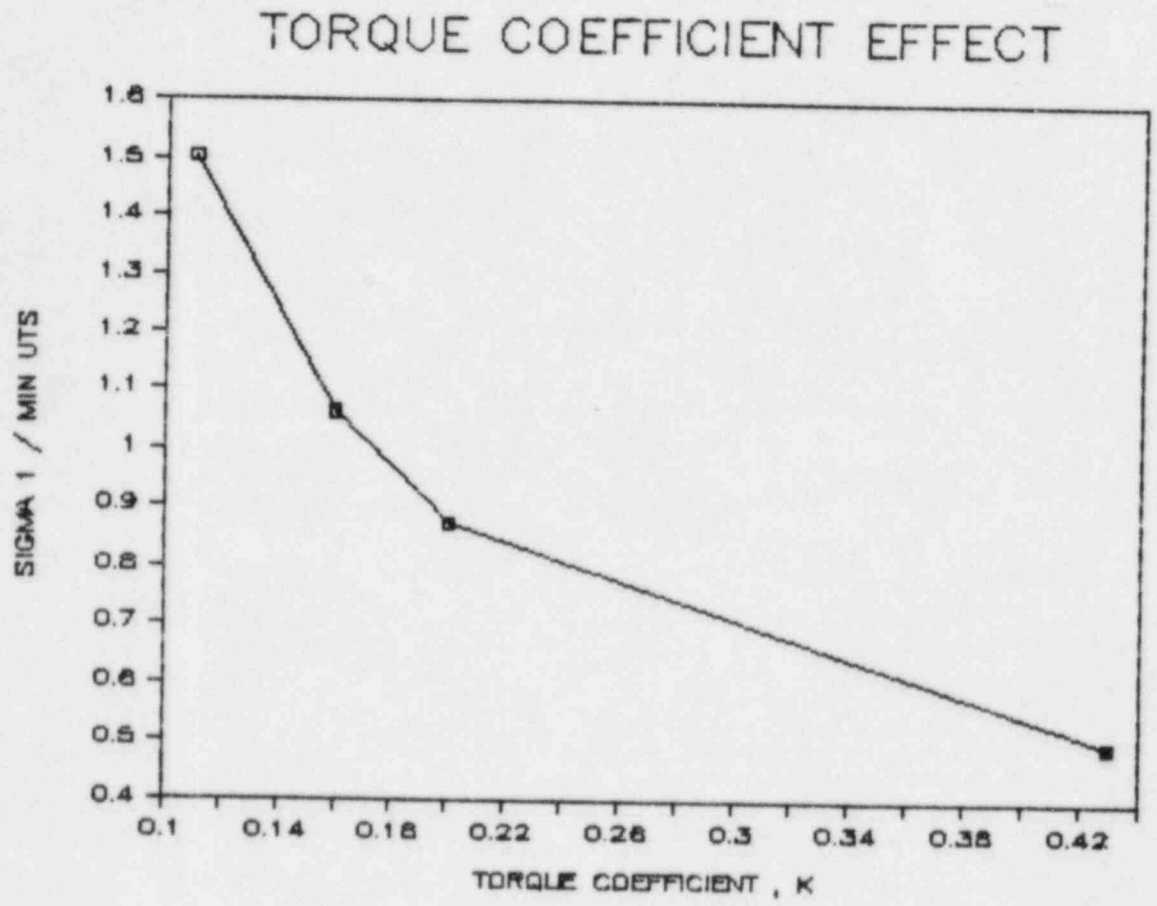


Figure 4-14. Effect of the Torque Coefficient on Principal Stress/Min. UTS During Preload to 1/2 Turn, Showing Potential for Overload Failure During Preload

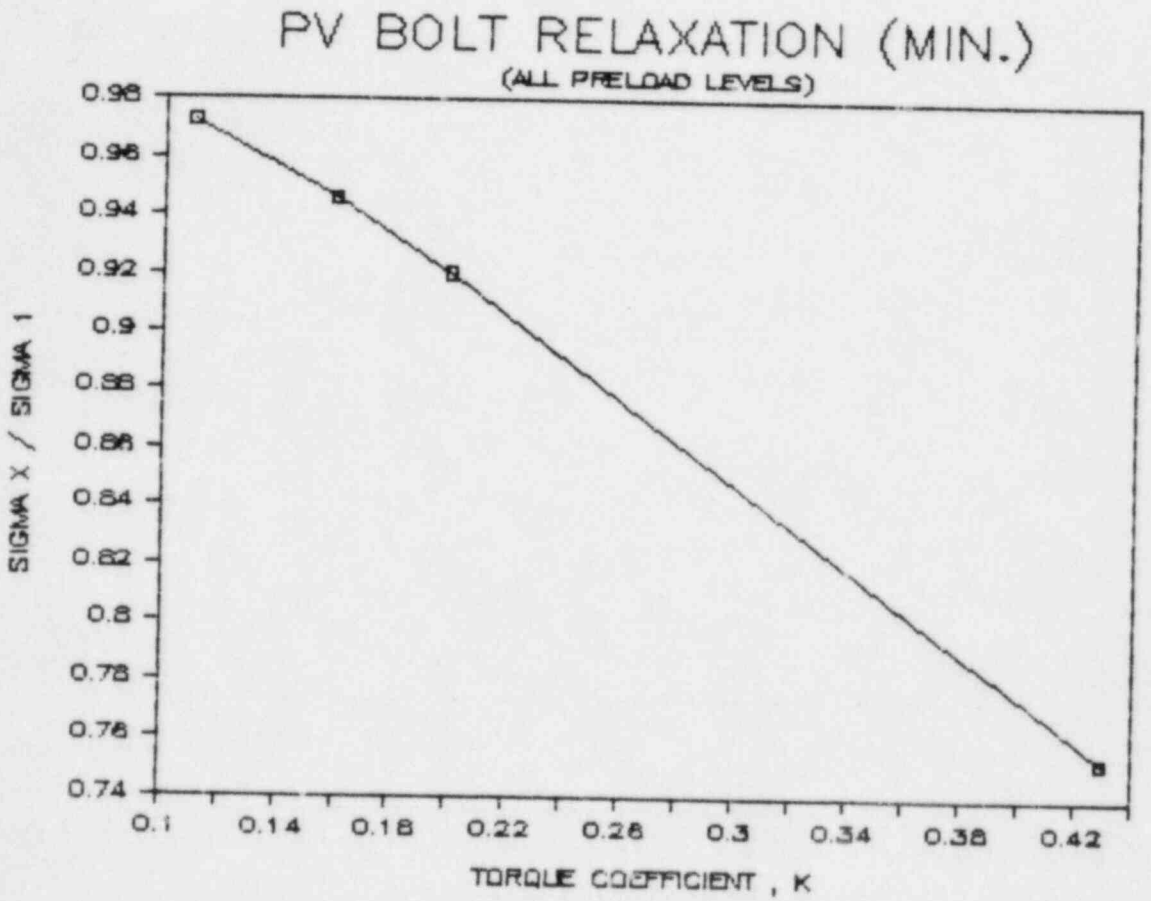


Figure 4-15. Palo Verde Bolt Stress Relaxation as a Result of Removing Torquing Shear Stress

5.0 UNDERTORQUING REVIEW AND EVALUATION

As with overtorquing, undertorquing will be considered with regard to potential failure mechanisms in service, and the Palo Verde data base will be specifally examined in this respect.

5.1 Potential Failure Mechanisms

Potential failure mechanisms, for properly designed bolts, due to undertorquing are: slippage in slotted holes, leakage in reactor coolant pressure boundary connections, and fatigue. As seen in Reference 14, leakage in bolted flange connections can be detected and remedied by tightening the bolts. Thus, this potential failure mechanism is handled in the above manner and will not be further considered here. Slippage of loose bolts in slotted holes can be a concern for structural steel. However, if a problem could occur, it would most likely have already shown some indications of slippage. Furthermore, as seen in Appendix K most connections have considerable design margins above and beyond the usual AISC margins. For example, with a stress design margin of 1.5 (typical in Appendix K) approximately 1/3 of the bolts in a connection could be completely loose and still meet the AISC design. Because of the above, and because all accessible critical friction joints have been reinspected and corrected, the mechanism of joint slippage will not be considered further.

The mechanism of most concern in undertorqued bolts (References 1, 2 and 3) is fatigue, which will be considered in more detail below.

5.2 Fatigue Evaluation for Palo Verde

The methodology of Section 4.0 of this report has been applied to predict fatigue margins at Palo Verde. Because Unit 2 showed a tendency toward multiple loose or undertorqued bolts in a connection, calculations of fatigue resistance were made with the assumption of no preload at all. In order to realistically make this evaluation, information was obtained from Bechtel (Reference 4) on typical fatigue loadings at Palo Verde, as shown in

Appendix K. Based on Appendix K, the maximum cyclic stress range per bolt was assumed to be 3 Ksi for cases of vibration and high cycle fatigue in rotating equipment. This stress, along with the assumption of zero preload, was used to compute fatigue margins for the common bolting grades at Palo Verde, as shown in Table 5-1 and Figure 5-1. These results show factors against high cycle fatigue failure ranging from 2 to 5, depending on the bolt grade, even for no preload. The approximate maximum allowable stress was also conservatively assumed (Table 5-1) in order to include maximum mean stress effects. The consideration of alternating stresses due to earthquakes is a relatively low cycle event (960 cycles per plant life for 2 earthquakes) based on the FSAR (Reference 15). Earthquake cycling is considered to be included in the fatigue endurance stress concepts (greater than 10^6 cycles of life) employed above.

Further margin against fatigue is provided by the fact that connections in general carry some preload, even when some percentage of connections are loose or undertorqued. The correlation between nut rotation deviation and preload stress for various bolt conditions is shown in Figure 5-2. Figure 5-2 indicates that nut rotations of half the specified turn (0.5) for all bolts in a connection would still result in a joint preload stress of from about 0.15 to 0.70 of minimum UTS.

5.3 Undertorquing Conclusions

Based on vibratory stress ranges at Palo Verde supplied by Bechtel, ample margins against fatigue exist, even for severe undertorquing situations. Because of the design margins, and because 100% of accessible critical friction joints have been checked (and would see only low cycle fatigue, Ref. 15), undertorquing is not expected to cause failure at Palo Verde.

TABLE 5-1

PREDICTED FATIGUE RESISTANCE FOR PALO VERDE BOLTING

PALO VERDE FATIGUE RESISTANCE OF UNDER-TORQUED BOLTS (ZERO PRELOAD ASSUMED)

BOLT GRADE	SIZE(IN)	NUT ROTAT	N TH/IN	A SQ.IN	TURN SPEC	TURN ACT	Fi ACT	SIGMA X	UTS MIN	ASSUMED FATIGUE RANGE/ BOLT	ALLOWABLE STRESS	ALLOWABLE FATIGUE RANGE/ BOLT	ACTUAL/ ALLOWABLE RANGE
A325	0.875	0.500	9.000	0.462	0.500	0.000	0.000	0.000	105000.000	3000.000	44000.000	8812.500	0.340
A490	0.875	0.500	9.000	0.462	0.500	0.000	0.000	0.000	150000.000	3000.000	54000.000	13747.500	0.218
A307	0.875	0.500	9.000	0.462	0.500	0.000	0.000	0.000	60000.000	3000.000	20000.000	5851.500	0.513
A193	0.875	0.500	9.000	0.462	0.500	0.000	0.000	0.000	125000.000	3000.000	42000.000	11914.500	0.252
A354BD	0.875	0.500	9.000	0.462	0.500	0.000	0.000	0.000	150000.000	3000.000	54000.000	13747.500	0.218
A449	0.875	0.500	9.000	0.462	0.500	0.000	0.000	0.000	120000.000	3000.000	40000.000	11491.500	0.261

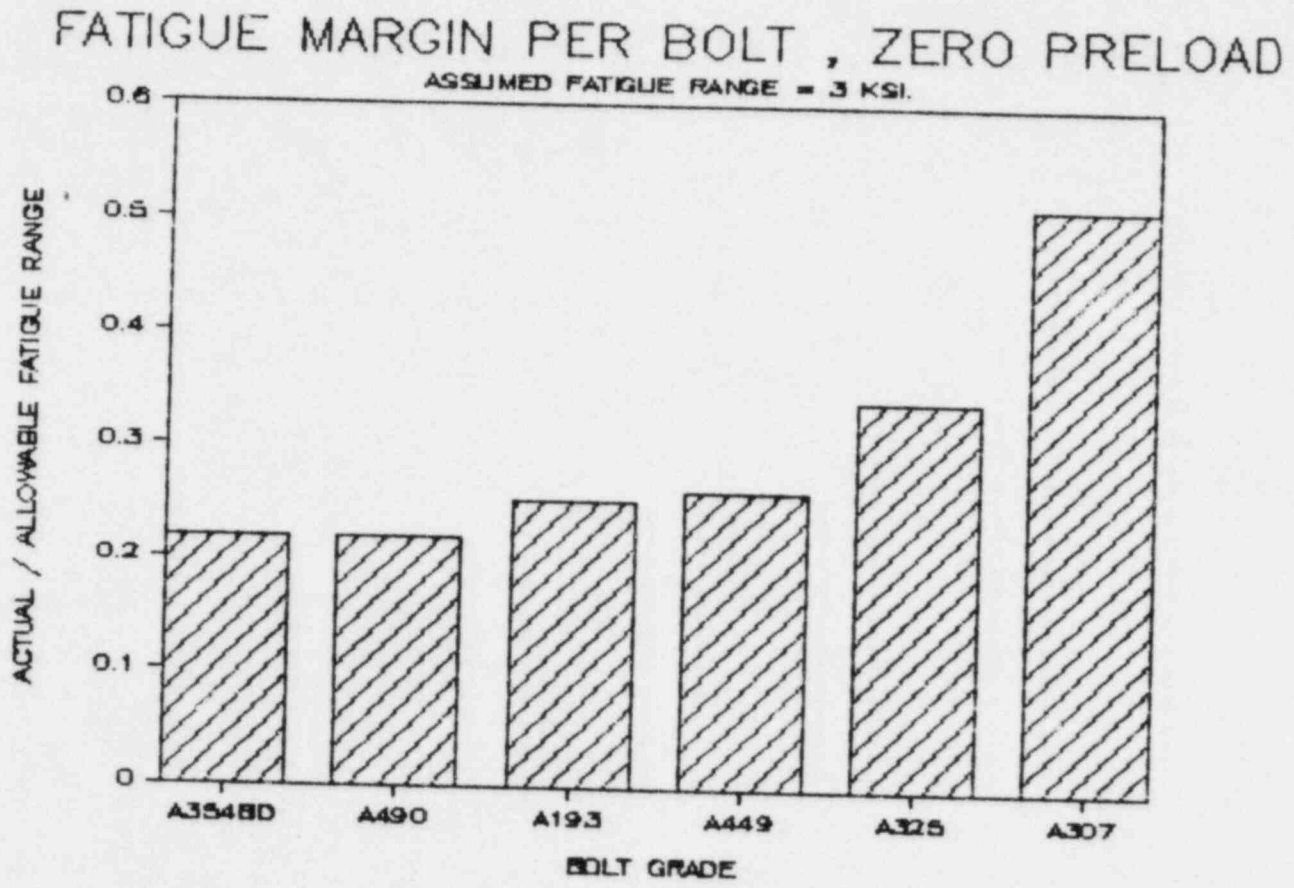


Figure 5-1. Calculated Fatigue Margins at Palo Verde for High Cycle Fatigue Vibrations with an Assumed Actual Stress Range of 3 Ksi and Zero Preload While at Maximum Working Stresses (≈ 1/3 UTS)

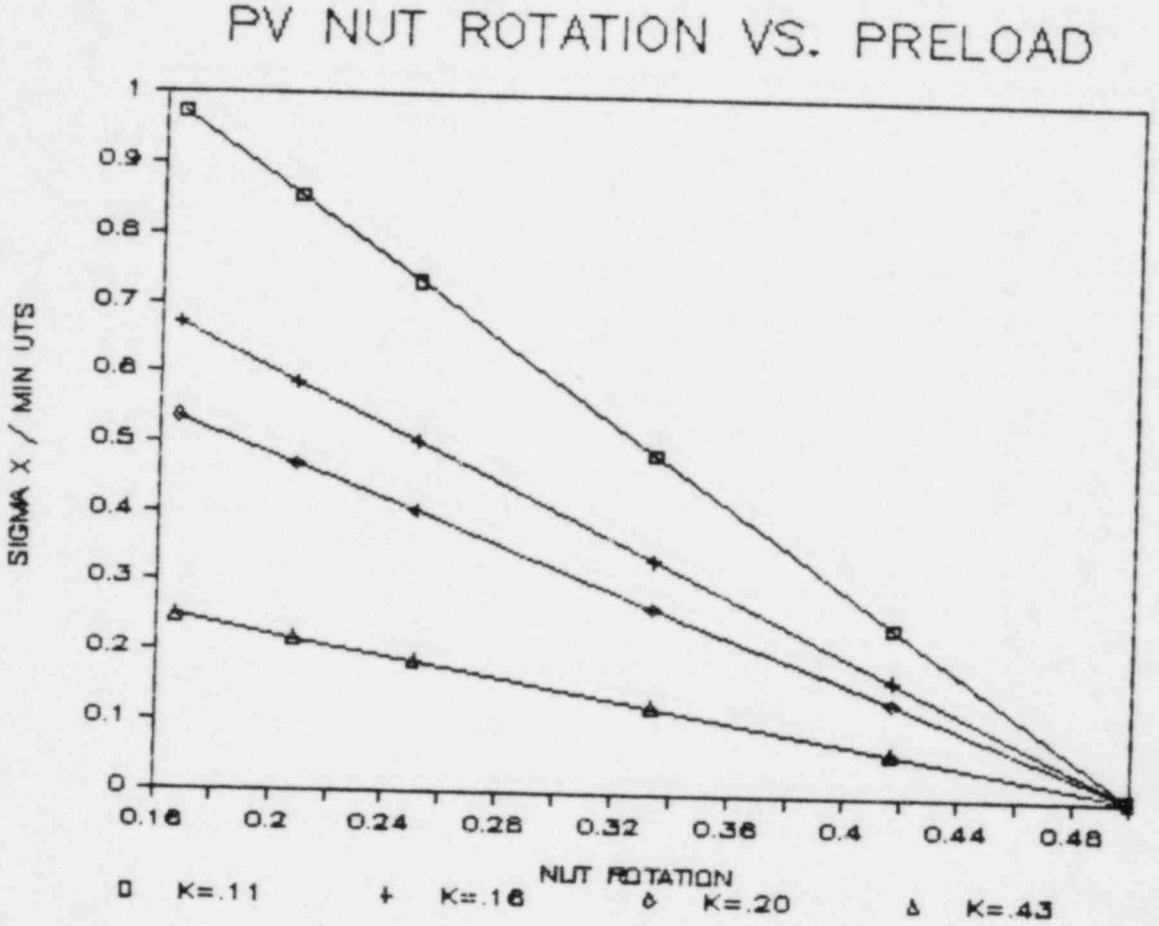


Figure 5-2. Effect of Nut Rotation Deviation from a Requirement of 1/2 Turn on Preload Stress/Min. UTS for Various Torque Coefficients

6.0 DOUBLE-NUTTING REVIEW AND EVALUATION

Double-nutting is the practice of putting two nuts on a single bolt. There are several reasons for this practice: (1) load-sharing between the two nuts, and (2) the second nut acts as a locking device to prevent loosening the first nut. In cases of load-sharing, the second nut is generally designed to be larger than the first nut, since it can see a significant proportion of the load. This is especially true for "soft" nuts, where yielding of the threads will permit more load transfer (Reference 2), and a large second nut is required for adequate preload and load-bearing capacity.

However, in the case of Palo Verde, the double-nutting was employed on U-bolts and pipe hangers simply as a locking device to comply with ASME Code NF-4725 (References 5 and 6). The first, or primary, nut in these cases was designed to take the full load of the connection. Thus, the practice at Palo Verde of making both nuts the same size or the second nut half-size is acceptable. In fact, NF-4725 permits locking devices such as nut drilling and wiring and thread upsetting, where no second nut at all is employed. Therefore, the size of the second nut at Palo Verde is not a concern when used as a locking device as described above.

7.0 CONCLUSIONS

The following conclusions were reached as a result of assessing bolting integrity at Palo Verde Units 1, 2 and 3.

1. Because of extensive studies, reinspections, corrective actions and inherent joint design margins at Palo Verde Units 1, 2 and 3, the bolted joint integrity is considered above-average and acceptable for service. The key points are that typical Palo Verde bolted connections are overdesigned, and deficiencies in critical connections have been corrected.

2. Variations in bolt torque from specified AISC values were found in critical friction joint structural bolting during torque checks, especially at Unit 2. Bolt condition and torquing methods contributed to these variations. Similar variations have been found in other studies (Ref. 1) and are not unexpected. All accessible critical joints at Palo Verde were reinspected and are now properly torqued.

3. SCC, overloading and fatigue were considered as possible failure mechanisms due to overtorquing. SCC is not an expected failure mechanism because of Palo Verde bolting generally having hardnesses below the threshold for SCC. (Sustained load derating was implemented in certain cases of high hardness). This conclusion regarding SCC also applies to bolts which were acid cleaned. Fatigue was shown to not be a concern for overtorqued bolts, through use of a generic calculation. It was shown that although a number of overload failures was predicted during preload torquing, that stress relaxation after preload is significant and precludes such failures during the service of properly designed bolts. Therefore, overtorquing is not a problem unless the bolt fails immediately.

4. The effect of undertorquing was evaluated with respect to possible multiple loose bolts in a connection. It was found that fatigue is the most likely failure mechanism of concern for undertorqued bolts.

Detailed typical joint designs for Palo Verde were found to include relatively large margins against fatigue. It was shown that such designs could tolerate the evaluated cases of high cycle fatigue at Palo Verde, even with no preload on the bolts.

5. The double-nutting practice at Palo Verde is acceptable for its intended purpose of locking the primary nut in place, in accordance with ASME Code NF-4725.

8.0 REFERENCES

1. Looram, M. E., "Preload Control for Structural Bolting", presented at Bolting Degradation or Failure in Nuclear Plants Seminar, sponsored by EPRI, Knoxville, TN, Nov. 2-4, 1983.

2. Shigley, J. E., Mechanical Engineering Design, Chapter 7, "The Design of Screws, Fasteners, and Joints", McGraw-Hill, NY, Second Ed., c. 1972.

3. Juvinall, R. C., Engineering Considerations of Stress, Strain, and Strength, McGraw-Hill, NY, p. 310.

4. Bechtel Letter B/SIA-E-49741, MOC350421, W. G. Bingham to J. F. Copeland, Nov. 8, 1984.

5. Bechtel Specification No. 13-PM-204, "Specification for Field Fabrication and Installation of Nuclear Piping Systems for the Arizona Public Service Company Palo Verde Nuclear Generating Station Units 1, 2 and 3", Rev. 13, February 23, 1984.

6. Corner & Lada Co. Inc. Load Capacity Data Sheet for Component Standard Supports, Double Bolt Pipe Clamp, P209A0-27-2, Rev. 1, April 1, 1977.

7. Specification for "Structural Joints Using ASTM A325 or A490 Bolts", AISC, Aug. 14, 1980.

8. NRC Construction Assessment Team (CAT) Report Findings and Responses, Attachment D, II.B.1 and II.B.2, Inspection conducted Sept. 1983.

9. Bechtel Construction Inspection Planning for Job No. 10407, CIP No. 551.0, "Critical Friction-Type High Strength Bolted Connections", issued March 2, 1984.

10. Shiosaka, D. R., "Engineering Evaluation of Nonconforming ASTM A354 Grade BD Studs and Bolts", DER No. 81-14 (and appendices), Sept. 1982.

11. Billy, A. F., "Background and History of the Bolting Degradation or Failure in Nuclear Plants Issue", presented at Bolting Degradation or Failure in Nuclear Plants Seminar, sponsored by EPRI, Knoxville, TN, Nov. 2-4, 1983.

12. Cipolla, R. C., "Fracture Mechanics Based Methodology for Assessing the Integrity of High Strength Bolting Materials", presented at Bolting Degradation or Failure in Nuclear Plants Seminar, sponsored by EPRI, Knoxville, TN, Nov. 2-4, 1983.

13. Dieter, G. E., Jr., Mechanical Metallurgy, McGraw-Hill, NY, c. 1961, p. 23.

14. ASME Boiler and Pressure Vessel Code, Section III, Article XII-1000, "Design Considerations for Bolted Flange Connections", Winter 1983 Addenda.

15. PVNGS FSAR, Section 3.7.3.2, "Determination of Number of Earthquake Cycles", Amendment 4, May 1981.

APPENDIX A

NRC IE INFORMATION NOTICE NO. 82-06

and

NRC IE BULLETIN NO. 82-02

SSINS No.: 6835
Accession No.
8202040130
IN 82-06

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

March 12, 1982

IE INFORMATION NOTICE NO. 82-06: FAILURE OF STEAM GENERATOR PRIMARY SIDE MANWAY CLOSURE STUDS

Description of Circumstances:

The Nuclear Regulatory Commission (NRC) was notified by Maine Yankee Atomic Power Company and by Combustion Engineering (CE) that during routine disassembly of a steam generator primary side manway at Maine Yankee, 6 of the 20 manway closure studs failed and another 5 were found by ultrasonic testing to be cracked. These are 1½ x 10 inch studs of SA 540 grade B 24 alloy steel. The studs had been exposed to boric acid from a small primary coolant leak and to Furmanite sealing compound (primary grade) applied in an attempt to seal this leak. The studs exhibited evidence of surface corrosion attack possibly as a result of an interaction associated with stud preload, lubricant, Furmanite and primary coolant leakage environment. A metallurgical analysis to determine the failure mechanism is currently underway at CE. The entire set of studs on the affected steam generater (SG #2) have been replaced and an ultrasonic examination of all primary manway studs on steam generator units 2 and 3 is being performed. Further corrective actions are pending stud failure analysis and its applicability to other primary boundary closures.

In the last few years there have been a significant number of incidents of failed or severely degraded bolts and studs. Examples of the latter; primary coolant pump stud-bolts (Calvert Cliffs and Ft Calhoun) and steam generator primary manway closures studs (Oconee and ANO-1). The failures described were attributed to stress corrosion cracking and corrosion wastage of high strength studs that are difficult to detect.

The NRC has contacted the CE Regulatory Response Group and requested a review of the problem.

This IE information notice is provided as an early notification of a potentially significant matter that is still under review by the NRC staff. If NRC evaluation so indicates, further licensee action may be requested. In the interim, we expect that licensees will review this information for applicability to their facilities.

No written response to this information notice is requested. If you need additional information, please contact the Regional Administrator of the appropriate NRC Regional Office.

Attachment:
Recently issued IE Information Notices

SSINS No.: 6820
IEB 82-02
OMB NO: 3150-0086
Expiration Date: 5/30/86

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

June 2, 1982

IE BULLETIN NO. 82-02: DEGRADATION OF THREADED FASTENERS IN THE REACTOR COOLANT PRESSURE BOUNDARY OF PWR PLANTS

Addressees:

All pressurized water nuclear power reactor facilities holding an operating license (OL), for action. All other nuclear power reactor facilities holding an operating license or construction permit (CP), for information.

Purpose:

The purpose of this bulletin is to: (1) notify licensees and construction permit holders about incidents of severe degradation of threaded fasteners (bolts and studs) in closures in the reactor coolant pressure boundary (RCPB), and (2) to require appropriate actions. A response to this bulletin is required from pressurized water reactors (PWRs) holding an operating license as discussed below.

Description of Circumstances:

In May 1980, Omaha Public Power District (OPPD) submitted a special maintenance report to the NRC about the significant corrosion wastage experienced with closure studs in the reactor coolant pumps at its Fort Calhoun facility. The corrosion wastage was attributed to boric acid attack as a result of leakage at flexitallic gasketed joints between the pump casing and pump cover. These closure studs are 3.5 inches in diameter, and are manufactured of SA 193-B7 (AISI 4140) low-alloy, high-strength steel. Accordingly, the NRC issued Information Notice No. 80-27 on June 11, 1980 to all PWR licensees about the potential for undetected boric acid corrosion wastage and emphasized the need for supplemental visual inspection of pressure-retaining bolting in pump and valve components. Subsequently, similar occurrences of corrosion wastage from borated water leakage have been identified at other PWR plants, as discussed below.

On March 10, 1982, the NRC was notified by Maine Yankee Atomic Power Company and Combustion Engineering (C-E) that during routine disassembly of a steam generator primary manway at Maine Yankee, 6 of the 20 manway closure studs failed and another 5 were found, by ultrasonic examination using specialized techniques, to be cracked. Leakage had been noted from this manway during the current operating cycle and several efforts were made to eliminate the leakage. These efforts involved increasing the joint operating compression through torquing the studs to hydrotest levels and repeatedly injecting Furmanite sealant. Normal plant operation continued until a planned maintenance outage.

Preliminary results of a metallurgical analysis C-E performed on the affected studs have indicated that the failure mode was stress-corrosion cracking (SCC). By Information Notice No. 82-06 (issued March 12, 1982), the Office of Inspection and Enforcement notified all licensees and construction permit holders about this degradation to emphasize the increased potential for studs to fail by the joint action of stud preload, material conditions and a corrosive environment generated by the presence of primary coolant leakage. As a follow-up to the information notice, the utility established that the root cause of leakage was due to an interference contact between the gasket retainer lip and vessel cladding which prevented proper compression of the flexitallic gasket during reinstallation of the manway cover. This problem was corrected and all 20 studs were replaced. Magnetic particle and ultrasonic examinations of the studs in manways of the other two steam generators identified no other failures.

In the last several years a significant number of incidents have been reported of bolts and studs that have failed or become severely degraded because of boric acid corrosion wastage or SCC mechanisms. Preliminary results of an NRC staff review of threaded fastener experience in operating nuclear power plants have identified that specific generic actions need to be taken before the study is complete. The staff review identified 44 incidents of threaded fastener degradation since 1964. From Table 1 it can be seen that since 1977, 15 incidents related to primary coolant pressure boundary application have been recorded. These incidents involved 9 PWR plants. Of concern is that degradation and failure of such threaded fasteners constitute a potential loss of RCPB integrity and, in the extreme case, a loss-of-coolant accident could occur, should extensive fastener failures in a pressure-retaining closure not be detected.

In some instances, it has been reported that sealant compounds have been injected into bolted closures in the RCPB as a means of convenient maintenance to control leakage. A review of the limited chemical analysis available on Furmanite indicates it has a variable composition with respect to concentration of chlorine, fluorine, and sulfur which are leachable and well recognized promoters of SCC. Consequently, prolonged exposure of this sealant to leakage and high temperature conditions causing a gradual release of its potentially corrosive ions must be taken into account.

Also, certain lubricants may be formulated with molybdenum disulfide (MoS_2) which contains a significant level of sulfide constituent. Experience suggests that MoS_2 has a pronounced tendency to decompose in the presence of high temperature and moisture conditions to release sulfide which is a known promoter of SCC.

Therefore, care should be exercised in the selection and application of lubricants and injection sealants to minimize the risk of SCC from potentially corrosive ions due to the gradual breakdown and/or synergistic interaction of such materials with prolonged exposure to leakage conditions. This would be of

particular concern for fastener materials made of high-strength low-alloy steels and, austenitic and martensitic stainless steels (i.e., 304, 316, 416, 17-4 PH, etc.) which are known to be susceptible to halogen/sulfide SCC degradation.

The above concerns are further compounded by the fact that under the present ASME Code Section XI inservice inspection rules ultrasonic examination is not required on threaded fasteners in sizes 2 inches and less in diameter (e.g., Table IWB-2500-1). However, except for the reactor coolant pump stud wastage, most failures have occurred in fastener sizes 2 inches and smaller. Furthermore, experience has clearly shown that Code-specified ultrasonic testing (UT) methods are not singularly adequate to detect corrosion wastage conditions. Moreover, the present Code UT procedures are not sufficiently sensitive to detect initiation of stress corrosion cracking (SCC) but requires the use of specialized UT techniques and calibration standards based on notch reflectors simulating critical flaw parameters to enhanc reliability of detection. At the present time, visual examination (e.g., IWA 2210, VT-1) appears to be the only method to detect borated water corrosion wastage or erosion-corrosion damage and may require insulation removal and/or disassembly of the component, in some cases, in order to have direct visual access to the threaded fasteners. Therefore, degradation could go undetected when there is no clear evidence of leakage in the surrounding area. Similarly, the reliability of visual examination alone is questionable in detection of SCC initiation of threaded fasteners either in-situ or removed. Accordingly, it is necessary that a combination of nondestructive examination techniques (UT, VT-1, MT, PT) be employed to the maximum extent practical to enhance detection of the degradation mechanisms discussed above.

Actions To Be Taken by PWR Facilities Holding Operating Licenses:

The scope of action items listed below is limited to the RCPB. Included are the threaded fasteners (studs or bolts) in (1) steam generator and pressurizer manway closures, (2) valve bonnets, and pump flange connections installed on lines having a nominal diameter of 6 inches or greater and (3) control rod drive (CRD) flange and pressurizer heater connections that do not have seal welds to provide leak-tight integrity. That is, CRDs having an omega seal weld design are excluded from this bulletin action. The reactor vessel head closure studs are also excluded for those PWR licensees committed to the provisions of Regulatory Guide 1.65, "Materials and Inspection for Reactor Vessel Closure Studs."

Action Item 1 is to be completed prior to the performance of the subsequent action items. Action Item 2 is to be performed within the next cycle, but no later than the completion of the next refueling outage that is initiated after 60 days from the date of this bulletin. The report requested by Action Item 3 is to be submitted within 60 days from the date of this bulletin.

1. Where procedures do not exist, develop and implement maintenance procedures for threaded fastener practices. These procedures should

include, but not limited to the following: (1) maintenance crew training of proper bolting/stud practices, tools application, specifications and requirements, (2) detensioning and retensioning practices (torque iteration), specified tolerances, and other controls for disassembly and reassembly of component closure/seal connections, (3) gasket installation and controls, and (4) retensioning methods and other measures to eliminate reactor coolant leakage during operations.

Quality assurance measures should also be established for proper selection, procurement, and application of fastener lubricants and injection sealant compounds to minimize fastener susceptibility to SCC environments.

2. Threaded fasteners of closure connections, identified in the scope of this bulletin, when opened for component inspection or maintenance shall be removed*, cleaned, and inspected per IWA-2210 and IWA-2220 of ASME Code Section XI (1974 edition or later) before being reused.

3. NRC Information Notice Nos. 80-27 and 82-06, and similar INPO (Institute of Nuclear Power Operations) correspondence (with recommendations) have been issued in regard to corrosion problems associated with bolts/studs in RCPB closures (INPO/NSAC SER 81-12). To assist the Nuclear Regulatory Commission in its ongoing review and assessment of the scope of the problem you are asked to provide the following information for closures and connections within the scope of this bulletin:

   a. Identify those bolted closures of the RCPB that have experienced leakage, particularly those locations where leakage occurred during the most recent plant operating cycle. Describe the inspections made and corrective measures taken to eliminate the problem. If the leakage was attributed to gasket failure or its design, so indicate.

   b. Identify those closures and connections, if any, where fastener lubricants and injection sealant materials have been or are being used and report on plant experience with their application particularly any instances of SCC of fasteners. Include types and composition of materials used.

4. A written report signed under oath or affirmation under provisions of Section 182a, Atomic Energy Act of 1954 as amended, shall be submitted to the Regional Administrator of the appropriate NRC Regional Office within 60 days following the completion of the outage during which Action Item 2 was performed. The report is to include:

   a. A statement that Action Item 1 has been completed.

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* Fasteners "seized" or designed with interference fit, may be inspected in place.

b. Identification of the specific connections examined as required by Action Item 2.

c. The results of the examinations performed on the threaded fasteners as required by Action Item 2. If no degradation was observed for a particular connection, a statement to that effect, identification of the connection and, whether the fasteners were examined in place or removed is all that is required. If degradation was observed, the report should provide detailed information.

5. A written report signed under oath or affirmation under provisions of Section 182a, Atomic Energy Act of 1954 as amended, shall be submitted to the Regional Administrator of the appropriate NRC Regional Office within 60 days of the date of this bulletin. The report is to provide the information requested by Action Item 3.

Potential occupational exposure of personnel as a result of the above requirements should be considered in the program formulation process in an effort to maintain incurred exposures as low as reasonably achievable. Personnel exposure-savings techniques such as use of steam generator primary manway cover-handling fixtures offer substantial time and man-rem savings.

This request for information was approved by the Office of Management and Budget under clearance number 3150-0086. Comments on burden and duplication should be directed to the Office of Management and Budget, Reports Management, Room 3208, New Executive Office Building, Washington, D.C. 20503.

While no specific request or requirement is intended, the following information would be helpful to the NRC in evaluating the cost of this bulletin:

1. Staff time to perform requested inspection.
2. Radiation exposure attributed to requested inspections.
3. Staff time spent to prepare written responses.

If you have any questions regarding this matter, please contact the Regional Administrator of the appropriate NRC Regional Office, or this office.

Richard C. DeYoung, Director
Office of Inspection and Enforcement

Technical Contact: W. J. Collins
301-492-4780

Attachments:
1. Table 1
2. List of Recently Issued IE Bulletins

TABLE 1. SUMMARY OF DEGRADED THREADED FASTENERS IN REACTOR COOLANT PRESSURE BOUNDARY

ıraded Reactor Coolant Pressure Boundary Threaded Fasteners	No. of Reported Incidents	Plants (Year Incident Reported) & Reactor Vendor	Mode of Failure*
ɛssurizer manway closure studs	2	Calvert Cliffs 2 (1981) C-E	BC
		St. Lucie 1 (1978) C-E	BC
ɛam generator manway closure ıds	7	Maine Yankee (1982) C-E	SC
		Oconee 3 (1980) B&W	SC
		Arkansas 1 (1978) B&W	BC
		Arkansas 1 (1980) B&W	SC
		Calvert Cliffs 1 (1980) C-E	BC
		St. Lucie 1 (1977) C-E	BC
		San Onofre 1 (1977) W	SC
ıctor coolant pump closure ıds	5	Ft. Calhoun (1980) C-E	BC
		Calvert Cliffs 1 (1980) C-E	BC
		Calvert Cliffs 2 (1981) C-E	BC
		Oconee 3 (1981) B&W	BC
		Oconee 2 (1981) B&W	BC
ety injection check valve ds	1	Calvert Cliffs 2 (1981) C-E	BC

C = stress corrosion; BC = borated water corrosion.

APPENDIX B

PALO VERDE UNIT 1 HIGH STRENGTH BOLT TORQUE CHECK
FOR CRITICAL FRICTION FASTENERS

PALO VERDE UNIT 1 HIGH STRENGTH BOLT TORQUE

INSP. DATE	BOLT GRADE	SIZE (IN)	DWG. NO.	CONN. NO.	BOLT NO.	NUT ROTAT
3-7-84	A325	0.875	535	34	01	0.750
3-2-84	A325	0.875	529	04	01	0.333
3-7-84	A325	0.875	535	25	05	0.333
3-7-84	A325	0.875	535	25	04	0.333
3-9-84	A490	1.000	532	24	06	0.271
3-9-84	A490	1.000	532	24	07	0.250
3-5-84	A325	0.875	532	06	03	0.250
3-7-84	A325	0.875	533	10	07	0.250
3-5-84	A325	0.875	536	14	01	0.250
3-9-84	A490	1.000	532	24	09	0.250
3-6-84	A325	0.875	532	17	07	0.250
3-2-84	A325	0.875	529	04	02	0.250
3-5-84	A325	0.875	536	14	02	0.250
3-8-84	A325	0.875	533	31	07	0.167
3-2-84	A325	0.875	529	06	02	0.167
3-6-84	A325	0.875	532	19	05	0.167
3-9-84	A490	1.000	532	24	08	0.167
3-6-84	A325	0.875	532	26	04	0.167
3-7-84	A325	0.875	533	14	01	0.167
3-5-84	A325	0.875	530	01	03	0.167
3-5-84	A325	0.875	532	06	02	0.167
3-6-84	A325	0.875	532	26	02	0.167
3-9-84	A490	0.875	535	33	01	0.125
3-6-84	A325	0.875	532	14	01	0.111
3-7-84	A325	0.875	535	37	05	0.083
3-8-84	A325	0.875	533	34	02	0.083
3-6-84	A325	0.875	533	02	09	0.083
3-7-84	A325	0.875	533	10	06	0.083
3-5-84	A325	0.875	532	05	08	0.083
3-6-84	A325	0.875	532	19	06	0.083
3-9-84	A490	1.000	532	06	07	0.083
3-9-84	A490	1.000	532	24	10	0.083
3-7-84	A325	0.875	535	08	06	0.083
3-5-84	A325	0.875	532	06	04	0.083
3-9-84	A490	0.875	535	31	04	0.083
3-6-84	A325	0.875	532	26	01	0.083
3-6-84	A325	0.875	532	17	05	0.083
3-7-84	A325	0.875	535	34	03	0.083
3-6-84	A325	0.875	532	16	02	0.083
3-7-84	A325	0.875	535	34	02	0.083
3-6-84	A325	0.875	532	16	03	0.083
3-8-84	A325	0.875	533	34	07	0.083
3-6-84	A325	0.875	532	16	05	0.083
3-8-84	A325	0.875	533	04	01	0.083
3-6-84	A325	0.875	533	02	08	0.083
3-5-84	A325	0.875	531	01	07	0.083
3-5-84	A325	0.875	532	06	01	0.083
3-6-84	A325	0.875	532	26	03	0.083
3-6-84	A325	0.875	532	17	01	0.083
3-8-84	A325	0.875	533	02	03	0.083
3-8-84	A325	0.875	533	27	01	0.083
3-6-84	A325	0.875	532	26	05	[illegible]
3-8-84	A325	0.875	533	04	03	[illegible]

3-8-84	A325	0.875	536	16	02	0.083
3-5-84	A325	0.875	532	06	06	0.083
3-8-84	A325	0.875	533	34	08	0.083
3-6-84	A325	0.875	532	16	04	0.083
3-6-84	A325	0.875	532	16	01	0.083
3-5-84	A325	0.875	532	01	01	0.083
3-6-84	A325	0.875	533	02	07	0.083
3-7-84	A325	0.875	533	10	01	0.056
3-7-84	A325	0.875	533	10	08	0.056
3-6-84	A325	0.875	533	01	01	0.042
3-9-84	A490	0.875	535	15	05	0.042
3-8-84	A325	0.875	533	28	06	0.042
3-8-84	A325	0.875	533	01	01	0.042
3-6-84	A325	0.875	532	17	04	0.042
3-6-84	A325	0.875	532	27	02	0.042
3-6-84	A325	0.875	532	17	02	0.042
3-7-84	A325	0.875	535	35	01	0.042
3-8-84	A325	0.875	533	24	01	0.042
3-6-84	A325	0.875	532	26	07	0.042
3-7-84	A325	0.875	535	37	01	0.042
3-7-84	A325	0.875	535	37	04	0.042
3-5-84	A325	0.875	530	01	05	0.042
3-7-84	A325	0.875	533	07	07	0.042
3-8-84	A325	0.875	533	24	07	0.042
3-6-84	A325	0.875	532	19	08	0.042
3-6-84	A325	0.875	534	07	01	0.042
3-8-84	A325	0.875	536	16	01	0.042
3-9-84	A490	0.875	535	33	09	0.042
3-5-84	A325	0.875	532	01	02	0.042
3-8-84	A325	0.875	536	12	01	0.042
3-8-84	A325	0.875	533	27	02	0.042
3-5-84	A325	0.875	532	06	05	0.042
3-7-84	A325	0.875	535	07	08	0.042
3-8-84	A325	0.875	536	12	03	0.042
3-5-84	A325	0.875	532	01	05	0.042
3-8-84	A325	0.875	536	11	01	0.042
3-6-84	A325	0.875	532	20	01	0.042
3-8-84	A325	0.875	536	11	03	0.042
3-5-84	A325	0.875	531	01	01	0.042
3-8-84	A325	0.875	533	33	02	0.042
3-8-84	A325	0.875	533	27	06	0.042
3-8-84	A325	0.875	533	33	01	0.042
3-7-84	A325	0.875	535	37	06	0.042
3-5-84	A325	0.875	532	05	06	0.042
3-8-84	A325	0.875	533	33	03	0.042
3-7-84	A325	0.875	533	10	02	0.042
3-7-84	A325	0.875	535	28	06	0.042
3-5-84	A325	0.875	532	02	01	0.031
3-5-84	A325	0.875	530	01	04	0.028
3-5-84	A325	0.875	530	01	02	0.028
3-5-84	A325	0.875	530	01	03	0.028
3-5-84	A325	0.875	530	01	04	0.028
3-7-84	A325	0.875	535	07	02	0.021
3-7-84	A325	0.875	535	37	03	0.021
3-5-84	A325	0.875	532	05	05	[illegible]
3-9-84	A490	0.875	535	24	07	[illegible]

3-6-84	A325	0.875	534	22	06	0.021
3-9-84	A490	0.875	535	24	06	0.021
3-9-84	A490	0.875	535	24	04	0.021
3-7-84	A325	0.875	535	37	02	0.021
3-8-84	A325	0.875	533	34	06	0.021
3-7-84	A325	0.875	535	35	03	0.021
3-8-84	A325	0.875	533	34	01	0.021
3-7-84	A325	0.875	535	25	06	0.021
3-8-84	A325	0.875	533	33	08	0.021
3-7-84	A325	0.875	535	12	05	0.021
3-8-84	A325	0.875	533	31	05	0.021
3-7-84	A325	0.875	535	07	14	0.021
3-8-84	A325	0.875	536	13	03	0.021
3-7-84	A325	0.875	535	07	13	0.021
3-6-84	A325	0.875	534	22	04	0.021
3-7-84	A325	0.875	535	07	12	0.021
3-8-84	A325	0.875	533	24	05	0.021
3-7-84	A325	0.875	535	07	11	0.021
3-8-84	A325	0.875	533	27	04	0.021
3-7-84	A325	0.875	535	07	10	0.021
3-7-84	A325	0.875	533	07	06	0.021
3-7-84	A325	0.875	535	07	09	0.021
3-9-84	A490	0.875	535	24	05	0.021
3-7-84	A325	0.875	535	07	07	0.021
3-8-84	A325	0.875	533	34	03	0.021
3-7-84	A325	0.875	535	07	04	0.021
3-8-84	A325	0.875	533	31	06	0.021
3-7-84	A325	0.875	535	07	01	0.021
3-8-84	A325	0.875	536	11	02	0.021
3-6-84	A325	0.875	533	02	06	0.021
3-8-84	A325	0.875	533	27	05	0.021
3-6-84	A325	0.875	532	26	10	0.021
3-7-84	A325	0.875	535	37	07	0.021
3-6-84	A325	0.875	532	26	06	0.021
3-5-84	A325	0.875	531	01	02	0.021
3-6-84	A325	0.875	532	15	02	0.021
3-8-84	A325	0.875	536	12	02	0.021
3-6-84	A325	0.875	532	13	04	0.021
3-9-84	A490	0.875	535	15	06	0.021
3-7-84	A325	0.875	533	08	07	0.021
3-5-84	A325	0.875	536	14	03	0.021
3-6-84	A325	0.875	532	13	02	0.021
3-5-84	A325	0.875	532	02	09	0.016
3-5-84	A325	0.875	532	01	08	0.016
3-7-84	A325	0.875	535	14	07	0.000
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3-5-84	A325	0.875	532	08	05	0.000

3-7-84	A325	0.875	535	28	02	0.000
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3-7-84	A325	0.875	535	28	04	0.000
3-5-84	A325	0.875	532	07	04	0.000
3-7-84	A325	0.875	535	28	05	0.000
3-5-84	A325	0.875	532	05	07	0.000
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3-5-84	A325	0.875	532	05	09	0.000
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3-5-84	A325	0.875	532	03	02	0.000
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3-5-84	A325	0.875	530	01	01	0.000
3-6-84	A325	0.875	534	21	01	0.000
3-5-84	A325	0.875	532	02	07	0.000
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3-7-84	A325	0.875	535	34	04	0.000
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3-6-84	A325	0.875	532	14	02	

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3-7-84	A325	0.875	533	16	06	0.000
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3-7-84	A325	0.875	533	18	02	0.000
3-6-84	A325	0.875	532	17	06	0.000
3-7-84	A325	0.875	533	18	03	0.000
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3-7-84	A325	0.875	533	18	04	0.000
3-5-84	A325	0.875	530	01	02	0.000
3-7-84	A325	0.875	533	18	05	0.000
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3-7-84	A325	0.875	533	19	02	0.000
3-6-84	A325	0.875	532	18	01	0.000
3-7-84	A325	0.875	533	19	03	0.000
3-6-84	A325	0.875	532	18	03	0.000
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3-6-84	A325	0.875	532	18	05	0.000
3-8-84	A325	0.875	533	29	02	0.000
3-6-84	A325	0.875	532	19	01	0.000
3-8-84	A325	0.875	533	29	03	0.000
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3-8-84	A325	0.875	533	29	04	0.000
3-5-84	A325	0.875	530	01	03	0.000
3-8-84	A325	0.875	533	29	05	0.000
3-6-84	A325	0.875	532	19	07	0.000
3-8-84	A325	0.875	533	29	06	0.000
3-5-84	A325	0.875	530	01	09	0.000
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3-6-84	A325	0.875	532	20	03	0.000
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3-6-84	A325	0.875	532	20	05	0.000
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3-6-84	A325	0.875	532	23	01	0.000
3-8-84	A325	0.875	533	30	04	0.000
3-6-84	A325	0.875	532	23	03	0.000
3-8-84	A325	0.875	533	30	05	0.000
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3-6-84	A325	0.875	532	23	07	0.000
3-8-84	A325	0.875	533	31	01	0.000
3-6-84	A325	0.875	532	23	09	0.000
3-8-84	A325	0.875	533	31	02	0.000
3-5-84	A325	0.875	530	01	08	0.000

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-8-84	A325	0.875	533	31	03	0.000
3-5-84	A325	0.875	530	01	06	0.000
3-8-84	A325	0.875	533	31	04	0.000
3-5-84	A325	0.875	530	01	02	0.000
3-8-84	A325	0.875	533	26	05	0.000
3-5-84	A325	0.875	530	01	01	0.000
3-8-84	A325	0.875	533	26	06	0.000
3-6-84	A325	0.875	532	26	09	0.000
3-8-84	A325	0.875	533	26	07	0.000
3-6-84	A325	0.875	532	27	01	0.000
3-8-84	A325	0.875	533	26	08	0.000
3-6-84	A325	0.875	532	27	03	0.000
3-5-84	A325	0.875	530	01	08	0.000
3-6-84	A325	0.875	532	27	05	0.000
3-5-84	A325	0.875	530	01	07	0.000
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3-6-84	A325	0.875	533	02	03	0.000
3-5-84	A325	0.875	530	01	06	0.000
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3-8-84	A325	0.875	533	28	01	0.000
3-5-84	A325	0.875	530	01	05	0.000
3-8-84	A325	0.875	533	28	02	0.000
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3-6-84	A325	0.875	533	03	07	0.000
3-5-84	A325	0.875	530	01	04	0.000
3-6-84	A325	0.875	533	03	09	0.000
3-8-84	A325	0.875	533	24	02	0.000
3-7-84	A325	0.875	535	03	01	0.000
3-8-84	A325	0.875	533	24	03	0.000
3-7-84	A325	0.875	535	03	03	0.000
3-8-84	A325	0.875	533	24	04	0.000
3-7-84	A325	0.875	535	03	05	0.000
3-5-84	A325	0.875	532	02	02	0.000
3-7-84	A325	0.875	535	03	07	0.000
3-8-84	A325	0.875	533	24	06	0.000
3-7-84	A325	0.875	535	06	02	0.000
3-5-84	A325	0.875	530	01	03	0.000
3-7-84	A325	0.875	535	06	04	0.000
3-8-84	A325	0.875	533	24	08	0.000
3-7-84	A325	0.875	535	06	06	0.000
3-8-84	A325	0.875	533	25	01	0.000
3-7-84	A325	0.875	535	06	08	0.000
3-8-84	A325	0.875	533	25	02	0.000
3-7-84	A325	0.875	535	06	10	0.000

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-8-84	A325	0.875	533	25	03	0.000
3-7-84	A325	0.875	535	06	12	0.000
3-8-84	A325	0.875	533	25	04	0.000
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3-8-84	A325	0.875	533	25	06	0.000
3-5-84	A325	0.875	532	04	03	0.000
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3-5-84	A325	0.875	532	04	01	0.000
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3-7-84	A325	0.875	535	08	07	0.000
3-5-84	A325	0.875	532	01	07	0.000
3-7-84	A325	0.875	535	12	02	0.000
3-5-84	A325	0.875	530	01	07	0.000
3-7-84	A325	0.875	535	12	04	0.000
3-8-84	A325	0.875	536	13	01	0.000
3-7-84	A325	0.875	535	12	06	0.000
3-8-84	A325	0.875	536	13	02	0.000
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3-5-84	A325	0.875	532	01	06	0.000
3-7-84	A325	0.875	535	13	03	0.000
3-8-84	A325	0.875	536	06	01	0.000
3-7-84	A325	0.875	535	13	05	0.000
3-8-84	A325	0.875	536	06	02	0.000
3-7-84	A325	0.875	535	13	07	0.000
3-8-84	A325	0.875	536	06	03	0.000
3-7-84	A325	0.875	535	13	09	0.000
3-8-84	A325	0.875	536	05	01	0.000
3-7-84	A325	0.875	535	13	11	0.000
3-8-84	A325	0.875	536	05	02	0.000
3-7-84	A325	0.875	535	13	13	0.000
3-8-84	A325	0.875	536	05	03	0.000
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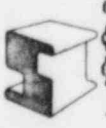
3-5-84	A325	0.875	530	01	01	0.000
3-9-84	A490	0.875	535	32	03	0.000
3-5-84	A325	0.875	530	01	01	0.000
3-9-84	A490	0.875	535	32	04	0.000
3-6-84	A325	0.875	532	18	06	0.000
3-9-84	A490	0.875	535	32	05	0.000
3-6-84	A325	0.875	532	23	02	0.000
3-9-84	A490	0.875	535	32	06	0.000
3-6-84	A325	0.875	532	26	08	0.000



STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-9-84	A490	0.875	535	32	07	0.000
3-6-84	A325	0.875	533	02	04	0.000
3-2-84	A325	0.875	530	05	02	0.000
3-6-84	A325	0.875	533	03	10	0.000
3-9-84	A490	0.875	535	33	02	0.000
3-7-84	A325	0.875	535	06	09	0.000
3-9-84	A490	0.875	535	33	03	0.000
3-5-84	A325	0.875	532	03	07	0.000
3-9-84	A490	0.875	535	33	04	0.000
3-7-84	A325	0.875	535	12	07	0.000
3-9-84	A490	0.875	535	33	05	0.000
3-7-84	A325	0.875	535	17	02	0.000
3-9-84	A490	0.875	535	33	06	0.000
3-7-84	A325	0.875	535	14	11	0.000
3-9-84	A490	0.875	535	33	07	0.000
3-7-84	A325	0.875	535	20	06	0.000
3-9-84	A490	0.875	535	33	08	0.000
3-5-84	A325	0.875	530	01	05	0.000
3-2-84	A325	0.875	530	05	01	0.000
3-6-84	A325	0.875	534	21	10	0.000
3-9-84	A490	0.875	535	33	10	0.000
3-6-84	A325	0.875	534	17	07	0.000
3-9-84	A490	0.875	535	33	11	0.000
3-6-84	A325	0.875	534	10	09	0.000
3-9-84	A490	0.875	535	33	12	0.000
3-6-84	A325	0.875	534	07	07	0.000
3-9-84	A490	0.875	535	33	13	0.000
3-6-84	A325	0.875	532	17	03	0.000
3-9-84	A490	0.875	535	33	14	0.000
3-5-84	A325	0.875	530	01	01	0.000
3-9-84	A490	0.875	535	38	01	0.000
3-5-84	A325	0.875	530	01	06	0.000
3-9-84	A490	0.875	535	38	02	0.000
3-7-84	A325	0.875	535	06	01	0.000
3-9-84	A490	0.875	535	38	03	0.000
3-5-84	A325	0.875	530	01	01	0.000
3-9-84	A490	0.875	535	38	04	0.000
3-7-84	A325	0.875	535	14	03	0.000
3-9-84	A490	0.875	535	38	05	0.000
3-5-84	A325	0.875	532	08	04	0.000
3-9-84	A490	0.875	535	38	06	0.000
3-6-84	A325	0.875	534	22	12	0.000
3-9-84	A490	0.875	535	38	07	0.000
3-6-84	A325	0.875	534	06	08	0.000
3-2-84	A325	0.875	529	05	02	0.000
3-6-84	A325	0.875	532	15	06	0.000
3-2-84	A325	0.875	529	05	01	0.000
3-6-84	A325	0.875	533	03	02	0.000
3-2-84	A325	0.875	529	03	02	0.000
3-7-84	A325	0.875	535	13	08	0.000
3-2-84	A325	0.875	529	03	01	0.000
3-6-84	A325	0.875	534	21	02	0.000
3-2-84	A325	0.875	529	02	02	0.000
3-6-84	A325	0.875	532	13	01	0.000
3-9-84	A490	1.000	532	06	04	0.000
3-7-84	A325	0.875	535	07	03	0.000

3-9-84	A490	1.000	532	06	05	0.000
3-6-84	A325	0.875	534	16	08	0.000
3-5-84	A325	0.875	530	01	07	0.000
3-6-84	A325	0.875	532	23	10	0.000
3-9-84	A490	1.000	532	06	06	0.000
3-2-84	A325	0.875	529	02	01	0.000

PALO VERDE UNIT 1 HIGH STRENGTH BOLT TORQUE

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	CONN. NO.	BOLT NO.	NUT ROTAT
3-14-84	A325	0.875	536	02	01	1.083
3-19-84	A325	0.875	535	11	06	0.500
3-19-84	A325	0.875	535	38	05	0.500
3-19-84	A325	0.875	535	11	05	0.500
3-12-84	A325	1.000	530	09	02	0.333
3-19-84	A325	0.875	535	38	02	0.333
3-12-84	A325	0.875	530	17	07	0.333
3-19-84	A325	0.875	535	05	04	0.333
3-19-84	A325	0.875	535	38	03	0.292
3-12-84	A325	0.875	532	11	03	0.278
3-13-84	A325	0.875	531	05	03	0.271
3-19-84	A325	0.875	535	38	04	0.250
3-12-84	A325	0.875	532	16	06	0.250
3-12-84	A325	0.875	530	17	06	0.250
3-19-84	A325	0.875	535	38	07	0.250
3-12-84	A325	1.000	530	09	03	0.250
3-19-84	A325	0.875	535	38	06	0.250
3-12-84	A325	1.000	530	07	04	0.250
3-19-84	A325	0.875	535	11	01	0.208
3-19-84	A325	0.875	535	11	04	0.208
3-12-84	A325	0.875	530	17	04	0.167
3-12-84	A325	1.000	530	09	04	0.167
3-19-84	A325	0.875	535	11	02	0.167
3-19-84	A325	0.875	535	11	07	0.167
3-12-84	A325	1.000	530	09	05	0.167
3-12-84	A325	0.875	530	13	06	0.167
3-12-84	A325	1.000	530	07	09	0.167
3-19-84	A325	0.875	535	11	03	0.167
3-12-84	A325	0.875	532	11	01	0.167
3-12-84	A325	0.875	530	17	05	0.167
3-12-84	A325	0.875	532	11	06	0.167
3-14-84	A325	0.875	536	11	01	0.147
3-9-84	A490	1.000	533	05	05	0.125
3-12-84	A325	1.000	530	07	03	0.125
3-22-84	A490	1.375	540	06*E	07	0.104
3-12-84	A325	1.000	530	09	06	0.083
3-19-84	A325	0.875	535	04	07	0.083
3-12-84	A325	1.000	530	09	07	0.083
3-12-84	A325	1.000	530	09	08	0.083
3-12-84	A325	1.000	530	07	07	0.083
3-12-84	A325	1.000	530	07	08	0.083
3-12-84	A490	0.875	534	09	04	0.083
3-19-84	A325	0.875	535	04	01	0.083
3-19-84	A325	0.875	535	04	04	0.083
3-12-84	A325	0.875	532	11	05	0.083
3-19-84	A325	0.875	535	04	06	0.083
3-12-84	A325	0.875	532	11	02	0.083
3-12-84	A325	0.875	532	21	03	0.083
3-14-84	A325	0.875	536	17	03	0.083
3-19-84	A325	0.875	535	05	03	0.083
3-12-84	A325	0.875	533	09	09	0.083
3-12-84	A325	1.000	530	09	09	0.083
3-30-84	A490	1.375	541	04E	06	

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-13-84	A325	0.875	531	03	01	0.083
3-12-84	A325	0.875	533	09	08	0.083
3-12-84	A325	0.875	532	21	04	0.083
3-13-84	A325	0.875	531	04	07	0.083
3-12-84	A325	1.000	530	07	02	0.083
3-19-84	A325	0.875	535	38	01	0.083
3-12-84	A325	0.875	532	21	02	0.083
3-28-84	A490	1.375	540	20W	01	0.056
3-22-84	A490	1.375	540	06*E	04	0.042
3-12-84	A325	0.875	532	21	06	0.042
3-30-84	A490	1.375	541	04E	02	0.042
3-12-84	A325	0.875	532	21	05	0.042
3-12-84	A325	0.875	533	09	07	0.042
3-13-84	A325	0.875	531	05	04	0.042
3-12-84	A325	1.000	530	09	01	0.042
3-12-84	A325	1.000	530	07	05	0.042
3-12-84	A325	0.875	530	17	01	0.042
3-9-84	A490	1.000	533	05	07	0.042
3-19-84	A325	0.875	535	04	03	0.042
3-9-84	A490	1.000	533	05	06	0.042
3-14-84	A325	0.875	536	17	01	0.042
3-19-84	A325	0.875	535	04	05	0.042
3-12-84	A325	0.875	533	09	05	0.042
3-22-84	A490	1.375	540	06*E	06	0.042
3-12-84	A325	0.875	532	21	07	0.042
3-19-84	A325	0.875	535	04	02	0.042
3-12-84	A325	0.875	532	11	04	0.042
3-12-84	A325	0.875	532	21	01	0.042
3-12-84	A490	0.875	534	08	04	0.021
4-5-84	A490	1.375	541	05E	02	0.021
3-20-84	A490	1.375	540	22	02A	0.021
3-28-84	A490	1.375	540	15W	01	0.021
3-12-84	A490	0.875	534	25	03	0.021
3-28-84	A490	1.375	540	20E	08	0.021
4-5-84	A490	1.375	540	41E	02	0.021
3-9-84	A490	1.000	533	05	10	0.021
3-30-84	A490	1.375	540	42W	07	0.021
3-9-84	A490	1.000	533	05	09	0.021
3-12-84	A325	0.875	533	09	01	0.021
3-28-84	A490	1.375	540	20E	01	0.021
3-12-84	A325	0.875	533	09	03	0.021
3-12-84	A325	1.000	530	07	06	0.021
3-30-84	A490	1.375	540	35W	03	0.021
3-12-84	A325	0.875	530	17	03	0.021
3-30-84	A490	1.375	540	35W	02	0.021
4-5-84	A490	1.375	541	05E	03	0.021
3-30-84	A490	1.375	541	04W	02	0.021
3-28-84	A490	1.375	540	14W	07	0.021
4-5-84	A490	1.375	540	41E	03	0.021
3-12-84	A325	1.000	530	07	01	0.021
3-30-84	A490	1.375	540	42W	05	0.021
4-5-84	A490	1.375	541	05E	04	0.021
3-12-84	A325	0.875	533	09	04	0.021
3-28-84	A490	1.375	540	14W	05	0.021
3-13-84	A325	0.875	531	03	05	0.021
3-13-84	A325	0.875	531	03	02	0.021

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3-12-84	A325	0.875	532	21	08	0.021
4-5-84	A490	1.375	541	05E	05	0.021
3-12-84	A325	0.875	533	09	06	0.021
3-30-84	A490	1.375	540	42W	02	0.021
4-5-84	A490	1.375	540	41E	06	0.021
3-12-84	A490	0.875	534	08	01	0.021
3-28-84	A490	1.375	540	18E	03	0.000
3-28-84	A490	1.375	540	10E	05	0.000
3-13-84	A325	0.875	531	03	06	0.000
3-28-84	A490	1.375	540	10E	06	0.000
3-13-84	A325	0.875	531	04	01	0.000
3-28-84	A490	1.375	540	16W	01	0.000
3-13-84	A325	0.875	531	04	03	0.000
3-28-84	A490	1.375	540	16W	02	0.000
3-13-84	A325	0.875	531	04	05	0.000
3-28-84	A490	1.375	540	16W	03	0.000
3-13-84	A325	0.875	531	03	04	0.000
3-28-84	A490	1.375	540	16W	04	0.000
3-13-84	A325	0.875	531	06	01	0.000
3-28-84	A490	1.375	540	16W	05	0.000
3-13-84	A325	0.875	531	06	03	0.000
3-28-84	A490	1.375	540	16W	06	0.000
3-13-84	A325	0.875	531	05	02	0.000
3-28-84	A490	1.375	540	17E	01	0.000
3-12-84	A325	0.875	530	17	02	0.000
3-28-84	A490	1.375	540	17E	02	0.000
3-13-84	A325	0.875	531	05	06	0.000
3-28-84	A490	1.375	540	17E	03	0.000
3-13-84	A325	0.875	531	05	08	0.000
3-28-84	A490	1.375	540	17E	04	0.000
3-13-84	A325	0.875	531	06	05	0.000
3-28-84	A490	1.375	540	17E	05	0.000
3-14-84	A325	0.875	536	01	02	0.000
3-28-84	A490	1.375	540	17E	06	0.000
3-12-84	A325	0.875	530	19	03	0.000
3-28-84	A490	1.375	540	18W	01	0.000
3-14-84	A325	0.875	536	02	03	0.000
3-28-84	A490	1.375	540	18W	02	0.000
3-14-84	A325	0.875	536	17	02	0.000
3-28-84	A490	1.375	540	18W	03	0.000
3-12-84	A325	0.875	533	09	10	0.000
3-28-84	A490	1.375	540	18W	04	0.000
3-14-84	A325	0.875	534	19	02	0.000
3-28-84	A490	1.375	540	18W	05	0.000
3-14-84	A325	0.875	534	19	04	0.000
3-28-84	A490	1.375	540	18W	06	0.000
3-14-84	A325	0.875	534	19	06	0.000
3-28-84	A490	1.375	540	19	01	0.000
3-14-84	A325	0.875	534	19	01	0.000
3-28-84	A490	1.375	540	19	02	0.000
3-14-84	A325	0.875	534	01	03	0.000
3-28-84	A490	1.375	540	19	03	0.000
3-14-84	A325	0.875	534	01	05	0.000
3-28-84	A490	1.375	540	19	04	0.000
				01	07	
				19	05	

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3-14-84	A490	1.000	532	25	05	0.000
3-28-84	A490	1.375	540	19	06	0.000
3-14-84	A490	1.000	532	25	07	0.000
3-12-84	A490	0.875	534	23	03	0.000
3-12-84	A325	0.875	533	09	02	0.000
3-28-84	A490	1.375	540	20W	02	0.000
3-12-84	A325	0.875	532	21	09	0.000
3-28-84	A490	1.375	540	20W	03	0.000
3-12-84	A325	0.875	533	17	03	0.000
3-28-84	A490	1.375	540	20W	04	0.000
3-12-84	A325	0.875	533	17	01	0.000
3-28-84	A490	1.375	540	20W	05	0.000
3-19-84	A325	0.875	535	05	02	0.000
3-28-84	A490	1.375	540	20W	06	0.000
3-12-84	A325	0.875	533	11	06	0.000
3-28-84	A490	1.375	540	20W	07	0.000
3-19-84	A325	0.875	535	05	06	0.000
3-28-84	A490	1.375	540	20W	08	0.000
3-19-84	A325	0.875	535	05	08	0.000
3-12-84	A490	0.875	534	23	02	0.000
3-12-84	A325	0.875	533	11	04	0.000
3-28-84	A490	1.375	540	20E	02	0.000
3-12-84	A325	0.875	533	11	02	0.000
3-28-84	A490	1.375	540	20E	03	0.000
3-12-84	A490	0.875	534	09	07	0.000
3-28-84	A490	1.375	540	20E	04	0.000
3-19-84	A325	0.875	535	10	01	0.000
3-28-84	A490	1.375	540	20E	05	0.000
3-19-84	A325	0.875	535	10	03	0.000
3-28-84	A490	1.375	540	20E	06	0.000
3-19-84	A325	0.875	535	10	05	0.000
3-28-84	A490	1.375	540	20E	07	0.000
3-19-84	A325	0.875	535	10	07	0.000
3-12-84	A490	0.875	534	23	01	0.000
3-19-84	A325	0.875	535	18	02	0.000
3-12-84	A490	0.875	534	26	07	0.000
3-19-84	A325	0.875	535	18	03	0.000
3-28-84	A490	1.375	540	15W	02	0.000
3-19-84	A325	0.875	535	18	05	0.000
3-28-84	A490	1.375	540	15W	03	0.000
3-19-84	A325	0.875	535	18	07	0.000
3-28-84	A490	1.375	540	15W	04	0.000
3-12-84	A490	0.875	534	09	03	0.000
3-28-84	A490	1.375	540	15W	05	0.000
3-12-84	A490	0.875	534	09	01	0.000
3-28-84	A490	1.375	540	15W	06	0.000
3-12-84	A490	0.875	534	08	06	0.000
3-28-84	A490	1.375	540	15E	01	0.000
3-20-84	A490	1.375	540	22	01A	0.000
3-28-84	A490	1.375	540	15E	02	0.000
3-20-84	A490	1.375	540	22	03A	0.000
3-28-84	A490	1.375	540	15E	03	0.000
3-20-84	A490	1.375	540	22	05A	0.000
3-28-84	A490	1.375	540	15E	04	0.000
3-20-84	A490	1.375	540	22	01B	0.000
3-28-84	A490	1.375	540	15E	05	

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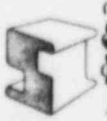
3-20-84	A490	1.375	540	22	03B	0.000
3-28-84	A490	1.375	540	15E	06	0.000
3-20-84	A490	1.375	540	22	05B	0.000
3-28-84	A490	1.375	540	01W	01	0.000
3-21-84	A490	1.375	540	23W	01	0.000
3-28-84	A490	1.375	540	01W	02	0.000
3-21-84	A490	1.375	540	23W	03	0.000
3-28-84	A490	1.375	540	01W	03	0.000
3-21-84	A490	1.375	540	23W	05	0.000
3-28-84	A490	1.375	540	01W	04	0.000
3-21-84	A490	1.375	540	24E	01	0.000
3-28-84	A490	1.375	540	01W	05	0.000
3-21-84	A490	1.375	540	24E	03	0.000
3-28-84	A490	1.375	540	01W	06	0.000
3-21-84	A490	1.375	540	24E	05	0.000
3-28-84	A490	1.375	541	01E	01	0.000
3-21-84	A490	1.375	540	25W	01	0.000
3-28-84	A490	1.375	541	01E	02	0.000
3-21-84	A490	1.375	540	25W	03	0.000
3-28-84	A490	1.375	541	01E	03	0.000
3-21-84	A490	1.375	540	25W	05	0.000
3-28-84	A490	1.375	541	01E	04	0.000
3-21-84	A490	1.375	540	26E	01	0.000
3-28-84	A490	1.375	541	01E	05	0.000
3-21-84	A490	1.375	540	26E	03	0.000
3-28-84	A490	1.375	541	01E	06	0.000
3-21-84	A490	1.375	540	26E	05	0.000
3-28-84	A490	1.375	541	02W	01	0.000
3-21-84	A490	1.375	540	27W	01	0.000
3-28-84	A490	1.375	541	02W	02	0.000
3-21-84	A490	1.375	540	27W	03	0.000
3-28-84	A490	1.375	541	02W	03	0.000
3-21-84	A490	1.375	540	27W	05	0.000
3-28-84	A490	1.375	541	02W	04	0.000
3-21-84	A490	1.375	540	27W	07	0.000
3-28-84	A490	1.375	541	02W	05	0.000
3-21-84	A490	1.375	540	27E	01	0.000
3-28-84	A490	1.375	541	02W	06	0.000
3-21-84	A490	1.375	540	27E	03	0.000
3-28-84	A490	1.375	541	02W	07	0.000
3-21-84	A490	1.375	540	27E	05	0.000
3-28-84	A490	1.375	541	02W	08	0.000
3-21-84	A490	1.375	540	27E	07	0.000
3-28-84	A490	1.375	541	02W	09	0.000
3-21-84	A490	1.375	540	28W	01	0.000
3-29-84	A490	1.375	541	02E	01	0.000
3-21-84	A490	1.375	540	28W	03	0.000
3-29-84	A490	1.375	541	02E	02	0.000
3-21-84	A490	1.375	540	28W	05	0.000
3-29-84	A490	1.375	541	02E	03	0.000
3-21-84	A490	1.375	540	28W	07	0.000
3-29-84	A490	1.375	541	02E	04	0.000
3-21-84	A490	1.375	540	28E	01	0.000
3-29-84	A490	1.375	541	02E	05	0.000
3-21-84	A490	1.375	540	28E	03	0.000
3-29-84	A490	1.375	541	02E	06	0.000

3-21-84	A490	1.375	540	28E	05	0.000
3-29-84	A490	1.375	541	02E	07	0.000
3-21-84	A490	1.375	540	28E	07	0.000
3-29-84	A490	1.375	541	02E	08	0.000
3-21-84	A490	1.375	540	01W	01	0.000
3-29-84	A490	1.375	541	02E	09	0.000
3-21-84	A490	1.375	540	01W	03	0.000
3-29-84	A490	1.375	541	03W	01	0.000
3-21-84	A490	1.375	540	01W	05	0.000
3-29-84	A490	1.375	541	03W	02	0.000
3-21-84	A490	1.375	540	01E	01	0.000
3-29-84	A490	1.375	541	03W	03	0.000
3-21-84	A490	1.375	540	01E	03	0.000
3-29-84	A490	1.375	541	03W	04	0.000
3-21-84	A490	1.375	540	01E	05	0.000
3-29-84	A490	1.375	541	03W	05	0.000
3-21-84	A490	1.375	540	07W	01	0.000
3-29-84	A490	1.375	541	03W	06	0.000
3-21-84	A490	1.375	540	07W	03	0.000
3-29-84	A490	1.375	541	03W	07	0.000
3-21-84	A490	1.375	540	07W	05	0.000
3-29-84	A490	1.375	541	03W	08	0.000
3-21-84	A490	1.375	540	07W	07	0.000
3-29-84	A490	1.375	541	03E	01	0.000
3-21-84	A490	1.375	540	07E	01	0.000
3-29-84	A490	1.375	541	03E	02	0.000
3-21-84	A490	1.375	540	07E	03	0.000
3-29-84	A490	1.375	541	03E	03	0.000
3-21-84	A490	1.375	540	07E	05	0.000
3-29-84	A490	1.375	541	03E	04	0.000
3-21-84	A490	1.375	540	07E	07	0.000
3-29-84	A490	1.375	541	03E	05	0.000
3-22-84	A490	1.375	540	06*W	01	0.000
3-29-84	A490	1.375	541	03E	06	0.000
3-22-84	A490	1.375	540	06*W	03	0.000
3-29-84	A490	1.375	541	03E	07	0.000
3-22-84	A490	1.375	540	06*W	05	0.000
3-29-84	A490	1.375	541	03E	08	0.000
3-22-84	A490	1.375	540	06*W	07	0.000
3-29-84	A490	1.375	540	21W	01	0.000
3-22-84	A490	1.375	540	06*E	02	0.000
3-29-84	A490	1.375	540	21W	02	0.000
3-22-84	A490	1.375	540	06*E	03	0.000
3-29-84	A490	1.375	540	21W	03	0.000
3-22-84	A490	1.375	540	06*E	05	0.000
3-29-84	A490	1.375	540	21W	04	0.000
3-12-84	A490	0.875	534	23	06	0.000
3-29-84	A490	1.375	540	21W	05	0.000
3-22-84	A490	1.375	540	02W	01	0.000
3-29-84	A490	1.375	540	21W	06	0.000
3-22-84	A490	1.375	540	02W	03	0.000
3-29-84	A490	1.375	540	21W	07	0.000
3-22-84	A490	1.375	540	02W	05	0.000
3-29-84	A490	1.375	540	21W	08	0.000
3-22-84	A490	1.375	540	03E	01	0.000
3-29-84	A490	1.375	540	21E	01	0.000



STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-22-84	A490	1.375	540	03E	03	0.000
3-29-84	A490	1.375	540	21E	02	0.000
3-22-84	A490	1.375	540	03E	05	0.000
3-29-84	A490	1.375	540	21E	03	0.000
3-22-84	A490	1.375	540	04W	01	0.000
3-29-84	A490	1.375	540	21E	04	0.000
3-22-84	A490	1.375	540	04W	03	0.000
3-29-84	A490	1.375	540	21E	05	0.000
3-22-84	A490	1.375	540	04W	05	0.000
3-29-84	A490	1.375	540	21E	06	0.000
3-22-84	A490	1.375	540	05E	01	0.000
3-29-84	A490	1.375	540	21E	07	0.000
3-22-84	A490	1.375	540	05E	03	0.000
3-29-84	A490	1.375	540	21E	08	0.000
3-22-84	A490	1.375	540	05E	05	0.000
3-29-84	A490	1.375	540	29W	01	0.000
3-28-84	A490	1.375	540	08W	01	0.000
3-29-84	A490	1.375	540	29W	02	0.000
3-28-84	A490	1.375	540	08W	04	0.000
3-29-84	A490	1.375	540	29W	03	0.000
3-28-84	A490	1.375	540	08W	06	0.000
3-29-84	A490	1.375	540	29W	04	0.000
3-28-84	A490	1.375	540	18E	02	0.000
3-29-84	A490	1.375	540	29W	05	0.000
3-28-84	A490	1.375	540	18E	04	0.000
3-29-84	A490	1.375	540	29W	06	0.000
3-28-84	A490	1.375	540	18E	06	0.000
3-29-84	A490	1.375	540	29E	01	0.000
3-28-84	A490	1.375	540	14W	02	0.000
3-29-84	A490	1.375	540	29E	02	0.000
3-28-84	A490	1.375	540	14W	04	0.000
3-29-84	A490	1.375	540	29E	03	0.000
3-28-84	A490	1.375	540	14W	06	0.000
3-29-84	A490	1.375	540	29E	04	0.000
3-28-84	A490	1.375	540	14W	08	0.000
3-29-84	A490	1.375	540	29E	05	0.000
3-28-84	A490	1.375	540	14E	02	0.000
3-29-84	A490	1.375	540	29E	06	0.000
3-28-84	A490	1.375	540	14E	04	0.000
3-30-84	A490	1.375	541	04W	01	0.000
3-28-84	A490	1.375	540	14E	06	0.000
3-12-84	A490	0.875	534	26	06	0.000
3-28-84	A490	1.375	540	14E	08	0.000
3-30-84	A490	1.375	541	04W	03	0.000
3-28-84	A490	1.375	540	13W	02	0.000
3-30-84	A490	1.375	541	04W	04	0.000
3-28-84	A490	1.375	540	13W	04	0.000
3-30-84	A490	1.375	541	04W	05	0.000
3-28-84	A490	1.375	540	13W	06	0.000
3-30-84	A490	1.375	541	04W	06	0.000
3-28-84	A490	1.375	540	13W	08	0.000
3-30-84	A490	1.375	541	04E	01	0.000
3-28-84	A490	1.375	540	13E	02	0.000
3-12-84	A490	0.875	534	26	05	0.000
3-28-84	A490	1.375	540	13E	04	0.000
3-30-84	A490	1.375	541	04E	03	0.000

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-28-84	A490	1.375	540	13E	06	0.000
3-30-84	A490	1.375	541	04E	04	0.000
3-28-84	A490	1.375	540	13E	08	0.000
3-30-84	A490	1.375	541	04E	05	0.000
3-28-84	A490	1.375	540	11W	02	0.000
3-12-84	A490	0.875	534	26	04	0.000
3-28-84	A490	1.375	540	11W	04	0.000
3-30-84	A490	1.375	540	36W	01	0.000
3-28-84	A490	1.375	540	11W	06	0.000
3-30-84	A490	1.375	540	36W	02	0.000
3-28-84	A490	1.375	540	12E	02	0.000
3-30-84	A490	1.375	540	36W	03	0.000
3-28-84	A490	1.375	540	12E	04	0.000
3-30-84	A490	1.375	540	36W	04	0.000
3-28-84	A490	1.375	540	09W	06	0.000
3-30-84	A490	1.375	540	36W	05	0.000
3-28-84	A490	1.375	540	09W	02	0.000
3-30-84	A490	1.375	540	36W	06	0.000
3-28-84	A490	1.375	540	09W	04	0.000
3-30-84	A490	1.375	540	36E	01	0.000
3-28-84	A490	1.375	540	09W	06	0.000
3-30-84	A490	1.375	540	36E	02	0.000
3-28-84	A490	1.375	540	10E	02	0.000
3-30-84	A490	1.375	540	36E	03	0.000
3-28-84	A490	1.375	540	10E	04	0.000
3-30-84	A490	1.375	540	36E	04	0.000
3-13-84	A325	0.875	531	04	02	0.000
3-30-84	A490	1.375	540	36E	05	0.000
3-13-84	A325	0.875	531	04	06	0.000
3-30-84	A490	1.375	540	36E	06	0.000
3-13-84	A325	0.875	531	06	02	0.000
3-30-84	A490	1.375	541	36W	01	0.000
3-13-84	A325	0.875	531	03	03	0.000
3-30-84	A490	1.375	541	36W	02	0.000
3-13-84	A325	0.875	531	05	07	0.000
3-30-84	A490	1.375	541	36W	03	0.000
3-14-84	A325	0.875	536	01	01	0.000
3-30-84	A490	1.375	541	36W	04	0.000
3-14-84	A325	0.875	536	02	02	0.000
3-30-84	A490	1.375	541	36W	05	0.000
3-12-84	A325	0.875	533	17	05	0.000
3-30-84	A490	1.375	541	36W	06	0.000
3-14-84	A325	0.875	534	19	03	0.000
3-30-84	A490	1.375	541	36W	07	0.000
3-14-84	A325	0.875	534	19	07	0.000
3-30-84	A490	1.375	541	36W	08	0.000
3-14-84	A325	0.875	534	01	04	0.000
3-30-84	A490	1.375	541	36E	02	0.000
3-14-84	A490	1.000	532	25	04	0.000
3-30-84	A490	1.375	541	36E	03	0.000
3-14-84	A490	1.000	532	25	09	0.000
3-30-84	A490	1.375	541	36E	04	0.000
3-12-84	A325	0.875	533	17	04	0.000
3-30-84	A490	1.375	541	36E	05	0.000
3-19-84	A325	0.875	535	05	01	0.000
3-30-84	A490	1.375	541	36E	06	0.000

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-19-84	A325	0.875	535	05	05	0.000
3-30-84	A490	1.375	541	36E	07	0.000
3-12-84	A325	0.875	533	11	05	0.000
3-30-84	A490	1.375	541	36E	08	0.000
3-12-84	A325	0.875	533	11	01	0.000
3-30-84	A490	1.375	540	35W	01	0.000
3-19-84	A325	0.875	535	10	02	0.000
3-12-84	A490	0.875	534	26	03	0.000
3-19-84	A325	0.875	535	10	06	0.000
3-12-84	A490	0.875	534	26	02	0.000
3-19-84	A325	0.875	535	18	02	0.000
3-30-84	A490	1.375	540	35W	04	0.000
3-19-84	A325	0.875	535	18	06	0.000
3-30-84	A490	1.375	540	35W	05	0.000
3-12-84	A490	0.875	534	09	02	0.000
3-30-84	A490	1.375	540	35W	06	0.000
3-12-84	A490	0.875	534	08	05	0.000
3-30-84	A490	1.375	540	35W	07	0.000
3-20-84	A490	1.375	540	22	04A	0.000
3-30-84	A490	1.375	540	35W	08	0.000
3-20-84	A490	1.375	540	22	02B	0.000
3-30-84	A490	1.375	540	35E	01	0.000
3-20-84	A490	1.375	540	22	06B	0.000
3-30-84	A490	1.375	540	35E	02	0.000
3-21-84	A490	1.375	540	23W	04	0.000
3-30-84	A490	1.375	540	35E	03	0.000
3-21-84	A490	1.375	540	24E	02	0.000
3-30-84	A490	1.375	540	35E	04	0.000
3-21-84	A490	1.375	540	24E	06	0.000
3-30-84	A490	1.375	540	35E	05	0.000
3-21-84	A490	1.375	540	25W	04	0.000
3-30-84	A490	1.375	540	35E	06	0.000
3-21-84	A490	1.375	540	26E	02	0.000
3-30-84	A490	1.375	540	35E	07	0.000
3-21-84	A490	1.375	540	26E	06	0.000
3-30-84	A490	1.375	540	35E	08	0.000
3-21-84	A490	1.375	540	27W	04	0.000
3-30-84	A490	1.375	540	42W	01	0.000
3-21-84	A490	1.375	540	27W	08	0.000
3-12-84	A490	0.875	534	26	01	0.000
3-21-84	A490	1.375	540	27E	04	0.000
3-30-84	A490	1.375	540	42W	03	0.000
3-21-84	A490	1.375	540	27E	08	0.000
3-30-84	A490	1.375	540	42W	04	0.000
3-21-84	A490	1.375	540	28W	04	0.000
3-12-84	A490	0.875	534	25	07	0.000
3-21-84	A490	1.375	540	28W	08	0.000
3-30-84	A490	1.375	540	42W	06	0.000
3-21-84	A490	1.375	540	28E	04	0.000
3-12-84	A490	0.875	534	25	06	0.000
3-21-84	A490	1.375	540	28E	08	0.000
3-30-84	A490	1.375	540	42W	08	0.000
3-21-84	A490	1.375	540	01W	04	0.000
3-30-84	A490	1.375	540	42E	01	0.000
3-21-84	A490	1.375	540	01E	02	0.000
3-30-84	A490	1.375	540	42E	02	0.000

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-21-84	A490	1.375	540	01E	06	0.000
3-30-84	A490	1.375	540	42E	03	0.000
3-21-84	A490	1.375	540	07W	04	0.000
3-30-84	A490	1.375	540	42E	04	0.000
3-21-84	A490	1.375	540	07W	08	0.000
3-30-84	A490	1.375	540	42E	05	0.000
3-21-84	A490	1.375	540	07E	04	0.000
3-30-84	A490	1.375	540	42E	06	0.000
3-21-84	A490	1.375	540	07E	08	0.000
3-30-84	A490	1.375	540	42E	07	0.000
3-22-84	A490	1.375	540	06*W	04	0.000
3-30-84	A490	1.375	540	42E	08	0.000
3-22-84	A490	1.375	540	06*W	08	0.000
3-30-84	A490	1.375	540	30W	01	0.000
3-12-84	A490	0.875	534	08	02	0.000
3-30-84	A490	1.375	540	30W	02	0.000
3-22-84	A490	1.375	540	06*E	08	0.000
3-30-84	A490	1.375	540	30W	03	0.000
3-22-84	A490	1.375	540	02W	04	0.000
3-30-84	A490	1.375	540	30W	04	0.000
3-22-84	A490	1.375	540	03E	02	0.000
3-30-84	A490	1.375	540	30W	05	0.000
3-22-84	A490	1.375	540	03E	06	0.000
3-30-84	A490	1.375	540	30W	06	0.000
3-22-84	A490	1.375	540	04W	04	0.000
3-30-84	A490	1.375	540	31E	01	0.000
3-22-84	A490	1.375	540	05E	02	0.000
3-30-84	A490	1.375	540	31E	02	0.000
3-22-84	A490	1.375	540	05E	06	0.000
3-30-84	A490	1.375	540	31E	03	0.000
3-28-84	A490	1.375	540	08W	05	0.000
3-30-84	A490	1.375	540	31E	04	0.000
3-9-84	A490	1.000	533	06	08	0.000
3-30-84	A490	1.375	540	31E	05	0.000
3-28-84	A490	1.375	540	14W	01	0.000
3-30-84	A490	1.375	540	31E	06	0.000
3-12-84	A490	0.875	534	23	05	0.000
3-30-84	A490	1.375	540	32W	01	0.000
3-28-84	A490	1.375	540	14E	01	0.000
3-30-84	A490	1.375	540	32W	02	0.000
3-28-84	A490	1.375	540	14E	05	0.000
3-30-84	A490	1.375	540	32W	03	0.000
3-28-84	A490	1.375	540	13W	01	0.000
3-30-84	A490	1.375	540	32W	04	0.000
3-28-84	A490	1.375	540	13W	05	0.000
3-30-84	A490	1.375	540	32W	05	0.000
3-28-84	A490	1.375	540	13E	01	0.000
3-30-84	A490	1.375	540	32W	06	0.000
3-28-84	A490	1.375	540	13E	05	0.000
3-30-84	A490	1.375	540	33E	01	0.000
3-28-84	A490	1.375	540	11W	01	0.000
3-30-84	A490	1.375	540	33E	02	0.000
3-28-84	A490	1.375	540	11W	05	0.000
3-30-84	A490	1.375	540	33E	03	0.000
3-28-84	A490	1.375	540	12E	03	0.000
3-30-84	A490	1.375	540	33E	04	0.000

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-28-84	A490	1.375	540	09W	01	0.000
3-30-84	A490	1.375	540	33E	05	0.000
3-28-84	A490	1.375	540	09W	05	0.000
3-30-84	A490	1.375	540	33E	06	0.000
3-28-84	A490	1.375	540	10E	03	0.000
3-30-84	A490	1.375	540	34W	01	0.000
3-13-84	A325	0.875	531	04	04	0.000
3-30-84	A490	1.375	540	34W	02	0.000
3-13-84	A325	0.875	531	05	01	0.000
3-30-84	A490	1.375	540	34W	03	0.000
3-13-84	A325	0.875	531	06	04	0.000
3-30-84	A490	1.375	540	34W	04	0.000
3-12-84	A325	0.875	533	17	06	0.000
3-30-84	A490	1.375	540	34W	05	0.000
3-14-84	A325	0.875	534	19	05	0.000
3-30-84	A490	1.375	540	34W	06	0.000
3-14-84	A325	0.875	534	01	06	0.000
3-30-84	A490	1.375	540	34W	07	0.000
3-12-84	A325	0.875	532	21	10	0.000
3-30-84	A490	1.375	540	34W	08	0.000
3-12-84	A325	0.875	533	15	06	0.000
3-30-84	A490	1.375	540	34E	01	0.000
3-12-84	A325	0.875	533	11	03	0.000
3-30-84	A490	1.375	540	34E	02	0.000
3-19-84	A325	0.875	535	10	04	0.000
3-30-84	A490	1.375	540	34E	03	0.000
3-19-84	A325	0.875	535	18	04	0.000
3-30-84	A490	1.375	540	34E	04	0.000
3-12-84	A490	0.875	534	08	07	0.000
3-30-84	A490	1.375	540	34E	05	0.000
3-20-84	A490	1.375	540	22	06A	0.000
3-30-84	A490	1.375	540	34E	06	0.000
3-21-84	A490	1.375	540	23W	02	0.000
3-30-84	A490	1.375	540	34E	07	0.000
3-21-84	A490	1.375	540	24E	04	0.000
3-30-84	A490	1.375	540	34E	08	0.000
3-21-84	A490	1.375	540	25W	06	0.000
3-30-84	A490	1.375	540	37W	01	0.000
3-21-84	A490	1.375	540	27W	02	0.000
3-30-84	A490	1.375	540	37W	02	0.000
3-21-84	A490	1.375	540	27E	02	0.000
3-30-84	A490	1.375	540	37W	03	0.000
3-21-84	A490	1.375	540	28W	02	0.000
3-30-84	A490	1.375	540	37W	04	0.000
3-21-84	A490	1.375	540	28E	02	0.000
3-30-84	A490	1.375	540	37W	05	0.000
3-21-84	A490	1.375	540	01W	02	0.000
3-30-84	A490	1.375	540	37W	06	0.000
3-21-84	A490	1.375	540	01E	04	0.000
3-30-84	A490	1.375	540	38E	01	0.000
3-21-84	A490	1.375	540	07W	06	0.000
3-30-84	A490	1.375	540	38E	02	0.000
3-21-84	A490	1.375	540	07E	06	0.000
3-30-84	A490	1.375	540	38E	03	0.000
3-22-84	A490	1.375	540	06*W	06	0.000
3-30-84	A490	1.375	540	38E	04	0.000

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3-12-84	A490	0.875	534	23	07	0.000
3-30-84	A490	1.375	540	38E	05	0.000
3-22-84	A490	1.375	540	02W	06	0.000
3-30-84	A490	1.375	540	38E	06	0.000
3-22-84	A490	1.375	540	04W	02	0.000
3-30-84	A490	1.375	540	39W	01	0.000
3-22-84	A490	1.375	540	05E	04	0.000
3-30-84	A490	1.375	540	39W	02	0.000
3-28-84	A490	1.375	540	18E	01	0.000
3-30-84	A490	1.375	540	39W	03	0.000
3-28-84	A490	1.375	540	14W	03	0.000
3-30-84	A490	1.375	540	39W	04	0.000
3-28-84	A490	1.375	540	14E	03	0.000
3-30-84	A490	1.375	540	39W	05	0.000
3-28-84	A490	1.375	540	13W	03	0.000
3-30-84	A490	1.375	540	39W	06	0.000
3-28-84	A490	1.375	540	13E	03	0.000
3-30-84	A490	1.375	540	40E	01	0.000
3-28-84	A490	1.375	540	11W	03	0.000
3-30-84	A490	1.375	540	40E	02	0.000
3-28-84	A490	1.375	540	12E	05	0.000
3-30-84	A490	1.375	540	40E	03	0.000
3-28-84	A490	1.375	540	10E	01	0.000
3-30-84	A490	1.375	540	40E	04	0.000
3-13-84	A325	0.875	531	04	08	0.000
3-30-84	A490	1.375	540	40E	05	0.000
3-14-84	A325	0.875	536	01	03	0.000
3-30-84	A490	1.375	540	40E	06	0.000
3-14-84	A325	0.875	534	01	02	0.000
4-5-84	A490	1.375	540	41W	01	0.000
3-12-84	A325	0.875	533	17	02	0.000
4-5-84	A490	1.375	540	41W	02	0.000
3-12-84	A490	0.875	534	09	06	0.000
4-5-84	A490	1.375	540	41W	03	0.000
3-12-84	A490	0.875	534	09	05	0.000
4-5-84	A490	1.375	540	41W	04	0.000
3-20-84	A490	1.375	540	22	04B	0.000
4-5-84	A490	1.375	540	41W	05	0.000
3-21-84	A490	1.375	540	25W	02	0.000
4-5-84	A490	1.375	540	41W	06	0.000
3-21-84	A490	1.375	540	27W	06	0.000
4-5-84	A490	1.375	540	41W	07	0.000
3-21-84	A490	1.375	540	28W	06	0.000
4-5-84	A490	1.375	540	41W	08	0.000
3-21-84	A490	1.375	540	01W	06	0.000
4-5-84	A490	1.375	540	41E	01	0.000
3-21-84	A490	1.375	540	07E	02	0.000
3-12-84	A490	0.875	534	25	05	0.000
3-22-84	A490	1.375	540	06*E	02	0.000
3-12-84	A490	0.875	534	25	04	0.000
3-22-84	A490	1.375	540	03E	04	0.000
4-5-84	A490	1.375	540	41E	04	0.000
3-28-84	A490	1.375	540	08W	03	0.000
4-5-84	A490	1.375	540	41E	05	0.000
3-12-84	A490	0.875	534	23	04	0.000
3-12-84	A490	0.875	534	25	02	0.000

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3-28-84	A490	1.375	540	13W	07	0.000
4-5-84	A490	1.375	540	41E	07	0.000
3-28-84	A490	1.375	540	12E	01	0.000
4-5-84	A490	1.375	540	41E	08	0.000
3-13-84	A325	0.875	531	03	07	0.000
4-5-84	A490	1.375	541	05W	01	0.000
3-14-84	A325	0.875	534	19	01	0.000
4-5-84	A490	1.375	541	05W	02	0.000
3-19-84	A325	0.875	535	05	07	0.000
4-5-84	A490	1.375	541	05W	03	0.000
3-12-84	A490	0.875	534	08	03	0.000
4-5-84	A490	1.375	541	05W	04	0.000
3-21-84	A490	1.375	540	26E	04	0.000
4-5-84	A490	1.375	541	05W	05	0.000
3-21-84	A490	1.375	540	28E	06	0.000
4-5-84	A490	1.375	541	05W	06	0.000
3-22-84	A490	1.375	540	06*W	02	0.000
4-5-84	A490	1.375	541	05W	07	0.000
3-22-84	A490	1.375	540	04W	06	0.000
4-5-84	A490	1.375	541	05W	08	0.000
3-28-84	A490	1.375	540	14E	07	0.000
4-5-84	A490	1.375	541	05W	09	0.000
3-28-84	A490	1.375	540	09W	03	0.000
4-5-84	A490	1.375	541	05E	01	0.000
3-14-84	A490	1.000	532	25	06	0.000
3-12-84	A490	0.875	534	25	01	0.000
3-21-84	A490	1.375	540	23W	06	0.000
3-9-84	A490	1.000	533	05	08	0.000
3-21-84	A490	1.375	540	07W	02	0.000
3-9-84	A490	1.000	533	06	10	0.000
3-28-84	A490	1.375	540	18E	05	0.000
3-9-84	A490	1.000	533	06	09	0.000
3-13-84	A325	0.875	531	05	05	0.000
4-5-84	A490	1.375	541	05E	06	0.000
3-21-84	A490	1.375	540	27E	06	0.000
4-5-84	A490	1.375	541	05E	07	0.000
3-28-84	A490	1.375	540	13E	07	0.000
3-22-84	A490	1.375	540	02W	02	0.000
3-19-84	A325	0.875	535	10	08	0.000
4-5-84	A490	1.375	541	05E	08	0.000
4-5-84	A490	1.375	541	05E	09	0.000

STRUCTURAL INTEGRITY ASSOCIATES, INC.

APPENDIX C

PALO VERDE UNIT 2 HIGH STRENGTH BOLT TORQUE CHECK
FOR CRITICAL FRICTION FASTENERS

STRUCTURAL INTEGRITY ASSOCIATES, INC.

PALO VERDE UNIT 2 HIGH STRENGTH BOLT TORQUE

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	CONN. NO.	BOLT NO.	NUT ROTAT	TORQUE
4-16-84	A490	1.375	534	39	01		300,000
4-16-84	A490	1.375	534	39	02		300,000
4-16-84	A490	1.375	534	39	03		150,000
4-16-84	A490	1.375	534	39	04		150,000
4-16-84	A490	1.375	534	40	01		350,000
4-16-84	A490	1.375	534	40	02		350,000
4-16-84	A490	1.375	534	40	03		300,000
4-16-84	A490	1.375	534	40	04		300,000
4-16-84	A490	1.375	534	41	01		200,000
4-16-84	A490	1.375	534	41	02		350,000
4-16-84	A490	1.375	534	41	03		200,000
4-16-84	A490	1.375	534	41	04		250,000
4-16-84	A490	1.375	534	41	05		250,000
4-16-84	A490	1.375	534	41	06		250,000
4-16-84	A490	1.375	534	42	01		250,000
4-16-84	A490	1.375	534	42	02		350,000
4-16-84	A490	1.375	534	42	03		325,000
4-16-84	A490	1.375	534	42	04		275,000
4-16-84	A490	1.375	534	42	05		350,000
4-16-84	A490	1.375	534	42	06		250,000
4-16-84	A490	1.375	535	47	01		1250,000
4-16-84	A490	1.375	535	47	02		1250,000
4-16-84	A490	1.375	535	47	03		1300,000
4-16-84	A490	1.375	535	47	04		1300,000
4-16-84	A490	1.375	535	47	05		1450,000
4-16-84	A490	1.375	535	47	06		1200,000
4-16-84	A490	1.375	535	48	01		900,000
4-16-84	A490	1.375	535	48	02		1000,000
4-16-84	A490	1.375	535	48	03		1700,000
4-16-84	A490	1.375	535	48	04		700,000
4-16-84	A490	1.375	535	48	05		850,000
4-16-84	A490	1.375	535	48	06		1350,000
4-16-84	A490	1.375	535	45	01		2000,000
4-16-84	A490	1.375	535	45	02		1200,000
4-16-84	A490	1.375	535	45	03		600,000
4-16-84	A490	1.375	535	45	04		600,000
4-16-84	A490	1.375	535	45	05		800,000
4-16-84	A490	1.375	535	45	06		750,000
4-16-84	A490	1.375	535	46	03		550,000
4-16-84	A490	1.375	535	46	04		300,000
4-16-84	A490	1.375	535	46	05		450,000
4-16-84	A490	1.375	535	46	06		650,000
4-13-84	A490	1.375	535	43	01		1150,000
4-13-84	A490	1.375	535	43	02		900,000
4-13-84	A490	1.375	535	43	03		700,000
4-13-84	A490	1.375	535	43	04		500,000
4-13-84	A490	1.375	535	43	05		800,000
4-13-84	A490	1.375	535	43	06		600,000
4-13-84	A490	1.375	535	44	01		750,000
4-13-84	A490	1.375	535	44	02		600,000
4-13-84	A490	1.375	535	44	03		600,000
4-13-84	A490	1.375	535	44	04		600,000
4-13-84	A490	1.375	535	44	05		750,000

4-13-84	A490	1.375	535	44	06	700,000
4-13-84	A490	1.375	535	42	01	500,000
4-13-84	A490	1.375	535	42	02	1000,000
4-13-84	A490	1.375	535	42	03	800,000
4-13-84	A490	1.375	535	42	04	600,000
4-13-84	A490	1.375	535	53	01	500,000
4-13-84	A490	1.375	535	53	02	400,000
4-13-84	A490	1.375	535	53	03	400,000
4-13-84	A490	1.375	535	53	04	175,000
4-13-84	A490	1.375	535	53	05	400,000
4-13-84	A490	1.375	535	53	06	200,000
4-13-84	A490	1.375	535	54	01	500,000
4-13-84	A490	1.375	535	54	02	350,000
4-13-84	A490	1.375	535	54	03	350,000
4-13-84	A490	1.375	535	54	04	275,000
4-13-84	A490	1.375	535	54	05	275,000
4-13-84	A490	1.375	535	54	06	400,000
4-13-84	A490	1.375	535	55	01	700,000
4-13-84	A490	1.375	535	55	02	800,000
4-13-84	A490	1.375	535	55	03	300,000
4-13-84	A490	1.375	535	55	04	650,000
4-13-84	A490	1.375	535	55	05	600,000
4-13-84	A490	1.375	535	55	06	300,000
4-13-84	A490	1.375	535	56	01	600,000
4-13-84	A490	1.375	535	56	02	300,000
4-13-84	A490	1.375	535	56	03	300,000
4-13-84	A490	1.375	535	56	04	750,000
4-13-84	A490	1.375	535	56	05	600,000
4-13-84	A490	1.375	535	56	06	450,000
4-12-84	A490	1.375	534	31	01	1100,000
4-12-84	A490	1.375	534	31	02	750,000
4-12-84	A490	1.375	534	31	03	800,000
4-12-84	A490	1.375	534	31	04	800,000
4-12-84	A490	1.375	534	31	05	800,000
4-12-84	A490	1.375	534	31	06	1100,000
4-12-84	A490	1.375	534	32	01	1000,000
4-12-84	A490	1.375	534	32	02	2000,000
4-12-84	A490	1.375	534	32	03	1600,000
4-12-84	A490	1.375	534	32	04	550,000
4-12-84	A490	1.375	534	32	05	1100,000
4-12-84	A490	1.375	534	32	06	1000,000
4-12-84	A490	1.375	534	33	01	800,000
4-12-84	A490	1.375	534	33	02	700,000
4-12-84	A490	1.375	534	33	03	700,000
4-12-84	A490	1.375	534	33	04	900,000
4-12-84	A490	1.375	534	33	05	700,000
4-12-84	A490	1.375	534	33	06	900,000
4-12-84	A490	1.375	534	34	01	800,000
4-12-84	A490	1.375	534	34	02	800,000
4-12-84	A490	1.375	534	34	03	700,000
4-12-84	A490	1.375	534	34	04	1200,000
4-12-84	A490	1.375	534	34	05	1250,000
4-12-84	A490	1.375	534	34	06	1000,000
3-22-84	A325	0.875	535	19	07	1,053
3-20-84	A490	0.875	535	21	07	
3-19-84	A325	0.875	532	18	06	

3-20-84	A490	0.875	535	21	04	1.000
3-22-84	A325	0.875	535	19	06	1.000
3-19-84	A325	0.875	532	18	03	0.917
3-22-84	A325	0.875	535	19	05	0.917
3-19-84	A325	0.875	532	18	01	0.917
3-19-84	A325	0.875	532	18	04	0.833
3-20-84	A490	0.875	535	21	06	0.833
3-20-84	A490	0.875	535	21	05	0.833
3-22-84	A325	0.875	535	19	02	0.833
3-22-84	A325	0.875	535	19	03	0.833
3-19-84	A325	0.875	532	18	02	0.750
3-13-84	A325	0.875	531	01	05	0.750
3-19-84	A325	0.875	532	18	05	0.750
3-23-84	A325	0.875	535	04	06	0.667
3-13-84	A490	0.875	535	15	05	0.667
3-13-84	A325	0.875	534	02	04	0.667
3-23-84	A325	0.875	535	04	07	0.667
3-22-84	A325	0.875	535	19	01	0.667
3-14-84	A325	0.875	535	11	01	0.667
3-16-84	A325	0.875	533	16	02	0.667
3-13-84	A325	0.875	534	02	06	0.583
3-14-84	A325	0.875	535	25	07	0.583
3-15-84	A325	0.875	535	07	04	0.583
3-13-84	A325	0.875	534	02	03	0.500
3-14-84	A325	0.875	535	25	04	0.500
3-14-84	A325	0.875	535	11	02	0.500
3-14-84	A325	0.875	535	25	02	0.500
3-13-84	A325	0.875	535	05	08	0.500
3-14-84	A325	0.875	535	25	03	0.500
3-14-84	A325	0.875	535	25	06	0.500
3-15-84	A325	0.875	535	07	03	0.500
3-22-84	A325	0.875	535	19	04	0.500
3-14-84	A325	0.875	535	17	03	0.500
3-13-84	A325	0.875	534	02	07	0.500
3-14-84	A325	0.875	535	25	05	0.458
3-13-84	A325	0.875	535	05	03	0.458
3-14-84	A325	0.875	535	17	04	0.458
3-23-84	A325	0.875	535	04	05	0.417
3-13-84	A325	0.875	535	05	01	0.417
3-23-84	A325	0.875	535	04	04	0.417
3-20-84	A490	0.875	535	21	03	0.417
3-15-84	A490	1.000	532	25	07	0.375
3-13-84	A325	0.875	535	05	04	0.375
3-14-84	A325	0.875	535	11	03	0.333
3-13-84	A325	0.875	534	02	05	0.333
3-13-84	A325	0.875	535	05	07	0.333
3-14-84	A325	0.875	535	11	05	0.333
3-19-84	A325	0.875	533	27	02	0.333
3-19-84	A325	0.875	533	27	01	0.333
3-16-84	A325	0.875	533	34	04	0.333
3-13-84	A490	0.875	535	02	07	0.333
3-13-84	A325	0.875	535	05	02	0.333
3-13-84	A325	0.875	534	02	02	0.333
3-13-84	A325	0.875	535	05	06	
3-13-84	A325	0.875	534	02	01	
3-14-84	A325	0.875	535	25	01	

3-14-84	A325	0.875	535	11	04	0.333
3-16-84	A325	0.875	533	34	05	0.333
3-13-84	A325	0.875	535	05	05	0.292
3-14-84	A325	0.875	535	11	06	0.250
3-13-84	A325	0.875	531	06	03	0.250
4-6-84	A490	0.875	540	37	05	0.250
3-13-84	A325	0.875	531	06	04	0.250
3-23-84	A325	0.875	535	04	03	0.250
3-13-84	A325	0.875	531	06	05	0.250
3-13-84	A325	0.875	531	06	01	0.250
3-15-84	A490	1.000	532	25	06	0.250
3-16-84	A325	0.875	533	16	03	0.250
3-15-84	A325	0.875	536	05	03	0.250
3-14-84	A325	0.875	535	17	01	0.208
3-13-84	A490	0.875	535	15	06	0.208
3-15-84	A325	0.875	536	05	02	0.188
3-22-84	A325	0.875	535	27	07	0.167
3-13-84	A325	0.875	531	06	02	0.167
3-14-84	A325	0.875	530	11	04	0.167
3-16-84	A325	0.875	532	12	05	0.167
3-20-84	A490	0.875	535	38	02	0.167
3-16-84	A325	0.875	532	12	06	0.167
3-15-84	A325	0.875	536	05	01	0.167
3-16-84	A325	0.875	533	34	06	0.167
3-23-84	A325	0.875	535	04	02	0.167
3-16-84	A325	0.875	533	16	04	0.167
3-20-84	A490	0.875	535	30	13	0.167
3-23-84	A325	0.875	535	04	01	0.167
4-6-84	A490	1.375	540	10	06	0.167
3-15-84	A490	1.000	532	25	10	0.167
3-22-84	A325	0.875	535	27	02	0.167
3-13-84	A490	0.875	535	24	01	0.167
3-14-84	A325	0.875	532	01	01	0.167
3-15-84	A325	0.875	535	07	14	0.167
3-14-84	A325	0.875	532	01	07	0.167
3-14-84	A325	0.875	530	11	06	0.167
3-14-84	A325	0.875	532	02	07	0.167
3-14-84	A325	0.875	535	17	07	0.167
3-14-84	A325	0.875	535	11	07	0.167
3-22-84	A325	0.875	535	27	06	0.167
3-22-84	A325	0.875	535	27	03	0.167
4-6-84	A490	1.375	540	25	02	0.125
4-6-84	A490	1.375	540	24	04	0.125
3-13-84	A490	0.875	535	15	04	0.125
3-14-84	A325	0.875	532	01	05	0.083
4-6-84	A490	1.375	540	25	04	0.083
3-13-84	A325	0.875	531	01	01	0.083
3-14-84	A325	0.875	530	11	02	0.083
3-16-84	A325	0.875	532	12	04	0.083
3-14-84	A325	0.875	530	11	01	0.083
3-16-84	A325	0.875	532	12	03	0.083
3-14-84	A325	0.875	530	16	01	0.083
4-6-84	A490	1.375	540	10	01	0.083
3-14-84	A325	0.875	530	11	05	0.083
3-20-84	A490	0.875	535	23	05	0.083
3-14-84	A325	0.875	532	02	06	0.083

3-13-84	A490	0.875	535	24	02	0.083
3-14-84	A325	0.875	530	12	08	0.083
3-13-84	A490	0.875	535	24	06	0.083
4-6-84	A490	1.375	540	16	05	0.083
3-15-84	A490	1.000	532	25	04	0.083
3-13-84	A325	0.875	531	01	04	0.083
3-13-84	A490	0.875	535	15	03	0.083
3-14-84	A325	0.875	530	12	09	0.083
3-15-84	A490	1.000	532	25	09	0.083
3-13-84	A490	0.875	535	02	05	0.083
4-6-84	A490	1.375	540	10	02	0.083
3-16-84	A325	0.875	533	34	01	0.083
4-6-84	A490	0.875	540	37	02	0.083
4-5-84	A490	1.375	540	03E	05	0.083
3-14-84	A325	0.875	535	17	02	0.083
3-13-84	A325	0.875	531	01	03	0.083
3-20-84	A490	0.875	534	08	06	0.083
3-14-84	A325	0.875	530	11	03	0.083
4-6-84	A490	1.375	540	12	06	0.083
3-14-84	A325	0.875	530	16	02	0.083
4-6-84	A490	1.375	540	18	06	0.083
3-14-84	A325	0.875	530	12	07	0.083
3-22-84	A325	0.875	535	27	05	0.083
3-14-84	A325	0.875	532	01	06	0.083
4-6-84	A490	1.375	540	18	03	0.083
3-14-84	A325	0.875	532	01	02	0.083
3-15-84	A325	0.875	535	07	06	0.083
3-16-84	A325	0.875	533	19	01	0.083
3-20-84	A490	0.875	535	21	02	0.083
4-6-84	A490	1.375	540	39	03	0.083
3-20-84	A490	0.875	535	30	05	0.083
4-6-84	A490	1.375	540	24	06	0.083
3-20-84	A325	0.875	532	26	03	0.083
3-14-84	A325	0.875	532	01	08	0.083
3-22-84	A325	0.875	535	27	08	0.083
3-13-84	A490	0.875	535	02	02	0.083
3-20-84	A490	0.875	535	30	07	0.083
3-16-84	A325	0.875	533	16	01	0.083
3-20-84	A490	0.875	535	38	06	0.083
3-14-84	A325	0.875	532	01	04	0.083
3-20-84	A325	0.875	532	26	01	0.083
4-6-84	A490	1.375	540	39	06	0.083
3-20-84	A490	0.875	535	30	03	0.083
4-5-84	A490	1.375	540	15W	03	0.042
4-6-84	A490	1.375	540	10	03	0.042
4-6-84	A490	1.375	540	38	04	0.042
4-5-84	A490	1.375	540	05E	01	0.042
3-20-84	A490	0.875	535	38	07	0.042
4-5-84	A490	1.375	540	04W	04	0.042
3-20-84	A490	0.875	535	21	01	0.042
3-22-84	A325	0.875	535	27	04	0.042
3-20-84	A490	0.875	535	38	03	0.042
4-6-84	A490	1.375	540	18	05	0.042
3-20-84	A490	0.875	535	38	01	0.042
3-13-84	A490	0.875	535	24	05	0.042
3-19-84	A325	0.875	533	27	04	0.042

3-19-84	A325	0.875	533	23	06	0.042
4-9-84	A490	0.875	540	36E	03	0.042
3-13-84	A490	0.875	535	24	03	0.042
3-13-84	A490	0.875	535	15	02	0.042
4-6-84	A490	1.375	540	18	01	0.042
3-13-84	A490	0.875	535	02	03	0.042
4-6-84	A490	1.375	540	16	06	0.042
3-13-84	A325	0.875	534	04	04	0.042
4-6-84	A490	1.375	540	16	04	0.042
3-20-84	A490	0.875	535	38	04	0.042
3-14-84	A325	0.875	535	17	05	0.042
3-13-84	A490	0.875	535	02	04	0.042
3-16-84	A325	0.875	533	34	08	0.042
3-13-84	A490	0.875	535	15	01	0.042
4-6-84	A490	1.375	540	12	05	0.042
4-9-84	A490	0.875	540	36W	02	0.042
4-6-84	A490	1.375	540	39	05	0.042
4-6-84	A490	0.875	540	38	02	0.042
3-15-84	A325	0.875	535	07	12	0.042
3-14-84	A325	0.875	532	02	08	0.042
4-6-84	A490	1.375	540	40	04	0.042
3-20-84	A490	0.875	535	23	04	0.036
3-14-84	A325	0.875	532	01	03	0.031
3-23-84	A325	0.875	530	02	04	0.021
4-5-84	A490	1.375	540	05E	05	0.021
4-6-84	A490	1.375	540	23	05	0.021
3-13-84	A490	0.875	535	24	07	0.021
4-6-84	A490	1.375	540	23	02	0.021
3-16-84	A325	0.875	533	21	04	0.021
4-6-84	A490	1.375	540	25	01	0.021
3-16-84	A325	0.875	533	21	02	0.021
3-16-84	A325	0.875	533	34	02	0.021
3-16-84	A325	0.875	533	16	06	0.021
3-16-84	A325	0.875	533	34	07	0.021
3-15-84	A325	0.875	536	06	03	0.021
4-6-84	A490	1.375	540	18	02	0.021
3-15-84	A325	0.875	536	13	01	0.021
4-6-84	A490	1.375	540	18	04	0.021
3-16-84	A325	0.875	533	16	05	0.021
4-6-84	A490	1.375	540	24	05	0.021
3-13-84	A490	0.875	535	15	07	0.021
3-20-84	A490	0.875	535	30	01	0.021
3-23-84	A325	0.875	530	02	01	0.021
3-13-84	A490	0.875	535	24	04	0.021
3-20-84	A490	0.875	535	38	05	0.021
4-6-84	A490	1.375	540	26	06	0.021
3-13-84	A490	0.875	535	02	01	0.021
3-14-84	A325	0.875	535	17	06	0.021
3-20-84	A490	0.875	535	30	06	0.021
3-19-84	A325	0.875	533	27	03	0.000
3-14-84	A325	0.875	530	12	02	0.000
3-14-84	A325	0.875	530	12	03	0.000
3-20-84	A325	0.875	533	03	06	0.000
3-14-84	A325	0.875	530	12	04	0.000
3-20-84	A325	0.875	533	03	08	0.000
3-14-84	A325	0.875	530	12	05	0.000

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3-20-84	A325	0.875	533	03	10	0.000
3-14-84	A325	0.875	530	12	06	0.000
3-20-84	A325	0.875	532	26	02	0.000
4-5-84	A490	1.375	540	04W	03	0.000
3-20-84	A325	0.875	532	26	04	0.000
4-5-84	A490	1.375	540	04W	02	0.000
3-20-84	A325	0.875	532	26	06	0.000
4-5-84	A490	1.375	540	04W	01	0.000
3-20-84	A325	0.875	532	26	08	0.000
4-5-84	A490	1.375	540	03E	06	0.000
3-20-84	A325	0.875	532	26	10	0.000
4-5-84	A490	1.375	540	03E	04	0.000
3-20-84	A325	0.875	532	27	02	0.000
4-5-84	A490	1.375	540	03E	03	0.000
3-20-84	A325	0.875	532	27	04	0.000
4-5-84	A490	1.375	540	03E	02	0.000
3-20-84	A325	0.875	533	03	02	0.000
4-5-84	A490	1.375	540	03E	01	0.000
3-13-84	A490	0.875	535	02	06	0.000
4-5-84	A490	1.375	540	02W	06	0.000
3-13-84	A325	0.875	535	03	04	0.000
4-5-84	A490	1.375	540	02W	05	0.000
3-22-84	A325	0.875	535	27	01	0.000
4-5-84	A490	1.375	540	02W	04	0.000
3-20-84	A490	0.875	535	23	02	0.000
4-5-84	A490	1.375	540	02W	03	0.000
3-23-84	A325	0.875	538	04	03	0.000
4-5-84	A490	1.375	540	02W	02	0.000
3-20-84	A490	0.875	535	23	06	0.000
4-5-84	A490	1.375	540	02W	01	0.000
3-23-84	A325	0.875	538	04	01	0.000
4-6-84	A490	1.375	540	16	03	0.000
3-23-84	A325	0.875	531	04	07	0.000
4-6-84	A490	1.375	540	16	02	0.000
3-23-84	A325	0.875	531	04	05	0.000
4-6-84	A490	1.375	540	16	01	0.000
3-23-84	A325	0.875	531	04	03	0.000
3-14-84	A325	0.875	535	20	01	0.000
3-20-84	A490	0.875	535	30	02	0.000
3-14-84	A325	0.875	535	20	02	0.000
3-20-84	A490	0.875	535	30	04	0.000
3-14-84	A325	0.875	535	20	03	0.000
3-23-84	A325	0.875	530	02	03	0.000
3-14-84	A325	0.875	535	20	04	0.000
3-20-84	A490	0.875	535	30	01	0.000
3-14-84	A325	0.875	535	20	05	0.000
3-20-84	A490	0.875	535	30	03	0.000
3-14-84	A325	0.875	535	20	06	0.000
3-20-84	A490	0.875	535	30	05	0.000
3-14-84	A325	0.875	535	20	07	0.000
3-23-84	A325	0.875	530	02	02	0.000
4-6-84	A490	1.375	540	12	04	0.000
3-20-84	A490	0.875	535	30	14	0.000
4-6-84	A490	1.375	540	12	03	0.000
3-20-84	A490	0.875	534	23	02	0.000
4-6-84	A490	1.375	540	12	02	0.000

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3-20-84	A490	0.875	534	23	04	0.000
4-6-84	A490	1.375	540	12	01	0.000
3-20-84	A490	0.875	534	23	06	0.000
4-6-84	A490	1.375	540	10	05	0.000
3-20-84	A490	0.875	534	20	03	0.000
4-6-84	A490	1.375	540	10	04	0.000
3-20-84	A490	0.875	534	08	02	0.000
4-6-84	A490	1.375	540	26	05	0.000
3-20-84	A490	0.875	534	08	04	0.000
3-14-84	A325	0.875	535	37	01	0.000
4-4-84	A325	0.875	532	21	09	0.000
3-14-84	A325	0.875	535	37	02	0.000
3-19-84	A325	0.875	532	17	01	0.000
3-14-84	A325	0.875	535	37	03	0.000
3-19-84	A325	0.875	532	17	03	0.000
3-14-84	A325	0.875	535	37	04	0.000
3-19-84	A325	0.875	532	17	05	0.000
3-14-84	A325	0.875	535	37	05	0.000
3-19-84	A325	0.875	532	17	07	0.000
3-14-84	A325	0.875	535	37	06	0.000
4-4-84	A325	0.875	532	21	08	0.000
3-14-84	A325	0.875	535	37	07	0.000
4-4-84	A325	0.875	532	21	06	0.000
3-14-84	A325	0.875	535	37	08	0.000
4-4-84	A325	0.875	532	21	04	0.000
3-14-84	A325	0.875	535	35	01	0.000
3-19-84	A325	0.875	533	20	01	0.000
3-14-84	A325	0.875	535	35	02	0.000
3-19-84	A325	0.875	533	20	03	0.000
3-14-84	A325	0.875	535	35	03	0.000
3-19-84	A325	0.875	533	20	05	0.000
3-14-84	A325	0.875	535	35	04	0.000
3-19-84	A325	0.875	533	20	07	0.000
3-14-84	A325	0.875	535	35	05	0.000
4-4-84	A325	0.875	532	21	02	0.000
3-14-84	A325	0.875	535	35	06	0.000
4-9-84	A490	0.875	540	36W	01	0.000
3-14-84	A325	0.875	535	35	07	0.000
3-19-84	A325	0.875	533	27	05	0.000
3-13-84	A325	0.875	530	05	01	0.000
3-19-84	A325	0.875	533	23	01	0.000
3-13-84	A325	0.875	530	05	02	0.000
3-19-84	A325	0.875	533	23	03	0.000
3-13-84	A325	0.875	530	05	03	0.000
3-19-84	A325	0.875	533	23	05	0.000
3-13-84	A325	0.875	530	05	04	0.000
3-16-84	A325	0.875	532	12	01	0.000
3-13-84	A325	0.875	530	05	05	0.000
4-4-84	A490	1.000	532	24	08	0.000
3-13-84	A325	0.875	530	05	06	0.000
4-4-84	A490	1.000	532	24	06	0.000
3-13-84	A325	0.875	530	05	07	0.000
3-16-84	A325	0.875	532	13	01	0.000
3-13-84	A325	0.875	530	05	08	0.000
3-16-84	A325	0.875	532	13	03	0.000
4-6-84	A490	1.375	540	26	04	0.000

3-16-84	A325	0.875	532	13	05	0.000
4-6-84	A490	1.375	540	26	03	0.000
3-16-84	A325	0.875	532	13	07	0.000
4-6-84	A490	1.375	540	26	02	0.000
3-16-84	A325	0.875	532	07	01	0.000
4-6-84	A490	1.375	540	26	01	0.000
3-16-84	A325	0.875	532	07	03	0.000
4-6-84	A490	1.375	540	25	06	0.000
3-16-84	A325	0.875	532	07	05	0.000
4-6-84	A490	1.375	540	25	05	0.000
3-16-84	A325	0.875	532	07	07	0.000
3-13-84	A325	0.875	531	01	02	0.000
3-16-84	A325	0.875	532	07	09	0.000
4-6-84	A490	1.375	540	25	03	0.000
3-16-84	A325	0.875	532	08	02	0.000
4-6-84	A490	1.375	540	24	03	0.000
3-16-84	A325	0.875	532	08	04	0.000
4-6-84	A490	1.375	540	24	02	0.000
3-16-84	A325	0.875	532	08	06	0.000
3-13-84	A325	0.875	531	02	01	0.000
3-16-84	A325	0.875	533	08	02	0.000
3-13-84	A325	0.875	531	02	02	0.000
3-16-84	A325	0.875	533	08	04	0.000
3-13-84	A325	0.875	531	02	03	0.000
3-16-84	A325	0.875	533	08	06	0.000
3-13-84	A325	0.875	531	02	04	0.000
3-16-84	A325	0.875	533	08	08	0.000
3-13-84	A325	0.875	531	02	05	0.000
3-16-84	A325	0.875	533	15	02	0.000
3-13-84	A325	0.875	531	02	06	0.000
3-16-84	A325	0.875	533	15	04	0.000
3-13-84	A325	0.875	531	02	07	0.000
3-16-84	A325	0.875	533	15	06	0.000
3-13-84	A325	0.875	534	03	01	0.000
4-4-84	A490	1.000	532	24	03	0.000
3-13-84	A325	0.875	534	03	02	0.000
4-4-84	A490	1.000	532	24	01	0.000
3-13-84	A325	0.875	534	03	03	0.000
4-5-84	A325	1.000	533	05	09	0.000
3-13-84	A325	0.875	534	03	04	0.000
3-16-84	A325	0.875	533	19	02	0.000
3-13-84	A325	0.875	534	04	01	0.000
3-16-84	A325	0.875	533	19	04	0.000
3-13-84	A325	0.875	534	04	02	0.000
3-16-84	A325	0.875	533	19	06	0.000
3-13-84	A325	0.875	534	04	03	0.000
4-5-84	A325	1.000	533	05	07	0.000
4-6-84	A490	1.375	540	24	01	0.000
4-5-84	A325	1.000	533	05	06	0.000
4-6-84	A490	1.375	540	23	06	0.000
3-16-84	A325	0.875	533	21	06	0.000
4-6-84	A490	1.375	540	23	04	0.000
4-5-84	A325	1.000	533	05	04	0.000
4-6-84	A490	1.375	540	23	03	0.000
4-5-84	A490	1.375	540	15E	05	0.000
4-6-84	A490	1.375	540	23	01	0.000

4-5-84	A490	1.375	540	15E	03	0.000
4-6-84	A490	1.375	540	40	06	0.000
4-5-84	A490	1.375	540	15E	01	0.000
4-6-84	A490	1.375	540	40	05	0.000
3-14-84	A325	0.875	532	02	02	0.000
4-6-84	A490	1.375	540	40	03	0.000
3-14-84	A325	0.875	532	02	04	0.000
3-13-84	A325	0.875	534	11	01	0.000
4-5-84	A490	1.375	540	15W	06	0.000
3-13-84	A325	0.875	534	11	02	0.000
4-5-84	A490	1.375	540	15W	04	0.000
3-13-84	A325	0.875	534	11	03	0.000
4-5-84	A490	1.375	540	15W	02	0.000
3-13-84	A325	0.875	534	11	04	0.000
3-14-84	A325	0.875	530	16	03	0.000
3-13-84	A325	0.875	534	11	05	0.000
3-14-84	A325	0.875	530	16	05	0.000
3-13-84	A325	0.875	534	11	06	0.000
3-14-84	A325	0.875	530	16	07	0.000
3-13-84	A325	0.875	534	11	07	0.000
3-14-84	A325	0.875	530	18	01	0.000
3-13-84	A325	0.875	534	13	01	0.000
3-14-84	A325	0.875	530	18	03	0.000
3-13-84	A325	0.875	534	13	02	0.000
3-14-84	A325	0.875	530	18	05	0.000
3-13-84	A325	0.875	534	13	03	0.000
3-14-84	A325	0.875	530	18	07	0.000
3-13-84	A325	0.875	534	13	04	0.000
4-5-84	A490	1.375	540	05E	04	0.000
3-13-84	A325	0.875	534	13	05	0.000
4-5-84	A490	1.375	540	05E	02	0.000
3-13-84	A325	0.875	534	13	06	0.000
4-5-84	A490	1.375	540	04W	05	0.000
3-13-84	A325	0.875	534	13	07	0.000
3-20-84	A325	0.875	533	03	05	0.000
3-13-84	A325	0.875	534	14	01	0.000
3-20-84	A325	0.875	533	03	09	0.000
3-13-84	A325	0.875	534	14	02	0.000
3-20-84	A325	0.875	533	03	03	0.000
3-13-84	A325	0.875	534	14	03	0.000
3-20-84	A325	0.875	532	26	07	0.000
3-13-84	A325	0.875	534	14	04	0.000
3-20-84	A325	0.875	532	27	01	0.000
3-13-84	A325	0.875	534	14	05	0.000
3-20-84	A325	0.875	532	27	05	0.000
3-13-84	A325	0.875	534	14	06	0.000
3-13-84	A325	0.875	535	03	05	0.000
3-13-84	A325	0.875	534	14	07	0.000
3-20-84	A490	0.875	535	23	01	0.000
3-13-84	A325	0.875	534	14	08	0.000
3-23-84	A325	0.875	538	04	02	0.000
3-13-84	A325	0.875	534	15	01	0.000
3-23-84	A325	0.875	531	04	08	0.000
3-13-84	A325	0.875	534	15	02	0.000
3-23-84	A325	0.875	531	04	04	0.000
3-13-84	A325	0.875	534	15	03	0.000

3-23-84	A325	0.875	531	04	01	0.000
3-13-84	A325	0.875	534	15	04	0.000
3-20-84	A490	0.875	535	30	07	0.000
3-13-84	A325	0.875	534	15	05	0.000
3-20-84	A490	0.875	535	30	04	0.000
3-13-84	A325	0.875	534	15	06	0.000
4-4-84	A325	0.875	532	21	10	0.000
3-13-84	A325	0.875	534	15	07	0.000
3-20-84	A490	0.875	534	23	03	0.000
3-13-84	A325	0.875	534	22	01	0.000
3-20-84	A490	0.875	534	23	07	0.000
3-13-84	A325	0.875	534	22	02	0.000
3-20-84	A490	0.875	534	08	03	0.000
3-13-84	A325	0.875	534	22	03	0.000
3-20-84	A490	0.875	534	08	07	0.000
3-13-84	A325	0.875	534	22	04	0.000
3-19-84	A325	0.875	532	17	04	0.000
3-13-84	A325	0.875	534	22	05	0.000
3-19-84	A325	0.875	532	17	08	0.000
3-13-84	A325	0.875	534	22	06	0.000
4-4-84	A325	0.875	532	21	05	0.000
3-13-84	A325	0.875	534	22	07	0.000
3-19-84	A325	0.875	533	20	02	0.000
3-16-84	A325	0.875	533	22	01	0.000
3-19-84	A325	0.875	533	20	06	0.000
3-16-84	A325	0.875	533	22	02	0.000
4-4-84	A325	0.875	532	21	01	0.000
3-16-84	A325	0.875	533	22	03	0.000
3-19-84	A325	0.875	533	27	06	0.000
3-16-84	A325	0.875	533	22	04	0.000
3-19-84	A325	0.875	533	23	04	0.000
3-16-84	A325	0.875	533	22	05	0.000
3-16-84	A325	0.875	532	12	02	0.000
3-16-84	A325	0.875	533	22	06	0.000
4-4-84	A490	1.000	532	24	05	0.000
3-16-84	A325	0.875	533	22	07	0.000
3-16-84	A325	0.875	532	13	04	0.000
3-16-84	A325	0.875	533	29	08	0.000
3-16-84	A325	0.875	532	13	08	0.000
3-16-84	A325	0.875	533	29	09	0.000
3-16-84	A325	0.875	532	07	04	0.000
3-16-84	A325	0.875	533	29	10	0.000
3-16-84	A325	0.875	532	07	08	0.000
3-16-84	A325	0.875	533	29	11	0.000
3-16-84	A325	0.875	532	08	03	0.000
3-16-84	A325	0.875	533	29	12	0.000
3-16-84	A325	0.875	533	08	01	0.000
3-16-84	A325	0.875	533	26	01	0.000
3-16-84	A325	0.875	533	08	05	0.000
3-16-84	A325	0.875	533	26	02	0.000
3-16-84	A325	0.875	533	15	01	0.000
3-16-84	A325	0.875	533	26	03	0.000
3-16-84	A325	0.875	533	15	05	0.000
3-16-84	A325	0.875	533	26	04	0.000
4-4-84	A490	1.000	532	24	02	0.000
3-16-84	A325	0.875	533	26	05	0.000

4-5-84	A325	1.000	533	05	08	0.000
3-16-84	A325	0.875	533	26	06	0.000
3-16-84	A325	0.875	533	19	05	0.000
3-16-84	A325	0.875	533	26	07	0.000
3-16-84	A325	0.875	533	21	03	0.000
3-16-84	A325	0.875	533	26	08	0.000
4-5-84	A325	1.000	533	05	05	0.000
3-16-84	A325	0.875	533	24	01	0.000
4-5-84	A490	1.375	540	15E	04	0.000
3-16-84	A325	0.875	533	24	02	0.000
3-14-84	A325	0.875	532	02	01	0.000
3-16-84	A325	0.875	533	24	03	0.000
3-14-84	A325	0.875	532	02	05	0.000
3-16-84	A325	0.875	533	24	04	0.000
3-14-84	A325	0.875	532	02	09	0.000
3-16-84	A325	0.875	533	24	05	0.000
3-14-84	A325	0.875	530	16	04	0.000
3-16-84	A325	0.875	533	24	06	0.000
3-14-84	A325	0.875	530	16	08	0.000
3-16-84	A325	0.875	533	24	07	0.000
3-14-84	A325	0.875	530	18	04	0.000
3-16-84	A325	0.875	533	24	08	0.000
4-5-84	A490	1.375	540	05E	06	0.000
4-6-84	A490	1.375	540	40	02	0.000
4-5-84	A490	1.375	540	04W	06	0.000
4-6-84	A490	1.375	540	40	01	0.000
3-20-84	A325	0.875	533	03	07	0.000
3-16-84	A325	0.875	533	34	03	0.000
3-20-84	A325	0.875	532	26	05	0.000
4-6-84	A490	1.375	540	39	04	0.000
3-20-84	A325	0.875	532	27	03	0.000
4-6-84	A490	1.375	540	39	02	0.000
3-13-84	A325	0.875	535	03	03	0.000
4-6-84	A490	1.375	540	39	01	0.000
3-20-84	A490	0.875	535	23	07	0.000
4-6-84	A490	1.375	540	38	06	0.000
3-23-84	A325	0.875	531	04	02	0.000
4-6-84	A490	1.375	540	38	05	0.000
3-20-84	A490	0.875	535	30	02	0.000
3-16-84	A325	0.875	533	33	01	0.000
3-20-84	A490	0.875	534	23	01	0.000
3-16-84	A325	0.875	533	33	02	0.000
3-20-84	A490	0.875	534	08	01	0.000
3-16-84	A325	0.875	533	33	03	0.000
3-19-84	A325	0.875	532	17	02	0.000
3-16-84	A325	0.875	533	33	04	0.000
4-4-84	A325	0.875	532	21	07	0.000
3-16-84	A325	0.875	533	33	05	0.000
3-19-84	A325	0.875	533	20	04	0.000
3-16-84	A325	0.875	533	33	06	0.000
4-4-84	A490	1.000	532	24	10	0.000
3-16-84	A325	0.875	533	33	07	0.000
4-4-84	A490	1.000	532	24	09	0.000
3-16-84	A325	0.875	533	33	08	0.000
3-16-84	A325	0.875	532	13	02	0.000
4-6-84	A490	0.875	540	38	03	0.000

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-16-84	A325	0.875	532	07	02	0.000
3-15-84	A490	1.000	532	25	05	0.000
3-16-84	A325	0.875	532	08	01	0.000
4-6-84	A490	0.875	540	38	01	0.000
3-16-84	A325	0.875	533	08	03	0.000
4-6-84	A490	0.875	540	37	06	0.000
3-16-84	A325	0.875	533	15	03	0.000
4-6-84	A490	0.875	540	37	04	0.000
4-5-84	A325	1.000	533	05	10	0.000
4-6-84	A490	0.875	540	37	03	0.000
3-16-84	A325	0.875	533	21	01	0.000
3-15-84	A325	0.875	536	15	01	0.000
4-5-84	A490	1.375	540	15E	06	0.000
3-15-84	A325	0.875	536	15	02	0.000
3-14-84	A325	0.875	532	02	03	0.000
3-15-84	A325	0.875	536	15	03	0.000
4-5-84	A490	1.375	540	15W	01	0.000
3-15-84	A325	0.875	536	16	01	0.000
3-14-84	A325	0.875	530	18	02	0.000
3-15-84	A325	0.875	536	16	02	0.000
4-5-84	A490	1.375	540	05E	03	0.000
3-15-84	A325	0.875	536	16	03	0.000
3-20-84	A325	0.875	533	03	04	0.000
3-15-84	A325	0.875	536	14	01	0.000
3-20-84	A325	0.875	533	03	01	0.000
3-15-84	A325	0.875	536	14	02	0.000
3-23-84	A325	0.875	531	04	06	0.000
3-15-84	A325	0.875	536	14	03	0.000
3-20-84	A490	0.875	535	30	06	0.000
3-15-84	A325	0.875	536	06	01	0.000
3-20-84	A490	0.875	534	08	05	0.000
3-15-84	A325	0.875	536	06	02	0.000
4-4-84	A325	0.875	532	21	03	0.000
4-6-84	A490	0.875	540	37	01	0.000
3-19-84	A325	0.875	533	23	02	0.000
4-9-84	A490	0.875	540	36E	06	0.000
3-16-84	A325	0.875	532	13	06	0.000
3-15-84	A325	0.875	536	13	02	0.000
3-16-84	A325	0.875	532	08	05	0.000
3-15-84	A325	0.875	536	13	03	0.000
4-4-84	A490	1.000	532	24	04	0.000
3-15-84	A325	0.875	536	08	01	0.000
3-16-84	A325	0.875	533	21	05	0.000
3-15-84	A325	0.875	536	08	02	0.000
4-5-84	A490	1.375	540	15W	05	0.000
3-15-84	A325	0.875	536	08	03	0.000
3-14-84	A325	0.875	530	18	06	0.000
4-9-84	A490	0.875	540	36E	05	0.000
3-20-84	A325	0.875	532	26	09	0.000
4-9-84	A490	0.875	540	36E	04	0.000
3-23-84	A325	0.875	530	02	05	0.000
4-9-84	A490	0.875	540	36E	02	0.000
3-19-84	A325	0.875	532	17	06	0.000
4-9-84	A490	0.875	540	36E	01	0.000
4-4-84	A490	1.000	532	24	07	0.000
4-9-84	A490	0.875	540	36W	06	0.000

3-16-84	A325	0.875	533	08	07	0.000
4-9-84	A490	0.875	540	36W	05	0.000
4-5-84	A490	1.375	540	15E	02	0.000
3-15-84	A325	0.875	535	07	08	0.000
3-14-84	A325	0.875	530	12	01	0.000
3-15-84	A325	0.875	535	07	09	0.000
3-20-84	A490	0.875	534	23	05	0.000
3-15-84	A325	0.875	535	07	10	0.000
3-16-84	A325	0.875	532	07	06	0.000
3-15-84	A325	0.875	535	07	11	0.000
3-14-84	A325	0.875	530	16	06	0.000
4-9-84	A490	0.875	540	36W	04	0.000
3-19-84	A325	0.875	533	20	08	0.000
3-20-84	A490	0.875	535	23	03	0.000
3-16-84	A325	0.875	533	19	03	0.000
3-15-84	A325	0.875	535	07	13	0.000
4-9-84	A490	0.875	540	36W	03	0.000

APPENDIX D

PALO VERDE UNIT 3 HIGH STRENGTH BOLT TORQUE CHECK
FOR CRITICAL FRICTION FASTENERS

PALO VERDE UNIT 3 HIGH STRENGTH BOLT TORQUE

INSP. DATE	BOLT GRADE	SIZE (IN)	DWG. NO.	CONN. NO.	BOLT NO.	NUT ROTAT TORQUE
4-24-84	A490	1.375	535	53	01	2385.000
4-24-84	A490	1.375	535	53	02	2385.000
4-24-84	A490	1.375	535	53	03	2385.000
4-24-84	A490	1.375	535	53	04	2385.000
4-24-84	A490	1.375	535	53	05	2385.000
4-24-84	A490	1.375	535	53	06	2385.000
4-24-84	A490	1.375	535	54	01	2385.000
4-24-84	A490	1.375	535	54	02	2385.000
4-24-84	A490	1.375	535	54	03	2385.000
4-24-84	A490	1.375	535	54	04	2385.000
4-24-84	A490	1.375	535	54	05	2385.000
4-24-84	A490	1.375	535	54	06	2385.000
4-24-84	A490	1.375	535	55	01	2385.000
4-24-84	A490	1.375	535	55	02	2385.000
4-24-84	A490	1.375	535	55	03	2385.000
4-24-84	A490	1.375	535	55	04	2385.000
4-24-84	A490	1.375	535	55	05	2385.000
4-24-84	A490	1.375	535	55	06	2385.000
4-24-84	A490	1.375	535	56	01	2385.000
4-24-84	A490	1.375	535	56	02	2385.000
4-24-84	A490	1.375	535	56	03	2385.000
4-24-84	A490	1.375	535	56	04	2385.000
4-24-84	A490	1.375	535	56	05	2385.000
4-20-84	A490	1.375	535	56	06	2385.000
4-20-84	A490	1.375	535	49	01	2385.000
4-20-84	A490	1.375	535	49	02	2385.000
4-20-84	A490	1.375	535	49	03	2385.000
4-20-84	A490	1.375	535	49	04	2385.000
4-20-84	A490	1.375	535	49	05	2385.000
4-20-84	A490	1.375	535	49	06	2385.000
4-20-84	A490	1.375	535	50	01	2385.000
4-20-84	A490	1.375	535	50	02	2385.000
4-20-84	A490	1.375	535	50	03	2385.000
4-20-84	A490	1.375	535	50	04	2385.000
4-20-84	A490	1.375	535	50	05	2385.000
4-20-84	A490	1.375	535	50	06	2385.000
4-20-84	A490	1.375	535	51	01	2385.000
4-20-84	A490	1.375	535	51	02	2385.000
4-20-84	A490	1.375	535	51	03	2385.000
4-20-84	A490	1.375	535	51	04	2385.000
4-20-84	A490	1.375	535	51	05	2385.000
4-20-84	A490	1.375	535	51	06	2385.000
4-20-84	A490	1.375	535	52	01	2385.000
4-20-84	A490	1.375	535	52	02	2385.000
4-20-84	A490	1.375	535	52	03	2385.000
4-20-84	A490	1.375	535	52	04	2385.000
4-20-84	A490	1.375	535	52	05	2385.000
4-20-84	A490	1.375	535	52	06	2385.000
4-19-84	A490	1.375	535	43	01	2385.000
4-19-84	A490	1.375	535	43	02	2385.000
4-19-84	A490	1.375	535	43	03	2385.000
4-19-84	A490	1.375	535	43	04	2385.000
4-19-84	A490	1.375	535	43	05	2385.000

4-19-84	A490	1.375	535	43	06	2385.000
4-19-84	A490	1.375	535	44	01	2385.000
4-19-84	A490	1.375	535	44	02	2385.000
4-19-84	A490	1.375	535	44	03	2385.000
4-19-84	A490	1.375	535	44	04	2385.000
4-19-84	A490	1.375	535	44	05	2385.000
4-19-84	A490	1.375	535	44	06	2385.000
4-19-84	A490	1.375	535	45	01	2385.000
4-19-84	A490	1.375	535	45	02	2385.000
4-19-84	A490	1.375	535	45	03	2385.000
4-19-84	A490	1.375	535	45	04	2385.000
4-19-84	A490	1.375	535	45	05	2385.000
4-19-84	A490	1.375	535	45	06	2385.000
4-19-84	A490	1.375	535	46	01	2385.000
4-19-84	A490	1.375	535	46	02	2385.000
4-19-84	A490	1.375	535	46	03	2385.000
4-19-84	A490	1.375	535	46	04	2385.000
4-19-84	A490	1.375	535	46	05	2385.000
4-19-84	A490	1.375	535	46	06	2385.000
4-19-84	A490	1.375	534	35	01	2385.000
4-19-84	A490	1.375	534	35	02	2385.000
4-19-84	A490	1.375	534	35	03	2385.000
4-19-84	A490	1.375	534	35	04	2385.000
4-19-84	A490	1.375	534	35	05	2385.000
4-19-84	A490	1.375	534	35	06	2385.000
4-19-84	A490	1.375	534	36	01	2385.000
4-19-84	A490	1.375	534	36	02	2385.000
4-19-84	A490	1.375	534	36	03	2385.000
4-19-84	A490	1.375	534	36	04	2385.000
4-19-84	A490	1.375	534	36	05	2385.000
4-19-84	A490	1.375	534	36	06	2385.000
4-19-84	A490	1.375	534	37	01	2385.000
4-19-84	A490	1.375	534	37	02	2385.000
4-19-84	A490	1.375	534	37	03	2385.000
4-19-84	A490	1.375	534	37	04	2385.000
4-19-84	A490	1.375	534	37	05	2385.000
4-19-84	A490	1.375	534	37	06	2385.000
4-19-84	A490	1.375	534	38	01	2385.000
4-19-84	A490	1.375	534	38	02	2385.000
4-19-84	A490	1.375	534	38	03	2385.000
4-19-84	A490	1.375	534	38	04	2385.000
4-19-84	A490	1.375	534	38	05	2385.000
4-18-84	A490	1.375	534	38	06	2385.000
4-18-84	A490	1.375	534	27	01	2385.000
4-18-84	A490	1.375	534	27	02	2385.000
4-18-84	A490	1.375	534	27	03	2385.000
4-18-84	A490	1.375	534	27	04	2385.000
4-18-84	A490	1.375	534	27	05	2385.000
4-18-84	A490	1.375	534	27	06	2385.000
4-18-84	A490	1.375	534	28	01	2385.000
4-18-84	A490	1.375	534	28	02	2385.000
4-18-84	A490	1.375	534	28	03	2385.000
4-18-84	A490	1.375	534	28	04	2385.000
4-18-84	A490	1.375	534	28	05	2385.000
4-18-84	A490	1.375	534	28	06	2385.000
		1.375	534	33	01	

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4-18-84	A490	1.375	534	33	02		2385.000
4-18-84	A490	1.375	534	33	03		2385.000
4-18-84	A490	1.375	534	33	04		2385.000
4-18-84	A490	1.375	534	33	05		2385.000
4-18-84	A490	1.375	534	33	06		2385.000
4-18-84	A490	1.375	534	34	01		2385.000
4-18-84	A490	1.375	534	34	02		2385.000
4-18-84	A490	1.375	534	34	03		2385.000
4-18-84	A490	1.375	534	34	04		2385.000
4-18-84	A490	1.375	534	34	05		2385.000
4-18-84	A490	1.375	534	34	06		2385.000
3-23-84	A325	0.875	532	09	01	0.500	
3-22-84	A325	0.875	530	17	06	0.417	
3-23-84	A325	0.875	531	02	04	0.333	
3-26-84	A325	0.875	532	21	03	0.250	
3-22-84	A325	0.875	530	03	02	0.250	
3-26-84	A325	0.875	532	21	02	0.250	
3-27-84	A325	0.875	535	06	08	0.208	
3-26-84	A325	0.875	532	27	01	0.167	
3-22-84	A325	0.875	530	16	05	0.167	
3-22-84	A325	0.875	530	03	08	0.167	
3-22-84	A325	0.875	530	03	04	0.167	
3-22-84	A325	0.875	530	03	06	0.083	
3-23-84	A325	0.875	531	02	03	0.083	
3-23-84	A325	0.875	531	02	02	0.083	
3-22-84	A325	0.875	530	03	03	0.083	
3-23-84	A325	0.875	531	02	01	0.083	
3-28-84	A325	0.875	535	13	02	0.083	
3-27-84	A325	0.875	535	28	01	0.083	
3-22-84	A325	0.875	530	03	01	0.083	
3-22-84	A325	0.875	530	01	03	0.083	
4-3-84	A325	0.875	529	03	01	0.083	
3-26-84	A325	0.875	533	09	06	0.083	
3-22-84	A325	0.875	530	03	07	0.042	
3-22-84	A325	0.875	530	16	04	0.042	
3-29-84	A490	0.875	535	23	06	0.042	
3-28-84	A490	0.875	534	08	02	0.042	
3-28-84	A490	0.875	534	08	01	0.042	
3-27-84	A325	0.875	535	06	09	0.042	
3-22-84	A325	0.875	530	16	03	0.042	
3-27-84	A325	0.875	534	10	09	0.042	
3-29-84	A490	0.875	535	23	01	0.042	
3-22-84	A325	0.875	530	17	07	0.042	
3-27-84	A325	0.875	535	06	12	0.021	
3-28-84	A490	0.875	534	09	03	0.021	
3-28-84	A490	0.875	534	09	02	0.021	
3-27-84	A325	0.875	535	06	10	0.021	
3-28-84	A490	0.875	534	09	01	0.021	
3-28-84	A490	0.875	534	09	07	0.021	
3-22-84	A325	0.875	530	16	02	0.021	
3-28-84	A490	0.875	534	09	05	0.021	
3-29-84	A490	0.875	535	02	01	0.021	
3-28-84	A490	0.875	534	08	03	0.021	
3-22-84	A325	0.875	530	16	07	0.021	
3-28-84	A490	0.875	534	09	06	0.021	
3-26-84	A325	0.875	534	07	07	0.021	

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3-28-84	A490	0.875	534	09	04	0.021
3-29-84	A490	0.875	535	23	05	0.021
3-27-84	A325	0.875	534	21	10	0.000
3-27-84	A325	0.875	534	10	05	0.000
3-29-84	A490	0.875	535	33	10	0.000
3-27-84	A325	0.875	534	10	06	0.000
3-29-84	A490	0.875	535	33	12	0.000
3-27-84	A325	0.875	534	10	07	0.000
3-29-84	A490	0.875	535	33	14	0.000
3-27-84	A325	0.875	534	10	08	0.000
3-29-84	A490	0.875	535	29	02	0.000
3-30-84	A490	1.000	532	25	05	0.000
3-29-84	A490	0.875	535	29	04	0.000
3-27-84	A325	0.875	534	12	01	0.000
3-29-84	A490	0.875	535	29	06	0.000
3-27-84	A325	0.875	534	12	02	0.000
3-29-84	A490	0.875	535	30	01	0.000
3-27-84	A325	0.875	534	12	03	0.000
3-29-84	A490	0.875	535	30	03	0.000
3-27-84	A325	0.875	534	12	04	0.000
3-29-84	A490	0.875	535	30	05	0.000
3-27-84	A325	0.875	534	12	05	0.000
3-29-84	A490	0.875	535	30	08	0.000
3-27-84	A325	0.875	534	12	06	0.000
3-29-84	A490	0.875	535	23	02	0.000
3-27-84	A325	0.875	534	12	07	0.000
3-29-84	A490	0.875	535	23	04	0.000
3-27-84	A325	0.875	534	12	08	0.000
3-29-84	A490	0.875	535	33	07	0.000
3-26-84	A325	0.875	533	14	01	0.000
3-29-84	A490	0.875	535	24	01	0.000
3-26-84	A325	0.875	533	14	02	0.000
3-29-84	A490	0.875	535	24	03	0.000
3-26-84	A325	0.875	533	14	03	0.000
3-29-84	A490	0.875	535	24	05	0.000
3-26-84	A325	0.875	533	14	04	0.000
3-29-84	A490	0.875	535	24	07	0.000
3-26-84	A325	0.875	533	14	05	0.000
3-29-84	A490	0.875	535	02	02	0.000
3-26-84	A325	0.875	533	14	06	0.000
3-29-84	A490	0.875	535	02	04	0.000
3-26-84	A325	0.875	533	14	07	0.000
3-29-84	A490	0.875	535	02	06	0.000
3-26-84	A325	0.875	533	14	08	0.000
3-29-84	A490	0.875	535	09	01	0.000
3-26-84	A325	0.875	533	16	01	0.000
3-29-84	A490	0.875	535	09	03	0.000
3-26-84	A325	0.875	533	16	02	0.000
3-29-84	A490	0.875	535	09	05	0.000
3-26-84	A325	0.875	533	16	03	0.000
3-29-84	A490	0.875	536	09	07	0.000
3-26-84	A325	0.875	533	16	04	0.000
3-28-84	A325	0.875	536	14	02	0.000
3-26-84	A325	0.875	533	16	05	0.000
3-28-84	A325	0.875	536	15	01	0.000
3-26-84	A325	0.875	533	16	06	0.000

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3-28-84	A325	0.875	536	15	03	0.000
3-26-84	A325	0.875	533	18	01	0.000
3-28-84	A325	0.875	536	16	02	0.000
3-26-84	A325	0.875	533	18	02	0.000
3-28-84	A325	0.875	536	17	01	0.000
3-26-84	A325	0.875	533	18	03	0.000
3-28-84	A325	0.875	536	17	03	0.000
3-26-84	A325	0.875	533	18	04	0.000
3-29-84	A490	0.875	535	33	05	0.000
3-26-84	A325	0.875	533	18	05	0.000
3-28-84	A325	0.875	535	13	04	0.000
3-26-84	A325	0.875	533	18	06	0.000
3-28-84	A325	0.875	535	13	06	0.000
3-26-84	A325	0.875	533	18	07	0.000
3-28-84	A325	0.875	535	17	01	0.000
3-26-84	A325	0.875	533	08	01	0.000
3-28-84	A325	0.875	535	17	03	0.000
3-26-84	A325	0.875	533	08	02	0.000
3-28-84	A325	0.875	535	17	05	0.000
3-26-84	A325	0.875	533	08	03	0.000
3-28-84	A325	0.875	535	17	07	0.000
3-26-84	A325	0.875	533	08	04	0.000
3-29-84	A490	0.875	535	33	03	0.000
3-26-84	A325	0.875	533	08	05	0.000
3-29-84	A490	0.875	535	33	01	0.000
3-26-84	A325	0.875	533	08	06	0.000
3-29-84	A490	0.875	535	31	06	0.000
3-26-84	A325	0.875	533	08	07	0.000
3-29-84	A490	0.875	535	31	04	0.000
3-26-84	A325	0.875	533	08	08	0.000
3-29-84	A490	0.875	535	31	02	0.000
3-26-84	A325	0.875	533	09	01	0.000
3-28-84	A490	0.875	534	08	05	0.000
3-26-84	A325	0.875	533	09	02	0.000
3-28-84	A490	0.875	534	08	07	0.000
3-26-84	A325	0.875	533	09	03	0.000
3-27-84	A325	0.875	536	01	02	0.000
3-26-84	A325	0.875	533	09	04	0.000
3-27-84	A325	0.875	536	02	01	0.000
3-26-84	A325	0.875	533	09	05	0.000
3-27-84	A325	0.875	536	02	03	0.000
3-30-84	A490	1.000	532	25	04	0.000
3-27-84	A325	0.875	536	03	02	0.000
3-26-84	A325	0.875	533	09	07	0.000
3-27-84	A325	0.875	536	04	01	0.000
3-26-84	A325	0.875	533	09	08	0.000
3-27-84	A325	0.875	536	04	03	0.000
3-26-84	A325	0.875	533	09	09	0.000
3-27-84	A325	0.875	536	05	02	0.000
3-26-84	A325	0.875	533	09	10	0.000
3-27-84	A325	0.875	536	06	01	0.000
3-30-84	A490	1.000	532	24	10	0.000
3-27-84	A325	0.875	536	06	03	0.000
3-26-84	A325	0.875	532	27	02	0.000
3-27-84	A325	0.875	533	26	02	0.000
3-26-84	A325	0.875	532	27	03	0.000

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3-27-84	A325	0.875	533	26	04	0.000
3-26-84	A325	0.875	532	27	04	0.000
3-27-84	A325	0.875	533	26	06	0.000
3-26-84	A325	0.875	532	27	05	0.000
3-27-84	A325	0.875	533	26	08	0.000
3-26-84	A325	0.875	532	19	01	0.000
3-27-84	A325	0.875	533	27	02	0.000
3-26-84	A325	0.875	532	19	02	0.000
3-27-84	A325	0.875	533	27	04	0.000
3-26-84	A325	0.875	532	19	03	0.000
3-27-84	A325	0.875	533	27	06	0.000
3-26-84	A325	0.875	532	19	04	0.000
3-27-84	A325	0.875	533	28	02	0.000
3-26-84	A325	0.875	532	19	05	0.000
3-27-84	A325	0.875	533	28	04	0.000
3-26-84	A325	0.875	532	19	06	0.000
3-27-84	A325	0.875	533	28	06	0.000
3-26-84	A325	0.875	532	19	07	0.000
3-27-84	A325	0.875	533	29	02	0.000
3-26-84	A325	0.875	532	19	08	0.000
3-27-84	A325	0.875	533	29	04	0.000
3-26-84	A325	0.875	532	21	01	0.000
3-27-84	A325	0.875	533	29	06	0.000
3-30-84	A490	1.000	532	24	09	0.000
3-27-84	A325	0.875	535	34	02	0.000
3-30-84	A490	1.000	532	24	08	0.000
3-27-84	A325	0.875	535	34	04	0.000
3-26-84	A325	0.875	532	21	04	0.000
3-27-84	A325	0.875	535	34	06	0.000
3-26-84	A325	0.875	532	21	05	0.000
3-27-84	A325	0.875	535	34	08	0.000
3-26-84	A325	0.875	532	21	06	0.000
3-27-84	A325	0.875	535	26	02	0.000
3-26-84	A325	0.875	532	21	07	0.000
3-27-84	A325	0.875	535	26	04	0.000
3-26-84	A325	0.875	532	21	08	0.000
3-27-84	A325	0.875	535	26	06	0.000
3-26-84	A325	0.875	532	21	09	0.000
3-29-84	A490	0.875	535	31	01	0.000
3-26-84	A325	0.875	532	21	10	0.000
3-27-84	A325	0.875	535	28	03	0.000
3-26-84	A325	0.875	534	07	01	0.000
3-27-84	A325	0.875	535	28	05	0.000
3-26-84	A325	0.875	534	07	02	0.000
3-27-84	A325	0.875	535	28	07	0.000
3-26-84	A325	0.875	534	07	03	0.000
3-27-84	A325	0.875	535	14	02	0.000
3-26-84	A325	0.875	534	07	04	0.000
3-27-84	A325	0.875	535	14	04	0.000
3-26-84	A325	0.875	534	07	05	0.000
3-27-84	A325	0.875	535	14	06	0.000
3-26-84	A325	0.875	534	07	06	0.000
3-27-84	A325	0.875	535	25	01	0.000
3-30-84	A490	1.000	532	24	07	0.000
3-27-84	A325	0.875	535	25	03	0.000
3-26-84	A325	0.875	534	04	01	0.000

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3-27-84	A325	0.875	535	25	05	0.000
3-26-84	A325	0.875	534	04	02	0.000
3-27-84	A325	0.875	535	25	07	0.000
3-26-84	A325	0.875	534	04	03	0.000
3-27-84	A325	0.875	535	06	02	0.000
3-26-84	A325	0.875	534	04	04	0.000
3-27-84	A325	0.875	535	06	04	0.000
3-23-84	A325	0.875	532	17	01	0.000
3-27-84	A325	0.875	535	06	06	0.000
3-23-84	A325	0.875	532	17	02	0.000
3-30-84	A490	1.000	532	25	10	0.000
3-23-84	A325	0.875	532	17	03	0.000
3-30-84	A490	1.000	532	25	08	0.000
3-23-84	A325	0.875	532	17	04	0.000
3-30-84	A490	1.000	532	25	07	0.000
3-23-84	A325	0.875	532	17	05	0.000
3-27-84	A325	0.875	535	06	14	0.000
3-23-84	A325	0.875	532	17	06	0.000
3-27-84	A325	0.875	535	24	02	0.000
3-23-84	A325	0.875	532	17	07	0.000
3-27-84	A325	0.875	535	24	04	0.000
3-23-84	A325	0.875	532	17	08	0.000
3-27-84	A325	0.875	534	24	06	0.000
3-23-84	A325	0.875	532	18	01	0.000
3-27-84	A325	0.875	534	03	01	0.000
3-23-84	A325	0.875	532	18	02	0.000
3-27-84	A325	0.875	534	03	03	0.000
3-23-84	A325	0.875	532	18	03	0.000
3-27-84	A325	0.875	534	03	05	0.000
3-23-84	A325	0.875	532	18	04	0.000
3-27-84	A325	0.875	534	03	07	0.000
3-23-84	A325	0.875	532	18	05	0.000
3-27-84	A325	0.875	534	21	02	0.000
3-23-84	A325	0.875	532	18	06	0.000
3-27-84	A325	0.875	534	21	04	0.000
3-23-84	A325	0.875	532	18	07	0.000
3-27-84	A325	0.875	534	21	06	0.000
3-23-84	A325	0.875	532	18	08	0.000
3-27-84	A325	0.875	534	21	08	0.000
3-23-84	A325	0.875	532	07	01	0.000
3-30-84	A490	1.000	532	25	06	0.000
3-23-84	A325	0.875	532	07	02	0.000
3-27-84	A325	0.875	534	21	12	0.000
3-23-84	A325	0.875	532	07	03	0.000
3-27-84	A325	0.875	534	21	14	0.000
3-23-84	A325	0.875	532	07	04	0.000
3-27-84	A325	0.875	534	14	02	0.000
3-23-84	A325	0.875	532	07	05	0.000
3-27-84	A325	0.875	534	14	04	0.000
3-23-84	A325	0.875	532	07	06	0.000
3-27-84	A325	0.875	534	14	06	0.000
3-23-84	A325	0.875	532	07	07	0.000
3-27-84	A325	0.875	534	14	08	0.000
3-23-84	A325	0.875	532	07	08	0.000
3-27-84	A325	0.875	534	20	02	0.000
3-23-84	A325	0.875	532	07	09	0.000

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3-27-84	A325	0.875	534	20	04	0.000
3-23-84	A325	0.875	532	08	01	0.000
3-27-84	A325	0.875	534	20	06	0.000
3-23-84	A325	0.875	532	08	02	0.000
3-27-84	A325	0.875	534	10	01	0.000
3-23-84	A325	0.875	532	08	03	0.000
3-27-84	A325	0.875	534	10	03	0.000
3-23-84	A325	0.875	532	08	04	0.000
3-29-84	A490	0.875	535	33	11	0.000
3-23-84	A325	0.875	532	08	05	0.000
3-29-84	A490	0.875	535	29	01	0.000
3-23-84	A325	0.875	532	08	06	0.000
3-29-84	A490	0.875	535	29	05	0.000
3-30-84	A490	1.000	532	24	06	0.000
3-29-84	A490	0.875	535	30	02	0.000
3-23-84	A325	0.875	532	09	02	0.000
3-29-84	A490	0.875	535	30	06	0.000
3-23-84	A325	0.875	532	09	03	0.000
3-29-84	A490	0.875	535	23	03	0.000
3-23-84	A325	0.875	532	09	04	0.000
3-29-84	A490	0.875	535	23	07	0.000
3-23-84	A325	0.875	532	09	05	0.000
3-29-84	A490	0.875	535	24	04	0.000
3-23-84	A325	0.875	532	09	06	0.000
3-29-84	A490	0.875	535	33	06	0.000
3-23-84	A325	0.875	532	01	01	0.000
3-29-84	A490	0.875	535	02	05	0.000
3-23-84	A325	0.875	532	01	02	0.000
3-29-84	A490	0.875	535	09	02	0.000
3-23-84	A325	0.875	532	01	03	0.000
3-29-84	A490	0.875	535	09	06	0.000
3-23-84	A325	0.875	532	01	04	0.000
3-28-84	A325	0.875	536	14	03	0.000
3-23-84	A325	0.875	532	01	05	0.000
3-28-84	A325	0.875	536	16	01	0.000
3-23-84	A325	0.875	532	01	06	0.000
3-28-84	A325	0.875	536	17	02	0.000
3-23-84	A325	0.875	532	01	07	0.000
3-28-84	A325	0.875	535	13	03	0.000
3-23-84	A325	0.875	532	01	08	0.000
3-28-84	A325	0.875	535	13	07	0.000
3-23-84	A325	0.875	532	02	01	0.000
3-28-84	A325	0.875	535	17	04	0.000
3-23-84	A325	0.875	532	02	02	0.000
3-29-84	A490	0.875	535	33	04	0.000
3-23-84	A325	0.875	532	02	03	0.000
3-29-84	A490	0.875	535	31	07	0.000
3-23-84	A325	0.875	532	02	04	0.000
3-29-84	A490	0.875	535	31	03	0.000
3-23-84	A325	0.875	532	02	05	0.000
3-28-84	A490	0.875	534	08	06	0.000
3-23-84	A325	0.875	532	02	06	0.000
3-27-84	A325	0.875	536	01	03	0.000
3-23-84	A325	0.875	532	02	07	0.000
3-27-84	A325	0.875	536	03	01	0.000
3-23-84	A325	0.875	532	02	08	0.000

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-27-84	A325	0.875	536	04	02	0.000
3-23-84	A325	0.875	532	02	09	0.000
3-27-84	A325	0.875	536	05	03	0.000
3-23-84	A325	0.875	532	03	01	0.000
3-27-84	A325	0.875	533	26	01	0.000
3-23-84	A325	0.875	532	03	02	0.000
3-27-84	A325	0.875	533	26	05	0.000
3-23-84	A325	0.875	532	03	03	0.000
3-27-84	A325	0.875	533	27	01	0.000
3-23-84	A325	0.875	532	03	04	0.000
3-27-84	A325	0.875	533	27	05	0.000
3-23-84	A325	0.875	532	03	05	0.000
3-27-84	A325	0.875	533	28	03	0.000
3-23-84	A325	0.875	532	03	06	0.000
3-27-84	A325	0.875	533	29	01	0.000
3-23-84	A325	0.875	532	03	07	0.000
3-27-84	A325	0.875	533	29	05	0.000
3-23-84	A325	0.875	532	03	08	0.000
3-27-84	A325	0.875	535	34	03	0.000
3-23-84	A325	0.875	532	03	09	0.000
3-27-84	A325	0.875	535	34	07	0.000
3-23-84	A325	0.875	531	01	01	0.000
3-27-84	A325	0.875	535	26	03	0.000
3-23-84	A325	0.875	531	01	02	0.000
3-27-84	A325	0.875	535	26	07	0.000
3-23-84	A325	0.875	531	01	03	0.000
3-27-84	A325	0.875	535	28	04	0.000
3-23-84	A325	0.875	531	01	04	0.000
3-27-84	A325	0.875	535	14	01	0.000
3-23-84	A325	0.875	531	01	05	0.000
3-27-84	A325	0.875	535	14	05	0.000
3-30-84	A490	1.000	532	24	05	0.000
3-27-84	A325	0.875	535	25	02	0.000
3-30-84	A490	1.000	532	24	04	0.000
3-27-84	A325	0.875	535	25	06	0.000
3-30-84	A490	1.000	532	24	03	0.000
3-27-84	A325	0.875	535	06	03	0.000
3-30-84	A490	1.000	532	24	02	0.000
3-27-84	A325	0.875	535	06	07	0.000
3-23-84	A325	0.875	531	02	05	0.000
3-27-84	A325	0.875	535	06	11	0.000
3-23-84	A325	0.875	531	02	06	0.000
3-27-84	A325	0.875	535	24	01	0.000
3-23-84	A325	0.875	531	02	07	0.000
3-27-84	A325	0.875	534	24	05	0.000
3-22-84	A325	0.875	530	15	01	0.000
3-27-84	A325	0.875	534	03	02	0.000
3-22-84	A325	0.875	530	15	02	0.000
3-27-84	A325	0.875	534	03	06	0.000
3-22-84	A325	0.875	530	15	03	0.000
3-27-84	A325	0.875	534	21	03	0.000
3-22-84	A325	0.875	530	15	04	0.000
3-27-84	A325	0.875	534	21	07	0.000
3-22-84	A325	0.875	530	15	05	0.000
3-27-84	A325	0.875	534	21	11	0.000
3-22-84	A325	0.875	530	15	06	0.000

3-27-84	A325	0.875	534	14	01	0.000
3-22-84	A325	0.875	530	15	07	0.000
3-27-84	A325	0.875	534	14	05	0.000
3-22-84	A325	0.875	530	15	08	0.000
3-27-84	A325	0.875	534	20	01	0.000
3-22-84	A325	0.875	530	16	01	0.000
3-27-84	A325	0.875	534	20	05	0.000
3-30-84	A490	1.000	532	24	01	0.000
3-27-84	A325	0.875	534	10	02	0.000
4-3-84	A325	0.875	538	03	03	0.000
3-29-84	A490	0.875	535	33	13	0.000
4-3-84	A325	0.875	538	03	02	0.000
3-29-84	A490	0.875	535	29	07	0.000
4-3-84	A325	0.875	538	03	01	0.000
3-29-84	A490	0.875	535	33	09	0.000
3-22-84	A325	0.875	530	16	06	0.000
3-29-84	A490	0.875	535	24	02	0.000
4-3-84	A325	0.875	538	02	03	0.000
3-29-84	A490	0.875	535	02	03	0.000
3-22-84	A325	0.875	530	16	08	0.000
3-29-84	A490	0.875	535	09	04	0.000
3-22-84	A325	0.875	530	10	01	0.000
3-28-84	A325	0.875	536	15	02	0.000
3-22-84	A325	0.875	530	10	02	0.000
3-28-84	A325	0.875	535	13	01	0.000
3-22-84	A325	0.875	530	10	03	0.000
3-28-84	A325	0.875	535	17	02	0.000
3-22-84	A325	0.875	530	10	04	0.000
3-29-84	A490	0.875	535	33	02	0.000
3-22-84	A325	0.875	530	10	05	0.000
3-28-84	A490	0.875	534	08	04	0.000
3-22-84	A325	0.875	530	10	06	0.000
3-27-84	A325	0.875	536	02	02	0.000
3-22-84	A325	0.875	530	10	07	0.000
3-27-84	A325	0.875	536	05	01	0.000
3-22-84	A325	0.875	530	10	08	0.000
3-27-84	A325	0.875	533	26	03	0.000
3-22-84	A325	0.875	530	10	09	0.000
3-27-84	A325	0.875	533	27	03	0.000
3-22-84	A325	0.875	530	11	11	0.000
3-27-84	A325	0.875	533	28	05	0.000
3-22-84	A325	0.875	530	11	11	0.000
3-27-84	A325	0.875	535	34	01	0.000
3-22-84	A325	0.875	530	11	11	0.000
3-27-84	A325	0.875	535	26	01	0.000
3-22-84	A325	0.875	530	11	11	0.000
3-27-84	A325	0.875	535	28	02	0.000
3-22-84	A325	0.875	530	11	11	0.000
3-27-84	A325	0.875	535	14	03	0.000
3-22-84	A325	0.875	530	11	11	0.000
3-27-84	A325	0.875	535	25	04	0.000
3-22-84	A325	0.875	530	01	01	0.000
3-27-84	A325	0.875	535	06	05	0.000
3-22-84	A325	0.875	530	01	02	0.000
3-27-84	A325	0.875	535	06	13	0.000
4-3-84	A325	0.875	538	02	02	0.000

3-27-84	A325	0.875	534	24	07	0.000
3-22-84	A325	0.875	530	01	04	0.000
3-27-84	A325	0.875	534	21	01	0.000
3-22-84	A325	0.875	530	01	05	0.000
3-27-84	A325	0.875	534	21	09	0.000
3-22-84	A325	0.875	530	01	06	0.000
3-27-84	A325	0.875	534	14	03	0.000
3-22-84	A325	0.875	530	01	07	0.000
3-27-84	A325	0.875	534	20	03	0.000
3-22-84	A325	0.875	530	01	08	0.000
3-27-84	A325	0.875	534	10	04	0.000
4-3-84	A325	0.875	538	02	01	0.000
3-29-84	A490	0.875	535	30	04	0.000
4-3-84	A325	0.875	538	04	03	0.000
3-29-84	A490	0.875	535	24	06	0.000
4-3-84	A325	0.875	538	04	02	0.000
3-28-84	A325	0.875	536	14	01	0.000
4-3-84	A325	0.875	538	04	01	0.000
3-28-84	A325	0.875	535	13	05	0.000
3-22-84	A325	0.875	530	03	05	0.000
3-29-84	A490	0.875	535	31	05	0.000
4-3-84	A325	0.875	538	01	03	0.000
3-27-84	A325	0.875	536	03	03	0.000
4-3-84	A325	0.875	538	01	02	0.000
3-27-84	A325	0.875	533	26	07	0.000
4-3-84	A325	0.875	538	01	01	0.000
3-27-84	A325	0.875	533	29	03	0.000
3-22-84	A325	0.875	530	04	01	0.000
3-27-84	A325	0.875	535	26	05	0.000
3-22-84	A325	0.875	530	04	02	0.000
3-27-84	A325	0.875	535	14	07	0.000
3-22-84	A325	0.875	530	04	03	0.000
3-30-84	A490	1.000	532	25	09	0.000
3-22-84	A325	0.875	530	04	04	0.000
3-27-84	A325	0.875	534	03	04	0.000
3-22-84	A325	0.875	530	04	05	0.000
3-27-84	A325	0.875	534	21	13	0.000
3-22-84	A325	0.875	530	17	01	0.000
3-27-84	A325	0.875	534	20	07	0.000
3-22-84	A325	0.875	530	17	02	0.000
3-29-84	A490	0.875	535	33	08	0.000
3-22-84	A325	0.875	530	17	03	0.000
3-28-84	A325	0.875	536	16	03	0.000
3-22-84	A325	0.875	530	17	04	0.000
3-27-84	A325	0.875	536	01	01	0.000
3-22-84	A325	0.875	530	17	05	0.000
3-27-84	A325	0.875	533	28	01	0.000
4-3-84	A325	0.875	529	06	02	0.000
3-27-84	A325	0.875	535	28	06	0.000
4-3-84	A325	0.875	529	06	01	0.000
3-27-84	A325	0.875	535	24	03	0.000
3-22-84	A325	0.875	530	14	01	0.000
3-27-84	A325	0.875	534	14	07	0.000
3-22-84	A325	0.875	530	14	02	0.000
3-29-84	A490	0.875	535	02	07	0.000
3-22-84	A325	0.875	530	14	03	0.000

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-27-84	A325	0.875	536	06	02	0.000
3-22-84	A325	0.875	530	14	04	0.000
3-27-84	A325	0.875	535	06	01	0.000
3-22-84	A325	0.875	530	14	05	0.000
3-29-84	A490	0.875	535	29	03	0.000
3-22-84	A325	0.875	530	14	06	0.000
3-27-84	A325	0.875	535	34	05	0.000
3-28-84	A325	0.875	535	17	06	0.000
3-27-84	A325	0.875	534	21	05	0.000
3-22-84	A325	0.875	530	14	07	0.000
3-22-84	A325	0.875	530	14	08	0.000

APPENDIX E

TORQUE COEFFICIENTS MEASURED BY BECHTEL FOR BOLTS IN VARIOUS CONDITIONS

CALCULATION SHEET

SIGNATURE G. Collins DATE 5-9-95 CALC. NO _____

PROJECT PVNGS CHECKED _____ DATE _____

SUBJECT UNIT 3 - A325 BOLT TENSIONING JOB NO 10497

SHEET 1 OF _____ SHEETS

29 - 7/8" ϕ A325 BOLTS SOME WITHOUT LUBRICATIO SOME RUSTED AND THE REST LUBRICATED WITH DIFFERENT TYPES OF LUBRICANT, WERE TENSIONED USING AN AIR DRIVEN IMPACT WRENCH UNTIL THE WRENCH STOPPED TENSIONING.

THE TENSION VALUES ON THE BOLT TENSIONING CALIBRATOR WERE RECORDED, THE TORQUE WAS MEASURED WITH A HAND TORQUE WRENCH AND EVERY BOLT WAS PUNCH MARKED.

DETERMINATION OF THE COEFICIENT OF FRICTION "C" IN EVERY CASE, BASED ON THE TORQUE FORMULA.

$$T = \frac{(C)(D)(\text{TENSILE FORCE})}{12} \quad (\text{RESULTS IN FT-LB})$$

$$C = \frac{12 \times (T)}{D \times (\text{TENSILE FORCE})}$$

T = TORQUE
C = COEFFICIENT OF FRICTION
D = BOLT NOMINAL DIAMETER

STRUCTURAL INTEGRITY ASSOCIATES, INC.

CALCULATION SHEET

CALC. NO. _____

SIGNATURE G. Caldwell DATE 3-9-83 CHECKED _____ DATE _____

PROJECT PYNGS JOB NO 10407

SUBJECT UNIT 3 - A325 BOLT TENSIONING SHEET 2 OF _____ SHEETS

BOLT No	TENSION (KIPS)	TORQUE Ft-Lbs	LUBRICANT	COEFFICIENT OF FRICTION "C"	BRINNELL HARDNESS BOLT	BRINNELL HARDNESS WASHER	REMARKS
02	38	390	USED BOLTS AS USED DAILY NO LUBRICANT USED	0.141			
03	48	530		0.151			
04	47	—					
05	51	600		0.161			
06	49	520		0.146			
1	42	500	CUTTING OIL	0.163			
2	28	360		0.176			
3	42.5	550		0.177			
4	51.5	580	SAE 30 OIL	0.154			
5	37.5	345		0.126			
6	50	540		0.148			
7	45	560	LIQUID WRENCH	0.171			
8	50.5	710		0.193			YIELDED AND WENT ON (AS WHEN CHECKING TORQU
9	51	560		0.151			
10	55	600	"NEVER SEEZE" PURE NICKEL	0.150			
11	42	480		0.157			
12	44.5	520		0.160			
13	50	610	"N 5000" GRAPHITE	0.167			
14	40	475		0.163			
15	36	400		0.152			
16	44	450	WD40	0.140			
17	32.5	445		0.188			
18	41	420		0.140			YIELDED & LOWERED TO 2 WHEN TORQUE CHECKING
19	45	560	"MAREAK" GREASE	0.171			
20	46	550		0.164			
21	49.5	600		0.166			
22	40.5	970	NONE	0.328			
23	29	900		0.426			
24	30	580		0.265			

STRUCTURAL INTEGRITY ASSOCIATES INC.

SIGNATURE Thomas J. Hunter DATE 5-17-83 CHECKED _____ DATE _____

PROJECT PVNGS JOB NO 10407

SUBJECT TEST DATA FOR NCR CC-4087 & DER 83-30 SHEET _____ OF _____ SHEETS

CALC NO _____

SAMPLE No.	MATERIAL TYPE	DIAMETER (INCHES)	THREADS PER INCH	Fu (LBS)	.7Fu (LBS)	ACTUAL TENSION	TORQUE (FT-LBS)	FRICTION COEF. (C)
1	A325	3/4	10	40,100	28,070	28,100	215	0.122
2	A325	3/4	10	40,100	28,070	28,100	220	0.125
3	A325	3/4	10	40,100	28,070	28,100	225	0.128
4	A325	3/4	10	40,100	28,070	28,100	240	0.137
5	A325	1	8	72,700	50,890	51,000	500	0.118
6	A325	1	8	72,700	50,890	51,000	580	0.136
7	A325	1	8	72,700	50,890	51,000	580	0.136
8	A325	1	8	72,700	50,890	51,100	540	0.127
9	A325	1 1/4	7	101,700	71,190	71,100	888	0.120
10	A325	1 1/4	7	101,700	71,190	71,500	962	0.129
11	A325	1 1/4	7	101,700	71,190	71,400	1129	0.151
12	A325	1 1/4	7	101,700	71,190	71,100	1092	0.147
13	A490	7/8	9	69,300	48,510	44,100	530	0.145
14	A490	7/8	9	69,300	48,510	49,100	440	0.123
15	A490	7/8	9	69,300	48,510	49,500	420	0.116
16	A490	7/8	9	69,300	48,510	49,100	540	0.151
17	A490	1	8	90,900	63,630	64,100	830	0.155
18	A490	1	8	90,900	63,630	64,000	700	0.131
19	A490	1	8	90,900	63,630	64,100	740	0.139
20	A490	1	8	90,900	63,630	64,500	750	0.140
21	A490	1 1/4	7	145,350	101,745	103,000	1591	0.148
22	A490	1 1/4	7	145,350	101,745	103,000	1480	0.138
23	A490	1 1/4	7	145,350	101,745	103,900	1480	0.137
24	A490	1 1/4	7	145,350	101,745	102,000	1351	0.127
25	A354 BD	1	8	90,900	63,630	64,000	865	0.162
26	A354 BD	1	8	90,900	63,630	64,000	800	0.150
27	A354 BD	1	8	90,900	63,630	63,600	805	0.152
28	A354 BD	1	8	90,900	63,630	64,200	720	0.135
29	A354 BD	1	8	90,900	63,630	64,500	895	0.167
30	A354 BD	1	8	90,900	63,630	64,500	800	0.149

CONT'D

NCR CC 4087 PAGE 6 OF

STRUCTURAL INTEGRITY ASSOCIATES, INC.

SIGNATURE Van J. Hester DATE 5-17-83 CALC. NO.

PROJECT PVNGS CHECKED DATE

SUBJECT TEST DATA FOR NCR CC 4087 & DER 83-30 JOB NO.

SHEET OF SHEETS

SAMPLE No.	MATERIAL TYPE	DIAMETER (INCHES)	THREADS PER INCH	Fu (LBS)	.7 Fu (LBS)	ACTUAL TENSION	TORQUE (FT-LBS)	FRICTION * COEF. (c)
31	A354 BD	1¼	8	~~150,000~~ ~~145,350~~	~~105,000~~ ~~101,745~~	105,100	1554	0.142
32	A354 BD	1¼	8	~~150,000~~ ~~145,350~~	~~105,000~~ ~~101,745~~	105,100	1625	0.149
33	A354 BD	1¼	8	~~150,000~~ ~~145,350~~	~~105,000~~ ~~101,745~~	106,000	1591	0.144
34	A354 BD	1¼	8	~~150,000~~ ~~145,350~~	~~105,000~~ ~~101,745~~	106,000	1647	0.149
35	A354 BD	1¼	7	145,350	101,745	102,000	1554	0.146
36	A354 BD	1¼	7	145,350	101,745	102,100	1480	0.139
37	A193 B7	¾	10	41,750	29,225	29,100	220	0.121
38	A193 B7	¾	10	41,750	29,225	29,100	220	0.121
39	A193 B7	¾	10	41,750	29,225	29,500	240	0.130
40	A193 B7	¾	10	41,750	29,225	29,100	235	0.129
41	A193 B7	1	8	75,750	53,025	52,400	640	0.145
42	A193 B7	1	8	75,750	53,025	53,000	720	0.163
43	A193 B7	1	8	75,750	53,025	53,500	530	0.119
44	A193 B7	1	8	75,750	53,025	53,900	500	0.111
45	A193 B7	1¼	7	121,125	84,790	85,000	1147	0.130
46	A193 B7	1¼	7	121,125	84,790	85,500	1332	0.150
47	A193 B7	1¼	7	121,125	84,790	86,500	1364	0.152
48	A193 B7	1¼	7	121,125	84,790	86,000	1147	0.128

* $C = \frac{\text{TORQUE} \times 12}{(\text{BOLT DIA.}) \times (\text{TENSION})}$

Fu = MINIMUM SPECIFIED TENSILE STRENGTH

TEST PERFORMED BY: VAN J. HESTER

WITNESSED BY: (QC) GARY GRIFFITH 8-17-83

WITNESSED BY: (FE) GUS CALDAS

TORQUE WRENCH USED: JMA 0936 (DUE DATE 9/8/83)

DIRECT TEN INDICATOR USED: JMA 0064 (DUE DATE 5/14/83)

* INSTRUMENT WAS USED ON 5/19/83 AND 5/24/83 FOR ABOVE TESTS. CALIBRATION IS WITHIN TOLERANCE. SEE PAGE 8

NCR CC 4087
PAGE 7c 8

STRUCTURAL INTEGRITY ASSOCIATES INC

APPENDIX F

PALO VERDE UNIT 1 PRELOAD CALCULATIONS
FOR NUTS MEASURED AS GREATER THAN 30° ROTATION FROM REQUIREMENT

PALO VERDE 1 NUT ROTATION) 30 DEGREES , PRELOAD CALCULATION (+=0.110)

INSP. DATE	BOLT GRADE	SIZE (IN)	DWG. NO.	CONN. NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ. IN	ASSUMED K	TURN SPEC	TURN ACT	F_i SPEC	TORQUE SPEC	F_i ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU IY	SIGMA 1	SIGMA I/ UTS MIN	SIGMA I/ SIGMA 1
3-2-84	A325	0.875	529	04	02	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-2-84	A325	0.875	529	04	01	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-2-84	A325	0.875	529	06	02	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-5-84	A325	0.875	530	01	03	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-12-84	A325	1.000	530	07	04	0.250	8.000	0.606	0.110	0.500	0.250	51000.000	10200.000	46363.636	76539.807	105000.000	0.729	12987.043	78683.377	0.749	0.973
3-12-84	A325	1.000	530	07	09	0.167	8.000	0.606	0.110	0.500	0.333	51000.000	10200.000	61818.182	102053.077	105000.000	0.972	17316.056	104911.169	0.999	0.973
3-12-84	A325	1.000	530	07	03	0.125	8.000	0.606	0.110	0.500	0.375	51000.000	10200.000	69545.455	114809.711	105000.000	1.093	19460.565	118025.066	1.124	0.973
3-12-84	A325	1.000	530	09	02	0.333	8.000	0.606	0.110	0.500	0.167	51000.000	10200.000	30909.091	51026.538	105000.000	0.486	8656.029	52455.585	0.500	0.973
3-12-84	A325	1.000	530	09	05	0.167	8.000	0.606	0.110	0.500	0.333	51000.000	10200.000	61818.182	102053.077	105000.000	0.972	17316.058	104911.169	0.999	0.973
3-12-84	A325	1.000	530	09	04	0.167	8.000	0.606	0.110	0.500	0.333	51000.000	10200.000	61818.182	102053.077	105000.000	0.972	17316.056	104911.169	0.999	0.973
3-12-84	A325	1.000	530	09	03	0.250	8.000	0.606	0.110	0.500	0.250	51000.000	10200.000	46363.636	76539.807	105000.000	0.729	12987.043	78683.377	0.749	0.973
3-12-84	A325	0.875	530	13	06	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-12-84	A325	0.875	530	17	06	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-12-84	A325	0.875	530	17	05	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-12-84	A325	0.875	530	17	04	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-12-84	A325	0.875	530	17	07	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-13-84	A325	0.875	531	05	03	0.271	9.000	0.462	0.110	0.500	0.229	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	11890.498	72341.199	0.689	0.973
3-5-84	A325	0.875	532	06	03	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-5-84	A325	0.875	532	06	02	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-12-84	A325	0.875	532	11	06	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-12-84	A325	0.875	532	11	01	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-12-84	A325	0.875	532	11	03	0.278	9.000	0.462	0.110	0.500	0.222	39000.000	6825.000	31515.152	68253.861	105000.000	0.650	11530.180	70149.041	0.668	0.973
3-6-84	A325	0.875	532	14	01	0.111	9.000	0.462	0.110	0.500	0.389	39000.000	6825.000	55151.515	119444.258	105000.000	1.138	20177.815	122760.822	1.169	0.973
3-12-84	A325	0.875	532	16	06	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-6-84	A325	0.875	532	17	07	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-6-84	A325	0.875	532	19	05	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-9-84	A490	1.000	532	24	08	0.167	8.000	0.606	0.110	0.500	0.333	64000.000	12800.000	77575.758	128066.606	150000.000	0.854	21729.955	131653.232	0.878	0.973
3-9-84	A490	1.000	532	24	06	0.271	8.000	0.606	0.110	0.500	0.229	64000.000	12800.000	53333.333	88045.792	150000.000	0.587	14939.344	90511.597	0.603	0.973
3-9-84	A490	1.000	532	24	09	0.250	8.000	0.606	0.110	0.500	0.250	64000.000	12800.000	58181.818	96049.954	150000.000	0.640	16297.466	98739.924	0.658	0.973
3-9-84	A490	1.000	532	24	07	0.250	8.000	0.606	0.110	0.500	0.250	64000.000	12800.000	58181.818	96049.954	150000.000	0.640	16297.466	98739.924	0.658	0.973
3-6-84	A325	0.875	532	26	04	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-6-84	A325	0.875	532	26	02	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-9-84	A490	1.000	533	05	05	0.125	8.000	0.606	0.110	0.500	0.375	64000.000	12800.000	87272.727	144074.932	150000.000	0.960	24446.199	148109.886	0.987	0.973
3-7-84	A325	0.875	533	10	07	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-7-84	A325	0.875	533	14	01	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-8-84	A325	0.875	533	31	07	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-19-84	A325	0.875	535	05	04	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-19-84	A325	0.875	535	11	06	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	535	11	01	0.208	9.000	0.462	0.110	0.500	0.292	39000.000	6825.000	41363.636	89583.193	105000.000	0.853	15133.361	92070.617	0.877	0.973
3-19-84	A325	0.875	535	11	04	0.208	9.000	0.462	0.110	0.500	0.292	39000.000	6825.000	41363.636	89583.193	105000.000	0.853	15133.361	92070.617	0.877	0.973
3-19-84	A325	0.875	535	11	07	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-19-84	A325	0.875	535	11	03	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-19-84	A325	0.875	535	11	05	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
	A325	0.875	535	11	02	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
	A325	0.875	535	25	04	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
	A325	0.875	535	25	05	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
	A490	0.875	535	33	01	0.125	9.000	0.462	0.110	0.500	0.375	49000.000	8575.000	66818.182	144711.312	150000.000	0.965	24446.199	148729.458	0.992	0.973
	A325	0.875	535	34	01	0.750	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
	A325	0.875	535	38	02	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
	A325	0.875	535	38	03	0.292	9.000	0.462	0.110	0.500	0.208	39000.000	6825.000	29545.455	63987.995	105000.000	0.609	10809.544	65764.726	0.626	0.973
	A325	0.875	535	38	06	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
	A325	0.875	535	38	04	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
	A325	0.875	535	38	07	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973

3-19-84	A325	0.875	535	38	05	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	536	02	01	1.063	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	536	11	01	0.147	9.000	0.462	0.110	0.500	0.353	39000.000	6825.000	50053.476	108403.192	105000.000	1.032	183[illegible]	111413.163	1.061	0.973
3-5-84	A325	0.875	536	14	02	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	129[illegible]	78917.672	0.752	0.973
3-5-84	A325	0.875	536	14	01	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	129[illegible]	78917.672	0.752	0.973
3-22-84	A490	1.375	540	06*E	07	0.104	6.000	1.155	0.110	0.500	0.396	121000.000	33275.000	174166.667	150808.936	150000.000	1.005	256[illegible]	155[illegible]	1.034	0.972

STRUCTURAL INTEGRITY ASSOCIATES, INC.

PALO VERDE 1 NUT ROTATION) 30 DEGREES , PRELOAD CALCULATION (K=0.160)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	CONN. NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ. IN	ASSUMED K	TURN SPEC	TURN ACT	F_i SPEC	TORQUE SPEC	F_i ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU XY	SIGMA I	SIGMA I/ UTS MIN	SIGMA I/ SIGMA Y
3-2-84	A325	0.875	529	04	02	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-2-84	A325	0.875	529	04	01	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-2-84	A325	0.875	529	06	02	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-5-84	A325	0.875	530	01	03	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-12-84	A325	1.000	530	07	04	0.250	8.000	0.606	0.160	0.500	0.250	51000.000	10200.000	31875.000	52621.118	105000.000	0.501	12987.043	55651.806	0.530	0.946
3-12-84	A325	1.000	530	07	09	0.167	8.000	0.606	0.160	0.500	0.333	51000.000	10200.000	42500.000	70161.490	105000.000	0.668	17316.058	74202.408	0.707	0.946
3-12-84	A325	1.000	530	07	03	0.125	8.000	0.606	0.160	0.500	0.375	51000.000	10200.000	47812.500	78931.676	105000.000	0.752	19460.563	83477.709	0.795	0.946
3-12-84	A325	1.000	530	09	02	0.333	8.000	0.606	0.160	0.500	0.167	51000.000	10200.000	21250.000	35080.745	105000.000	0.334	8656.029	37101.204	0.353	0.946
3-12-84	A325	1.000	530	09	05	0.167	8.000	0.606	0.160	0.500	0.333	51000.000	10200.000	42500.000	70161.490	105000.000	0.668	17316.058	74202.408	0.707	0.946
3-12-84	A325	1.000	530	09	04	0.167	8.000	0.606	0.160	0.500	0.333	51000.000	10200.000	42500.000	70161.490	105000.000	0.668	17316.058	74202.408	0.707	0.946
3-12-84	A325	1.000	530	09	03	0.250	8.000	0.606	0.160	0.500	0.250	51000.000	10200.000	31875.000	52621.118	105000.000	0.501	12987.043	55651.806	0.530	0.946
3-12-84	A325	0.875	530	13	06	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-12-84	A325	0.875	530	17	06	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-12-84	A325	0.875	530	17	05	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-12-84	A325	0.875	530	17	04	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-12-84	A325	0.875	530	17	07	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-13-84	A325	0.875	531	05	03	0.271	9.000	0.462	0.160	0.500	0.229	39000.000	6825.000	22343.750	48390.921	105000.000	0.461	11890.498	51154.768	0.487	0.946
3-5-84	A325	0.875	532	06	03	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-5-84	A325	0.875	532	06	02	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-12-84	A325	0.875	532	11	06	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-12-84	A325	0.875	532	11	01	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-12-84	A325	0.875	532	11	03	0.278	9.000	0.462	0.160	0.500	0.222	39000.000	6825.000	21666.667	46924.530	105000.000	0.447	11530.180	49604.624	0.472	0.946
3-6-84	A325	0.875	532	14	01	0.111	9.000	0.462	0.160	0.500	0.389	39000.000	6825.000	37916.667	82117.927	105000.000	0.782	20177.815	86808.092	0.827	0.946
3-12-84	A325	0.875	532	16	06	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-6-84	A325	0.875	532	17	07	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-6-84	A325	0.875	532	19	05	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-9-84	A490	1.000	532	24	08	0.167	8.000	0.606	0.160	0.500	0.333	64000.000	12800.000	53333.333	88045.792	150000.000	0.587	21729.955	93116.748	0.621	0.946
3-9-84	A490	1.000	532	24	06	0.271	8.000	0.606	0.160	0.500	0.229	64000.000	12800.000	36666.667	60531.482	150000.000	0.404	14939.344	64017.764	0.427	0.946
3-9-84	A490	1.000	532	24	09	0.250	8.000	0.606	0.160	0.500	0.250	64000.000	12800.000	40000.000	66034.344	150000.000	0.440	16297.466	69837.561	0.466	0.946
3-9-84	A490	1.000	532	24	07	0.250	8.000	0.606	0.160	0.500	0.250	64000.000	12800.000	40000.000	66034.344	150000.000	0.440	16297.466	69837.561	0.466	0.946
3-6-84	A325	0.875	532	26	04	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-6-84	A325	0.875	532	26	02	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-9-84	A490	1.000	533	05	05	0.125	8.000	0.606	0.160	0.500	0.375	64000.000	12800.000	60000.000	99051.516	150000.000	0.660	24446.199	104756.341	0.698	0.946
3-7-84	A325	0.875	533	10	07	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-8-84	A325	0.875	533	14	01	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-19-84	A325	0.875	533	31	07	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-19-84	A325	0.875	535	05	04	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-19-84	A325	0.875	535	11	06	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	535	11	01	0.208	9.000	0.462	0.160	0.500	0.292	39000.000	6825.000	28437.500	61588.445	105000.000	0.587	15133.361	65106.069	0.620	0.946
3-19-84	A325	0.875	535	11	04	0.208	9.000	0.462	0.160	0.500	0.292	39000.000	6825.000	28437.500	61588.445	105000.000	0.587	15133.361	65106.069	0.620	0.946
3-19-84	A325	0.875	535	11	07	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-19-84	A325	0.875	535	11	03	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-19-84	A325	0.875	535	11	05	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	535	11	02	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-19-84	A325	0.875	535	25	04	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-19-84	A325	0.875	535	25	05	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-19-84	A490	0.875	535	33	01	0.125	9.000	0.462	0.160	0.500	0.375	49000.000	8575.000	43937.500	99489.027	150000.000	0.663	24446.199	105171.342	0.701	0.946
3-19-84	A325	0.875	535	34	01	0.750	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	535	38	02	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-19-84	A325	0.875	535	38	03	0.292	9.000	0.462	0.160	0.500	0.208	39000.000	6825.000	20312.500	43991.747	105000.000	0.419	10809.544	46504.335	0.443	0.946
3-19-84	A325	0.875	535	38	06	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-19-84	A325	0.875	535	38	04	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-19-84	A325	0.875	535	38	07	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946

3-19-84	A325	0.875	535	38	05	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	536	02	01	1.083	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	536	11	01	0.147	9.000	0.462	0.160	0.500	0.353	39000.000	6825.000	34411.765	74527.194	105000.000	0.710	18312.639	78783.814	0.750	0.946
3-5-84	A325	0.875	536	14	02	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.262	0.531	0.946
3-5-84	A325	0.875	536	14	01	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.262	0.531	0.946
3-22-84	A490	1.375	540	06+E	07	0.104	6.000	1.155	0.160	0.500	0.396	121000.000	33275.000	119739.583	103681.144	150000.000	0.691	25804.321	106746.325	0.732	0.945

STRUCTURAL INTEGRITY ASSOCIATES, INC.

PALO VERDE 1 NUT ROTATION) 30 DEGREES , PRELOAD CALCULATION (K=0.20)

INSP. DATE	BOLT GRADE	SIZE (IN)	DWG. NO.	CONN. NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ. IN	ASSUMED K	TURN SPEC	TURN ACT	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU IY	SIGMA 1	SIGMA I/ UTS MIN	SIGMA I/ SIGMA 1
3-2-84	A325	0.875	529	04	02	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45696.001	0.437	0.920
3-2-84	A325	0.875	529	04	01	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-2-84	A325	0.875	529	06	02	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-5-84	A325	0.875	530	01	03	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-12-84	A325	1.000	530	07	04	0.250	8.000	0.606	0.200	0.500	0.250	51000.000	10200.000	25500.000	42096.894	105000.000	0.401	12987.043	45781.025	0.436	0.920
3-12-84	A325	1.000	530	07	09	0.167	8.000	0.606	0.200	0.500	0.333	51000.000	10200.000	34000.000	56129.192	105000.000	0.535	17316.056	61041.367	0.581	0.920
3-12-84	A325	1.000	530	07	03	0.125	8.000	0.606	0.200	0.500	0.375	51000.000	10200.000	38250.000	63145.341	105000.000	0.601	19480.565	68671.538	0.654	0.920
3-12-84	A325	1.000	530	09	02	0.333	8.000	0.606	0.200	0.500	0.167	51000.000	10200.000	17000.000	28064.596	105000.000	0.267	8658.029	30520.683	0.291	0.920
3-12-84	A325	1.000	530	09	05	0.167	8.000	0.606	0.200	0.500	0.333	51000.000	10200.000	34000.000	56129.192	105000.000	0.535	17316.058	61041.367	0.581	0.920
3-12-84	A325	1.000	530	09	04	0.167	8.000	0.606	0.200	0.500	0.333	51000.000	10200.000	34000.000	56129.192	105000.000	0.535	17316.056	61041.367	0.581	0.920
3-12-84	A325	1.000	530	09	03	0.250	8.000	0.606	0.200	0.500	0.250	51000.000	10200.000	25500.000	42096.894	105000.000	0.401	12987.043	45781.025	0.436	0.920
3-12-84	A325	0.875	530	13	06	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-12-84	A325	0.875	530	17	06	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-12-84	A325	0.875	530	17	05	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-12-84	A325	0.875	530	17	04	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-12-84	A325	0.875	530	17	07	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-13-84	A325	0.875	531	05	03	0.271	9.000	0.462	0.200	0.500	0.229	39000.000	6825.000	17875.000	38712.737	105000.000	0.369	11890.496	42073.167	0.401	0.920
3-5-84	A325	0.875	532	06	03	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-12-84	A325	0.875	532	06	02	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-12-84	A325	0.875	532	11	06	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-12-84	A325	0.875	532	11	01	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-12-84	A325	0.875	532	11	03	0.278	9.000	0.462	0.200	0.500	0.222	39000.000	6825.000	17333.333	37539.624	105000.000	0.358	11530.180	40798.223	0.389	0.920
3-6-84	A325	0.875	532	14	01	0.111	9.000	0.462	0.200	0.500	0.389	39000.000	6825.000	30333.333	65694.342	105000.000	0.626	20177.815	71396.890	0.680	0.920
3-12-84	A325	0.875	532	16	06	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-6-84	A325	0.875	532	17	07	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-6-84	A325	0.875	532	19	05	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-9-84	A490	1.000	532	24	08	0.167	8.000	0.606	0.200	0.500	0.333	64000.000	12800.000	42666.667	70436.633	150000.000	0.470	21729.955	76606.931	0.511	0.920
3-9-84	A490	1.000	532	24	06	0.271	8.000	0.606	0.200	0.500	0.229	64000.000	12800.000	29333.333	48425.185	150000.000	0.323	14939.344	52663.140	0.351	0.920
3-9-84	A490	1.000	532	24	09	0.250	8.000	0.606	0.200	0.500	0.250	64000.000	12800.000	32000.000	52827.475	150000.000	0.352	16297.466	57450.698	0.383	0.920
3-9-84	A490	1.000	532	24	07	0.250	8.000	0.606	0.200	0.500	0.250	64000.000	12800.000	32000.000	52827.475	150000.000	0.352	16297.466	57450.698	0.383	0.920
3-6-84	A325	0.875	532	26	04	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-6-84	A325	0.875	532	26	02	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-9-84	A490	1.000	533	05	05	0.125	8.000	0.606	0.200	0.500	0.375	64000.000	12800.000	48000.000	79241.212	150000.000	0.528	24446.199	86176.047	0.575	0.920
3-7-84	A325	0.875	533	10	07	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-7-84	A325	0.875	533	14	01	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-8-84	A325	0.875	533	31	07	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-19-84	A325	0.875	535	05	04	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-19-84	A325	0.875	535	11	06	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	535	11	01	0.208	9.000	0.462	0.200	0.500	0.292	39000.000	6825.000	22750.000	49270.756	105000.000	0.469	15133.361	53547.668	0.510	0.920
3-19-84	A325	0.875	535	11	04	0.208	9.000	0.462	0.200	0.500	0.292	39000.000	6825.000	22750.000	49270.756	105000.000	0.469	15133.361	53547.668	0.510	0.920
3-19-84	A325	0.875	535	11	07	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-19-84	A325	0.875	535	11	03	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-19-84	A325	0.875	535	11	05	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	535	11	02	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-19-84	A325	0.875	535	25	04	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-19-84	A325	0.875	535	25	05	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-19-84	A490	0.875	535	33	01	0.125	9.000	0.462	0.200	0.500	0.375	49000.000	8575.000	36750.000	79591.222	150000.000	0.531	24446.199	86500.078	0.577	0.920
3-19-84	A325	0.875	535	34	01	0.750	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	535	38	02	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-19-84	A325	0.875	535	38	03	0.292	9.000	0.462	0.200	0.500	0.208	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	10809.544	38248.334	0.364	0.920
3-19-84	A325	0.875	535	38	06	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-19-84	A325	0.875	535	38	04	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-19-84	A325	0.875	535	38	07	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-19-84	A325	0.875	535	38	05	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	536	02	01	1.063	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	536	11	01	0.147	9.000	0.462	0.200	0.500	0.355	39000.000	6825.000	27529.412	59621.755	105000.000	0.568	18312.629	64757.178	0.617	0.920
3-5-84	A325	0.875	536	14	02	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.462	12971.453	45856.001	0.437	0.920
3-5-84	A325	0.875	536	14	01	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.462	12971.453	45856.001	0.437	0.920
3-22-84	A490	1.375	540	06*E	07	0.104	6.000	1.155	0.200	0.500	0.396	121000.000	33275.000	95791.667	82944.915	150000.000	0.553	25804.321	90317.392	0.602	0.918

STRUCTURAL INTEGRITY ASSOCIATES, INC.

PALO VERDE 1 NUT ROTATION) 30 DEGREES ,PRELOAD CALCULATION (K=0.43)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG.NO.	CONN.NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ.IN	ASSUMED K	TURN SPEC	TURN ACT	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU IY	SIGMA I	SIGMA I/ UTS MIN	SIGMA I/ SIGMA I
3-2-84	A325	0.875	529	04	02	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-2-84	A325	0.875	529	04	01	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-2-84	A325	0.875	529	06	02	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-5-84	A325	0.875	530	01	03	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-12-84	A325	1.000	530	07	04	0.250	8.000	0.606	0.430	0.500	0.250	51000.000	10200.000	11860.465	19579.951	105000.000	0.186	12987.043	26053.644	0.248	0.752
3-12-84	A325	1.000	530	07	09	0.167	8.000	0.606	0.430	0.500	0.333	51000.000	10200.000	15813.953	26106.601	105000.000	0.249	17316.058	34738.192	0.331	0.752
3-12-84	A325	1.000	530	07	03	0.125	8.000	0.606	0.430	0.500	0.375	51000.000	10200.000	17790.698	29369.926	105000.000	0.280	19480.565	39080.466	0.372	0.752
3-12-84	A325	1.000	530	09	02	0.333	8.000	0.606	0.430	0.500	0.167	51000.000	10200.000	7906.977	13053.300	105000.000	0.124	8658.025	17369.096	0.165	0.752
3-12-84	A325	1.000	530	09	05	0.167	8.000	0.606	0.430	0.500	0.333	51000.000	10200.000	15813.953	26106.601	105000.000	0.249	17316.058	34738.192	0.331	0.752
3-12-84	A325	1.000	530	09	04	0.167	8.000	0.606	0.430	0.500	0.333	51000.000	10200.000	15813.953	26106.601	105000.000	0.249	17316.058	34738.192	0.331	0.752
3-12-84	A325	1.000	530	09	03	0.250	8.000	0.606	0.430	0.500	0.250	51000.000	10200.000	11860.465	19579.951	105000.000	0.186	12987.043	26053.644	0.248	0.752
3-12-84	A325	0.875	530	13	06	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-12-84	A325	0.875	530	17	06	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-12-84	A325	0.875	530	17	05	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-12-84	A325	0.875	530	17	04	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34786.790	0.331	0.753
3-12-84	A325	0.875	530	17	07	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-13-84	A325	0.875	531	05	03	0.271	9.000	0.462	0.430	0.500	0.229	39000.000	6825.000	8313.953	18005.924	105000.000	0.171	11890.498	23917.293	0.228	0.753
3-5-84	A325	0.875	532	06	03	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-5-84	A325	0.875	532	06	02	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-12-84	A325	0.875	532	11	06	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-12-84	A325	0.875	532	11	01	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-12-84	A325	0.875	532	11	03	0.278	9.000	0.462	0.430	0.500	0.222	39000.000	6825.000	8062.016	17460.290	105000.000	0.166	11530.180	23192.527	0.221	0.753
3-6-84	A325	0.875	532	14	01	0.111	9.000	0.462	0.430	0.500	0.389	39000.000	6825.000	14108.527	30555.508	105000.000	0.291	20177.815	40586.922	0.387	0.753
3-12-84	A325	0.875	532	16	06	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-6-84	A325	0.875	532	17	07	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-6-84	A325	0.875	532	19	05	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-9-84	A490	1.000	532	24	08	0.167	8.000	0.606	0.430	0.500	0.333	64000.000	12800.000	19844.961	32761.225	150000.000	0.218	21729.955	43593.025	0.291	0.752
3-9-84	A490	1.000	532	24	06	0.271	8.000	0.606	0.430	0.500	0.229	64000.000	12800.000	13643.411	22523.342	150000.000	0.150	14939.344	29970.205	0.200	0.752
3-9-84	A490	1.000	532	24	09	0.250	8.000	0.606	0.430	0.500	0.250	64000.000	12800.000	14883.721	24570.919	150000.000	0.164	16297.466	32694.769	0.218	0.752
3-9-84	A490	1.000	532	24	07	0.250	8.000	0.606	0.430	0.500	0.250	64000.000	12800.000	14883.721	24570.919	150000.000	0.164	16297.466	32694.769	0.218	0.752
3-6-84	A325	0.875	532	26	04	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-6-84	A325	0.875	532	26	02	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-9-84	A490	1.000	533	05	05	0.125	8.000	0.606	0.430	0.500	0.375	64000.000	12800.000	22325.581	36856.378	150000.000	0.246	24446.199	49042.153	0.327	0.752
3-7-84	A325	0.875	533	10	07	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-7-84	A325	0.875	533	14	01	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-8-84	A325	0.875	533	31	07	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-19-84	A325	0.875	535	05	04	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-19-84	A325	0.875	535	11	06	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	535	11	01	0.208	9.000	0.462	0.430	0.500	0.292	39000.000	6825.000	10581.395	22916.631	105000.000	0.218	15133.361	30440.192	0.290	0.753
3-19-84	A325	0.875	535	11	04	0.208	9.000	0.462	0.430	0.500	0.292	39000.000	6825.000	10581.395	22916.631	105000.000	0.218	15133.361	30440.192	0.290	0.753
3-19-84	A325	0.875	535	11	07	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-19-84	A325	0.875	535	11	03	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-19-84	A325	0.875	535	11	05	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	535	11	02	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-19-84	A325	0.875	535	25	04	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-19-84	A325	0.875	535	25	05	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-19-84	A490	0.875	535	33	01	0.125	9.000	0.462	0.430	0.500	0.375	49000.000	8575.000	17093.023	37019.173	150000.000	0.247	24446.199	49172.617	0.328	0.753
3-19-84	A325	0.875	535	34	01	0.750	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	535	38	02	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-19-84	A325	0.875	535	38	03	0.292	9.000	0.462	0.430	0.500	0.208	39000.000	6825.000	7558.140	16369.022	105000.000	0.156	10809.544	21742.994	0.207	0.753
3-19-84	A325	0.875	535	38	06	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-19-84	A325	0.875	535	38	04	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-19-84	A325	0.875	535	38	07	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753

3-19-84	A325	0.875	535	38	05	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	536	02	01	1.083	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	536	11	01	0.147	9.000	0.462	0.430	[illegible]00	0.353	39000.000	6825.000	12804.378	27731.049	105000.000	0.264	[illegible]	36835.190	0.351	0.753
3-5-84	A325	0.875	536	14	02	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	[illegible]	26091.593	0.248	0.753
3-5-84	A325	0.875	536	14	01	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	[illegible]	26091.593	0.248	0.753
3-22-84	A490	1.375	540	06*E	07	0.104	6.000	1.155	0.430	0.500	0.396	121000.000	33275.000	44554.264	38579.030	150000.000	0.257	[illegible]	51500.722	0.343	0.749

STRUCTURAL INTEGRITY ASSOCIATES, INC.

APPENDIX G

PALO VERDE UNIT 2 PRELOAD CALCULATIONS
FOR NUTS MEASURED AS GREATER THAN 30° ROTATION FROM REQUIREMENT

PALO VERDE 2 NUT ROTATION) 30 DEGREES , PRELOAD CALCULATION (K=0.110)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	CONN. NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ. IN	ASSUMED K	TURN SPEC	TURN ACT	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU Iy	SIGMA	SIGMA 1/ UTS MIN	SIGMA 1/ SIGMA 1
3-14-84	A325	0.875	530	11	06	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-14-84	A325	0.875	530	11	04	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-13-84	A325	0.875	531	01	05	0.750	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	531	06	05	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-13-84	A325	0.875	531	06	02	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-13-84	A325	0.875	531	06	01	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-13-84	A325	0.875	531	06	04	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-13-84	A325	0.875	531	06	03	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-14-84	A325	0.875	532	01	07	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-14-84	A325	0.875	532	01	01	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-14-84	A325	0.875	532	02	07	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-16-84	A325	0.875	532	12	06	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-16-84	A325	0.875	532	12	05	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-19-84	A325	0.875	532	18	02	0.750	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-19-84	A325	0.875	532	18	04	0.833	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	03	0.917	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	06	1.083	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	05	0.750	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	01	0.917	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-15-84	A490	1.000	532	25	07	0.375	8.000	0.606	0.110	0.500	0.125	64000.000	12800.000	29090.909	48024.977	150000.000	0.320	8148.732	49369.962	0.329	0.973
3-15-84	A490	1.000	532	25	10	0.167	8.000	0.606	0.110	0.500	0.333	64000.000	12800.000	77575.758	128066.606	150000.000	0.854	21729.955	131653.232	0.878	0.973
3-15-84	A490	1.000	532	25	06	0.250	8.000	0.606	0.110	0.500	0.250	64000.000	12800.000	58181.818	96049.954	150000.000	0.640	16297.466	98739.924	0.658	0.973
3-16-84	A325	0.875	533	16	02	0.667	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-16-84	A325	0.875	533	16	03	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-16-84	A325	0.875	533	16	04	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-19-84	A325	0.875	533	27	01	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-19-84	A325	0.875	533	27	02	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-16-84	A325	0.875	533	34	05	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-16-84	A325	0.875	533	34	06	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-16-84	A325	0.875	533	34	04	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-13-84	A325	0.875	534	02	03	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	05	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-13-84	A325	0.875	534	02	04	0.667	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	07	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	01	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-13-84	A325	0.875	534	02	02	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-13-84	A490	0.875	535	02	07	0.583	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	04	04	0.333	9.000	0.462	0.110	0.500	0.167	49000.000	8575.000	29696.970	64316.139	150000.000	0.429	10864.977	66101.981	0.441	0.973
3-23-84	A325	0.875	535	04	03	0.417	9.000	0.462	0.110	0.500	0.083	39000.000	6825.000	11818.182	25595.198	105000.000	0.244	4323.818	26305.891	0.251	0.973
3-23-84	A325	0.875	535	04	02	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-23-84	A325	0.875	535	04	05	0.417	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-23-84	A325	0.875	535	04	06	0.667	9.000	0.462	0.110	0.500	0.083	39000.000	6825.000	11818.182	25595.198	105000.000	0.244	4323.818	26305.891	0.251	0.973
3-23-84	A325	0.875	535	04	07	0.667	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	04	01	0.167	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	05	07	0.333	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-23-84	A325	0.875	535	05	08	0.500	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-23-84	A325	0.875	535	05	03	0.458	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	05	05	0.292	9.000	0.462	0.110	0.500	0.042	39000.000	6825.000	5909.091	12797.599	105000.000	0.122	2161.909	13132.945	0.125	0.973
3-23-84	A325	0.875	535	05	04	0.375	9.000	0.462	0.110	0.500	0.208	39000.000	6825.000	29545.455	63987.995	105000.000	0.609	10809.544	65764.726	0.626	0.973
3-23-84	A325	0.875	535	05	01	0.417	9.000	0.462	0.110	0.500	0.125	39000.000	6825.000	17727.273	38392.797	105000.000	0.366	6485.726	39458.836	0.376	0.973
3-23-84	A325	0.875	535	05	06	0.333	9.000	0.462	0.110	0.500	0.083	39000.000	6825.000	11818.182	25595.198	105000.000	0.244	4323.818	26305.891	0.251	0.973
3-23-84	A325	0.875	535	05	02	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973

3-15-84	A325	0.875	535	07	04	0.583	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-15-84	A325	0.875	535	07	03	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-15-84	A325	0.875	535	07	14	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973			
3-14-84	A325	0.875	535	11	01	0.667	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-14-84	A325	0.875	535	11	02	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-14-84	A325	0.875	535	11	03	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973			
3-14-84	A325	0.875	535	11	07	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973			
3-14-84	A325	0.875	535	11	05	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973			
3-14-84	A325	0.875	535	11	04	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973			
3-13-84	A490	0.875	535	11	06	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973			
3-13-84	A490	0.875	535	15	04	0.125	9.000	0.462	0.110	0.500	0.375	49000.000	8575.000	66818.182	144711.312	150000.000	0.965	24446.199	148729.458	0.992	0.973			
3-13-84	A490	0.875	535	15	05	0.667	9.000	0.462	0.110	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000			
3-14-84	A325	0.875	535	15	06	0.208	9.000	0.462	0.110	0.500	0.292	49000.000	8575.000	51969.697	112553.243	150000.000	0.750	19013.711	115678.467	0.771	0.973			
3-14-84	A325	0.875	535	17	03	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-14-84	A325	0.875	535	17	04	0.458	9.000	0.462	0.110	0.500	0.042	39000.000	6825.000	5909.091	12797.599	105000.000	0.122	2161.909	13152.945	0.125	0.973			
3-14-84	A325	0.875	535	17	07	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973			
3-22-84	A325	0.875	535	17	01	0.208	9.000	0.462	0.110	0.500	0.292	39000.000	6825.000	41363.636	89583.193	105000.000	0.853	15133.361	92070.617	0.877	0.973			
3-22-84	A325	0.875	535	19	02	0.833	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-22-84	A325	0.875	535	19	06	1.000	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-22-84	A325	0.875	535	19	05	0.917	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-22-84	A325	0.875	535	19	07	1.333	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-22-84	A325	0.875	535	19	03	0.833	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-22-84	A325	0.875	535	19	01	0.667	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-22-84	A325	0.875	535	19	04	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-20-84	A490	0.875	535	21	06	0.833	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-20-84	A490	0.875	535	21	03	0.417	9.000	0.462	0.110	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000			
3-20-84	A490	0.875	535	21	04	1.000	9.000	0.462	0.110	0.500	0.083	49000.000	8575.000	14848.485	32158.069	150000.000	0.214	5432.489	33050.991	0.220	0.973			
3-20-84	A490	0.875	535	21	05	0.833	9.000	0.462	0.110	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000			
3-20-84	A490	0.875	535	21	07	1.083	9.000	0.462	0.110	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000			
3-13-84	A490	0.875	535	24	01	0.167	9.000	0.462	0.110	0.500	0.333	49000.000	8575.000	59393.939	128632.277	150000.000	0.858	21729.955	132203.963	0.881	0.973			
3-14-84	A325	0.875	535	25	07	0.583	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-14-84	A325	0.875	535	25	01	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973			
3-14-84	A325	0.875	535	25	05	0.458	9.000	0.462	0.110	0.500	0.042	39000.000	6825.000	5909.091	12797.599	105000.000	0.122	2161.909	13152.945	0.125	0.973			
3-14-84	A325	0.875	535	25	06	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-14-84	A325	0.875	535	25	03	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-14-84	A325	0.875	535	25	02	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-14-84	A325	0.875	535	25	04	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000			
3-22-84	A325	0.875	535	27	02	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973			
3-22-84	A325	0.875	535	27	07	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973			
3-22-84	A325	0.875	535	27	03	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973			
3-22-84	A325	0.875	535	27	06	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973			
3-20-84	A490	0.875	535	30	13	0.167	9.000	0.462	0.110	0.500	0.333	49000.000	8575.000	59393.939	128632.277	150000.000	0.858	21729.955	132203.963	0.881	0.973			
3-20-84	A490	0.875	535	38	02	0.167	9.000	0.462	0.110	0.500	0.333	49000.000	8575.000	59393.939	128632.277	150000.000	0.858	21729.955	132203.963	0.881	0.973			
3-15-84	A325	0.875	536	05	01	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973			
3-15-84	A325	0.875	536	05	03	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973			
3-15-84	A325	0.875	536	05	02	0.188	9.000	0.462	0.110	0.500	0.313	39000.000	6825.000	44318.182	95981.993	105000.000	0.914	16214.316	98647.089	0.939	0.973			
4-6-84	A490	1.375	540	10	06	0.167	6.000	1.135	0.110	0.500	0.333	121000.000	33275.000	146666.667	126996.999	150000.000	0.847	21729.955	130612.212	0.871	0.972			
4-6-84	A490	1.375	540	24	04	0.125	6.000	1.135	0.110	0.500	0.375	121000.000	33275.000	165000.000	142871.624	150000.000	0.952	24446.199	146938.738	0.980	0.972			
4-6-84	A490	1.375	540	25	02	0.125	6.000	1.135	0.110	0.500	0.375	121000.000	33275.000	165000.000	142871.624	150000.000	0.952	24446.199	146938.738	0.980	0.972			
	A490	0.875	540	37	05	0.250	9.000	0.462	0.110	0.500	0.250	49000.000	8575.000	44545.455	98474.208	150000.000	0.643	16297.466	99152.972	0.661	0.973			

PALO VERDE 2 NUT ROTATION) 30 DEGREES , PRELOAD CALCULATION (K=0.160)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	COMP. NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ. IN	ASSUMED K	TURN SPEC	TURN ACT	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU IY	SIGMA 1	SIGMA 1/ UTS MIN	SIGMA I/ SIGMA 1
3-14-84	A325	0.875	530	11	06	0.167	9.000	0.462	0.160	0.500	0.332	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-14-84	A325	0.875	530	11	04	0.167	9.000	0.462	0.160	0.500	0.332	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-13-84	A325	0.875	531	01	05	0.750	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	531	06	05	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-13-84	A325	0.875	531	06	02	0.167	9.000	0.462	0.160	0.500	0.332	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-13-84	A325	0.875	531	06	01	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-13-84	A325	0.875	531	06	04	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-13-84	A325	0.875	531	06	03	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-14-84	A325	0.875	532	01	07	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-14-84	A325	0.875	532	01	01	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-14-84	A325	0.875	532	02	07	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-16-84	A325	0.875	532	12	06	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-16-84	A325	0.875	532	12	05	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-19-84	A325	0.875	532	18	02	0.750	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	04	0.833	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	03	0.917	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	06	1.083	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	05	0.750	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	01	0.917	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-15-84	A490	1.000	532	25	07	0.375	8.000	0.606	0.160	0.500	0.125	64000.000	12800.000	20006.000	33017.172	150000.000	0.220	8148.733	34918.780	0.233	0.946
3-15-84	A490	1.000	532	25	10	0.167	8.000	0.606	0.160	0.500	0.333	64000.000	12800.000	53333.333	88045.792	150000.000	0.587	21729.955	93116.748	0.621	0.946
3-15-84	A490	1.000	532	25	06	0.250	8.000	0.606	0.160	0.500	0.250	64000.000	12800.000	40000.000	66034.344	150000.000	0.440	16297.466	69837.561	0.466	0.946
3-16-84	A325	0.875	533	16	02	0.667	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-16-84	A325	0.875	533	16	03	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-16-84	A325	0.875	533	16	04	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-19-84	A325	0.875	533	27	01	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-19-84	A325	0.875	533	27	02	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-16-84	A325	0.875	533	34	05	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-16-84	A325	0.875	533	34	06	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-16-84	A325	0.875	533	34	04	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-13-84	A325	0.875	534	02	03	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	05	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-13-84	A325	0.875	534	02	04	0.667	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	07	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	01	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-13-84	A325	0.875	534	02	02	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-13-84	A490	0.875	535	02	07	0.583	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	04	04	0.333	9.000	0.462	0.160	0.500	0.167	49000.000	8575.000	20416.667	44217.345	150000.000	0.295	10864.977	46742.819	0.312	0.946
3-23-84	A325	0.875	535	04	03	0.417	9.000	0.462	0.160	0.500	0.083	39000.000	6825.000	8125.000	17596.699	105000.000	0.168	4323.818	18601.734	0.177	0.946
3-21-84	A325	0.875	535	04	02	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-23-84	A325	0.875	535	04	05	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-23-84	A325	0.875	535	04	06	0.417	9.000	0.462	0.160	0.500	0.083	39000.000	6825.000	8125.000	17596.699	105000.000	0.168	4323.818	18601.734	0.177	0.946
3-23-84	A325	0.875	535	04	07	0.667	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	04	01	0.167	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	05	07	0.333	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-23-84	A325	0.875	535	05	08	0.500	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-23-84	A325	0.875	535	05	03	0.458	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	05	05	0.292	9.000	0.462	0.160	0.500	0.042	39000.000	6825.000	4062.500	8798.349	105000.000	0.084	2161.909	9300.867	0.089	0.946
3-23-84	A325	0.875	535	05	04	0.375	9.000	0.462	0.160	0.500	0.208	39000.000	6825.000	20312.500	43991.747	105000.000	0.419	10809.544	46504.335	0.443	0.946
3-23-84	A325	0.875	535	05	01	0.417	9.000	0.462	0.160	0.500	0.125	39000.000	6825.000	12187.500	26395.048	105000.000	0.251	6485.726	27902.601	0.266	0.946
3-23-84	A325	0.875	535	05	06	0.333	9.000	0.462	0.160	0.500	0.083	39000.000	6825.000	8125.000	17596.699	105000.000	0.168	4323.818	18601.734	0.177	0.946
3-23-84	A325	0.875	535	05	02	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946

3-15-84	A325	0.875	535	07	04	0.583	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-15-84	A325	0.875	535	07	03	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-15-84	A325	0.875	535	07	14	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-14-84	A325	0.875	535	11	01	0.667	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	535	11	02	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	535	11	03	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-14-84	A325	0.875	535	11	07	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-14-84	A325	0.875	535	11	05	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-14-84	A325	0.875	535	11	04	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-14-84	A325	0.875	535	11	06	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-13-84	A490	0.875	535	15	04	0.125	9.000	0.462	0.160	0.500	0.375	49000.000	8575.000	45937.500	99489.027	150000.000	0.663	24446.199	105171.348	0.701	0.946
3-13-84	A490	0.875	535	15	05	0.667	9.000	0.462	0.160	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A490	0.875	535	15	06	0.208	9.000	0.462	0.160	0.500	0.292	49000.000	8575.000	35729.167	77380.354	150000.000	0.516	19013.711	81799.932	0.545	0.946
3-14-84	A325	0.875	535	17	03	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	535	17	04	0.458	9.000	0.462	0.160	0.500	0.042	39000.000	6825.000	4062.500	8798.349	105000.000	0.084	2161.909	9300.867	0.089	0.946
3-14-84	A325	0.875	535	17	07	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-14-84	A325	0.875	535	17	01	0.208	9.000	0.462	0.160	0.500	0.292	39000.000	6825.000	28437.500	61588.445	105000.000	0.587	15133.361	65106.069	0.620	0.946
3-22-84	A325	0.875	535	19	02	0.833	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-22-84	A325	0.875	535	19	06	1.000	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-22-84	A325	0.875	535	19	05	0.917	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-22-84	A325	0.875	535	19	07	1.333	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-22-84	A325	0.875	535	19	03	0.833	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-22-84	A325	0.875	535	19	01	0.667	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-22-84	A325	0.875	535	19	04	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-20-84	A490	0.875	535	21	06	0.833	9.000	0.462	0.160	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000
3-20-84	A490	0.875	535	21	03	0.417	9.000	0.462	0.160	0.500	0.083	49000.000	8575.000	10208.333	22108.673	150000.000	0.147	5432.489	23371.409	0.156	0.946
3-20-84	A490	0.875	535	21	04	1.000	9.000	0.462	0.160	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000
3-20-84	A490	0.875	535	21	05	0.833	9.000	0.462	0.160	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000
3-20-84	A490	0.875	535	21	07	1.083	9.000	0.462	0.160	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A490	0.875	535	24	01	0.167	9.000	0.462	0.160	0.500	0.333	49000.000	8575.000	40833.333	88434.691	150000.000	0.590	21729.955	93485.637	0.623	0.946
3-14-84	A325	0.875	535	25	07	0.583	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	535	25	01	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-14-84	A325	0.875	535	25	05	0.458	9.000	0.462	0.160	0.500	0.042	39000.000	6825.000	4062.500	8798.349	105000.000	0.084	2161.909	9300.867	0.089	0.946
3-14-84	A325	0.875	535	25	06	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	535	25	03	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	535	25	02	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-14-84	A325	0.875	535	25	04	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-22-84	A325	0.875	535	27	02	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-22-84	A325	0.875	535	27	07	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-22-84	A325	0.875	535	27	03	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-22-84	A325	0.875	535	27	06	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-20-84	A490	0.875	535	30	13	0.167	9.000	0.462	0.160	0.500	0.333	49000.000	8575.000	40833.333	88434.691	150000.000	0.590	21729.955	93485.637	0.623	0.946
3-20-84	A490	0.875	535	38	02	0.167	9.000	0.462	0.160	0.500	0.333	49000.000	8575.000	40833.333	88434.691	150000.000	0.590	21729.955	93485.637	0.623	0.946
3-15-84	A325	0.875	536	05	01	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-15-84	A325	0.875	536	05	03	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-15-84	A325	0.875	536	05	02	0.188	9.000	0.462	0.160	0.500	0.313	39000.000	6825.000	30468.750	65987.620	105000.000	0.628	16214.316	69756.502	0.664	0.946
[illegible]	A490	1.375	540	10	06	0.167	6.000	1.155	0.160	0.500	0.333	121000.000	33275.000	100833.333	87310.437	150000.000	0.582	21729.955	92419.642	0.616	0.945
[illegible]	A490	1.375	540	24	04	0.125	6.000	1.155	0.160	0.500	0.375	121000.000	33275.000	113437.500	98224.241	150000.000	0.635	24446.199	103972.098	0.693	0.945
[illegible]	A490	1.375	540	25	02	0.125	6.000	1.155	0.160	0.500	0.375	121000.000	33275.000	113437.500	98224.241	150000.000	0.635	24446.199	103972.098	0.693	0.945
[illegible]	A490	0.875	540	37	05	0.250	9.000	0.462	0.160	0.500	0.250	49000.000	8575.000	30625.000	66326.018	150000.000	0.442	16297.466	70114.228	0.467	0.946

STRUCTURAL INTEGRITY ASSOCIATES, INC.

PALO VERDE 2 NUT ROTATION) 30 DEGREES , PRELOAD CALCULATION (K=0.200)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	COMP. NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ.IN	ASSUMED K	TURN SPEC	TURN ACT	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU IY	SIGMA 1	SIGMA I/ UTS MIN	SIGMA I/ SIGMA 1
3-14-84	A325	0.875	530	11	06	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-14-84	A325	0.875	530	11	04	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-13-84	A325	0.875	531	01	05	0.750	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	531	06	05	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-13-84	A325	0.875	531	06	02	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-13-84	A325	0.875	531	06	01	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-13-84	A325	0.875	531	06	04	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-13-84	A325	0.875	531	06	03	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-14-84	A325	0.875	532	01	07	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-14-84	A325	0.875	532	01	01	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-14-84	A325	0.875	532	02	07	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-16-84	A325	0.875	532	12	06	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-16-84	A325	0.875	532	12	05	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-19-84	A325	0.875	532	18	02	0.750	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-19-84	A325	0.875	532	18	04	0.833	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	03	0.917	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	06	1.083	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	05	0.750	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	01	0.917	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-15-84	A490	1.000	532	25	07	0.375	8.000	0.606	0.200	0.500	0.125	64000.000	12800.000	16000.000	26413.737	150000.000	0.176	8148.733	28725.349	0.192	0.920
3-15-84	A490	1.000	532	25	10	0.167	8.000	0.606	0.200	0.500	0.333	64000.000	12800.000	42666.667	70436.633	150000.000	0.470	21729.955	76600.931	0.511	0.920
3-15-84	A490	1.000	532	25	06	0.250	8.000	0.606	0.200	0.500	0.250	64000.000	12800.000	32000.000	52827.475	150000.000	0.352	16297.466	57450.698	0.383	0.920
3-16-84	A325	0.875	533	16	02	0.667	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-16-84	A325	0.875	533	16	03	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-16-84	A325	0.875	533	16	04	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-19-84	A325	0.875	533	27	01	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-19-84	A325	0.875	533	27	02	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-16-84	A325	0.875	533	34	05	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-16-84	A325	0.875	533	34	06	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-16-84	A325	0.875	533	34	04	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-13-84	A325	0.875	534	02	03	0.500	9.000	0.462	0.200	0.300	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	05	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-13-84	A325	0.875	534	02	04	0.667	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	07	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	01	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-13-84	A325	0.875	534	02	02	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-13-84	A325	0.875	534	02	06	0.583	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A490	0.875	535	02	07	0.333	9.000	0.462	0.200	0.500	0.167	49000.000	8575.000	16333.333	35373.876	150000.000	0.236	10864.977	38444.679	0.256	0.920
3-23-84	A325	0.875	535	04	04	0.417	9.000	0.462	0.200	0.500	0.083	39000.000	6825.000	6500.000	14077.359	105000.000	0.134	4323.818	15299.334	0.146	0.920
3-23-84	A325	0.875	535	04	03	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-23-84	A325	0.875	535	04	02	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-23-84	A325	0.875	535	04	05	0.417	9.000	0.462	0.200	0.500	0.083	39000.000	6825.000	6500.000	14077.359	105000.000	0.134	4323.818	15299.334	0.146	0.920
3-23-84	A325	0.875	535	04	06	0.667	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	04	07	0.667	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	04	01	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-13-84	A325	0.875	535	05	07	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-13-84	A325	0.875	535	05	08	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	535	05	03	0.458	9.000	0.462	0.200	0.500	0.042	39000.000	6825.000	3250.000	7038.679	105000.000	0.067	2161.909	7649.667	0.073	0.920
3-13-84	A325	0.875	535	05	05	0.292	9.000	0.462	0.200	0.500	0.208	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	10809.544	38248.334	0.364	0.920
3-13-84	A325	0.875	535	05	04	0.375	9.000	0.462	0.200	0.500	0.125	39000.000	6825.000	9750.000	21116.038	105000.000	0.201	6485.726	22949.000	0.219	0.920
3-13-84	A325	0.875	535	05	01	0.417	9.000	0.462	0.200	0.500	0.083	39000.000	6825.000	6500.000	14077.359	105000.000	0.134	4323.818	15299.334	0.146	0.920
3-13-84	A325	0.875	535	05	06	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-13-84	A325	0.875	535	05	02	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920

3-15-84	A325	0.875	535	07	04	0.583	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-15-84	A325	0.875	535	07	03	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-15-84	A325	0.875	535	07	14	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920	
3-14-84	A325	0.875	535	11	01	0.667	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	11	02	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	11	03	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920	
3-14-84	A325	0.875	535	11	07	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920	
3-14-84	A325	0.875	535	11	05	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920	
3-14-84	A325	0.875	535	11	04	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920	
3-14-84	A325	0.875	535	11	06	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45836.001	0.437	0.920	
3-13-84	A490	0.875	535	15	04	0.125	9.000	0.462	0.200	0.500	0.375	49000.000	8575.000	36750.000	79591.222	150000.000	0.531	24446.199	86500.078	0.577	0.920	
3-13-84	A490	0.875	535	15	05	0.667	9.000	0.462	0.200	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000	
3-13-84	A490	0.875	535	15	06	0.208	9.000	0.462	0.200	0.500	0.292	49000.000	8575.000	28583.333	61904.283	150000.000	0.413	19013.711	67277.839	0.449	0.920	
3-14-84	A325	0.875	535	17	03	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	17	04	0.458	9.000	0.462	0.200	0.500	0.042	39000.000	6825.000	3250.000	7038.679	105000.000	0.067	2161.909	7649.667	0.073	0.920	
3-14-84	A325	0.875	535	17	07	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920	
3-14-84	A325	0.875	535	17	01	0.206	9.000	0.462	0.200	0.500	0.292	39000.000	6825.000	22750.000	49270.756	105000.000	0.469	15133.361	53547.668	0.510	0.920	
3-22-84	A325	0.875	535	19	02	0.833	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	19	06	1.000	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	19	05	0.917	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	19	07	1.333	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	19	03	0.833	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	19	01	0.667	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	19	04	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-20-84	A490	0.875	535	21	06	0.833	9.000	0.462	0.200	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000	
3-20-84	A490	0.875	535	21	03	0.417	9.000	0.462	0.200	0.500	0.083	49000.000	8575.000	8166.667	17686.938	150000.000	0.118	5432.489	19222.240	0.128	0.920	
3-20-84	A490	0.875	535	21	04	1.000	9.000	0.462	0.200	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000	
3-20-84	A490	0.875	535	21	05	0.833	9.000	0.462	0.200	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000	
3-20-84	A490	0.875	535	21	07	1.083	9.000	0.462	0.200	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000	
3-13-84	A490	0.875	535	24	01	0.167	9.000	0.462	0.200	0.500	0.333	49000.000	8575.000	32666.667	70747.753	150000.000	0.472	21729.955	76888.959	0.513	0.920	
3-14-84	A325	0.875	535	25	07	0.583	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	25	01	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920	
3-14-84	A325	0.875	535	25	05	0.458	9.000	0.462	0.200	0.500	0.042	39000.000	6825.[illegible]	[illegible]000	7038.679	105000.000	0.067	2161.909	7649.667	0.073	0.920	
3-14-84	A325	0.875	535	25	06	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.[illegible]	[illegible]00	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	25	03	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.[illegible]	[illegible]00	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	25	02	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	25	04	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	27	02	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920	
3-22-84	A325	0.875	535	27	07	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920	
3-22-84	A325	0.875	535	27	03	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920	
3-22-84	A325	0.875	535	27	06	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920	
3-20-84	A490	0.875	535	30	13	0.167	9.000	0.462	0.200	0.500	0.333	49000.000	8575.000	32666.667	70747.753	150000.000	0.472	21729.955	76888.959	0.513	0.920	
3-20-84	A490	0.875	535	38	02	0.167	9.000	0.462	0.200	0.500	0.333	49000.000	8575.000	32666.667	70747.753	150000.000	0.472	21729.955	76888.959	0.513	0.920	
3-15-84	A325	0.875	536	05	01	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920	
3-15-84	A325	0.875	536	05	03	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920	
3-15-84	A325	0.875	536	05	02	0.188	9.000	0.462	0.200	0.500	0.313	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	16214.316	57372.501	0.546	0.920	
4-6-84	A490	1.375	540	10	06	0.167	6.000	1.155	0.200	0.500	0.333	121000.000	33275.000	80666.667	69848.349	150000.000	0.466	21729.955	76056.752	0.507	0.918	
4-6-84	A490	1.375	540	24	04	0.125	6.000	1.155	0.200	0.500	0.375	121000.000	33275.000	90750.000	78579.393	150000.000	0.524	24446.199	85563.846	0.570	0.918	
4-6-84	A490	1.375	540	25	02	0.125	6.000	1.155	0.200	0.500	0.375	121000.000	33275.000	90750.000	78579.393	150000.000	0.524	24446.199	85563.846	0.570	0.918	
4-6-84	A490	0.875	540	37	05	0.250	9.000	0.462	0.200	0.500	0.250	49000.000	8575.000	24500.000	53060.814	150000.000	0.354	16297.466	57666.719	0.384	0.920	

STRUCTURAL INTEGRITY ASSOCIATES, INC.

PALO VERDE 2 NUT ROTATION) 30 DEGREES , PRELOAD CALCULATION (K=0.430)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	CONN. NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ.IN	ASSUMED K	TURN SPEC	TURN ACT	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU IY	SIGMA I	SIGMA I/ UTS MIN	SIGMA I/ SIGMA I
3-14-84	A325	0.875	530	11	06	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-14-84	A325	0.875	530	11	04	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-13-84	A325	0.875	531	01	05	0.750	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	531	06	05	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-13-84	A325	0.875	531	06	02	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-13-84	A325	0.875	531	06	01	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-13-84	A325	0.875	531	06	04	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-14-84	A325	0.875	531	06	03	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-14-84	A325	0.875	532	01	07	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-14-84	A325	0.875	532	01	01	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-16-84	A325	0.875	532	12	06	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-16-84	A325	0.875	532	12	05	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-19-84	A325	0.875	532	18	02	0.750	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-19-84	A325	0.875	532	18	04	0.833	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	03	0.917	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	06	1.083	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	05	0.750	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-19-84	A325	0.875	532	18	01	0.917	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-15-84	A490	1.000	532	25	07	0.375	8.000	0.606	0.430	0.500	0.125	64000.000	12800.000	7441.860	12285.459	150000.000	0.082	8148.733	16347.384	0.109	0.752
3-15-84	A490	1.000	532	25	10	0.167	8.000	0.606	0.430	0.500	0.333	64000.000	12800.000	19844.961	32761.225	150000.000	0.218	21729.955	43593.025	0.291	0.752
3-15-84	A490	1.000	532	25	06	0.250	8.000	0.606	0.430	0.500	0.250	64000.000	12800.000	14883.721	24570.919	150000.000	0.164	16297.466	32694.769	0.218	0.752
3-16-84	A325	0.875	533	16	02	0.667	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-16-84	A325	0.875	533	16	03	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-16-84	A325	0.875	533	16	04	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-19-84	A325	0.875	533	27	01	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-19-84	A325	0.875	533	27	02	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-16-84	A325	0.875	533	34	05	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-16-84	A325	0.875	533	34	06	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-16-84	A325	0.875	533	34	04	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-13-84	A325	0.875	534	02	03	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	05	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-13-84	A325	0.875	534	02	04	0.667	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	07	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	534	02	01	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-13-84	A325	0.875	534	02	02	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-13-84	A325	0.875	534	02	06	0.583	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A490	0.875	535	02	07	0.333	9.000	0.462	0.430	0.500	0.167	49000.000	8575.000	7596.899	16432.966	150000.000	0.110	10864.977	21854.496	0.146	0.753
3-23-84	A325	0.875	535	04	04	0.417	9.000	0.462	0.430	0.500	0.083	39000.000	6825.000	3023.256	6547.609	105000.000	0.062	4323.818	8697.198	0.083	0.753
3-23-84	A325	0.875	535	04	03	0.250	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-23-84	A325	0.875	535	04	02	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-23-84	A325	0.875	535	04	05	0.417	9.000	0.462	0.430	0.500	0.083	39000.000	6825.000	3023.256	6547.609	105000.000	0.062	4323.818	8697.198	0.083	0.753
3-23-84	A325	0.875	535	04	06	0.667	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	04	07	0.667	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-23-84	A325	0.875	535	04	01	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-13-84	A325	0.875	535	05	07	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-13-84	A325	0.875	535	05	08	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-13-84	A325	0.875	535	05	03	0.458	9.000	0.462	0.430	0.500	0.042	39000.000	6825.000	1511.628	3273.804	105000.000	0.031	2161.909	4348.599	0.041	0.753
3-13-84	A325	0.875	535	05	05	0.292	9.000	0.462	0.430	0.500	0.208	39000.000	6825.000	7558.140	16369.022	105000.000	0.156	10809.544	21742.994	0.207	0.753
3-13-84	A325	0.875	535	05	04	0.375	9.000	0.462	0.430	0.500	0.125	39000.000	6825.000	4534.884	9821.413	105000.000	0.094	6485.726	13045.796	0.124	0.753
3-13-84	A325	0.875	535	05	01	0.417	9.000	0.462	0.430	0.500	0.083	39000.000	6825.000	3023.256	6547.609	105000.000	0.062	4323.818	8697.198	0.083	0.753
3-13-84	A325	0.875	535	05	06	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-13-84	A325	0.875	535	05	02	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753

STRUCTURAL INTEGRITY ASSOCIATES, INC.

3-15-84	A325	0.875	535	07	04	0.583	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-15-84	A325	0.875	535	07	03	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-15-84	A325	0.875	535	07	14	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753	
3-14-84	A325	0.875	535	11	01	0.667	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	11	02	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	11	03	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753	
3-14-84	A325	0.875	535	11	07	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753	
3-14-84	A325	0.875	535	11	05	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753	
3-14-84	A325	0.875	535	11	04	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753	
3-13-84	A490	0.875	535	15	04	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753	
3-13-84	A490	0.875	535	15	05	0.667	9.000	0.462	0.430	0.500	0.375	49000.000	8575.000	17093.023	37019.173	150000.000	0.247	24446.199	49172.617	0.328	0.753	
3-14-84	A325	0.875	535	15	06	0.268	9.000	0.462	0.430	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	17	03	0.500	9.000	0.462	0.430	0.500	0.292	49000.000	8575.000	13294.574	28792.690	150000.000	0.192	19013.711	38245.369	0.255	0.753	
3-14-84	A325	0.875	535	17	04	0.458	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	17	07	0.167	9.000	0.462	0.430	0.500	0.042	39000.000	6825.000	1511.628	3273.804	105000.000	0.031	2161.909	4348.599	0.041	0.753	
3-14-84	A325	0.875	535	17	01	0.208	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753	
3-22-84	A325	0.875	535	19	02	0.833	9.000	0.462	0.430	0.500	0.292	39000.000	6825.000	10581.395	22916.631	105000.000	0.218	15133.361	30440.192	0.290	0.753	
3-22-84	A325	0.875	535	19	06	1.000	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	19	05	0.917	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	19	07	1.333	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	19	03	0.833	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	19	01	0.667	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	19	04	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-20-84	A490	0.875	535	21	06	0.833	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-20-84	A490	0.875	535	21	03	0.417	9.000	0.462	0.430	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000	
3-20-84	A490	0.875	535	21	04	1.000	9.000	0.462	0.430	0.500	0.083	49000.000	8575.000	3798.450	8226.483	150000.000	0.055	5432.489	10927.248	0.073	0.753	
3-20-84	A490	0.875	535	21	05	0.833	9.000	0.462	0.430	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000	
3-20-84	A490	0.875	535	21	07	1.083	9.000	0.462	0.430	0.500	0.000	49000.000	8575.000	0.000	0.000	150000.000	0.000	0.000	0.000	0.000	0.000	
3-13-84	A490	0.875	535	24	01	0.167	9.000	0.462	0.430	0.500	0.333	49000.000	8575.000	15193.798	32905.931	150000.000	0.219	21729.955	43708.993	0.291	0.753	
3-14-84	A325	0.875	535	25	07	0.583	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	25	01	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753	
3-14-84	A325	0.875	535	25	05	0.458	9.000	0.462	0.430	0.500	0.042	39000.000	6825.000	1511.628	3273.804	105000.000	0.031	2161.909	4348.599	0.041	0.753	
3-14-84	A325	0.875	535	25	06	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	25	03	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	25	02	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-14-84	A325	0.875	535	25	04	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	27	02	0.167	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000	
3-22-84	A325	0.875	535	27	07	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753	
3-22-84	A325	0.875	535	27	03	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753	
3-22-84	A325	0.875	535	27	06	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753	
3-20-84	A490	0.875	535	30	13	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753	
3-20-84	A490	0.875	535	38	02	0.167	9.000	0.462	0.430	0.500	0.333	49000.000	8575.000	15193.798	32905.931	150000.000	0.219	21729.955	43708.993	0.291	0.753	
3-15-84	A325	0.875	536	05	01	0.167	9.000	0.462	0.430	0.500	0.333	49000.000	8575.000	15193.798	32905.931	150000.000	0.219	21729.955	43708.993	0.291	0.753	
3-15-84	A325	0.875	536	05	03	0.250	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753	
3-15-84	A325	0.875	536	05	02	0.188	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753	
4-6-84	A490	1.375	540	10	06	0.167	6.000	1.135	0.430	0.500	0.313	39000.000	6825.000	11337.209	24553.533	105000.000	0.234	16214.316	32614.491	0.311	0.753	
4-6-84	A490	1.375	540	24	04	0.125	6.000	1.135	0.430	0.500	0.333	121000.000	33275.000	37519.380	32487.604	150000.000	0.217	21729.955	43374.081	0.289	0.749	
4-6-84	A490	1.375	540	25	02	0.125	6.000	1.135	0.430	0.500	0.375	121000.000	33275.000	42209.302	36548.555	150000.000	0.244	24446.199	48795.842	0.325	0.749	
4-6-84	A490	0.875	540	37	05	0.250	9.000	0.462	0.430	0.500	0.375	121000.000	33275.000	42209.302	36548.555	150000.000	0.244	24446.199	48795.842	0.325	0.749	
						0.250	9.000	0.462	0.430	0.500	0.250	49000.000	8575.000	11395.349	24673.449	150000.000	0.185	16297.466	32781.745	0.219	0.753	

STRUCTURAL INTEGRITY ASSOCIATES, INC.

APPENDIX H

PALO VERDE UNIT 2 PRELOAD CALCULATIONS
BASED ON RESTART TORQUE

PALO VERDE UNIT 2 HIGH STRENGTH BOLT TORQUE PRELOAD CALCULATIONS (K=0.11

INSP. DATE	BOLT GRADE	SIZE (IN)	DWG. NO.	COMP. NO.	BOLT NO.	TORQUE	TORQUE	N THD/IN	A SQ.IN	ASSUMED K	F_i SPEC	TORQUE SPEC	F_i ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TR. IN	SIGMA T	SIGMA I/ UTS MIN	SIGMA I/ SIGMA T
4-16-84	A490	1.375	534	39	01	300.000	3600.000	6.000	1.155	0.110	121000.000	33275.000	23801.653	20609.581	150000.000	0.137	3526.424	21196.272	0.141	0.972
4-16-84	A490	1.375	534	39	02	300.000	3600.000	6.000	1.155	0.110	121000.000	33275.000	23801.653	20609.581	150000.000	0.137	3526.424	21196.272	0.141	0.972
4-16-84	A490	1.375	534	39	03	150.000	1800.000	6.000	1.155	0.110	121000.000	33275.000	11900.826	10304.790	150000.000	0.069	1763.212	10598.136	0.071	0.972
4-16-84	A490	1.375	534	39	04	150.000	1800.000	6.000	1.155	0.110	121000.000	33275.000	11900.826	10304.790	150000.000	0.069	1763.212	10598.136	0.071	0.972
4-16-84	A490	1.375	534	40	01	350.000	4200.000	6.000	1.155	0.110	121000.000	33275.000	27768.595	24044.511	150000.000	0.160	4114.161	24728.984	0.165	0.972
4-16-84	A490	1.375	534	40	02	350.000	4200.000	6.000	1.155	0.110	121000.000	33275.000	27768.595	24044.511	150000.000	0.160	4114.161	24728.984	0.165	0.972
4-16-84	A490	1.375	534	40	03	300.000	3600.000	6.000	1.155	0.110	121000.000	33275.000	23801.653	20609.581	150000.000	0.137	3526.424	21196.272	0.141	0.972
4-16-84	A490	1.375	534	40	04	300.000	3600.000	6.000	1.155	0.110	121000.000	33275.000	23801.653	20609.581	150000.000	0.137	3526.424	21196.272	0.141	0.972
4-16-84	A490	1.375	534	41	01	200.000	2400.000	6.000	1.155	0.110	121000.000	33275.000	15867.769	13739.720	150000.000	0.092	2350.949	14130.848	0.094	0.972
4-16-84	A490	1.375	534	41	02	350.000	4200.000	6.000	1.155	0.110	121000.000	33275.000	27768.595	24044.511	150000.000	0.160	4114.161	24728.984	0.165	0.972
4-16-84	A490	1.375	534	41	03	200.000	2400.000	6.000	1.155	0.110	121000.000	33275.000	15867.769	13739.720	150000.000	0.092	2350.949	14130.848	0.094	0.972
4-16-84	A490	1.375	534	41	04	250.000	3000.000	6.000	1.155	0.110	121000.000	33275.000	19834.711	17174.651	150000.000	0.114	2938.687	17663.560	0.118	0.972
4-16-84	A490	1.375	534	41	05	250.000	3000.000	6.000	1.155	0.110	121000.000	33275.000	19834.711	17174.651	150000.000	0.114	2938.687	17663.560	0.118	0.972
4-16-84	A490	1.375	534	41	06	250.000	3000.000	6.000	1.155	0.110	121000.000	33275.000	19834.711	17174.651	150000.000	0.114	2938.687	17663.560	0.118	0.972
4-16-84	A490	1.375	534	42	01	250.000	3000.000	6.000	1.155	0.110	121000.000	33275.000	19834.711	17174.651	150000.000	0.114	2938.687	17663.560	0.118	0.972
4-16-84	A490	1.375	534	42	02	350.000	4200.000	6.000	1.155	0.110	121000.000	33275.000	27768.595	24044.511	150000.000	0.160	4114.161	24728.984	0.165	0.972
4-16-84	A490	1.375	534	42	03	325.000	3900.000	6.000	1.155	0.110	121000.000	33275.000	25785.124	22327.046	150000.000	0.149	3820.293	22962.628	0.153	0.972
4-16-84	A490	1.375	534	42	04	375.000	4500.000	6.000	1.155	0.110	121000.000	33275.000	29752.066	25761.976	150000.000	0.172	4408.030	26495.340	0.177	0.972
4-16-84	A490	1.375	534	42	05	350.000	4200.000	6.000	1.155	0.110	121000.000	33275.000	27768.595	24044.511	150000.000	0.160	4114.161	24728.984	0.165	0.972
4-16-84	A490	1.375	534	42	06	250.000	3000.000	6.000	1.155	0.110	121000.000	33275.000	19834.711	17174.651	150000.000	0.114	2938.687	17663.560	0.118	0.972
4-16-84	A490	1.375	535	47	01	1250.000	15000.000	6.000	1.155	0.110	121000.000	33275.000	99173.554	85873.253	150000.000	0.572	14693.433	88317.799	0.589	0.972
4-16-84	A490	1.375	535	47	02	1250.000	15000.000	6.000	1.155	0.110	121000.000	33275.000	99173.554	85873.253	150000.000	0.572	14693.433	88317.799	0.589	0.972
4-16-84	A490	1.375	535	47	03	1300.000	15600.000	6.000	1.155	0.110	121000.000	33275.000	103140.496	89308.183	150000.000	0.595	15281.170	91850.511	0.612	0.972
4-16-84	A490	1.375	535	47	04	1300.000	15600.000	6.000	1.155	0.110	121000.000	33275.000	103140.496	89308.183	150000.000	0.595	15281.170	91850.511	0.612	0.972
4-16-84	A490	1.375	535	47	05	1450.000	17400.000	6.000	1.155	0.110	121000.000	33275.000	115041.322	99612.973	150000.000	0.664	17044.362	102446.847	0.682	0.972
4-16-84	A490	1.375	535	47	06	1200.000	14400.000	6.000	1.155	0.110	121000.000	33275.000	95206.612	82438.322	150000.000	0.550	14105.696	84785.067	0.565	0.972
4-16-84	A490	1.375	535	48	01	900.000	10800.000	6.000	1.155	0.110	121000.000	33275.000	71404.959	61828.742	150000.000	0.412	10579.272	63588.615	0.424	0.972
4-16-84	A490	1.375	535	48	02	1000.000	12000.000	6.000	1.155	0.110	121000.000	33275.000	79338.843	68698.602	150000.000	0.458	11754.746	70654.239	0.471	0.972
4-16-84	A490	1.375	535	48	03	1700.000	20400.000	6.000	1.155	0.110	121000.000	33275.000	134876.033	116787.623	150000.000	0.779	19983.369	120116.267	0.801	0.972
4-16-84	A490	1.375	535	48	04	700.000	8400.000	6.000	1.155	0.110	121000.000	33275.000	55537.190	48085.021	150000.000	0.321	8228.323	49457.368	0.330	0.972
4-16-84	A490	1.375	535	48	05	850.000	10200.000	6.000	1.155	0.110	121000.000	33275.000	67438.017	58393.812	150000.000	0.389	9991.534	60056.103	0.400	0.972
4-16-84	A490	1.375	535	48	06	1250.000	15000.000	6.000	1.155	0.110	121000.000	33275.000	99173.554	85873.253	150000.000	0.572	14693.433	88317.799	0.589	0.972
4-16-84	A490	1.375	535	45	01	2000.000	24000.000	6.000	1.155	0.110	121000.000	33275.000	158677.686	137397.204	150000.000	0.916	23509.493	141308.479	0.942	0.972
4-16-84	A490	1.375	535	45	02	1200.000	14400.000	6.000	1.155	0.110	121000.000	33275.000	95206.612	82438.322	150000.000	0.550	14105.696	84785.067	0.565	0.972
4-16-84	A490	1.375	535	45	03	600.000	7200.000	6.000	1.155	0.110	121000.000	33275.000	47603.306	41219.161	150000.000	0.275	7052.848	42396.544	0.283	0.972
4-16-84	A490	1.375	535	45	04	1400.000	16800.000	6.000	1.155	0.110	121000.000	33275.000	111074.380	96178.043	150000.000	0.641	16456.645	98915.935	0.659	0.972
4-16-84	A490	1.375	535	45	05	800.000	9600.000	6.000	1.155	0.110	121000.000	33275.000	63471.074	54958.882	150000.000	0.366	9403.797	56523.391	0.377	0.972
4-16-84	A490	1.375	535	45	06	750.000	9000.000	6.000	1.155	0.110	121000.000	33275.000	59504.132	51523.952	150000.000	0.343	8816.060	52990.679	0.353	0.972
4-16-84	A490	1.375	535	46	03	550.000	6600.000	6.000	1.155	0.110	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	6465.111	38859.832	0.259	0.972
4-16-84	A490	1.375	535	46	04	520.000	6000.000	6.000	1.155	0.110	121000.000	33275.000	39669.421	34349.301	150000.000	0.229	5877.373	35327.120	0.236	0.972
4-16-84	A490	1.375	535	46	05	450.000	5400.000	6.000	1.155	0.110	121000.000	33275.000	35702.479	30914.371	150000.000	0.206	5289.636	31794.408	0.212	0.972
4-16-84	A490	1.375	535	46	06	650.000	7800.000	6.000	1.155	0.110	121000.000	33275.000	51570.248	44654.091	150000.000	0.298	7640.585	45925.256	0.306	0.972
4-13-84	A490	1.375	535	43	01	1150.000	13800.000	6.000	1.155	0.110	121000.000	33275.000	91239.669	79003.392	150000.000	0.527	13517.958	81252.375	0.542	0.972
4-13-84	A490	1.375	535	43	02	900.000	10800.000	6.000	1.155	0.110	121000.000	33275.000	71404.959	61828.742	150000.000	0.412	10579.272	63588.615	0.424	0.972
4-13-84	A490	1.375	535	43	03	700.000	8400.000	6.000	1.155	0.110	121000.000	33275.000	55537.190	48089.021	150000.000	0.321	8228.323	49457.368	0.330	0.972
4-13-84	A490	1.375	535	43	04	800.000	9600.000	6.000	1.155	0.110	121000.000	33275.000	63471.074	54958.882	150000.000	0.366	9403.797	56523.391	0.377	0.972
4-13-84	A490	1.375	535	43	05	800.000	9600.000	6.000	1.155	0.110	121000.000	33275.000	63471.074	54958.882	150000.000	0.366	9403.797	56523.391	0.377	0.972
4-13-84	A490	1.375	535	43	06	1000.000	12000.000	6.000	1.155	0.110	121000.000	33275.000	79338.843	68698.602	150000.000	0.458	11754.746	70654.239	0.471	0.972
4-13-84	A490	1.375	535	44	01	750.000	9000.000	6.000	1.155	0.110	121000.000	33275.000	59504.132	51523.952	150000.000	0.343	8816.060	52990.679	0.353	0.972
4-13-84	A490	1.375	535	44	02	950.000	11400.000	6.000	1.155	0.110	121000.000	33275.000	75371.901	65263.672	150000.000	0.435	11167.009	67121.527	0.447	0.972
4-13-84	A490	1.375	535	44	03	200.000	2400.000	6.000	1.155	0.110	121000.000	33275.000	15867.769	13739.720	150000.000	0.092	2350.949	14130.848	0.094	0.972
4-13-84	A490	1.375	535	44	04	550.000	6600.000	6.000	1.155	0.110	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	6465.111	38859.832	0.259	0.972
4-13-84	A490	1.375	535	44	05	750.000	9000.000	6.000	1.155	0.110	121000.000	33275.000	59504.132	51523.952	150000.000	0.343	8816.060	52990.679	0.353	0.972

STRUCTURAL INTEGRITY ASSOCIATES, INC

4-13-84	DA9	1.375	535	44	[illegible]	700.000	8400.000	6.000	1.155	0.110	121000.000	33275.000	55537.190	48089.021	150000.000	0.321	8228.323	49457.968	0.330	0.972
4-13-84	DA9	1.375	535	42	11	500.000	6000.000	6.000	1.155	0.110	121000.000	33275.000	39669.421	34349.301	150000.000	0.229	5877.373	35327.120	0.236	0.972
4-13-84	DA9	1.375	535	42	03	1000.000	12000.000	6.000	1.155	0.110	121000.000	33275.000	79338.843	68698.602	150000.000	0.458	11754.746	70654.239	0.471	0.972
4-13-84	DA9	1.375	535	42	04	200.000	2400.000	6.000	1.155	0.110	121000.000	33275.000	15867.769	13739.720	150000.000	0.092	2351.945	14130.848	0.094	0.972
4-13-84	DA9	1.375	535	42	05	600.000	7200.000	6.000	1.155	0.110	121000.000	33275.000	47603.306	41219.161	150000.000	0.275	7052.848	42392.544	0.283	0.972
4-13-84	DA9	1.375	535	53	01	500.000	6000.000	6.000	1.155	0.110	121000.000	33275.000	39669.421	34349.301	150000.000	0.229	5877.373	35327.120	0.236	0.972
4-13-84	DA9	1.375	535	53	02	400.000	4800.000	6.000	1.155	0.110	121000.000	33275.000	31735.537	27479.441	150000.000	0.183	4701.899	28261.696	0.188	0.972
4-13-84	DA9	1.375	535	53	03	400.000	4800.000	6.000	1.155	0.110	121000.000	33275.000	31735.537	27479.441	150000.000	0.183	4701.899	28261.696	0.188	0.972
4-13-84	DA9	1.375	535	53	04	175.000	2100.000	6.000	1.155	0.110	121000.000	33275.000	13884.298	12022.255	150000.000	0.080	2057.081	12364.452	0.082	0.972
4-13-84	DA9	1.375	535	53	05	400.000	4800.000	6.000	1.155	0.110	121000.000	33275.000	31735.537	27479.441	150000.000	0.183	4701.899	28261.696	0.188	0.972
4-13-84	DA9	1.375	535	53	06	200.000	2400.000	6.000	1.155	0.110	121000.000	33275.000	15867.769	13739.720	150000.000	0.092	2350.945	14130.848	0.094	0.972
4-13-84	DA9	1.375	535	54	01	500.000	6000.000	6.000	1.155	0.110	121000.000	33275.000	39669.421	34349.301	150000.000	0.229	5877.373	35327.120	0.236	0.972
4-13-84	DA9	1.375	535	54	02	550.000	6600.000	6.000	1.155	0.110	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	6465.111	38859.832	0.259	0.972
4-13-84	DA9	1.375	535	54	03	250.000	3000.000	6.000	1.155	0.110	121000.000	33275.000	19834.711	17174.651	150000.000	0.114	2938.687	17663.560	0.118	0.972
4-13-84	DA9	1.375	535	54	04	275.000	3300.000	6.000	1.155	0.110	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	3232.555	19429.916	0.130	0.972
4-13-84	DA9	1.375	535	54	05	275.000	3300.000	6.000	1.155	0.110	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	3232.555	19429.916	0.130	0.972
4-13-84	DA9	1.375	535	54	06	400.000	4800.000	6.000	1.155	0.110	121000.000	33275.000	31735.537	27479.441	150000.000	0.183	4701.899	28261.696	0.188	0.972
4-13-84	DA90	1.375	535	55	01	700.000	8400.000	6.000	1.155	0.110	121000.000	33275.000	55537.190	48089.021	150000.000	0.321	8228.323	49457.968	0.330	0.972
4-13-84	DA90	1.375	535	55	02	800.000	9600.000	6.000	1.155	0.110	121000.000	33275.000	63471.074	54958.882	150000.000	0.366	9403.797	56523.391	0.377	0.972
4-13-84	DA90	1.375	535	55	03	300.000	3600.000	6.000	1.155	0.110	121000.000	33275.000	23801.653	20609.581	150000.000	0.137	3526.424	21196.272	0.141	0.972
4-13-84	DA90	1.375	535	55	04	650.000	7800.000	6.000	1.155	0.110	121000.000	33275.000	51570.248	44654.091	150000.000	0.298	7640.585	45925.256	0.306	0.972
4-13-84	DA90	1.375	535	55	05	600.000	7200.000	6.000	1.155	0.110	121000.000	33275.000	47603.306	41219.161	150000.000	0.275	7052.848	42392.544	0.283	0.972
4-13-84	DA90	1.375	535	55	06	300.000	3600.000	6.000	1.155	0.110	121000.000	33275.000	23801.653	20609.581	150000.000	0.137	3526.424	21196.272	0.141	0.972
4-13-84	DA90	1.375	535	56	01	600.000	7200.000	6.000	1.155	0.110	121000.000	33275.000	47603.306	41219.161	150000.000	0.275	7052.848	42392.544	0.283	0.972
4-13-84	DA90	1.375	535	56	02	300.000	3600.000	6.000	1.155	0.110	121000.000	33275.000	23801.653	20609.581	150000.000	0.137	3526.424	21196.272	0.141	0.972
4-13-84	DA90	1.375	535	56	03	300.000	3600.000	6.000	1.155	0.110	121000.000	33275.000	23801.653	20609.581	150000.000	0.137	3526.424	21196.272	0.141	0.972
4-13-84	DA90	1.375	535	56	04	750.000	9000.000	6.000	1.155	0.110	121000.000	33275.000	59504.132	51523.952	150000.000	0.343	8816.060	52990.679	0.353	0.972
4-13-84	DA90	1.375	535	56	05	600.000	7200.000	6.000	1.155	0.110	121000.000	33275.000	47603.306	41219.161	150000.000	0.275	7052.848	42392.544	0.283	0.972
4-13-84	DA90	1.375	535	56	06	450.000	5400.000	6.000	1.155	0.110	121000.000	33275.000	35702.479	30914.371	150000.000	0.206	5289.636	31794.408	0.212	0.972
4-12-84	DA90	1.375	534	31	01	1100.000	13200.000	6.000	1.155	0.110	121000.000	33275.000	87272.727	75568.462	150000.000	0.504	12930.221	77719.663	0.518	0.972
4-12-84	DA90	1.375	534	31	02	750.000	9000.000	6.000	1.155	0.110	121000.000	33275.000	59504.132	51523.952	150000.000	0.343	8816.060	52990.679	0.353	0.972
4-12-84	DA90	1.375	534	31	03	800.000	9600.000	6.000	1.155	0.110	121000.000	33275.000	63471.074	54958.882	150000.000	0.366	9403.797	56523.391	0.377	0.972
4-12-84	DA90	1.375	534	31	04	800.000	9600.000	6.000	1.155	0.110	121000.000	33275.000	63471.074	54958.882	150000.000	0.366	9403.797	56523.391	0.377	0.972
4-12-84	DA90	1.375	534	31	05	800.000	9600.000	6.000	1.155	0.110	121000.000	33275.000	63471.074	54958.882	150000.000	0.366	9403.797	56523.391	0.377	0.972
4-12-84	DA90	1.375	534	31	06	1100.000	13200.000	6.000	1.155	0.110	121000.000	33275.000	87272.727	75568.462	150000.000	0.504	12930.221	77719.663	0.518	0.972
4-12-84	DA90	1.375	534	32	01	1000.000	12000.000	6.000	1.155	0.110	121000.000	33275.000	79338.843	68698.602	150000.000	0.458	11754.746	70654.239	0.471	0.972
4-12-84	DA90	1.375	534	32	02	2000.000	24000.000	6.000	1.155	0.110	121000.000	33275.000	158677.686	137397.204	150000.000	0.916	23509.493	141308.479	0.942	0.972
4-12-84	DA90	1.375	534	32	03	1600.000	19200.000	6.000	1.155	0.110	121000.000	33275.000	126942.149	109917.763	150000.000	0.733	18807.594	113046.783	0.754	0.972
4-12-84	DA90	1.375	534	32	04	550.000	6600.000	6.000	1.155	0.110	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	6465.111	38859.832	0.259	0.972
4-12-84	DA90	1.375	534	32	05	1100.000	13200.000	6.000	1.155	0.110	121000.000	33275.000	87272.727	75568.462	150000.000	0.504	12930.221	77719.663	0.518	0.972
4-12-84	DA90	1.375	534	32	06	1000.000	12000.000	6.000	1.155	0.110	121000.000	33275.000	79338.843	68698.602	150000.000	0.458	11754.746	70654.239	0.471	0.972
4-12-84	DA90	1.375	534	33	01	800.000	9600.000	6.000	1.155	0.110	121000.000	33275.000	63471.074	54958.882	150000.000	0.366	9403.797	56523.391	0.377	0.972
4-12-84	DA90	1.375	534	33	02	700.000	8400.000	6.000	1.155	0.110	121000.000	33275.000	55537.190	48089.021	150000.000	0.321	8228.323	49457.968	0.330	0.972
4-12-84	DA90	1.375	534	33	03	700.000	8400.000	6.000	1.155	0.110	121000.000	33275.000	55537.190	48089.021	150000.000	0.321	8228.323	49457.968	0.330	0.972
4-12-84	DA90	1.375	534	33	04	900.000	10800.000	6.000	1.155	0.110	121000.000	33275.000	71404.959	61828.742	150000.000	0.412	10579.272	63588.815	0.424	0.972
4-12-84	DA90	1.375	534	33	05	700.000	8400.000	6.000	1.155	0.110	121000.000	33275.000	55537.190	48089.021	150000.000	0.321	8228.323	49457.968	0.330	0.972
4-12-84	DA90	1.375	534	33	06	900.000	10800.000	6.000	1.155	0.110	121000.000	33275.000	71404.959	61828.742	150000.000	0.412	10579.272	63588.815	0.424	0.972
4-12-84	DA90	1.375	534	34	01	800.000	9600.000	6.000	1.155	0.110	121000.000	33275.000	63471.074	54958.882	150000.000	0.366	9403.797	56523.391	0.377	0.972
4-12-84	DA90	1.375	534	34	02	800.000	9600.000	6.000	1.155	0.110	121000.000	33275.000	63471.074	54958.882	150000.000	0.366	9403.797	56523.391	0.377	0.972
4-12-84	DA90	1.375	534	34	03	700.000	8400.000	6.000	1.155	0.110	121000.000	33275.000	55537.190	48089.021	150000.000	0.321	8228.323	49457.968	0.330	0.972
4-12-84	DA90	1.375	534	34	04	500.000	6000.000	6.000	1.155	0.110	121000.000	33275.000	39669.421	34349.301	150000.000	0.229	5877.373	35327.120	0.236	0.972
4-12-84	DA90	1.375	534	34	05	2550.000	30600.000	6.000	1.155	0.110	121000.000	33275.000	202314.050	175181.435	150000.000	1.168	29974.603	180168.310	1.201	0.972
4-12-84	DA90	1.375	534	34	06	400.000	4800.000	6.000	1.155	0.110	121000.000	33275.000	31735.537	27479.441	150000.000	0.183	4701.899	28261.696	0.188	0.972

STRUCTURAL INTEGRITY ASSOCIATES, INC.

BOLT VERIFICATION & HIGH STRENGTH BOLT TORQUE PRELOAD CALCULATIONS (K=0.16)

INSP. DATE	BOLT GRADE	SIZE (IN.)	DWG. NO.	COMP. NO.	BOLT NO.	TORQUE MIN	TORQUE SPEC	N MIN	A SQ. IN	ASSUMED K	F_i SPEC	TORQUE SPEC	F_i ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TQL IV	SIGMA I	SIGMA I/ UTS MIN	SIGMA I/ SIGMA Y
4-16-84	A490	1.375	534	39	01	300.000	3600.000	6.000	1.155	0.160	121000.000	33275.000	16363.636	14169.087	150000.000	0.094	3526.424	14936.229	0.100	0.945
4-16-84	A490	1.375	534	39	02	300.000	3600.000	6.000	1.155	0.160	121000.000	33275.000	16363.636	14169.087	150000.000	0.094	3526.424	14936.229	0.100	0.945
4-16-84	A490	1.375	534	39	03	150.000	1800.000	6.000	1.155	0.160	121000.000	33275.000	8181.818	7084.543	150000.000	0.047	1763.212	7479.114	0.050	0.945
4-16-84	A490	1.375	534	39	04	150.000	1800.000	6.000	1.155	0.160	121000.000	33275.000	8181.818	7084.543	150000.000	0.047	1763.212	7479.114	0.050	0.945
4-16-84	A490	1.375	534	40	01	350.000	4200.000	6.000	1.155	0.160	121000.000	33275.000	19090.909	16530.601	150000.000	0.110	4114.161	17457.934	0.117	0.945
4-16-84	A490	1.375	534	40	02	350.000	4200.000	6.000	1.155	0.160	121000.000	33275.000	19090.909	16530.601	150000.000	0.110	4114.161	17457.934	0.117	0.945
4-16-84	A490	1.375	534	40	03	300.000	3600.000	6.000	1.155	0.160	121000.000	33275.000	16363.636	14169.087	150000.000	0.094	3526.424	14936.229	0.100	0.945
4-16-84	A490	1.375	534	40	04	300.000	3600.000	6.000	1.155	0.160	121000.000	33275.000	16363.636	14169.087	150000.000	0.094	3526.424	14936.229	0.100	0.945
4-16-84	A490	1.375	534	41	01	200.000	2400.000	6.000	1.155	0.160	121000.000	33275.000	10909.091	9446.058	150000.000	0.063	2350.949	9958.819	0.067	0.945
4-16-84	A490	1.375	534	41	02	350.000	4200.000	6.000	1.155	0.160	121000.000	33275.000	19090.909	16530.601	150000.000	0.110	4114.161	17457.934	0.117	0.945
4-16-84	A490	1.375	534	41	03	200.000	2400.000	6.000	1.155	0.160	121000.000	33275.000	10909.091	9446.058	150000.000	0.063	2350.949	9958.819	0.067	0.945
4-16-84	A490	1.375	534	41	04	250.000	3000.000	6.000	1.155	0.160	121000.000	33275.000	13636.364	11807.572	150000.000	0.079	2938.687	12498.524	0.083	0.945
4-16-84	A490	1.375	534	41	05	250.000	3000.000	6.000	1.155	0.160	121000.000	33275.000	13636.364	11807.572	150000.000	0.079	2938.687	12498.524	0.083	0.945
4-16-84	A490	1.375	534	41	06	250.000	3000.000	6.000	1.155	0.160	121000.000	33275.000	13636.364	11807.572	150000.000	0.079	2938.687	12498.524	0.083	0.945
4-16-84	A490	1.375	534	42	01	250.000	3000.000	6.000	1.155	0.160	121000.000	33275.000	13636.364	11807.572	150000.000	0.079	2938.687	12498.524	0.083	0.945
4-16-84	A490	1.375	534	42	02	350.000	4200.000	6.000	1.155	0.160	121000.000	33275.000	19090.909	16530.601	150000.000	0.110	4114.161	17457.934	0.117	0.945
4-16-84	A490	1.375	534	42	03	325.000	3900.000	6.000	1.155	0.160	121000.000	33275.000	17727.273	15349.844	150000.000	0.102	3820.293	16248.081	0.108	0.945
4-16-84	A490	1.375	534	42	04	375.000	4500.000	6.000	1.155	0.160	121000.000	33275.000	20454.545	17711.358	150000.000	0.118	4408.030	18747.786	0.125	0.945
4-16-84	A490	1.375	534	42	05	350.000	4200.000	6.000	1.155	0.160	121000.000	33275.000	19090.909	16530.601	150000.000	0.110	4114.161	17457.934	0.117	0.945
4-16-84	A490	1.375	534	42	06	250.000	3000.000	6.000	1.155	0.160	121000.000	33275.000	13636.364	11807.572	150000.000	0.079	2938.687	12498.524	0.083	0.945
4-16-84	A490	1.375	535	47	01	1250.000	15000.000	6.000	1.155	0.160	121000.000	33275.000	68181.818	59037.861	150000.000	0.394	14693.433	62492.621	0.417	0.945
4-16-84	A490	1.375	535	47	02	1250.000	15000.000	6.000	1.155	0.160	121000.000	33275.000	68181.818	59037.861	150000.000	0.394	14693.433	62492.621	0.417	0.945
4-16-84	A490	1.375	535	47	03	1300.000	15600.000	6.000	1.155	0.160	121000.000	33275.000	70909.091	61399.376	150000.000	0.409	15281.170	64992.325	0.433	0.945
4-16-84	A490	1.375	535	47	04	1300.000	15600.000	6.000	1.155	0.160	121000.000	33275.000	70909.091	61399.376	150000.000	0.409	15281.170	64992.325	0.433	0.945
4-16-84	A490	1.375	535	47	05	1450.000	17400.000	6.000	1.155	0.160	121000.000	33275.000	79090.909	68483.919	150000.000	0.457	17044.382	72491.440	0.483	0.945
4-16-84	A490	1.375	535	47	06	1200.000	14400.000	6.000	1.155	0.160	121000.000	33275.000	65454.545	56676.347	150000.000	0.378	14105.696	59992.916	0.400	0.945
4-16-84	A490	1.375	535	48	01	900.000	10800.000	6.000	1.155	0.160	121000.000	33275.000	49090.909	42507.260	150000.000	0.283	10579.272	44994.687	0.300	0.945
4-16-84	A490	1.375	535	48	02	1000.000	12000.000	6.000	1.155	0.160	121000.000	33275.000	54545.455	47230.289	150000.000	0.315	11754.746	49994.097	0.333	0.945
4-16-84	A490	1.375	535	48	03	1700.000	20400.000	6.000	1.155	0.160	121000.000	33275.000	92727.273	80291.491	150000.000	0.535	19983.069	84989.364	0.567	0.945
4-16-84	A490	1.375	535	48	04	700.000	8400.000	6.000	1.155	0.160	121000.000	33275.000	38181.818	33061.202	150000.000	0.220	8228.323	34995.868	0.233	0.945
4-16-84	A490	1.375	535	48	05	850.000	10200.000	6.000	1.155	0.160	121000.000	33275.000	46363.636	40145.746	150000.000	0.268	9991.534	42494.382	0.283	0.945
4-16-84	A490	1.375	535	48	06	1250.000	15000.000	6.000	1.155	0.160	121000.000	33275.000	68181.818	59037.861	150000.000	0.394	14693.433	62492.621	0.417	0.945
4-16-84	A490	1.375	535	45	01	2000.000	24000.000	6.000	1.155	0.160	121000.000	33275.000	109090.909	94460.578	150000.000	0.630	23509.493	99988.193	0.667	0.945
4-16-84	A490	1.375	535	45	02	1200.000	14400.000	6.000	1.155	0.160	121000.000	33275.000	65454.545	56676.347	150000.000	0.378	14105.696	59992.916	0.400	0.945
4-16-84	A490	1.375	535	45	03	600.000	7200.000	6.000	1.155	0.160	121000.000	33275.000	32727.273	28338.173	150000.000	0.189	7052.848	29996.458	0.200	0.945
4-16-84	A490	1.375	535	45	04	1400.000	16800.000	6.000	1.155	0.160	121000.000	33275.000	76363.636	66122.404	150000.000	0.441	16456.645	69991.735	0.467	0.945
4-16-84	A490	1.375	535	45	05	800.000	9600.000	6.000	1.155	0.160	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	9403.797	39995.277	0.267	0.945
4-16-84	A490	1.375	535	45	06	750.000	9000.000	6.000	1.155	0.160	121000.000	33275.000	40909.091	35422.717	150000.000	0.236	8816.060	37495.572	0.250	0.945
4-16-84	A490	1.375	535	46	03	550.000	6600.000	6.000	1.155	0.160	121000.000	33275.000	30000.000	25976.659	150000.000	0.173	6465.111	27496.753	0.183	0.945
4-16-84	A490	1.375	535	46	04	500.000	6000.000	6.000	1.155	0.160	121000.000	33275.000	27272.727	23615.144	150000.000	0.157	5877.373	24997.048	0.167	0.945
4-16-84	A490	1.375	535	46	05	450.000	5400.000	6.000	1.155	0.160	121000.000	33275.000	24545.455	21253.630	150000.000	0.142	5289.636	22497.343	0.150	0.945
4-16-84	A490	1.375	535	46	06	650.000	7800.000	6.000	1.155	0.160	121000.000	33275.000	35454.545	30699.688	150000.000	0.205	7640.585	32496.163	0.217	0.945
4-13-84	A490	1.375	535	43	01	1150.000	13800.000	6.000	1.155	0.160	121000.000	33275.000	62727.273	54314.832	150000.000	0.362	13517.958	57493.211	0.383	0.945
4-13-84	A490	1.375	535	43	02	900.000	10800.000	6.000	1.155	0.160	121000.000	33275.000	49090.909	42507.260	150000.000	0.283	10579.272	44994.687	0.300	0.945
4-13-84	A490	1.375	535	43	03	700.000	8400.000	6.000	1.155	0.160	121000.000	33275.000	38181.818	33061.202	150000.000	0.220	8228.323	34995.868	0.233	0.945
4-13-84	A490	1.375	535	43	04	800.000	9600.000	6.000	1.155	0.160	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	9403.797	39995.277	0.267	0.945
4-13-84	A490	1.375	535	43	05	800.000	9600.000	6.000	1.155	0.160	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	9403.797	39995.277	0.267	0.945
4-13-84	A490	1.375	535	43	06	1000.000	12000.000	6.000	1.155	0.160	121000.000	33275.000	54545.455	47230.289	150000.000	0.315	11754.746	49994.097	0.333	0.945
4-13-84	A490	1.375	535	44	01	750.000	9000.000	6.000	1.155	0.160	121000.000	33275.000	40905.091	35422.717	150000.000	0.236	8816.060	37495.572	0.250	0.945
4-13-84	A490	1.375	535	44	02	950.000	11400.000	6.000	1.155	0.160	121000.000	33275.000	51818.182	44868.774	150000.000	0.299	11167.009	47494.352	0.317	0.945
4-13-84	A490	1.375	535	44	03	200.000	2400.000	6.000	1.155	0.160	121000.000	33275.000	10909.091	9446.058	150000.000	0.063	2350.949	9998.819	0.067	0.945
4-13-84	A490	1.375	535	44	04	550.000	6600.000	6.000	1.155	0.160	121000.000	33275.000	30000.000	25976.659	150000.000	0.173	6465.111	27496.753	0.183	0.945
4-13-84	A490	1.375	535	44	05	750.000	9000.000	6.000	1.155	0.160	121000.000	33275.000	40905.091	35422.717	150000.000	0.236	8816.060	37495.572	0.250	0.945

STRUCTURAL INTEGRITY ASSOCIATES, INC.

4-13-84	A490	1.375	S35	44	06	700.000	8400.000	6.000	1.155	0.160	121000.000	33275.000	38181.818	33061.202	150000.000	0.220	8228.323	34995.868	0.233	0.945
4-13-84	A490	1.375	S35	42	01	500.000	6000.000	6.000	1.155	0.160	121000.000	33275.000	27272.727	23615.144	150000.000	0.157	5877.373	24997.048	0.167	0.945
4-13-84	A490	1.375	S35	42	02	1000.000	12000.000	6.000	1.155	0.160	121000.000	33275.000	54545.455	47230.289	150000.000	0.315	11754.746	49994.097	0.333	0.945
4-13-84	A490	1.375	S35	42	03	200.000	2400.000	6.000	1.155	0.160	121000.000	33275.000	10909.091	9446.058	150000.000	0.063	2350.949	9998.819	0.067	0.945
4-13-84	A490	1.375	S35	42	04	600.000	7200.000	6.000	1.155	0.160	121000.000	33275.000	32727.273	28338.173	150000.000	0.189	7052.848	29996.458	0.200	0.945
4-13-84	A490	1.375	S35	53	01	500.000	6000.000	6.000	1.155	0.160	121000.000	33275.000	27272.727	23615.144	150000.000	0.157	5877.373	24997.048	0.167	0.945
4-13-84	A490	1.375	S35	53	02	400.000	4800.000	6.000	1.155	0.160	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	4701.899	19997.639	0.133	0.945
4-13-84	A490	1.375	S35	53	03	400.000	4800.000	6.000	1.155	0.160	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	4701.899	19997.639	0.133	0.945
4-13-84	A490	1.375	S35	53	04	175.000	2100.000	6.000	1.155	0.160	121000.000	33275.000	9545.455	8265.301	150000.000	0.055	2057.081	8748.967	0.058	0.945
4-13-84	A490	1.375	S35	53	05	400.000	4800.000	6.000	1.155	0.160	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	4701.899	19997.639	0.133	0.945
4-13-84	A490	1.375	S35	53	06	200.000	2400.000	6.000	1.155	0.160	121000.000	33275.000	10909.091	9446.058	150000.000	0.063	2350.949	9998.819	0.067	0.945
4-13-84	A490	1.375	S35	54	01	500.000	6000.000	6.000	1.155	0.160	121000.000	33275.000	27272.727	23615.144	150000.000	0.157	5877.373	24997.048	0.167	0.945
4-13-84	A490	1.375	S35	54	02	550.000	6600.000	6.000	1.155	0.160	121000.000	33275.000	30000.000	25976.659	150000.000	0.173	6465.111	27496.753	0.183	0.945
4-13-84	A490	1.375	S35	54	03	250.000	3000.000	6.000	1.155	0.160	121000.000	33275.000	13636.364	11807.572	150000.000	0.079	2938.687	12498.524	0.083	0.945
4-13-84	A490	1.375	S35	54	04	275.000	3300.000	6.000	1.155	0.160	121000.000	33275.000	15000.000	12986.329	150000.000	0.087	3232.555	13748.377	0.092	0.945
4-13-84	A490	1.375	S35	54	05	275.000	3300.000	6.000	1.155	0.160	121000.000	33275.000	15000.000	12988.329	150000.000	0.087	3232.555	13748.377	0.092	0.945
4-13-84	A490	1.375	S35	54	06	400.000	4800.000	6.000	1.155	0.160	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	4701.899	19997.639	0.133	0.945
4-13-84	A490	1.375	S35	55	01	700.000	8400.000	6.000	1.155	0.160	121000.000	33275.000	38181.818	33061.202	150000.000	0.220	8228.323	34995.868	0.233	0.945
4-13-84	A490	1.375	S35	55	02	800.000	9600.000	6.000	1.155	0.160	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	9403.797	39995.277	0.267	0.945
4-13-84	A490	1.375	S35	55	03	300.000	3600.000	6.000	1.155	0.160	121000.000	33275.000	16363.636	14169.087	150000.000	0.094	3526.424	14998.229	0.100	0.945
4-13-84	A490	1.375	S35	55	04	650.000	7800.000	6.000	1.155	0.160	121000.000	33275.000	35454.545	30699.688	150000.000	0.205	7640.585	32496.163	0.217	0.945
4-13-84	A490	1.375	S35	55	05	600.000	7200.000	6.000	1.155	0.160	121000.000	33275.000	32727.273	28338.173	150000.000	0.189	7052.848	29996.458	0.200	0.945
4-13-84	A490	1.375	S35	55	06	300.000	3600.000	6.000	1.155	0.160	121000.000	33275.000	16363.636	14169.087	150000.000	0.094	3526.424	14998.229	0.100	0.945
4-13-84	A490	1.375	S35	56	01	600.000	7200.000	6.000	1.155	0.160	121000.000	33275.000	32727.273	28338.173	150000.000	0.189	7052.848	29996.458	0.200	0.945
4-13-84	A490	1.375	S35	56	02	300.000	3600.000	6.000	1.155	0.160	121000.000	33275.000	16363.636	14169.087	150000.000	0.094	3526.424	14998.229	0.100	0.945
4-13-84	A490	1.375	S35	56	03	300.000	3600.000	6.000	1.155	0.160	121000.000	33275.000	16363.636	14169.087	150000.000	0.094	3526.424	14998.229	0.100	0.945
4-13-84	A490	1.375	S35	56	04	750.000	9000.000	6.000	1.155	0.160	121000.000	33275.000	40909.091	35422.717	150000.000	0.236	8816.060	37495.572	0.250	0.945
4-13-84	A490	1.375	S35	56	05	600.000	7200.000	6.000	1.155	0.160	121000.000	33275.000	32727.273	28338.173	150000.000	0.189	7052.848	29996.458	0.200	0.945
4-13-84	A490	1.375	S35	56	06	450.000	5400.000	6.000	1.155	0.160	121000.000	33275.000	24545.455	21253.630	150000.000	0.142	5285.636	22497.343	0.150	0.945
4-12-84	A490	1.375	S34	31	01	1100.000	13200.000	6.000	1.155	0.160	121000.000	33275.000	60000.000	51953.318	150000.000	0.346	12930.221	54993.506	0.367	0.945
4-12-84	A490	1.375	S34	31	02	756.000	9000.000	6.000	1.155	0.160	121000.000	33275.000	40909.091	35422.717	150000.000	0.236	8816.060	37495.572	0.250	0.945
4-12-84	A490	1.375	S34	31	03	800.000	9600.000	6.000	1.155	0.160	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	9403.797	39995.277	0.267	0.945
4-12-84	A490	1.375	S34	31	04	800.000	9600.000	6.000	1.155	0.160	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	9403.797	39995.277	0.267	0.945
4-12-84	A490	1.375	S34	31	05	800.000	9600.000	6.000	1.155	0.160	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	9403.797	39995.277	0.267	0.945
4-12-84	A490	1.375	S34	31	06	1100.000	13200.000	6.000	1.155	0.160	121000.000	33275.000	60000.000	51953.318	150000.000	0.346	12930.221	54993.506	0.367	0.945
4-12-84	A490	1.375	S34	32	01	1000.000	12000.000	6.000	1.155	0.160	121000.000	33275.000	54545.455	47230.289	150000.000	0.315	11754.746	49994.097	0.333	0.945
4-12-84	A490	1.375	S34	32	02	2000.000	24000.000	6.000	1.155	0.160	121000.000	33275.000	109090.909	94460.578	150000.000	0.630	23509.493	99988.193	0.667	0.945
4-12-84	A490	1.375	S34	32	03	1600.000	19200.000	6.000	1.155	0.160	121000.000	33275.000	87272.727	75568.462	150000.000	0.504	18807.594	79990.554	0.533	0.945
4-12-84	A490	1.375	S34	32	04	550.000	6600.000	6.000	1.155	0.160	121000.000	33275.000	30000.000	25976.659	150000.000	0.173	6465.111	27496.753	0.183	0.945
4-12-84	A490	1.375	S34	32	05	1100.000	13200.000	6.000	1.155	0.160	121000.000	33275.000	60000.000	51953.318	150000.000	0.346	12930.221	54993.506	0.367	0.945
4-12-84	A490	1.375	S34	32	06	1000.000	12000.000	6.000	1.155	0.160	121000.000	33275.000	54545.455	47230.289	150000.000	0.315	11754.746	49994.097	0.333	0.945
4-12-84	A490	1.375	S34	33	01	800.000	9600.000	6.000	1.155	0.160	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	9403.797	39995.277	0.267	0.945
4-12-84	A490	1.375	S34	33	02	700.000	8400.000	6.000	1.155	0.160	121000.000	33275.000	38181.818	33061.202	150000.000	0.220	8228.323	34995.868	0.233	0.945
4-12-84	A490	1.375	S34	33	03	700.000	8400.000	6.000	1.155	0.160	121000.000	33275.000	38181.818	33061.202	150000.000	0.220	8228.323	34995.868	0.233	0.945
4-12-84	A490	1.375	S34	33	04	900.000	10800.000	6.000	1.155	0.160	121000.000	33275.000	49090.909	42507.260	150000.000	0.283	10579.272	44994.687	0.300	0.945
4-12-84	A490	1.375	S34	33	05	700.000	8400.000	6.000	1.155	0.160	121000.000	33275.000	38181.818	33061.202	150000.000	0.220	8228.323	34995.868	0.233	0.945
4-12-84	A490	1.375	S34	33	06	900.000	10800.000	6.000	1.155	0.160	121000.000	33275.000	49090.909	42507.260	150000.000	0.283	10579.272	44994.687	0.300	0.945
4-12-84	A490	1.375	S34	34	01	800.000	9600.000	6.000	1.155	0.160	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	9403.797	39995.277	0.267	0.945
4-12-84	A490	1.375	S34	34	02	800.000	9600.000	6.000	1.155	0.160	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	9403.797	39995.277	0.267	0.945
4-12-84	A490	1.375	S34	34	03	700.000	8400.000	6.000	1.155	0.160	121000.000	33275.000	38181.818	33061.202	150000.000	0.220	8228.323	34995.868	0.233	0.945
4-12-84	A490	1.375	S34	34	04	500.000	6000.000	6.000	1.155	0.160	121000.000	33275.000	27272.727	23615.144	150000.000	0.157	5877.373	24997.048	0.167	0.945
4-12-84	A490	1.375	S34	34	05	2550.000	30600.000	6.000	1.155	0.160	121000.000	33275.000	139090.909	120437.237	150000.000	0.803	29974.603	127484.946	0.850	0.945
4-12-84	A490	1.375	S34	34	06	400.000	4800.000	6.000	1.155	0.160	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	4701.899	19997.639	0.133	0.945

STRUCTURAL INTEGRITY ASSOCIATES, INC.

BOLD VERDE PART 2 HIGH STRENGTH BOLT TORQUE / PRELOAD CALCULATIONS (REV. 2)

INSP. DATE	BOLT GRADE	SIZE (IN)	DWG. NO.	CONN. NO.	BOLT NO.	TORQUE	TORQUE	N TYP/IN	C SLOPE/IN	ASSUMED K	F_i SPEC	TORQUE SPEC	F_i ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	T_{AL} KY	SIGMA I	SIGMA I/ UTS MIN	SIGMA I/ SIGMA Y
4-16-84	A490	1.375	534	39	01	300.000	3600.000	6.000	1.155	0.200	121000.000	33275.000	13090.909	11335.269	150000.000	0.076	3526.424	12342.794	0.082	0.918
4-16-84	A490	1.375	534	39	02	300.000	3600.000	6.000	1.155	0.200	121000.000	33275.000	13090.909	11335.269	150000.000	0.076	3526.424	12342.794	0.082	0.918
4-16-84	A490	1.375	534	39	03	150.000	1800.000	6.000	1.155	0.200	121000.000	33275.000	6545.455	5667.635	150000.000	0.038	1763.212	6171.397	0.041	0.918
4-16-84	A490	1.375	534	39	04	150.000	1800.000	6.000	1.155	0.200	121000.000	33275.000	6545.455	5667.635	150000.000	0.038	1763.212	6171.397	0.041	0.918
4-16-84	A490	1.375	534	40	01	350.000	4200.000	6.000	1.155	0.200	121000.000	33275.000	15272.727	13224.481	150000.000	0.088	4114.161	14399.926	0.096	0.918
4-16-84	A490	1.375	534	40	02	350.000	4200.000	6.000	1.155	0.200	121000.000	33275.000	15272.727	13224.481	150000.000	0.088	4114.161	14399.926	0.096	0.918
4-16-84	A490	1.375	534	40	03	300.000	3600.000	6.000	1.155	0.200	121000.000	33275.000	13090.909	11335.269	150000.000	0.076	3526.424	12342.794	0.082	0.918
4-16-84	A490	1.375	534	40	04	300.000	3600.000	6.000	1.155	0.200	121000.000	33275.000	13090.909	11335.269	150000.000	0.076	3526.424	12342.794	0.082	0.918
4-16-84	A490	1.375	534	41	01	200.000	2400.000	6.000	1.155	0.200	121000.000	33275.000	8727.273	7556.846	150000.000	0.050	2350.949	8228.529	0.055	0.918
4-16-84	A490	1.375	534	41	02	350.000	4200.000	6.000	1.155	0.200	121000.000	33275.000	15272.727	13224.481	150000.000	0.088	4114.161	14399.926	0.096	0.918
4-16-84	A490	1.375	534	41	03	200.000	2400.000	6.000	1.155	0.200	121000.000	33275.000	8727.273	7556.846	150000.000	0.050	2350.949	8228.529	0.055	0.918
4-16-84	A490	1.375	534	41	04	250.000	3000.000	6.000	1.155	0.200	121000.000	33275.000	10909.091	9446.058	150000.000	0.063	2938.687	10285.661	0.069	0.918
4-16-84	A490	1.375	534	41	05	250.000	3000.000	6.000	1.155	0.200	121000.000	33275.000	10909.091	9446.058	150000.000	0.063	2938.687	10285.661	0.069	0.918
4-16-84	A490	1.375	534	41	06	250.000	3000.000	6.000	1.155	0.200	121000.000	33275.000	10909.091	9446.058	150000.000	0.063	2938.687	10285.661	0.069	0.918
4-16-84	A490	1.375	534	42	01	250.000	3000.000	6.000	1.155	0.200	121000.000	33275.000	10909.091	9446.058	150000.000	0.063	2938.687	10285.661	0.069	0.918
4-16-84	A490	1.375	534	42	02	350.000	4200.000	6.000	1.155	0.200	121000.000	33275.000	15272.727	13224.481	150000.000	0.088	4114.161	14399.926	0.096	0.918
4-16-84	A490	1.375	534	42	03	325.000	3900.000	6.000	1.155	0.200	121000.000	33275.000	14181.818	12279.875	150000.000	0.082	3820.293	13371.360	0.089	0.918
4-16-84	A490	1.375	534	42	04	375.000	4500.000	6.000	1.155	0.200	121000.000	33275.000	16363.636	14169.087	150000.000	0.094	4408.030	15426.492	0.103	0.918
4-16-84	A490	1.375	534	42	05	350.000	4200.000	6.000	1.155	0.200	121000.000	33275.000	15272.727	13224.481	150000.000	0.088	4114.161	14399.926	0.096	0.918
4-16-84	A490	1.375	534	42	06	250.000	3000.000	6.000	1.155	0.200	121000.000	33275.000	10909.091	9446.058	150000.000	0.063	2938.687	10285.661	0.069	0.918
4-16-84	A490	1.375	535	47	01	1250.000	15000.000	6.000	1.155	0.200	121000.000	33275.000	54545.455	47230.289	150000.000	0.315	14693.433	51428.307	0.343	0.918
4-16-84	A490	1.375	535	47	02	1250.000	15000.000	6.000	1.155	0.200	121000.000	33275.000	54545.455	47230.289	150000.000	0.315	14693.433	51428.307	0.343	0.918
4-16-84	A490	1.375	535	47	03	1300.000	15600.000	6.000	1.155	0.200	121000.000	33275.000	56727.273	49119.500	150000.000	0.327	15281.170	53485.440	0.357	0.918
4-16-84	A490	1.375	535	47	04	1300.000	15600.000	6.000	1.155	0.200	121000.000	33275.000	56727.273	49119.500	150000.000	0.327	15281.170	53485.440	0.357	0.918
4-16-84	A490	1.375	535	47	05	1450.000	17400.000	6.000	1.155	0.200	121000.000	33275.000	63272.727	54787.135	150000.000	0.365	17044.382	59656.836	0.398	0.918
4-16-84	A490	1.375	535	47	06	1200.000	14400.000	6.000	1.155	0.200	121000.000	33275.000	52363.636	45341.077	150000.000	0.302	14105.696	49371.175	0.329	0.918
4-16-84	A490	1.375	535	48	01	900.000	10800.000	6.000	1.155	0.200	121000.000	33275.000	39272.727	34005.808	150000.000	0.227	10579.272	37028.381	0.247	0.918
4-16-84	A490	1.375	535	48	02	1000.000	12000.000	6.000	1.155	0.200	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	11754.746	41142.646	0.274	0.918
4-16-84	A490	1.375	535	48	03	1700.000	20400.000	6.000	1.155	0.200	121000.000	33275.000	74181.818	64233.193	150000.000	0.428	19983.069	69944.498	0.466	0.918
4-16-84	A490	1.375	535	48	04	700.000	8400.000	6.000	1.155	0.200	121000.000	33275.000	30545.455	26448.962	150000.000	0.176	8228.323	28799.852	0.192	0.918
4-16-84	A490	1.375	535	48	05	850.000	10200.000	6.000	1.155	0.200	121000.000	33275.000	37090.909	32116.596	150000.000	0.214	9991.534	34971.249	0.233	0.918
4-16-84	A490	1.375	535	48	06	1250.000	15000.000	6.000	1.155	0.200	121000.000	33275.000	54545.455	47230.289	150000.000	0.315	14693.433	51428.307	0.343	0.918
4-16-84	A490	1.375	535	45	01	7000.000	24000.000	6.000	1.155	0.200	121000.000	33275.000	87272.727	75568.462	150000.000	0.504	23509.493	82285.292	0.549	0.918
4-16-84	A490	1.375	535	45	02	1200.000	14400.000	6.000	1.155	0.200	121000.000	33275.000	52363.636	45341.077	150000.000	0.302	14105.696	49371.175	0.329	0.918
4-16-84	A490	1.375	535	45	03	600.000	7200.000	6.000	1.155	0.200	121000.000	33275.000	26181.818	22670.539	150000.000	0.151	7052.848	24685.587	0.165	0.918
4-16-84	A490	1.375	535	45	04	1400.000	16800.000	6.000	1.155	0.200	121000.000	33275.000	61090.909	52897.924	150000.000	0.353	16456.645	57599.704	0.384	0.918
4-16-84	A490	1.375	535	45	05	800.000	9600.000	6.000	1.155	0.200	121000.000	33275.000	34909.091	30227.385	150000.000	0.202	9403.797	32914.117	0.219	0.918
4-16-84	A490	1.375	535	45	06	750.000	9000.000	6.000	1.155	0.200	121000.000	33275.000	32727.273	28338.173	150000.000	0.189	8816.060	30856.984	0.206	0.918
4-16-84	A490	1.375	535	46	03	550.000	6600.000	6.000	1.155	0.200	121000.000	33275.000	24000.000	20781.327	150000.000	0.139	6465.111	22628.455	0.151	0.918
4-16-84	A490	1.375	535	46	04	500.000	6000.000	6.000	1.155	0.200	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	5877.373	20571.323	0.137	0.918
4-16-84	A490	1.375	535	46	05	450.000	5400.000	6.000	1.155	0.200	121000.000	33275.000	19636.364	17002.904	150000.000	0.113	5289.636	18514.191	0.123	0.918
4-16-84	A490	1.375	535	46	06	650.000	7800.000	6.000	1.155	0.200	121000.000	33275.000	28363.636	24559.750	150000.000	0.164	7640.585	26742.720	0.178	0.918
4-13-84	A490	1.375	535	43	01	1150.000	13800.000	6.000	1.155	0.200	121000.000	33275.000	50181.818	43451.866	150000.000	0.290	13517.958	47314.043	0.315	0.918
4-13-84	A490	1.375	535	43	02	900.000	10800.000	6.000	1.155	0.200	121000.000	33275.000	39272.727	34005.808	150000.000	0.227	10579.272	37028.381	0.247	0.918
4-13-84	A490	1.375	535	43	03	700.000	8400.000	6.000	1.155	0.200	121000.000	33275.000	30545.455	26448.962	150000.000	0.176	8228.323	28799.852	0.192	0.918
4-13-84	A490	1.375	535	43	04	800.000	9600.000	6.000	1.155	0.200	121000.000	33275.000	34909.091	30227.385	150000.000	0.202	9403.797	32914.117	0.219	0.918
4-13-84	A490	1.375	535	43	05	800.000	9600.000	6.000	1.155	0.200	121000.000	33275.000	34909.091	30227.385	150000.000	0.202	9403.797	32914.117	0.219	0.918
4-13-84	A490	1.375	535	43	06	1000.000	12000.000	6.000	1.155	0.200	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	11754.746	41142.646	0.274	0.918
4-13-84	A490	1.375	535	44	01	750.000	9000.000	6.000	1.155	0.200	121000.000	33275.000	32727.273	28338.173	150000.000	0.189	8816.060	30856.984	0.206	0.918
4-13-84	A490	1.375	535	44	02	950.000	11400.000	6.000	1.155	0.200	121000.000	33275.000	41454.545	35895.020	150000.000	0.239	11167.009	39085.513	0.261	0.918
4-13-84	A490	1.375	535	44	03	200.000	2400.000	6.000	1.155	0.200	121000.000	33275.000	8727.273	7556.846	150000.000	0.050	2350.949	8228.529	0.055	0.918
4-13-84	A490	1.375	535	44	04	550.000	6600.000	6.000	1.155	0.200	121000.000	33275.000	24000.000	20781.327	150000.000	0.139	6465.111	22628.455	0.151	0.918
4-13-84	A490	1.375	535	44	05	750.000	9000.000	6.000	1.155	0.200	121000.000	33275.000	32727.273	28338.173	150000.000	0.189	8816.060	30856.984	0.206	0.918

STRUCTURAL INTEGRITY ASSOCIATES, INC

4-13-84	A490	1.375	S35	44	06	700.000	8400.000	6.000	1.155	0.200	121000.000	33275.000	30545.455	26448.962	150000.000	0.176	8228.323	28799.852	0.192	0.918
4-13-84	A490	1.375	S35	45	01	500.000	6000.000	6.000	1.155	0.200	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	5877.373	20571.323	0.137	0.918
4-13-84	A490	1.375	S35	45	02	1000.000	12000.000	6.000	1.155	0.200	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	11754.746	41142.646	0.274	0.918
4-13-84	A490	1.375	S35	45	03	200.000	2400.000	6.000	1.155	0.200	121000.000	33275.000	8727.273	7556.846	150000.000	0.050	2350.949	8228.529	0.055	0.918
4-13-84	A490	1.375	S35	45	04	600.000	7200.000	6.000	1.155	0.200	121000.000	33275.000	26181.818	22670.539	150000.000	0.151	7052.848	24685.587	0.165	0.918
4-13-84	A490	1.375	S35	53	01	500.000	6000.000	6.000	1.155	0.200	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	5877.373	20571.323	0.137	0.918
4-13-84	A490	1.375	S35	53	02	400.000	4800.000	6.000	1.155	0.200	121000.000	33275.000	17454.545	15113.692	150000.000	0.101	4701.899	16457.058	0.110	0.918
4-13-84	A490	1.375	S35	53	03	400.000	4800.000	6.000	1.155	0.200	121000.000	33275.000	17454.545	15113.692	150000.000	0.101	4701.899	16457.058	0.110	0.918
4-13-84	A490	1.375	S35	53	04	175.000	2100.000	6.000	1.155	0.200	121000.000	33275.000	7636.364	6612.240	150000.000	0.044	2057.08	7200.780	0.048	0.918
4-13-84	A490	1.375	S35	53	05	400.000	4800.000	6.000	1.155	0.200	121000.000	33275.000	17454.545	15113.692	150000.000	0.101	4701.899	16457.058	0.110	0.918
4-13-84	A490	1.375	S35	53	06	200.000	2400.000	6.000	1.155	0.200	121000.000	33275.000	8727.273	7556.846	150000.000	0.050	2350.949	8228.529	0.055	0.918
4-13-84	A490	1.375	S35	54	01	500.000	6000.000	6.000	1.155	0.200	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	5877.373	20571.323	0.137	0.918
4-13-84	A490	1.375	S35	54	02	550.000	6600.000	6.000	1.155	0.200	121000.000	33275.000	24000.000	2076..327	150000.000	0.139	6465.111	22628.455	0.151	0.918
4-13-84	A490	1.375	S35	54	03	250.000	3000.000	6.000	1.155	0.200	121000.000	33275.000	10909.091	9446.058	150000.000	0.063	2938.687	10285.661	0.069	0.918
4-13-84	A490	1.375	S35	54	04	275.000	3300.000	6.000	1.155	0.200	121000.000	33275.000	12000.000	10390.664	150000.000	0.069	3232.555	11314.226	0.075	0.918
4-13-84	A490	1.375	S35	54	05	275.000	3300.000	6.000	1.155	0.200	121000.000	33275.000	12000.000	10390.664	150000.000	0.069	3232.555	11314.226	0.075	0.918
4-13-84	A490	1.375	S35	54	06	400.000	4800.000	6.000	1.155	0.200	121000.000	33275.000	17454.545	15113.692	150000.000	0.101	4701.899	16457.058	0.110	0.918
4-13-84	A490	1.375	S35	55	01	700.000	8400.000	6.000	1.155	0.200	121000.000	33275.000	30545.455	26448.962	150000.000	0.176	8228.323	28799.852	0.192	0.918
4-13-84	A490	1.375	S35	55	02	800.000	9600.000	6.000	1.155	0.200	121000.000	33275.000	34909.091	30227.385	150000.000	0.202	9403.797	32914.117	0.219	0.918
4-13-84	A490	1.375	S35	55	03	300.000	3600.000	6.000	1.155	0.200	121000.000	33275.000	13090.909	11335.269	150000.000	0.076	3526.424	12342.794	0.082	0.918
4-13-84	A490	1.375	S35	55	04	650.000	7800.000	6.000	1.155	0.200	121000.000	33275.000	28363.636	24559.750	150000.000	0.164	7640.585	26742.720	0.178	0.918
4-13-84	A490	1.375	S35	55	05	600.000	7200.000	6.000	1.155	0.200	121000.000	33275.000	26181.818	22670.539	150000.000	0.151	7052.848	24685.587	0.165	0.918
4-13-84	A490	1.375	S35	55	06	300.000	3600.000	6.000	1.155	0.200	121000.000	33275.000	13090.909	11335.269	150000.000	0.076	3526.424	12342.794	0.082	0.918
4-13-84	A490	1.375	S35	56	01	600.000	7200.000	6.000	1.155	0.200	121000.000	33275.000	26181.818	22670.539	150000.000	0.151	7052.848	24685.587	0.165	0.918
4-13-84	A490	1.375	S35	56	02	300.000	3600.000	6.000	1.155	0.200	121000.000	33275.000	13090.909	11335.269	150000.000	0.076	3526.424	12342.794	0.082	0.918
4-13-84	A490	1.375	S35	56	03	300.000	3600.000	6.000	1.155	0.200	121000.000	33275.000	13090.909	11335.269	150000.000	0.076	3526.424	12342.794	0.082	0.918
4-13-84	A490	1.375	S35	56	04	750.000	9000.000	6.000	1.155	0.200	121000.000	33275.000	32727.273	28338.173	150000.000	0.189	8816.060	30856.564	0.206	0.918
4-13-84	A490	1.375	S35	56	05	600.000	7200.000	6.000	1.155	0.200	121000.000	33275.000	26181.818	22670.539	150000.000	0.151	7052.848	24685.587	0.165	0.918
4-13-84	A490	1.375	S35	56	06	450.000	5400.000	6.000	1.155	0.200	121000.000	33275.000	19636.364	17002.904	150000.000	0.113	5289.636	18514.191	0.123	0.918
4-12-84	A490	1.375	S3A	31	01	1100.000	13200.000	6.000	1.155	0.200	121000.000	33275.000	48000.000	41562.654	150000.000	0.277	12930.221	45256.910	0.302	0.918
4-12-84	A490	1.375	S3A	31	02	750.000	9000.000	6.000	1.155	0.200	121000.000	33275.000	32727.273	28338.173	150000.000	0.189	8816.060	30856.564	0.206	0.918
4-12-84	A490	1.375	S3A	31	03	800.000	9600.000	6.000	1.155	0.200	121000.000	33275.000	34909.091	30227.385	150000.000	0.202	9403.797	32914.117	0.219	0.918
4-12-84	A490	1.375	S3A	31	04	800.000	9600.000	6.000	1.155	0.200	121000.000	33275.000	34909.091	30227.385	150000.000	0.202	9403.797	32914.117	0.219	0.918
4-12-84	A490	1.375	S3A	31	05	800.000	9600.000	6.000	1.155	0.200	121000.000	33275.000	34909.091	30227.385	150000.000	0.202	9403.797	32914.117	0.219	0.918
4-12-84	A490	1.375	S3A	31	06	1100.000	13200.000	6.000	1.155	0.200	121000.000	33275.000	48000.000	41562.654	150000.000	0.277	12930.221	45256.910	0.302	0.918
4-12-84	A490	1.375	S3A	32	01	1000.000	12000.000	6.000	1.155	0.200	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	11754.746	41142.646	0.274	0.918
4-12-84	A490	1.375	S3A	32	02	2000.000	24000.000	6.000	1.155	0.200	121000.000	33275.000	87272.727	75568.462	150000.000	0.504	23509.493	82285.292	0.549	0.918
4-12-84	A490	1.375	S3A	32	03	1600.000	19200.000	6.000	1.155	0.200	121000.000	33275.000	69818.182	60454.770	150000.000	0.403	18807.594	65828.233	0.439	0.918
4-12-84	A490	1.375	S3A	32	04	550.000	6600.000	6.000	1.155	0.200	121000.000	33275.000	24000.000	20781.327	150000.000	0.139	6465.111	22628.455	0.151	0.918
4-12-84	A490	1.375	S3A	32	05	1100.000	13200.000	6.000	1.155	0.200	121000.000	33275.000	48000.000	41562.654	150000.000	0.277	12930.221	45256.910	0.302	0.918
4-12-84	A490	1.375	S3A	32	06	1000.000	12000.000	6.000	1.155	0.200	121000.000	33275.000	43636.364	37784.231	150000.000	0.252	11754.746	41142.646	0.274	0.918
4-12-84	A490	1.375	S3A	33	01	800.000	9600.000	6.000	1.155	0.200	121000.000	33275.000	34909.091	30227.385	150000.000	0.202	9403.797	32914.117	0.219	0.918
4-12-84	A490	1.375	S3A	33	02	700.000	8400.000	6.000	1.155	0.200	121000.000	33275.000	30545.455	26448.962	150000.000	0.176	8228.323	28799.852	0.192	0.918
4-12-84	A490	1.375	S3A	33	03	700.000	8400.000	6.000	1.155	0.200	121000.000	33275.000	30545.455	26448.962	150000.000	0.176	8228.323	28799.852	0.192	0.918
4-12-84	A490	1.375	S3A	33	04	900.000	10800.000	6.000	1.155	0.200	121000.000	33275.000	39272.727	34005.808	150000.000	0.227	10579.272	37028.381	0.247	0.918
4-12-84	A490	1.375	S3A	33	05	700.000	8400.000	6.000	1.155	0.200	121000.000	33275.000	30545.455	26448.962	150000.000	0.176	8228.323	28799.852	0.192	0.918
4-12-84	A490	1.375	S3A	33	06	900.000	10800.000	6.000	1.155	0.200	121000.000	33275.000	39272.727	34005.808	150000.000	0.227	10579.272	37028.381	0.247	0.918
4-12-84	A490	1.375	S3A	34	01	800.000	9600.000	6.000	1.155	0.200	121000.000	33275.000	34909.091	30227.385	150000.000	0.202	9403.797	32914.117	0.219	0.918
4-12-84	A490	1.375	S3A	34	02	800.000	9600.000	6.000	1.155	0.200	121000.000	33275.000	34909.091	30227.385	150000.000	0.202	9403.797	32914.117	0.219	0.918
4-12-84	A490	1.375	S3A	34	03	700.000	8400.000	6.000	1.155	0.200	121000.000	33275.000	30545.455	26448.962	150000.000	0.176	8228.323	28799.852	0.192	0.918
4-12-84	A490	1.375	S3A	34	04	500.000	6000.000	6.000	1.155	0.200	121000.000	33275.000	21818.182	18892.116	150000.000	0.126	5877.373	20571.323	0.137	0.918
4-12-84	A490	1.375	S3A	34	05	2550.000	30600.000	6.000	1.155	0.200	121000.000	33275.000	111272.727	96349.789	150000.000	0.642	29974.603	104913.747	0.699	0.918
4-12-84	A490	1.375	S3A	34	06	400.000	4800.000	6.000	1.155	0.200	121000.000	33275.000	17454.545	15113.692	150000.000	0.101	4701.899	16457.058	0.110	0.918

STRUCTURAL INTEGRITY ASSOCIATES, INC.

ROLLS ROYCE JOINT 2 HIGH STRENGTH BOLT TORQUE /PRELOAD CALCULATIONS (METRIC)

INSP. DATE	BOLT GRADE	SIZE (IN)	DWG NO.	DOWN NO.	BOLT NO.	TORQUE	TORQUE	K TWIN	R SQUIN	ASSUMED K	F_1 SPEC	TORQUE SPEC	F_1 ACT	SIGMA X	UTS MIN	SIGMA X/ UTS MIN	TAU X	SIGMA Y	SIGMA X/ UTS MIN	SIGMA X/ SIGMA Y
4-16-84	B49	1.375	534	39	01	300.000	3600.000	6.000	1.155	0.430	121000.000	33275.000	6088.795	5272.218	150000.000	0.035	3526.424	7038.919	0.047	0.749
4-16-84	B49	1.375	534	39	02	300.000	3600.000	6.000	1.155	0.430	121000.000	33275.000	6088.795	5272.218	150000.000	0.035	3526.424	7038.919	0.047	0.749
4-16-84	B49	1.375	534	39	03	150.000	1800.000	6.000	1.155	0.430	121000.000	33275.000	3044.397	2636.109	150000.000	0.018	1763.212	3519.460	0.023	0.749
4-16-84	B49	1.375	534	39	04	150.000	1800.000	6.000	1.155	0.430	121000.000	33275.000	3044.397	2636.109	150000.000	0.018	1763.212	3519.460	0.023	0.749
4-16-84	B49	1.375	534	40	01	350.000	4200.000	6.000	1.155	0.430	121000.000	33275.000	7103.594	6150.921	150000.000	0.041	4114.161	8212.073	0.055	0.749
4-16-84	B49	1.375	534	40	02	350.000	4200.000	6.000	1.155	0.430	121000.000	33275.000	7103.594	6150.921	150000.000	0.041	4114.161	8212.073	0.055	0.749
4-16-84	B49	1.375	534	40	03	300.000	3600.000	6.000	1.155	0.430	121000.000	33275.000	6088.795	5272.218	150000.000	0.035	3526.424	7038.919	0.047	0.749
4-16-84	B49	1.375	534	40	04	300.000	3600.000	6.000	1.155	0.430	121000.000	33275.000	6088.795	5272.218	150000.000	0.035	3526.424	7038.919	0.047	0.749
4-16-84	B49	1.375	534	41	01	200.000	2400.000	6.000	1.155	0.430	121000.000	33275.000	4059.197	3514.812	150000.000	0.023	2350.949	4692.613	0.031	0.749
4-16-84	B49	1.375	534	41	02	350.000	4200.000	6.000	1.155	0.430	121000.000	33275.000	7103.594	6150.921	150000.000	0.041	4114.161	8212.073	0.055	0.749
4-16-84	B49	1.375	534	41	03	200.000	2400.000	6.000	1.155	0.430	121000.000	33275.000	4059.197	3514.812	150000.000	0.023	2350.949	4692.613	0.031	0.749
4-16-84	B49	1.375	534	41	04	250.000	3000.000	6.000	1.155	0.430	121000.000	33275.000	5073.996	4393.515	150000.000	0.029	2938.687	5865.766	0.039	0.749
4-16-84	B49	1.375	534	41	05	250.000	3000.000	6.000	1.155	0.430	121000.000	33275.000	5073.996	4393.515	150000.000	0.029	2938.687	5865.766	0.039	0.749
4-16-84	B49	1.375	534	41	06	250.000	3000.000	6.000	1.155	0.430	121000.000	33275.000	5073.996	4393.515	150000.000	0.029	2938.687	5865.766	0.039	0.749
4-16-84	B49	1.375	534	42	01	250.000	3000.000	6.000	1.155	0.430	121000.000	33275.000	5073.996	4393.515	150000.000	0.029	2938.687	5865.766	0.039	0.749
4-16-84	B49	1.375	534	42	02	350.000	4200.000	6.000	1.155	0.430	121000.000	33275.000	7103.594	6150.921	150000.000	0.041	4114.161	8212.073	0.055	0.749
4-16-84	B49	1.375	534	42	03	325.000	3900.000	6.000	1.155	0.430	121000.000	33275.000	6596.195	5711.570	150000.000	0.038	3820.293	7625.496	0.051	0.749
4-16-84	B49	1.375	534	42	04	375.000	4500.000	6.000	1.155	0.430	121000.000	33275.000	7610.994	6590.273	150000.000	0.044	4408.031	8756.649	0.059	0.749
4-16-84	B49	1.375	534	42	05	350.000	4200.000	6.000	1.155	0.430	121000.000	33275.000	7103.594	6150.921	150000.000	0.041	4114.161	8212.073	0.055	0.749
4-16-84	B49	1.375	534	42	06	250.000	3000.000	6.000	1.155	0.430	121000.000	33275.000	5073.996	4393.515	150000.000	0.029	2938.687	5865.766	0.039	0.749
4-16-84	B49	1.375	535	47	01	1250.000	15000.000	6.000	1.155	0.430	121000.000	33275.000	25369.979	21967.576	150000.000	0.146	14693.433	29328.830	0.196	0.749
4-16-84	B49	1.375	535	47	02	1250.000	15000.000	6.000	1.155	0.430	121000.000	33275.000	25369.979	21967.576	150000.000	0.146	14693.433	29328.830	0.196	0.749
4-16-84	B49	1.375	535	47	03	1300.000	15600.000	6.000	1.155	0.430	121000.000	33275.000	26384.778	22846.279	150000.000	0.152	15281.170	30501.984	0.203	0.749
4-16-84	B49	1.375	535	47	04	1300.000	15600.000	6.000	1.155	0.430	121000.000	33275.000	26384.778	22846.279	150000.000	0.152	15281.170	30501.984	0.203	0.749
4-16-84	B49	1.375	535	47	05	1450.000	17400.000	6.000	1.155	0.430	121000.000	33275.000	29429.175	25482.388	150000.000	0.170	17044.383	34021.448	0.227	0.749
4-16-84	B49	1.375	535	47	06	1200.000	14400.000	6.000	1.155	0.430	121000.000	33275.000	24355.180	21088.873	150000.000	0.141	14105.696	28155.677	0.188	0.749
4-16-84	B49	1.375	535	48	01	900.000	10800.000	6.000	1.155	0.430	121000.000	33275.000	18266.385	15816.655	150000.000	0.105	10579.272	21116.758	0.141	0.749
4-16-84	B49	1.375	535	48	02	1000.000	12000.000	6.000	1.155	0.430	121000.000	33275.000	20295.983	17574.061	150000.000	0.117	11754.746	23463.064	0.156	0.749
4-16-84	B49	1.375	535	48	03	1700.000	20400.000	6.000	1.155	0.430	121000.000	33275.000	34503.171	29875.904	150000.000	0.199	19983.369	39887.219	0.266	0.749
4-16-84	B49	1.375	535	48	04	700.000	8400.000	6.000	1.155	0.430	121000.000	33275.000	14207.188	12301.843	150000.000	0.082	8228.323	16424.145	0.109	0.749
4-16-84	B49	1.375	535	48	05	850.000	10200.000	6.000	1.155	0.430	121000.000	33275.000	17251.586	14937.952	150000.000	0.100	9994.534	19943.805	0.133	0.749
4-16-84	B49	1.375	535	48	06	1250.000	15000.000	6.000	1.155	0.430	121000.000	33275.000	25369.979	21967.576	150000.000	0.146	14693.433	29328.830	0.196	0.749
4-16-84	B49	1.375	535	45	01	2000.000	24000.000	6.000	1.155	0.430	121000.000	33275.000	40591.966	35148.122	150000.000	0.234	23509.493	46926.129	0.313	0.749
4-16-84	B49	1.375	535	45	02	1200.000	14400.000	6.000	1.155	0.430	121000.000	33275.000	24355.180	21088.873	150000.000	0.141	14105.696	28155.677	0.188	0.749
4-16-84	B49	1.375	535	45	03	600.000	7200.000	6.000	1.155	0.430	121000.000	33275.000	12177.590	10544.437	150000.000	0.070	7052.848	14077.839	0.094	0.749
4-16-84	B49	1.375	535	45	04	1400.000	16800.000	6.000	1.155	0.430	121000.000	33275.000	28414.376	24603.685	150000.000	0.164	16456.545	32849.290	0.219	0.749
4-16-84	B49	1.375	535	45	05	800.000	9600.000	6.000	1.155	0.430	121000.000	33275.000	16236.786	14059.249	150000.000	0.094	9403.797	18770.451	0.125	0.749
4-16-84	B49	1.375	535	45	06	750.000	9000.000	6.000	1.155	0.430	121000.000	33275.000	15221.987	13180.546	150000.000	0.088	8816.060	17597.298	0.117	0.749
4-16-84	B49	1.375	535	46	03	550.000	6600.000	6.000	1.155	0.430	121000.000	33275.000	11162.791	9665.734	150000.000	0.064	6465.111	12904.685	0.086	0.749
4-16-84	B49	1.375	535	46	04	500.000	6000.000	6.000	1.155	0.430	121000.000	33275.000	10147.992	8787.030	150000.000	0.059	5877.373	11731.532	0.078	0.749
4-16-84	B49	1.375	535	46	05	450.000	5400.000	6.000	1.155	0.430	121000.000	33275.000	9133.192	7908.327	150000.000	0.053	5289.636	10558.379	0.070	0.749
4-16-84	B49	1.375	535	46	06	650.000	7800.000	6.000	1.155	0.430	121000.000	33275.000	13192.389	11423.140	150000.000	0.076	7640.582	15250.992	0.102	0.749
4-13-84	B49	1.375	535	43	01	1150.000	13800.000	6.000	1.155	0.430	121000.000	33275.000	23340.381	20210.170	150000.000	0.135	13517.958	26982.524	0.180	0.749
4-13-84	B49	1.375	535	43	02	900.000	10800.000	6.000	1.155	0.430	121000.000	33275.000	18266.385	15816.655	150000.000	0.105	10579.272	21116.758	0.141	0.749
4-13-84	B49	1.375	535	43	03	700.000	8400.000	6.000	1.155	0.430	121000.000	33275.000	14207.188	12301.843	150000.000	0.082	8228.323	16424.145	0.109	0.749
4-13-84	B49	1.375	535	43	04	800.000	9600.000	6.000	1.155	0.430	121000.000	33275.000	16236.786	14059.249	150000.000	0.094	9403.797	18770.451	0.125	0.749
4-13-84	B49	1.375	535	43	05	800.000	9600.000	6.000	1.155	0.430	121000.000	33275.000	16236.786	14059.249	150000.000	0.094	9403.797	18770.451	0.125	0.749
4-13-84	B49	1.375	535	43	06	1000.000	12000.000	6.000	1.155	0.430	121000.000	33275.000	20295.983	17574.061	150000.000	0.117	11754.746	23463.064	0.156	0.749
4-13-84	B49	1.375	535	44	01	750.000	9000.000	6.000	1.155	0.430	121000.000	33275.000	15221.987	13180.546	150000.000	0.088	8816.060	17597.298	0.117	0.749
4-13-84	B49	1.375	535	44	02	950.000	11400.000	6.000	1.155	0.430	121000.000	33275.000	19281.184	16695.358	150000.000	0.111	11167.309	22285.911	0.149	0.749
4-13-84	B49	1.375	535	44	03	200.000	2400.000	6.000	1.155	0.430	121000.000	33275.000	4059.197	3514.812	150000.000	0.023	2350.949	4692.613	0.031	0.749
4-13-84	B49	1.375	535	44	04	550.000	6600.000	6.000	1.155	0.430	121000.000	33275.000	11162.791	9665.734	150000.000	0.064	6465.111	12904.685	0.086	0.749
4-13-84	B49	1.375	535	44	05	750.000	9000.000	6.000	1.155	0.430	121000.000	33275.000	15221.987	13180.546	150000.000	0.088	8816.060	17597.298	0.117	0.749

STRUCTURAL INTEGRITY ASSOCIATES, INC.

4-13-84	A490	1.375	S35	44	06	700.000	8400.000	6.000	1.155
4-13-84	A490	1.375	S35	42	01	500.000	6000.000	6.000	1.155
4-13-84	A490	1.375	S35	42	02	1000.000	12000.000	6.000	1.155
4-13-84	A490	1.375	S35	42	03	200.000	2400.000	6.000	1.155
4-13-84	A490	1.375	S35	42	04	600.000	7200.000	6.000	1.155
4-13-84	A490	1.375	S35	53	01	500.000	6000.000	6.000	1.155
4-13-84	A490	1.375	S35	53	02	400.000	4800.000	6.000	1.155
4-13-84	A490	1.375	S35	53	03	400.000	4800.000	6.000	1.155
4-13-84	A490	1.375	S35	53	04	175.000	2100.000	6.000	1.155
4-13-84	A490	1.375	S35	53	05	400.000	4800.000	6.000	1.155
4-13-84	A490	1.375	S35	53	06	200.000	2400.000	6.000	1.155
4-13-84	A490	1.375	S35	54	01	500.000	6000.000	6.000	1.155
4-13-84	A490	1.375	S35	54	02	550.000	6600.000	6.000	1.155
4-13-84	A490	1.375	S35	54	03	250.000	3000.000	6.000	1.155
4-13-84	A490	1.375	S35	54	04	275.000	3300.000	6.000	1.155
4-13-84	A490	1.375	S35	54	05	275.000	3300.000	6.000	1.155
4-13-84	A490	1.375	S35	54	06	400.000	4800.000	6.000	1.155
4-13-84	A490	1.375	S35	55	01	700.000	8400.000	6.000	1.155
4-13-84	A490	1.375	S35	55	02	800.000	9600.000	6.000	1.155
4-13-84	A490	1.375	S35	55	03	300.000	3600.000	6.000	1.155
4-13-84	A490	1.375	S35	55	04	650.000	7800.000	6.000	1.155
4-13-84	A490	1.375	S35	55	05	600.000	7200.000	6.000	1.155
4-13-84	A490	1.375	S35	55	06	300.000	3600.000	6.000	1.155
4-13-84	A490	1.375	S35	56	01	600.000	7200.000	6.000	1.155
4-13-84	A490	1.375	S35	56	02	300.000	3600.000	6.000	1.155
4-13-84	A490	1.375	S35	56	03	300.000	3600.000	6.000	1.155
4-13-84	A490	1.375	S35	56	04	750.000	9000.000	6.000	1.155
4-13-84	A490	1.375	S35	56	05	600.000	7200.000	6.000	1.155
4-13-84	A490	1.375	S35	56	06	450.000	5400.000	6.000	1.155
4-12-84	A490	1.375	S34	31	01	1100.000	13200.000	6.000	1.155
4-12-84	A490	1.375	S34	31	02	750.000	9000.000	6.000	1.155
4-12-84	A490	1.375	S34	31	03	800.000	9600.000	6.000	1.155
4-12-84	A490	1.375	S34	31	04	800.000	9600.000	6.000	1.155
4-12-84	A490	1.375	S34	31	05	800.000	9600.000	6.000	1.155
4-12-84	A490	1.375	S34	31	06	1100.000	13200.000	6.000	1.155
4-12-84	A490	1.375	S34	32	01	1000.000	12000.000	6.000	1.155
4-12-84	A490	1.375	S34	32	02	2000.000	24000.000	6.000	1.155
4-12-84	A490	1.375	S34	32	03	1600.000	19200.000	6.000	1.155
4-12-84	A490	1.375	S34	32	04	550.000	6600.000	6.000	1.155
4-12-84	A490	1.375	S34	32	05	1100.000	13200.000	6.000	1.155
4-12-84	A490	1.375	S34	32	06	1000.000	12000.000	6.000	1.155
4-12-84	A490	1.375	S34	33	01	800.000	9600.000	6.000	1.155
4-12-84	A490	1.375	S34	33	02	700.000	8400.000	6.000	1.155
4-12-84	A490	1.375	S34	33	03	700.000	8400.000	6.000	1.155
4-12-84	A490	1.375	S34	33	04	900.000	10800.000	6.000	1.155
4-12-84	A490	1.375	S34	33	05	700.000	8400.000	6.000	1.155
4-12-84	A490	1.375	S34	33	06	900.000	10800.000	6.000	1.155
4-12-84	A490	1.375	S34	34	01	800.000	9600.000	6.000	1.155
4-12-84	A490	1.375	S34	34	02	800.000	9600.000	6.000	1.155
4-12-84	A490	1.375	S34	34	03	700.000	8400.000	6.000	1.155
4-12-84	A490	1.375	S34	34	04	500.000	6000.000	6.000	1.155
4-12-84	A490	1.375	S34	34	05	2550.000	30600.000	6.000	1.155
4-12-84	A490	1.375	S34	34	06	400.000	4800.000	6.000	1.155

0.430	121000.000	33275.000	14207.188	12301.843	150000.000	0.082	8228.323	16424.145	0.109	0.749
0.430	121000.000	33275.000	10147.992	8787.030	150000.000	0.059	5877.373	11731.532	0.078	0.749
0.430	121000.000	33275.000	20295.983	17574.061	150000.000	0.117	11754.746	23463.064	0.156	0.749
0.430	121000.000	33275.000	4059.197	3514.812	150000.000	0.023	2351.349	4693.813	0.031	0.749
0.430	121000.000	33275.000	12177.596	10544.437	150000.000	0.070	7052.648	14077.839	0.094	0.749
0.430	121000.000	33275.000	10147.992	8787.030	150000.000	0.059	5877.373	11731.532	0.078	0.749
0.430	121000.000	33275.000	8118.393	7029.624	150000.000	0.047	4701.899	9385.226	0.063	0.749
0.430	121000.000	33275.000	8118.393	7029.624	150000.000	0.047	4701.899	9385.226	0.063	0.749
0.430	121000.000	33275.000	2559.757	3075.481	150000.000	0.021	2057.761	4106.136	0.027	0.749
0.430	121000.000	33275.000	8118.393	7029.624	150000.000	0.047	4701.899	9385.226	0.063	0.749
0.430	121000.000	33275.000	4059.197	3514.812	150000.000	0.023	2351.349	4693.813	0.031	0.749
0.430	121000.000	33275.000	10147.992	8787.030	150000.000	0.059	5877.373	11731.532	0.078	0.749
0.430	121000.000	33275.000	11166.791	9665.734	150000.000	0.064	6465.111	12904.685	0.086	0.749
0.430	121000.000	33275.000	5073.996	4392.515	150000.000	0.029	2938.687	5865.766	0.039	0.749
0.430	121000.000	33275.000	556.395	4832.867	150000.000	0.032	3232.555	6451.343	0.043	0.749
0.430	121000.000	33275.000	556.395	4832.867	150000.000	0.032	3232.555	6451.343	0.043	0.749
0.430	121000.000	33275.000	8118.393	7029.624	150000.000	0.047	4701.899	9385.226	0.063	0.749
0.430	121000.000	33275.000	14207.188	12301.843	150000.000	0.082	8228.323	16424.145	0.109	0.749
0.430	121000.000	33275.000	16236.786	14059.249	150000.000	0.094	9403.797	18770.451	0.125	0.749
0.430	121000.000	33275.000	6088.795	5272.218	150000.000	0.035	3526.424	7038.919	0.047	0.749
0.430	121000.000	33275.000	13192.389	11423.140	150000.000	0.076	7640.588	15251.957	0.102	0.749
0.430	121000.000	33275.000	12177.590	10544.437	150000.000	0.070	7052.648	14077.839	0.094	0.749
0.430	121000.000	33275.000	6088.795	5272.218	150000.000	0.035	3526.424	7038.919	0.047	0.749
0.430	121000.000	33275.000	12177.590	10544.437	150000.000	0.070	7052.648	14077.839	0.094	0.749
0.430	121000.000	33275.000	6088.795	5272.218	150000.000	0.035	3526.424	7038.919	0.047	0.749
0.430	121000.000	33275.000	6088.795	5272.218	150000.000	0.035	3526.424	7038.919	0.047	0.749
0.430	121000.000	33275.000	15221.987	13180.546	150000.000	0.088	8816.060	17597.298	0.117	0.749
0.430	121000.000	33275.000	12177.590	10544.437	150000.000	0.070	7052.648	14077.839	0.094	0.749
0.430	121000.000	33275.000	9133.192	7908.327	150000.000	0.053	5289.636	10558.379	0.070	0.749
0.430	121000.000	33275.000	22325.581	19331.467	150000.000	0.129	12930.221	25809.371	0.172	0.749
0.430	121000.000	33275.000	15221.987	13180.546	150000.000	0.088	8816.060	17597.298	0.117	0.749
0.430	121000.000	33275.000	16236.786	14059.249	150000.000	0.094	9403.797	18770.451	0.125	0.749
0.430	121000.000	33275.000	16236.786	14059.249	150000.000	0.094	9403.797	18770.451	0.125	0.749
0.430	121000.000	33275.000	16236.786	14059.249	150000.000	0.094	9403.797	18770.451	0.125	0.749
0.430	121000.000	33275.000	22325.581	19331.467	150000.000	0.129	12930.221	25809.371	0.172	0.749
0.430	121000.000	33275.000	20295.983	17574.061	150000.000	0.117	11754.746	23463.064	0.156	0.749
0.430	121000.000	33275.000	40591.966	35146.122	150000.000	0.234	23509.493	46926.129	0.313	0.749
0.430	121000.000	33275.000	32473.573	28118.498	150000.000	0.187	18807.594	37540.903	0.250	0.749
0.430	121000.000	33275.000	11162.791	9665.734	150000.000	0.064	6465.111	12904.685	0.086	0.749
0.430	121000.000	33275.000	22325.581	19331.467	150000.000	0.129	12930.221	25809.371	0.172	0.749
0.430	121000.000	33275.000	20295.983	17574.061	150000.000	0.117	11754.746	23463.064	0.156	0.749
0.430	121000.000	33275.000	16236.786	14059.249	150000.000	0.094	9403.797	18770.451	0.125	0.749
0.430	121000.000	33275.000	14207.188	12301.843	150000.000	0.082	8228.323	16424.145	0.109	0.749
0.430	121000.000	33275.000	14207.188	12301.843	150000.000	0.082	8228.323	16424.145	0.109	0.749
0.430	121000.000	33275.000	18266.385	15816.655	150000.000	0.105	10579.272	21116.758	0.141	0.749
0.430	121000.000	33275.000	14207.188	12301.843	150000.000	0.082	8228.323	16424.145	0.109	0.749
0.430	121000.000	33275.000	18266.385	15816.655	150000.000	0.105	10579.272	21116.758	0.141	0.749
0.430	121000.000	33275.000	16236.786	14059.249	150000.000	0.094	9403.797	18770.451	0.125	0.749
0.430	121000.000	33275.000	16236.786	14059.249	150000.000	0.094	9403.797	18770.451	0.125	0.749
0.430	121000.000	33275.000	14207.188	12301.843	150000.000	0.082	8228.323	16424.145	0.109	0.749
0.430	121000.000	33275.000	10147.992	8787.030	150000.000	0.059	5877.373	11731.532	0.078	0.749
0.430	121000.000	33275.000	51754.757	44813.856	150000.000	0.299	29974.603	59830.814	0.399	0.749
0.430	121000.000	33275.000	8118.393	7029.624	150000.000	0.047	4701.899	9385.226	0.063	0.749

STRUCTURAL INTEGRITY ASSOCIATES, INC.

APPENDIX I

PALO VERDE UNIT 3 PRELOAD CALCULATIONS
FOR NUTS MEASURED AS GREATER THAN 30° ROTATION FROM REQUIREMENT

PALO VERDE 3 NUT ROTATION = 30 DEGREES , PRELOAD CALCULATION (K=0.110)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	COMP. NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ. IN	ASSUMED K	TURN SPEC	TURN ACT	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU IY	SIGMA I	SIGMA I/ UTS MIN	SIGMA I/ SIGMA 1
3-22-84	A325	0.875	530	03	02	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-22-84	A325	0.875	530	03	04	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-22-84	A325	0.875	530	03	08	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-22-84	A325	0.875	530	16	05	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-22-84	A325	0.875	530	17	06	0.417	9.000	0.462	0.110	0.500	0.083	39000.000	6825.000	11818.182	25595.198	105000.000	0.244	4323.818	26325.891	0.251	0.973
3-23-84	A325	0.875	531	02	04	0.333	9.000	0.462	0.110	0.500	0.167	39000.000	6825.000	23636.364	51190.396	105000.000	0.488	8647.635	52611.781	0.501	0.973
3-23-84	A325	0.875	532	09	01	0.500	9.000	0.462	0.110	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-26-84	A325	0.875	532	21	02	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-26-84	A325	0.875	532	21	03	0.250	9.000	0.462	0.110	0.500	0.250	39000.000	6825.000	35454.545	76785.594	105000.000	0.731	12971.453	78917.672	0.752	0.973
3-26-84	A325	0.875	532	27	01	0.167	9.000	0.462	0.110	0.500	0.333	39000.000	6825.000	47272.727	102380.792	105000.000	0.975	17295.270	105223.562	1.002	0.973
3-27-84	A325	0.875	535	06	08	0.208	9.000	0.462	0.110	0.500	0.292	39000.000	6825.000	41363.636	89583.193	105000.000	0.853	15133.361	92076.617	0.877	0.973

STRUCTURAL INTEGRITY ASSOCIATES, INC.

PALO VERDE 3 NUT ROTATION) 30 DEGREES , PRELOAD CALCULATION (K=0.160)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	COMP. NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ. IN	ASSUMED K	TURN SPEC	TURN ACT	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA X	UTS MIN	SIGMA X/ UTS MIN	TAU XY	SIGMA 1	SIGMA 1/ UTS MIN	SIGMA X/ SIGMA 1
3-22-84	A325	0.875	530	03	02	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-22-84	A325	0.875	530	03	04	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-22-84	A325	0.875	530	03	08	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-22-84	A325	0.875	530	16	05	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-22-84	A325	0.875	530	17	06	0.417	9.000	0.462	0.160	0.500	0.083	39000.000	6825.000	8125.000	17596.699	105000.000	0.168	4323.818	18601.734	0.177	0.946
3-23-84	A325	0.875	531	02	04	0.333	9.000	0.462	0.160	0.500	0.167	39000.000	6825.000	16250.000	35193.397	105000.000	0.335	8647.635	37203.468	0.354	0.946
3-23-84	A325	0.875	532	09	01	0.500	9.000	0.462	0.160	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-26-84	A325	0.875	532	21	02	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-26-84	A325	0.875	532	21	03	0.250	9.000	0.462	0.160	0.500	0.250	39000.000	6825.000	24375.000	52790.096	105000.000	0.503	12971.453	55805.202	0.531	0.946
3-26-84	A325	0.875	532	27	01	0.167	9.000	0.462	0.160	0.500	0.333	39000.000	6825.000	32500.000	70386.795	105000.000	0.670	17295.270	74406.936	0.709	0.946
3-27-84	A325	0.875	535	06	08	0.208	9.000	0.462	0.160	0.500	0.292	39000.000	6825.000	28437.300	61588.445	105000.000	0.587	15133.361	65106.069	0.620	0.946

STRUCTURAL INTEGRITY ASSOCIATES, INC.

PALO VERDE 3 NUT ROTATION) 30 DEGREES , PRELOAD CALCULATION (K=0.200)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	CONN. NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ. IN	ASSUMED K	TURN SPEC	TURN ACT	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU XY	SIGMA 1	SIGMA I/ UTS MIN	SIGMA I/ SIGMA 1
3-22-84	A325	0.875	530	03	02	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-22-84	A325	0.875	530	03	04	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.581	0.920
3-22-84	A325	0.875	530	03	08	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-22-84	A325	0.875	530	16	05	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-22-84	A325	0.875	530	17	06	0.417	9.000	0.462	0.200	0.500	0.083	39000.000	6825.000	6500.000	14077.359	105000.000	0.134	4323.818	15299.334	0.146	0.920
3-23-84	A325	0.875	531	02	04	0.333	9.000	0.462	0.200	0.500	0.167	39000.000	6825.000	13000.000	28154.718	105000.000	0.268	8647.635	30598.667	0.291	0.920
3-26-84	A325	0.875	532	09	01	0.500	9.000	0.462	0.200	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-26-84	A325	0.875	532	21	02	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-26-84	A325	0.875	532	21	03	0.250	9.000	0.462	0.200	0.500	0.250	39000.000	6825.000	19500.000	42232.077	105000.000	0.402	12971.453	45898.001	0.437	0.920
3-26-84	A325	0.875	532	27	01	0.167	9.000	0.462	0.200	0.500	0.333	39000.000	6825.000	26000.000	56309.436	105000.000	0.536	17295.270	61197.334	0.583	0.920
3-27-84	A325	0.875	535	06	08	0.208	9.000	0.462	0.200	0.500	0.292	39000.000	6825.000	22750.000	49270.756	105000.000	0.469	15133.361	53547.668	0.510	0.920

STRUCTURAL INTEGRITY ASSOCIATES, INC.

PALO VERDE 3 NUT ROTATION) 30 DEGREES , PRELOAD CALCULATION (K=0.430)

INSP. DATE	BOLT GRADE	SIZE (IN)	DWG. NO.	CONN. NO.	BOLT NO.	NUT ROTAT	N TH/IN	A SQ. IN	ASSUMED K	TURN SPEC	TURN ACT	F_i SPEC	TORQUE SPEC	F_i ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU IY	SIGMA 1	SIGMA I/ UTS MIN	SIGMA I/ SIGMA 1
3-22-84	A325	0.875	530	03	02	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-22-84	A325	0.875	530	03	04	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-22-84	A325	0.875	530	03	08	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-22-84	A325	0.875	530	16	05	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-22-84	A325	0.875	530	17	06	0.417	9.000	0.462	0.430	0.500	0.083	39000.000	6825.000	3023.256	6547.609	105000.000	0.062	4323.818	8697.198	0.083	0.753
3-23-84	A325	0.875	531	02	04	0.333	9.000	0.462	0.430	0.500	0.167	39000.000	6825.000	6046.512	13095.218	105000.000	0.125	8647.635	17394.395	0.166	0.753
3-23-84	A325	0.875	532	09	01	0.500	9.000	0.462	0.430	0.500	0.000	39000.000	6825.000	0.000	0.000	105000.000	0.000	0.000	0.000	0.000	0.000
3-26-84	A325	0.875	532	21	02	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-26-84	A325	0.875	532	21	03	0.250	9.000	0.462	0.430	0.500	0.250	39000.000	6825.000	9069.767	19642.826	105000.000	0.187	12971.453	26091.593	0.248	0.753
3-26-84	A325	0.875	532	27	01	0.167	9.000	0.462	0.430	0.500	0.333	39000.000	6825.000	12093.023	26190.435	105000.000	0.249	17295.270	34788.790	0.331	0.753
3-27-84	A325	0.875	535	06	08	0.208	9.000	0.462	0.430	0.500	0.292	39000.000	6825.000	10581.395	22916.631	105000.000	0.218	15133.361	30440.192	0.290	0.753

STRUCTURAL INTEGRITY ASSOCIATES, INC.

APPENDIX J

PALO VERDE UNIT 3 PRELOAD CALCULATIONS BASED ON RESTART TORQUE

PALO VERDE UNIT 3 HIGH STRENGTH BOLT TORQUE (K=0.110)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	COMP. NO.	BOLT NO.	TORQUE	TORQUE	N TH/IN	A SQ.IN	ASSUMED K	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA I	UTS MIN	SIGMA I/ UTS MIN	TAU IY	SIGMA I	SIGMA 1/ UTS MIN	SIGMA I/ SIGMA 1
4-24-84	A490	1.375	535	53	01	2385.000	28620.000	6.000	1.155	0.110	121000.000	33275.000	189223.140	163846.166	150000.000	1.092	28035.070	168510.361	1.123	0.972
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STRUCTURAL INTEGRITY ASSOCIATES, INC.

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4-18-84	A490	1.375	534	27	01	2385.000	28620.000	6.000	1.155	0.110	121000.000	33275.000	189223.140	163846.166	150000.000	1.092	28035.070	168510.361	1.123	0.972
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4-18-84	A490	1.375	534	33	04	2385.000	28620.000	6.000	1.155	0.110	121000.000	33275.000	189223.140	163846.166	150000.000	1.092	28035.070	1685[illegible]	1.123	0.972
4-18-84	A490	1.375	534	33	05	2385.000	28620.000	6.000	1.155	0.110	121000.000	33275.000	189223.140	163846.166	150000.000	1.092	28035.070	1685[illegible]	1.123	0.972
4-18-84	A490	1.375	534	33	06	2385.000	28620.000	6.000	1.155	0.110	121000.000	33275.000	189223.140	163846.166	150000.000	1.092	28035.070	1685[illegible]	1.123	0.972
4-18-84	A490	1.375	534	34	01	2385.000	28620.000	6.000	1.155	0.110	121000.000	33275.000	189223.140	163846.166	150000.000	1.092	28035.070	1685[illegible]	1.123	0.972
4-18-84	A490	1.375	534	34	02	2385.000	28620.000	6.000	1.155	0.110	121000.000	33275.000	189223.140	163846.166	150000.000	1.092	28035.070	1685[illegible]	1.123	0.972
4-18-84	A490	1.375	534	34	03	2385.000	28620.000	6.000	1.155	0.110	121000.000	33275.000	189223.140	163846.166	150000.000	1.092	28035.070	1685[illegible]	1.123	0.972
4-18-84	A490	1.375	534	34	04	2385.000	28620.000	6.000	1.155	0.110	121000.000	33275.000	189223.140	163846.166	150000.000	1.092	28035.070	1685[illegible]	1.123	0.972
4-18-84	A490	1.375	534	34	05	2385.000	28620.000	6.000	1.155	0.110	121000.000	33275.000	189223.140	163846.166	150000.000	1.092	28035.070	1685[illegible]	1.123	0.972
4-18-84	A490	1.375	534	34	06	2385.000	28620.000	6.000	1.155	0.110	121000.000	33275.000	189223.140	163846.166	150000.000	1.092	28035.070	1685[illegible]	1.123	[illegible]

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PALO VERDE UNIT 3 HIGH STRENGTH BOLT TORQUE (K=0.160)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	CONN. NO.	BOLT NO.	TORQUE	TORQUE	N TH/IN	A SQ. IN	ASSUMED K	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA X	UTS MIN	SIGMA X/ UTS MIN	TAU XY	SIGMA 1	SIGMA 1/ UTS MIN	SIGMA X/ SIGMA 1
4-24-84	A490	1.375	535	53	01	2385.000	28620.000	6.000	1.155	0.160	121000.000	33275.000	130090.909	112644.239	150000.000	0.751	28035.070	118235.920	0.788	0.945

PALO VERDE UNIT 3 HIGH STRENGTH BOLT TORQUE (K=0.200)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	CONN. NO.	BOLT NO.	TORQUE	TORQUE	N TH/IN	A SQ. IN	ASSUMED K	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA X	UTS MIN	SIGMA X/ UTS MIN	TAU XY	SIGMA 1	SIGMA 1/ UTS MIN	SIGMA X/ SIGMA 1
4-24-84	A490	1.375	535	53	01	2385.000	28620.000	6.000	1.155	0.200	121000.000	33275.000	104072.727	90115.391	150000.000	0.601	28035.070	96125.210	0.654	0.918

PALO VERDE UNIT 3 HIGH STRENGTH BOLT TORQUE (K=0.430)

INSP. DATE	BOLT GRADE	SIZE(IN)	DWG. NO.	CONN. NO.	BOLT NO.	TORQUE	TORQUE	N TH/IN	A SQ. IN	ASSUMED K	Fi SPEC	TORQUE SPEC	Fi ACT	SIGMA X	UTS MIN	SIGMA X/ UTS MIN	TAU XY	SIGMA 1	SIGMA 1/ UTS MIN	SIGMA X/ SIGMA 1
4-24-84	A490	1.375	535	53	01	2385.000	28620.000	6.000	1.155	0.430	121000.000	33275.000	48405.920	41914.135	150000.000	0.279	28035.070	55959.408	0.373	0.749

STRUCTURAL INTEGRITY ASSOCIATES, INC.

APPENDIX K

RANGE OF VIBRATION STRESSES IN ANCHOR BOLTS
FOR ROTATING EQUIPMENT AND ACTUAL VS. ALLOWABLE LOADS
IN EQUIPMENT ANCHORAGE AND STRUCTURAL STEEL JOINTS (PER BECHTEL REF. 4)

TABLE A. RANGE OF STRESSES IN THE ANCHOR BOLTS DUE TO VIBRATIONS IN THE ROTATING TYPE EQUIPMENT

No.	Name of Equipment	Location	Dwg. No.	Type, Number and Size of Anch. Bolts	Torque Required	Actual Vibratory Stress	Allowable Stress per AISC Appendix B for 2×10^6 Cycles or More	Remarks
1	High Pressure Safety Injection Pump SIB-P02	Aux El. 40'	13-C-ZAS-110	14-3/4" ϕ A-307	0 (Snug Tight)	2.3 ksi	Variation of at least 8 ksi (Table B3)	
2	Essential Chilled Water Pump ECB-P01	Control El. 74'	13-C-ZJS-100	8-1/2" ϕ A-307	0 (Snug Tight)	0.75 ksi	Variation of at least 8 ksi (Table B3)	
3	Containment Spray Pump	Aux El. 40'	13-C-ZAS-242	3-2" ϕ A-193	240-250 ft-lbs	1.0 ksi	//	See note
	SIA-P03		13-C-ZAS-110	12-1-1/4" ϕ A-307	0 (Snug Tight)	1.9 ksi	Variation of at least 8 ksi (Table B3)	Support at Basemat
4	Diesel Generator Room Essential Exhaust Fan (HDA-J01)	DGB El. 131'-0"	DET 11 on 13-C-ZGS-116	4-1/2" ϕ A-307	0 (Snug Tight)	1.0 ksi	Variation of at least 8 ksi (Table B3)	
5	Essential Air Handling Unit HAA-Z06	Aux El. 120'	13-P-ZAL-206 13-C-ZAS-58'	4-7/8" ϕ A-307	0 (Snug Tight)	0.23 ksi	Variation of at least 8 ksi (Table 3)	

NOTE: The prestress corresponding to a torque of 240 ft-lbs is 2.8 ksi which is larger than the stresses in the bolts due to vibration.

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TABLE B. ACTUAL VS. ALLOWABLE LOADS IN EQUIPMENT ANCHORAGE

Name of Equipment	Location	Dwg. No.	No. Size and Type of Anchor Bolts	Actual Load in the Anchor Bolts	Allowable Load in the Anchor Bolts	Remarks
1. Containment CEDM Air Cooling Unit	Top of Reactor Vessel Missile Shield Slab	13-C-ZCS-382	10-1" ϕ A449 Anchor Bolts Supplied	NOMINAL	42.4 K/Bolt	Vendor requires 10-1 ϕ A-307 anchor bolts. Therefore no calculations have been made.
2. Containment Normal Air Cooling Unit Fans	EL. 140'	13-C-ZCS-534	6-5/8" ϕ A307	3.5 k Tension	4.52 k	Fan is SUSPENDED FROM PLATFORM.
3.a Containment Reactor Cavity	EL. 95'-11	13-C-ZCS-544	4-1" ϕ A325	Shear 1.13 k/Bolt Tension 0.7 k/Bolt	Shear 11.78 k/Bolt Tension 31.4 k/Bolt	
3.b Fan Support Beam C8 x 18.75	EL. 95'-11	13-C-ZCS-544	2-7/8" ϕ A325	Shear 2.1 k	Shear 18.4 k	

TABLE C. ACTUAL VS. ALLOWABLE LOADS IN STRUCTURAL STEEL JOINTS

	Building	Location	Dwg. No.	Beam Connection Type	Actual Reaction	Allowable Reaction per Table I of AISC	Margin (F.S.)
1.	Auxiliary	El. 120 Ft.	13-C-ZAS-533	4 7/8" ϕ A325-N	46.6^{k}	72.2^{k}	1.55
2.	Control	El. 120 Ft.	13-C-ZJS-510	6 7/8" ϕ A325-N	93^{k}	108.2^{k}	1.16
3.	Auxiliary	El. 120 Ft.	13-C-ZAS-584	2 7/8" ϕ A325-N	9.5^{k}	18.04^{k}	1.90
4.	Containment	El. 100'-0"	13-C-ZCS-530	9-1" ϕ A325	165.5^{k}	212^{k}	1.28[1]
5.	Containment	El. 140'-0"	13-C-ZCS-535	7 7/8" ϕ A490F	107.6^{k}	168.4	1.57[2]
6.	Containment	El. 140'-0"	13-C-ZCS-535	7 7/8" ϕ A490F	96.1^{k}	168.4	1.75[2]
7.	Containment	El. 140'-0"	13-C-ZCS-573 Det. 1	6 1-3/8" ϕ A490F	Shear 13.6^{k}/Bolt Ten. 13.4^{k}/Bolt	Shear 26.4^{k}/Bolt Ten. 80.2^{k}/ Bolt	1.94[3] 5.99
8.a	Containment	El. 155'-0"	13-C-ZCS-540	12 1-3/8" ϕ A490F	Shear 75.88^{k}/Bolt	Shear 79.52^{k}/Bolt	1.05[4]
8.b	Containment	El. 155'-0"	13-C-ZCS-540	6 1-3/8" ϕ A490	1096^{k}	1796^{k}	1.64
8.c	Containment	El. 155'-0"	13-C-ZCS-540	16 1-3/8" ϕ A490	667^{k}	3828^{k}	5.74
9.	Containment	El. 140'-0"	13-C-ZCS-534	10 7/8" ϕ A490	216.0^{k} w/o pipe reaction	241.0^{k}	1.12
					261 w/pipe reaction	362^{k}	1.39
10.	Containment	El. 140'-0"	13-C-ZCS-535	7 7/8" ϕ A490	86.2^{k} w/o pipe reaction	126^{k}	1.46

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TABLE C. ACTUAL VS. ALLOWABLE LOADS IN STRUCTURAL STEEL JOINTS

Building	Location	Dwg. No.	Beam Connection Type	Actual Reaction	Allowable Reaction per Table I of AISC	Margin (F.S.)
10. CONT'D.				114.4^{k} w/pipe reaction	189^{k} *	1.65

1. Critical connection
2. Critical connection providing lateral support for safety injection tank
3. Critical connection attaching keyway to structural steel beam
4. Critical connection pipe whip restraint for main steam line

* ALLOWABLES ARE INCREASED PER DESIGN CRITERIA IN CASE WHERE PIPE REACTIONS ARE INCLUDED

NOTE: The critical connections were identified on the following basis;

1. The connections for steel members which provided support for critical components such as the safety injection tanks.
2. Structural steel supporting large piping such as main steam line pipe whip restraints
3. The primary 'Column Circle' connections for members which do not support concrete slabs and 'radial' members which link the main columns to the reinforced concrete interior structures.
4. Members which provide primary seismic support for platforms

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