

Franke, Mark

From: Thomas, George *NR*
Sent: Wednesday, October 21, 2009 5:58 PM
To: Masters, Anthony
Cc: Lake, Louis
Subject: RE: Crystal River 3 containment
Attachments: SP5909.pdf; SP0182 Tendon Surveillance Program.pdf

Anthony,

Here are the documents I have. Attached is a spec for installation and prestressing of original tendons and a procedure of CR-3's Tendon Surveillance Program. Did you happen to copy the folders of IWE and IWL examinations and tendon surveillance the licensee had put in the "Requested by NRC folder" on their L:\drive - that should provide info on the IWL inspections.

Thanks.
George

m-t

C O N T E N T S

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ATTACHMENTS

Contract Form - OD-17-A

Contractor's Affidavit - OD-28-C

Certificate of Insurance - OD-17-C

SECTION I
INSTRUCTIONS TO BIDDERS

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1:01 Invitation

Proposals are requested by the Florida Power Corporation for the equipment, materials, and related WORK, set forth in the attached Specification, which will be incorporated in the Crystal River Plant Unit 3, located approximately five miles northwest of Crystal River, Florida.

1:02 Submission of Proposals

1:02.1 Original and five copies of the Proposal shall be submitted in quadruplicate and shall be transmitted to:

Florida Power Corporation
P. O. Box 14042
St. Petersburg, Florida 33733

Attention: Mr. C. H. Thompson
Purchasing Agent

1:02.2 Proposals must be received by Florida Power Corporation or post marked prior to twelve noon _____.

1:02.3 Bidders shall furnish with their Proposals all drawings, catalog data, and other supplementary information necessary to describe thoroughly the materials and equipment covered by their Proposal.

1:02.4 Each Bidder shall submit with his Proposal the name of the manufacturer and the type or model of each principal item of the equipment or material he proposes to furnish. He shall also submit drawings and descriptive matter which will show general arrangement and dimensions, appearance, principle of operation, and extent of factory assembly.

1:02.5 If the equipment cannot be shipped completely factory assembled, Bidders shall include with their Proposal the number, dimensions, and weight of each shipping unit and the amount of field work required to assemble the equipment completely.

1:02.6 The successful bidder may be required to furnish a service representative to work with Florida Power Corporation's personnel during the initial operation of the equipment. The services of this representative shall be outlined in the Proposal and the per diem charges stated separately.

1:02.7 One copy of provisional recommendations for spare parts shall be furnished with each Proposal.

- 1:02.8 Each Bidder shall include in his Proposal the cost of furnishing one complete set of all special tools, suitably packed and all in first class condition, which may be required for maintenance of the equipment covered by the Proposal.
- 1:02.9 The price stated in the Proposal shall include all taxes and licenses which might lawfully be assessed, on the date of the Proposal, against Florida Power Corporation or the Bidder in connection with the proposed WORK. Exception:
1. If the price stated in the Proposal is for the furnishing of materials and/or equipment only and does not include field labor for erection and/or installation, do not include Florida State Sales Tax in the bid. Florida Power Corporation will pay such tax direct to the State of Florida.
 2. If the price includes erection and/or installation labor to be performed at the job site, the Florida State Sales and Use Tax must be paid by the Bidder on the cost of the materials and supplies furnished. The Bidder awarded the Contract for this WORK shall be responsible for the payment of this tax to the State of Florida and should take this into account in his bid price.
- 1:02.10 The Bidders shall state in their Proposals that the materials and/or equipment will meet the Specifications as set forth herein. Any exceptions to the Specifications set forth herein shall be stated clearly in the Bidders' Proposals.
- 1:02.11 Bidders shall state in their Proposals the complete terms of their warranty applicable to the materials and/or equipment they propose to furnish under this Specification, and the terms of extension of the warranty in the event of repair or replacement being required.
- 1:02.12 Bidders shall also state in their Proposals the extent of their guarantees for the performance of the equipment offered and for correction of items which fail to meet the warranty.
- 1:02.13 Royalties and fees for patents covering materials, articles, apparatus, devices or equipment used in the WORK shall be included in the Contract price.
- 1:02.14 The Bidders shall not include in their Proposals the costs of insurance for equipment subsequent to receipt by the OWNER on the job site.
- 1:02.15 The labor rates of this WORK shall be executed under the working conditions and wage rates established by the applicable collective bargaining group having jurisdiction over the area, and shall be performed in accordance with the safety regulations of the Florida Industrial Commission.

1:02.16 Bidders are advised that, due to the scope of this construction project, certain materials and equipment are required, of necessity, to be delivered considerably in advance of the actual commercial operation of the equipment. It is presently anticipated that actual commercial use, other than preliminary testing, of the material or equipment will not commence until September, 1972. Bidders are requested to take this into consideration in setting forth their warranty and guarantee terms.

1:02.17 Bidders shall set forth in their Proposals the terms of payment normal to their company or industry, including cash and/or trade discounts allowed, if any. Transportation charges shall be included from shipping point with full freight allowed to destination.

1:03 Evaluation of Proposals

1:03.1 Bidders' ability to satisfy the OWNER of their capability to perform the WORK within the scheduled dates set forth herein will be a basic consideration in evaluating the Proposals.

1:03.2 It shall be understood that the evaluation of Proposals received in accordance with these Instructions to Bidders and the attached Specification will be conducted solely by Florida Power Corporation.

1:04 Insurance Requirements

Florida Power Corporation Contract insurance requirements are set forth in paragraphs 5 and 6 of Contract Form OD-17-A (copy attached). The successful bidder shall comply with these requirements prior to performing any WORK specified herein.

1:05 Performance and Payment Bond

Bidders are advised that a Performance and Payment Bond may be required from the successful bidder. The cost of such Performance and Payment Bond is to be set forth as a separate item in the Proposal. In the event Florida Power Corporation elects not to require a Performance and Payment Bond, 10 percent of each progress payment, if any, will be withheld until completion and acceptance of all WORK and receipt of CONTRACTOR'S Affidavit (copy attached) properly executed in duplicate.

1:06 Contract Forms and Certificates

1:06.1 The following documents will be incorporated into or referenced by the Contract awarded to the successful bidder:

1. Contract Form - OD-17-A.

2. Contractor's Affidavit - OD-28-A, B, or C.

3. Insurance Certificate - OD-17-C.

1:06.2 Copies of these documents are attached herewith; and Bidders shall thoroughly familiarize themselves with all of the terms, conditions and instructions contained therein prior to submitting their Proposal.

1:07 Acceptance of Proposals

Florida Power Corporation reserves the right to accept or reject any or all Proposals.

1:08 Awards to Bidders and Payment

Florida Power Corporation will issue all purchase orders and make payment for the materials and/or equipment purchased.

1:09 Shipping Information

Bidders are advised that the shipments may be made to the plant site by the following carriers. All shipments shall be consigned to Florida Power Corporation, Crystal River Plant Unit No. 3:

Via Railroad: Seaboard Coast Line (SCL) delivering carrier: Carload shipments only - destination station Red Level Junction, Florida. L.C.L. Shipments - destination station Crystal River, Florida.

Via Truck Lines: Commercial Carriers - destination Red Level, Florida.

Water Transportation: A 15 foot deep barge channel has been dredged from the Gulf of Mexico to the plant site. Contact Florida Power Corporation for particulars if barge delivery is contemplated.

Parcel Post: P. O. Box 276, Crystal River, Florida 32629

SECTION II
GENERAL CONDITIONS

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2:01 Scope

These General Conditions are applicable to equipment, materials and related WORK which will be incorporated in the new addition to Florida Power Corporation's Crystal River Plant.

2:02 Definitions

It shall be understood that the following terms as used in the Specifications shall have the meaning herein given:

1. "OWNER" shall mean the FLORIDA POWER CORPORATION.
2. "ENGINEER" shall mean GILBERT ASSOCIATES, INC., Consulting Engineers.
3. "CONTRACTOR" shall mean the successful bidder for the WORK who will undertake the performance of the WORK required by the Contract.
4. "WORK" shall mean labor, services, materials and equipment as set forth in the CONTRACT DOCUMENTS.
5. "CONTRACT DOCUMENTS" shall mean all Drawings, Specifications and Addenda thereto as prepared and issued by the OWNER, the Invitation to Bid, the CONTRACTOR'S Proposal, and Manufacturer's Drawings as approved by the ENGINEER, all of which are part of the CONTRACTOR'S Contract with the OWNER. These CONTRACT DOCUMENTS are complementary and what is called for by any one of them shall be as binding as if called for by all. Any conflicts in the CONTRACT DOCUMENTS shall be resolved by the OWNER.
6. "EQUAL" shall mean equal as approved by the OWNER or the ENGINEER.

2:03 Equipment and Materials to be Supplied by the Contractor

All equipment and materials furnished under these Specifications shall be manufactured within the continental limits of the United States of America.

2:04 Codes and Standards

Unless specified otherwise herein, equipment and materials shall comply with all governing regulations and with the applicable standard specifications and codes of USAS, ASTM, ASME, IPCEA, NEMA, KEI, IEEE, UL, and other such regular published and accepted standards. The regulation, specification or code applied in each case shall be the latest version of such regulation or standard adopted and published at the date of taking bids. Any conflict between standards shall be referred to the OWNER who will determine which standard shall govern.

2:05 Laws and Regulations

All equipment and WORK shall be in accordance with the laws of the State of Florida and the Rules of the Florida Industrial Commission.

2:06 Engineering Data, Shop and Erection Drawings

2:06.1 Upon Award of a Contract, engineering data covering all equipment and fabricated materials to be furnished shall be submitted promptly by the CONTRACTOR for approval.

2:06.2 The CONTRACTOR shall submit 2 sepia copies and 2 prints of preliminary drawings and necessary data for approval, to the ENGINEER, at the address below:

Gilbert Associates, Inc.
Consulting Engineers
525 Lancaster Avenue
Reading, Pennsylvania 19603

Attention: Mr. E. R. Hottenstein
Project Manager

2:06.3 These drawings shall be sufficient and complete for system design purposes and for use in designing associated systems.

2:06.4 For final approval, the CONTRACTOR shall submit 2 sepia copies and 2 prints of drawings and necessary data for approval to the ENGINEER.

2:06.5 On each drawing submission (original, revisions, and final) the CONTRACTOR shall send one copy of each drawing and data direct to:

Florida Power Corporation
P. O. Box 14042
St. Petersburg, Florida 33733

Attention: Mr. W. O. May
Manager - Power Engineering

- 2:06.6 These drawings shall be sufficient and complete for adequate erection, operation, and maintenance of the equipment. The engineering data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment. Data submitted shall include all required piping arrangement drawings, design calculations, pneumatic control system schematic diagrams, detailed drawings and data for structural systems, and complete power and control circuit logic diagrams, schematics, and wiring diagrams.
- 2:06.7 No WORK shall be performed in connection with the fabrication or manufacture of materials and equipment, nor shall any accessory or appurtenance be purchased until the drawings and data therefore have been approved, except at the CONTRACTOR'S own risk and responsibility.
- 2:06.8 Exceptions to item 2:06.7 shall be by agreement with the OWNER.

2:07 Instruction Manuals

- 2:07.1 The CONTRACTOR shall furnish eleven complete and final copies of instruction manuals not later than 60 days prior to shipment of the equipment. Ten copies shall be sent to:

Florida Power Corporation
P. O. Box 14042
St. Petersburg, Florida 33733

Attention: Mr. W. O. May
Manager - Power Engineering

One copy shall be sent to:

Gilbert Associates, Inc.
Consulting Engineers
525 Lancaster Avenue
Reading, Pennsylvania 19603

Attention: Mr. E. R. Hottenstein
Project Manager

- 2:07.2 The instruction manuals shall cover complete installation, operating and maintenance instructions, drawings, and parts lists for each item of equipment furnished.

2:07.3 The instruction manuals shall be bound with covers suitable for rough usage. The front covers shall be stamped with lettering indicating the OWNER'S name, unit number, name of power plant, location of power plant, name of equipment, basic capacity rating of equipment, and name of manufacturer.

2:08 Recommended Spare Parts

The list of recommended spare parts, with the price of each such item, and a schedule of required lubricants, as recommended by the manufacturer of each item of equipment, shall be included in the instruction manuals.

2:09 Design and Manufacturing Program

2:09.1 The manufacturer's design engineer shall be prepared to visit the office of the OWNER or the ENGINEER for design conference at such times as are required to expedite the handling of engineering matters.

2:09.2 The Contract program will be controlled by CPM diagrams, and the CONTRACTOR shall provide all necessary information requested by the OWNER or the ENGINEER for compilation of these. In general, information required will include drawing schedules, purchasing schedules for major equipment items, and delivery dates.

2:10 Manufacturing Errors

Equipment and materials shall be complete in all respects within the limits herein outlined. All manufacturing errors or omissions required to be corrected in the field shall be performed by the CONTRACTOR at his expense; or if done by the OWNER, the cost of same shall be borne by the CONTRACTOR.

2:11 Bill of Material

2:11.1 The CONTRACTOR shall prepare a Bill of Material covering all material and equipment furnished under this Specification. The Bill of Material shall be submitted in a preliminary form with the preliminary drawing submission and be finalized approximately two weeks before the scheduled arrival time of the first shipment. The Bill of Material shall be itemized in sufficient detail to permit an accurate determination of the completion of shipment of the material and equipment furnished under these Specifications.

2:11.2 The mailing address for the finalized Bill of Material is:

Florida Power Corporation
Crystal River Plant Unit No. 3
P. O. Box 276
Crystal River, Florida 32629

Attention: Mr. H. L. Bennett
Construction Manager

2:11.3 All items of equipment delivered to site shall be marked adequately to allow identification from the Bill of Material.

2:11.4 If the equipment is to be shipped in sections, with accessories or appurtenances detached, or otherwise not completely factory assembled, the extent of assembly shall be in accordance with the information submitted with the Proposal regarding the number, dimensions and weight of each section, accessory or appurtenance, and the amount of field WORK required to completely assemble the equipment.

2:11.5 Suitable labels shall be affixed to all pre-assembled/pre-fabricated parts.

2:12 Manufacture and Inspection of Equipment

2:12.1 The CONTRACTOR shall advise the OWNER of all his major subcontractors before orders are placed, and he shall not place orders with any subcontractor until approval of the OWNER has been obtained. The CONTRACTOR shall indicate where the equipment will be fabricated, and the OWNER and/or its representative shall have the right to inspect all manufacturing facilities before approving the subcontractor.

2:12.2 The OWNER and/or its representative reserves the right to inspect fully all phases of manufacture of the equipment included in the Contract. Any item found to be unsatisfactory shall be replaced or repaired at no cost to the OWNER. Any inspection by the OWNER and/or its representative shall not relieve the CONTRACTOR of his responsibility for conforming to the stated conditions and shall not be considered a waiver of warranty or other rights. No repairs or changes in excess of original Specifications or applicable codes, if requested by the inspector, shall be made without the approval of the OWNER.

2:12.3 All shop tests required for certification and proof that the equipment conforms to all applicable codes and standards shall be made at the expense of the CONTRACTOR. Any additional tests required by the OWNER and/or its representative shall be at OWNER'S expense with price to be negotiated for each individual case.

2:12.4 All parts of the equipment shall be protected against damage or corrosion during and following any tests.

- 2:12.5 The OWNER and the ENGINEER shall have the right of representation at all shop tests, and they shall be notified at least one (1) week in advance of all shop tests and inspection.
- 2:12.6 One (1) properly identified copy of the CONTRACTOR'S welding procedures, and other special fabrication data for the equipment, shall be submitted to the ENGINEER for review and approval, and three (3) copies shall be sent to the OWNER.
- 2:12.7 One (1) certified copy of all shop test data for the equipment, properly identified, shall be forwarded to the ENGINEER for acceptance, and three (3) copies shall be sent to the OWNER.

2:13 Shipment of Completed Work

All equipment shall be shipped completely factory assembled, except when the physical size, arrangement or configuration of the equipment or shipping and handling limitations make the shipment of completely assembled equipment impracticable.

2:14 Special Tools

- 2:14.1 The CONTRACTOR shall furnish one complete set of all special tools, all in first class condition, which will be required for maintenance of the equipment covered by the Contract. Identification of all tools by name and number shall be provided, and this number shall appear on drawings and instructions to indicate the application of the tools furnished and to permit ordering replacements.
- 2:14.2 The tools shall be shipped in a separate, heavily constructed, wooden box or boxes provided with hinged covers and padlock clasps. The boxes shall be marked with a large painted legend as follows:

Florida Power Corp. - Crystal River Unit No. 3

Maintenance Tools - (Name of equipment)

2:15 Protection During Shipment and Storage

- 2:15.1 Except as specified otherwise herein, exposed iron and steel surfaces of all equipment shall be given one coat of primer paint before shipment of the equipment to the job site. Before application of paint, all surfaces shall be free of rust, scale, lubricants, moisture, and other substances. Surfaces prepared for field welding shall be left unpainted for a distance of two inches from the weld. These surfaces shall be given a protective film of oil or other easily removed material to prevent rusting before erection.

- 2:15.2 The CONTRACTOR will be advised of the acceptable prime paint for exposed carbon steel surfaces of equipment and material to be installed inside the reactor building.
- 2:15.3 All exposed carbon steel surfaces of all other equipment shall be painted with zinc chromate pigment, rust inhibitive, metal primer paint recommended by the paint manufacturer for the service intended, and for application to metals prepared for painting by wire brushing. Paint shall be applied in accordance with the paint manufacturer's recommendations.
- 2:15.4 Machined surfaces such as shafts, pins, bushings, shaft couplings, and other similar parts whose operation would be impaired by painting shall not be painted. These surfaces shall be protected by application of an easily removable rust preventative compound.
- 2:15.5 Plastics, corrosion-resistant metals such as aluminum, brass, bronze, or stainless steel, and chrome plate or galvanized surfaces shall not be painted.
- 2:15.6 Each piece of equipment shall be cleaned thoroughly and dried prior to shipment. Equipment made of carbon steel shall contain adequate bags of silica-gel or approved equivalent desiccant to maintain a dew point of 40 F. Desiccant bags shall be securely anchored within the equipment. All openings of all equipment shall be closed prior to shipment with an easy to remove plug of suitable material.
- 2:15.7 All equipment and accessory items shall be suitably boxed, crated, wrapped, or covered to the extent practicable, to prevent entrance of dirt or moisture and to prevent accidental damage during shipment to the job site and during outdoor storage at the job site. Where necessary, a desiccant shall be included within the packing enclosure of items sensitive to changes in humidity.
- 2:15.8 All accessory items shall be shipped with the equipment. Boxes and crates containing accessory items shall be marked so that they are identified with the main equipment. The contents of the boxes and crates shall also be indicated.
- 2:16 Shipping Notices
- 2:16.1 The CONTRACTOR shall provide two copies of a shipping notice describing each shipment of material or equipment. The shipping notice shall be mailed on a schedule so that the notice will arrive approximately three days ahead of the estimated arrival time of the shipment.

2:16.2 The shipping notice shall be identified with the OWNER'S name, purchase order number, and name of the item of equipment or material.

2:16.3 The mailing address for the shipping notice is:

Florida Power Corporation
Crystal River Plant Unit No. 3
P. O. Box 276
Crystal River, Florida 32629

Attention: Mr. H. L. Bennett
Construction Manager

2:17 Patents

The CONTRACTOR shall satisfy all demands that may be made at any time for royalties and fees, and he shall be liable for any damages or claims for patent infringements. The CONTRACTOR shall, at his own expense, defend all suits or proceedings that may be instituted against the OWNER for infringement or alleged infringement of any patents involved in the WORK, and, in the case of an award of damages, the CONTRACTOR shall pay such award.

2:18 Conflicts

In the event of discrepancies between the detailed requirements of this Specification and those of the General Conditions, the detailed requirements shall prevail.

SECTION III
DETAILED SPECIFICATIONS
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3:01

Scope of Work

The WORK to be performed under this Contract shall include the receiving, storing, installing, and stressing of the prestressing system tendons required for the Reactor Building for the Crystal River Unit 3, Florida Power Corporation. The WORK shall be as specified herein and/or as shown on the Drawings and shall include, but is not necessarily limited to, the following:

1. Receiving and storing on the job site - tendons, tendon anchorage components, installation and stressing equipment, all supplied by Others.
2. Measuring tendon lengths.
3. Cleaning the inside surface of the embedded tendon conduit and coating with a corrosion-protection wax.
4. Installing tendons and protective end caps.
5. Button-heading and tensioning the tendons.
6. Re-installing protective end caps, if the tendons are not stressed immediately after installation, and dry air purging of the tendons.
7. Supplying equipment for complete installation and stressing of tendons including rigging and scaffolding.
8. Developing and maintaining WORK procedures and the required records for the WORK, as detailed in this Specification.
9. Supplying small hand tools and equipment noted on page 11 of the VENDOR'S (as defined in Item 3:02) "Field Installation Manual".
10. Maintenance of the tendon installation and stressing equipment (as noted in item 3:03.3) in accordance with the minimum requirements noted in the VENDOR'S (as defined in Item 3:02) "Field Installation Manual".
11. Coordinating with the OWNER the various phases of the WORK to suit the OWNER'S construction requirements. The OWNER will supply an outline schedule of the WORK.
12. Supplying details of and embedments for support of the scaffolding at the ring girder (see item 3:04 subitem 6).

13. Supplying eccentricity and "Go" "No-Go" gauges (see item 3:08.3 subitems 3 and 4). These gauges may be obtained from the VENDOR.
14. Supplying air pressure gauges for the dry air purging.
15. Supplying dry air purging equipment capable of delivering 350 SCFM of air @ 100 psig with a dew point of -20 F.

3:02

Definitions

In addition to the definitions in Item 2:02 of the GENERAL CONDITIONS, the following definition shall apply:

"VENDOR" - shall mean The Prescon Corporation of Corpus Christi, Texas, the supplier of the prestressing system.

3:03

Work, Materials, and Equipment Not Included in Scope of Work

The following items associated with the tendons are not included in this Contract and will be provided by Others:

1. Furnishing and delivering of wrapped and coated tendons to the job site with attached stressing washers, dead end plates, stressing washers, shims and increment shims, protective end caps and gaskets, all supplied by the VENDOR.
2. Furnishing, delivery, and installation of embedded conduit and bearing plates.
3. Furnishing and delivery of the following tendon installation and stressing equipment to the job site:
 - a. Three (3) uncoiling tables.
 - b. Three (3) hydraulic tuggers.
 - c. Three (3) units for backing the tendons into the conduit.
 - d. Three (3) button-heading machines.
 - e. Six (6) stressing machines.
4. Suitable on-site storage for tendons and anchorage components.
5. Suitable supply of electricity.
6. Tendon length measuring equipment.

3:04

General Information and Requirements

The following is a brief description of the WORK and associated items. Additional information may be available from the OWNER and/or ENGINEER upon request.

1. The Reactor Building is a prestressed post-tensioned concrete structure containing 144 vertical, 282 horizontal, and 123 dome tendons. Each tendon will consist of 163 7mm diameter wires and will have installed in one end a 5'-0" long wire surveillance specimen. At 70% of the wire's minimum ultimate strength, the tendon force is 1633.5 kips. The pre-stressing system tendons, anchorage components, and the equipment listed in Item 3:03 subitem 3 are to be supplied by the VENDOR.
2. The VENDOR will supply to the OWNER and the CONTRACTOR technical assistance in training the CONTRACTOR'S operators in the use and maintenance of the equipment supplied by the VENDOR. This technical assistance will be available to the CONTRACTOR during all phases of tendon installation and stressing.
3. The VENDOR will supply to the OWNER, the ENGINEER and the CONTRACTOR, copies of his "Field Installation Manual". This manual may be revised from time to time and the most recent revision shall be used at all times.
4. If the CONTRACTOR wishes to perform part of the WORK in a manner different than as specified herein, he shall make a written request to the OWNER for consideration. No WORK may be performed differently than specified, unless written approval is given by the OWNER or the ENGINEER.
5. The CONTRACTOR will have adequate access to the Reactor Building for installation and stressing tendons. An indication of the access to be provided in the Intermediate and Auxiliary Buildings is shown on Drawing SC-400-017.
6. The CONTRACTOR shall supply to the OWNER, for use by the CONTRACTOR and OWNER, permanent track for supporting scaffolding platforms at the top of the ring girder (elevation 267'-6"). Additionally, the CONTRACTOR shall supply to the OWNER and the ENGINEER details of the required embedments and, after approval of the OWNER has been obtained, he shall deliver the embedments to the job site in sufficient time to allow them to be cast into the structure. Details of ring girder are shown on Drawing SC-421-031.
7. Upon completion of the WORK, the CONTRACTOR shall make his scaffolding available to the OWNER for a limited time for the purpose of painting exposed surfaces of the bearing plates and protective end caps.

3:05 Codes and Manuals

Except as noted otherwise hereinafter, all WORK shall be in accordance with the following codes and manuals:

1. ACI 318-63 "Building Code Requirements for Reinforced Concrete".
2. ACI 301-66 "Specifications for Structural Concrete for Buildings".
3. The VENDOR'S "Field Installation Manual".

3:06 On-Site Receipt, Storage, Handling, Etc.

3:06.1 Upon delivery to the site by the VENDOR, the CONTRACTOR shall inspect, unload, and place the tendons and anchorage components in on-site storage, supplied by the OWNER (see Item 3:03 subitem b).

3:06.2 Tendons and anchorage components delivered to the job site will have identification numbers stamped or tagged on them by the VENDOR. The CONTRACTOR shall develop written records of the identification numbers, assigned by the VENDOR, for the tendons and anchorage components received on the job site. These numbers shall be used in all the documentation developed by the CONTRACTOR, as required by this Specification. The CONTRACTOR shall notify the OWNER of discrepancies which occur between identification numbers marked or tagged and those listed on the shipping forms.

3:06.3 If the inspection reveals any tendons or anchorage components which are damaged, or have their protective coverings or corrosion-protection material damaged, they shall be documented by the CONTRACTOR. If the damage cannot be repaired, they shall be rejected. The OWNER shall be advised of all rejected material and the CONTRACTOR shall document all rejections. If the damage can be repaired, the repair work will be performed by the OWNER or the VENDOR. Tendons delivered with rust on the wire shall have their protective covering removed in order that the whole length of the tendon can be examined. The wire rust grade inspection criteria is:

DEFINITION

PHYSICAL EVALUATION

A = EXCELLENT

Uniform color
No foreign matter
Slight spotting of Oxide film coating
Few light scratches to bright metal
No scale
No pitting

No cleaning for inspection required.

DEFINITION

PHYSICAL EVALUATION

B = GOOD

Partial loss of color
Little foreign matter
Dull finish of applied Oxide film
Few light scratches to bright metal
Small quantity light scale
No pitting

Rag wipe cleaning required for visual inspection of wire metal.

C = FAIR (Minimum Storage Time)

Major loss of color
Some foreign matter
Major loss of Oxide film
Color and gloss
Many light scratches to bright metal
Large quantity light scale
No pitting

Partial area requires light sanding or scratching required for visual inspection of wire metal.

(10 heavy passes with 100 grit sandpaper or 2 heavy passes with a sharp edge.)

D = USABLE (Immediate Production)

Total loss of color
Much foreign matter
Total loss of Oxide film
Many heavy scratches to bright metal
Small quantities of heavy scale.
No pitting

Total area requires light sanding or scratching required for visual inspection of wire metal.
(20 heavy passes with 100 grit sandpaper or 4 heavy passes with a sharp edge.)

E = FAIL (Reject to Salvage)

Emulsion color and gloss
Completely overcome by small pitting or heavy scaling
Large quantities of heavy scale.

Total area requires heavy sanding or scraping for visual inspection of wire metal.
(30 passes with 100 grit sandpaper or 6 passes with a sharp edge.)

Definitions:

Small Pitting - a pit is defined as an indentation 0.0156 - 1/64 inches deep and 0.0625 - 1/16 inches in diameter.

Scale - Defined as an incrustation of foreign materials, a lamina or flake such as peels off from a surface.

- 3:06.4 Tendons and anchorage components shall only be removed from on-site storage immediately before being placed in the structure. Should tendons or anchorage components be left out of on-site storage for a period of time exceeding eight (8) hours, they shall be returned to on-site storage. Tendons shall be protected at all times from rain, moisture, condensation, etc. If a tendon is exposed to rain, or if condensation causes moisture to form on the tendon wires, the CONTRACTOR shall remove the moisture from the tendon. Removal of moisture from the tendon shall not remove or disturb the protective coating.
- 3:06.5 Tendons and anchorage components shall at all times be handled in accordance with the VENDOR'S recommendations noted in the "Field Installation Manual".
- 3:06.6 The CONTRACTOR shall measure the required length of each tendon by means of a measuring device supplied by the VENDOR. The method of measurement shall be in accordance with the recommendations of the VENDOR. The required tendon lengths shall be transmitted to the VENDOR in writing and two copies shall be forwarded to the OWNER. The CONTRACTOR'S attention is drawn to the fact that he shall forward the required tendon lengths to the VENDOR in time to allow the VENDOR to fabricate the tendons and deliver them to the job site in accordance with the OWNER'S construction schedule. To accomplish this the CONTRACTOR, the OWNER, and the VENDOR will together establish a schedule for this WORK.
- 3:07 Tendon Installation
- 3:07.1 Prior to the installation of the tendon, the field installed temporary protective covers shall be removed from the bearing plates. The conduit shall then be cleaned to remove dirt, debris, and moisture. A suggested method of accomplishing this is:

Use a cloth pull-through to clean the conduit. After the conduit has been pulled through and is considered clean and dry, one final pull-through shall be made using a clean white cloth. If after pulling-through the conduit the cloth is found to be clean and dry to the touch of the hand, the conduit is considered to be clean and dry. If the pull-through cloth is dirty and/or damp, pulling-through shall continue until the clean white cloth comes out clean and dry. When the inside surface of the conduit is clean and dry, it shall be coated with a corrosion-protection wax supplied by the OWNER. To accomplish this the CONTRACTOR shall pull-through cloths soaked in the corrosion-protection wax. If after pulling-through the conduit the cloth is found to be free of the corrosion-protection wax, the cloth shall be re-soaked and pulled through again. This process shall continue until the pull-through cloth comes out with corrosion-protection wax adhering to it. The CONTRACTOR shall note that it may be necessary to place a plug of corrosion-protection wax ahead of the pull-through cloth and then pull-through the cloth and plug of wax.

3:07.2 The corrosion-protection wax shall be NO-OK-ID "CN" Casing Filler, Nuclear Grade, modified as noted below in item 3:07.3, or EQUAL. The CONTRACTOR'S attention is drawn to the fact that the corrosion-protection wax may require heating to assist application to the inside of the conduit. The CONTRACTOR shall submit procedures for cleaning and coating the inside of the conduit to the OWNER and the ENGINEER for approval. Exposure of the open conduit to the atmosphere shall be kept to a minimum and shall not exceed eight (8) hours. The conduit shall not be left open during rain. To protect the conduit during rain the CONTRACTOR may either re-install the temporary protective covers or install the permanent protective end caps and gaskets as supplied by the VENDOR.

3:07.3 The corrosion-protection wax shall be NO-OK-ID "CN" Casing Filler - Nuclear Grade, as manufactured by The Dearborn Chemical Division of W. R. Grace and Company, modified so that at 115 F it will not flow down vertically oriented tendons wires. The corrosion-protection wax shall have the following additional properties:

<u>Item</u>	<u>Range</u>	<u>Method</u>
1. Specific gravity	0.88 - 0.90	ASTM D 287-67
2. Weight per gallon	7.35 - 7.50 lbs.	-
3. Flash point (COC)	400 F, min	ASTM D 92-66
4. Penetration (cone) at 77 F	328 - 367	ASTM D 937-67
5. Thermal conductivity	0.12 Btu/hr/ft ² /F/ft thickness (approx)	-
6. Specific heat (heat capacity)	0.51 Btu/lb/F (approx)	-
7. Shrinkage factor from 150 F to 75 F	3.5% - 4.5%	-

3:07.4 Additional tests shall be performed to determine chloride, sulphide and nitrate content. The frequency of these tests shall be dependant on the method the CONTRACTOR uses to coat the inside of the conduit. The CONTRACTOR shall propose to the OWNER and the ENGINEER the frequency of these tests based upon his method of coating the inside of the conduit. The additional tests are as follows:

a. Chlorides:

The initial screening test on both raw materials and finished product shall be the Beilstein Test. If a positive Beilstein indication is obtained, a conforming test shall be made on water extracts of the product using standard titration of colorimetric procedures described in ASTM D 512-67. A limit of 10 ppm chloride shall be set for either raw material or finished product.

b. Sulfides:

The method shall be a water extraction followed by a total sulfide determination. To the extraction water shall be added zinc acetate to precipitate sulfides. Sulfides present shall then be measured in accordance with Paragraph 8 of ASTM D 1255-65 T. An alternate colorimetric procedure may also be used in which sulfides are volatilized from an acidified extraction solution to create a colored spot on lead acetate paper. Spot intensity is measured to determine sulfide concentration. The extraction procedure shall be in accordance with ASTM D 1255-65 T. A limit of 10 ppm sulfides shall be set for either raw material or finished product.

c. Nitrates:

The method shall be a water extraction followed by chloroform extraction of the water extract, followed by colorimetric measurements, based on ASTM D 992-52. A limit of 10 ppm nitrates shall be set for either raw material or finished product.

- 3:07.5 The **VENDOR** of the tendons has assigned a unique identifying number to each tendon. This unique identifying number is marked on each tendon and is shown on the **VENDOR'S** tendon placement drawings. The **CONTRACTOR** shall follow the **VENDOR'S** drawings when placing tendons to ensure that each tendon is placed in its correct location in the structure.
- 3:07.6 Tendons may only be taken out of on-site storage for installation directly into the conduit.
- 3:07.7 The tendon bandings shall only be removed immediately before the tendon is inserted in the conduit. Tendons shall be inserted from the long trumpet end. This location is noted on the **VENDOR'S** drawings. The **CONTRACTOR** shall develop work-procedures for inserting the tendons in the conduit and shall submit them to the **OWNER** and the **ENGINEER** for approval.
- 3:07.8 The **CONTRACTOR** shall handle the tendons in accordance with the **VENDOR'S** recommendations. He shall take care in handling the tendons not to cause undue disruption of the corrosion-protection wax coating. If the **CONTRACTOR** elects to button-head the tendon at some later date, the protective end caps and gaskets, both supplied by the **VENDOR**, shall be properly secured to the bearing plates. For this condition, the **CONTRACTOR** shall note that when he comes to button-head the tendon, he shall be required by the **VENDOR** to pull the end of the tendon, which is to be button-headed, out of the conduit for approximately five (5) feet. Refer to item 3:08.2.

- 3:07.9 As each tendon is inserted into the conduit, the surface shall be visually inspected to ensure that it is completely coated with the corrosion-protection wax (refer to item 3:07.3). Tendons or parts of tendons not completely coated shall be recoated by the CONTRACTOR with approved corrosion-protection wax, supplied by the OWNER, before the tendons are installed. The tendons shall only be installed under dry conditions. If the tendons are not stressed immediately after installation, the protective end caps with gaskets (both supplied by the VENDOR) shall be installed to prevent entrance of moisture.
- 3:07.10 Field installation of tendons shall be performed so as to avoid staining of the concrete surfaces with the corrosion-protection wax. Any concrete surfaces stained with the corrosion-protection wax shall be cleaned by the CONTRACTOR at no cost to the OWNER.
- 3:08 Button-heading
- 3:08.1 The CONTRACTOR shall button-head the tendon wires, maintain the button-heading machines, and maintain the button-head dies, all in accordance with the VENDOR'S recommendations.
- 3:08.2 Each tendon supplied by the VENDOR will have a stressing washer button-headed on one end. The CONTRACTOR shall place on the other end of the tendon either another stressing washer or a dead end plate as called for on the VENDOR'S drawings, and shall button-head it onto that end of the tendon. The VENDOR'S procedures for backing the tendon into the conduit to allow button-heading at the other end shall be followed. The CONTRACTOR shall record the identification number of the field button-headed stressing washer or dead end plate on a form, together with tendon number, date, and inspection results.
- 3:08.3 The following requirements shall apply to button-heads formed in the field by the CONTRACTOR:
1. Button-heads shall be the cold upset type, made with dies supplied by the VENDOR (refer to Item 3:03 subitem 3.d. and 3:08.1) to the dimensional criteria noted in subitems 5 and 6 below. All button-heads shall be visually inspected for malformation. Any malformed button-head shall be included in the random check noted in subitem 3 below.
 2. The frequency of visual inspection for splits (cracks) shall be 100%. Any button-head found to have a split (crack) or splits (cracks) shall be checked to determine if it complies with the split criteria noted in subitem 6 below.
 3. A random check with "Go" and "No-Go" gauges, for sizes noted in subitem 5.a. below, shall be made of a minimum of 10% of the button-heads on each tendon. If at the inspection frequency of 10% one or more button-heads do not meet the criteria noted in subitem 5.a. the inspection frequency shall be increased to 100% for that tendon.

4. Button-head eccentricity shall be checked by means of the VENDOR'S gauge (refer to Item 3:01 subitem 13). Immediately before commencing button-heading a tendon the CONTRACTOR shall form a button-head on a sample of wire and measure the eccentricity. After 50% of the tendon has been button-headed, that is approximately 80 button-heads, the CONTRACTOR shall form another button-head on a sample of wire and measure the eccentricity. If the eccentricity of any sample button-head is unacceptable (refer to subitem 5.c.), the CONTRACTOR shall check all button-heads produced since the last sample check. The samples of wire shall be the same size and type of wire as used in the tendon and shall be purchased from the VENDOR.
5. Dimensional acceptance criteria of the button-heads shall be as follows:
 - a. Diameter shall be equal to or greater than 0.400 inches and equal to or less than 0.450 inches.
 - b. A bearing surface shall exist on all sides of the lower portion of the head adjacent to its connection with the wire portion.
 - c. Maximum eccentricity shall be 0.015 inches.
6. Acceptance criteria for splits (cracks) in button-heads are as follows:
 - a. Splits shall be inclined not more than 50 degrees to the axis of the wire.
 - b. The maximum length per split shall be 0.350 inches.
 - c. The maximum width per split shall be 0.060 inches.
 - d. The maximum number of splits shall be four (4) per button-head.

3:08.4

If, at any field button-headed tendon end, more than three button-heads are found to exceed some or all the tolerances noted in item 3:08.3, the CONTRACTOR shall immediately advise the OWNER and the ENGINEER in writing for evaluation. The evaluation will take into account the number of unacceptable button-heads on adjacent tendons and the location of the tendons in the structure. The OWNER and the ENGINEER will advise the CONTRACTOR of the results of the evaluation and if the tendon is unacceptable it shall be rejected and replaced by the CONTRACTOR at no extra cost to the OWNER. If the field button-headed tendon end contains less than three unacceptable button-heads, the tendon is acceptable; however, the CONTRACTOR'S attention is drawn to the requirements noted in item 3:09.3 subitem 1, concerning the combination of broken wires and unacceptable button-heads.

- 3:08.5 Before commencing button-heading the production tendons (tendons to be placed in the structure), the CONTRACTOR shall demonstrate his ability to produce button-heads meeting the criteria noted in item 3:08.3. To accomplish this, he shall obtain sufficient lengths of wire from the VENDOR to make 50 trial button-heads. The wire shall be the same size and type as used in the tendon. This wire may be purchased from the VENDOR. These 50 trial button-heads shall all be inspected for size, eccentricity, and splits. Rejected button-heads will be examined by the VENDOR, who may make a recommendation to the CONTRACTOR to alter his procedure in order that acceptable button-heads may be produced. The CONTRACTOR may not proceed with button-heading production tendons until he has satisfactorily demonstrated his ability to produce acceptable button-heads.
- 3:08.6 After installing and button-heading a tendon, the CONTRACTOR may leave the tendon unstressed provided that the protective end caps and gaskets, as supplied by the VENDOR, are installed. The CONTRACTOR shall note that in order to install the protective end caps it will be necessary for him to pull the tendon back into the conduit, after button-heading. The installation of the caps shall be in accordance with the recommendations of the VENDOR. Tendons may be left unstressed in the sealed conduit for a maximum time of six (6) months.
- 3:08.7 The CONTRACTOR shall develop documentation records for the tendon installation and button-heading. The records shall, as a minimum, note that the conduit was cleaned and coated with the corrosion-protection wax (refer to item 3:07.1), the date and time of installation, the VENDOR'S identification number for the field button-headed stressing washer or dead end plate, the VENDOR'S tendon number, and the record of the button-head inspections. The records may also be used to record the stressing data, noted in item 3:09.8.
- 3:08.8 The CONTRACTOR shall develop work-procedures for button-heading the tendons, and shall submit them to the OWNER and the ENGINEER for approval before commencement of the WORK.
- 3:09 Tendon Stressing
- 3:09.1 The CONTRACTOR shall follow the maintenance, handling, and operating procedures developed by the VENDOR for the stressing equipment.
- 3:09.2 Tendons shall not be stressed until all concrete for the complete Reactor Building shell has been placed and has reached a minimum strength of 5,000 psi and has been in place for 28 days.

3:09.3 Force and Strain Measurements:

1. Each tendon shall be stressed to eighty percent of the minimum guaranteed ultimate capacity of the tendon. The jacking force shall then be reduced to seventy percent of ultimate capacity when locked off (shimmed in place). The wire manufacturer's stress-strain curves for the production lots used will be submitted by the VENDOR to the OWNER, the ENGINEER, and the CONTRACTOR. The CONTRACTOR shall incorporate these with the final gauge reading and elongation for each stressed tendon and shall submit them to the OWNER and the ENGINEER. If the loss of prestress force due to broken wires exceeds one wire per tendon, the OWNER and the ENGINEER shall be immediately advised. If one to three tendon wires break during stressing the tendon may be acceptable, provided that the combination of broken wires and unacceptable button-heads does not exceed three (3) wires total. If the tendon contains more than three unacceptable wires (either broken wires and/or unacceptable button-heads) the CONTRACTOR shall immediately advise the OWNER and the ENGINEER in writing for evaluation. The evaluation will take into account the number of unacceptable wires contained in adjacent tendons and the location of the tendons in the structure. The OWNER and the ENGINEER will advise the CONTRACTOR of the results of the evaluation. If the tendon is unacceptable due to unacceptable field formed button-heads, it shall be rejected and replaced by the CONTRACTOR at no extra cost to the OWNER. If the tendon is unacceptable due to broken wires, it will be rejected and replaced by the VENDOR. If the tendon is unacceptable due to a combination of broken wires and unacceptable button-heads, it shall be rejected and replaced by the VENDOR and the CONTRACTOR at no extra cost to the OWNER.

2. After taking up initial slack by jacking to a maximum jack pressure of 500 psi, force and strain measurements shall be made by measurement of elongation of the prestressing wire and comparison with the force indicated by the jack-dynamometer or pressure gauge. The gauge shall indicate the pressure in the jack within plus or minus two percent. Force-jack pressure gauge or dynamometer combinations shall be calibrated just before prestressing operations begin by using a standard whose calibration is certified as being traceable to the National Bureau of Standards. Pressure gauges and jacks so calibrated shall always be used together. During stressing, records shall be made of elongations as well as pressures obtained for each tendon. At the equivalent pressure gauge or dynamometer reading of 70% of the guaranteed ultimate tendon force, the tendon elongation shall be measured at each stressing end and compared to the elongation predicted by the VENDOR (using average load elongation curves). If the discrepancy between the measured

and predicted elongations exceeds plus or minus 5 percent, the CONTRACTOR shall immediately advise the OWNER, the ENGINEER, and the VENDOR, in writing, of the discrepancy. The VENDOR shall evaluate the discrepancy, in conjunction with the OWNER, the ENGINEER, and the CONTRACTOR, and shall instruct the CONTRACTOR to carry out the necessary remedial WORK. The CONTRACTOR shall document in writing the elongation discrepancies and the remedial action taken. Calibration of the jack-dynamometer or pressure gauge combinations shall be maintained to be accurate within the above limits and, if requested by the OWNER and the ENGINEER, shall be recalibrated, or newly calibrated combinations substituted, during and at the end of the tensioning operations.

3:09.4 The stressing sequence shall be performed in the following order:

1. Vertical tendons.
2. Dome tendons.
3. Horizontal tendons.

3:09.5 The details for stressing each type of tendon shall be as follows:

1. Vertical Tendons:

All vertical tendons shall be stressed from the top end only using six (6) sets of stressing equipment equally spaced around the ring girder according to the following sequence:

- a. Begin stressing near the centerline of each buttress.
- b. Stress every other tendon moving in a clockwise direction.
- c. After moving 60° , or one buttress, continue in a clockwise direction stressing the unstressed tendons.
- d. After all vertical tendons are stressed, each set of stressing equipment will have moved 120° .

2. Dome Tendons:

There will be six (6) sets of stressing equipment stressing three (3) tendons simultaneously. A sequence is composed of three (3) tendons which shall be stressed simultaneously. The stressing sequences are as follows:

Sequence
No.

1.	D131	D211	D331
2.	D127	D215	D327
3.	D123	D219	D323
4.	D119	D223	D319
5.	D115	D227	D315
6.	D111	D231	D311
7.	D107	D235	D307
8.	D103	D239	D303
9.	D135	D207	D335
10.	D139	D203	D339
11.	D141	D201	D341
12.	D137	D205	D337
13.	D133	D209	D333
14.	D129	D213	D329
15.	D125	D217	D325
16.	D121	D221	D321
17.	D117	D225	D317
18.	D113	D229	D313
19.	D109	D233	D309
20.	D105	D237	D305
21.	D101	D241	D301
22.	D102	D240	D302
23.	D106	D236	D306
24.	D110	D232	D310
25.	D114	D228	D314

Sequence
No.

26.	D118	D224	D318
27.	D122	D220	D322
28.	D126	D216	D326
29.	D130	D212	D330
30.	D134	D208	D334
31.	D138	D204	D338
32.	D140	D202	D340
33.	D136	D206	D336
34.	D132	D210	D332
35.	D128	D214	D328
36.	D124	D218	D324
37.	D120	D222	D320
38.	D116	D226	D316
39.	D112	D230	D312
40.	D108	D234	D308
41.	D104	D238	D304

3. Horizontal Tendons:

All horizontal tendons shall be stressed from both ends using six (6) sets of stressing equipment. Three (3) horizontal tendons shall be stressed simultaneously according to the following sequence:

- a. Raise the scaffold to the bottom of the ring girder at the odd numbered buttresses (1, 3, 5).
- b. Stress the top tendons on both sides of each of these buttresses.
- c. Stress every other tendon down both sides of the odd numbered buttresses to the top of base slab.

- d. Move scaffold to both sides of the even numbered buttresses (2, 4, 6).
- e. Stress bottom tendons on both sides of each of these buttresses.
- f. Stress every other tendon up both sides of the even numbered buttresses up to the bottom of the ring girder.
- g. Move scaffold to both sides of the odd numbered buttresses (1, 3, 5).
- h. Stress the remaining tendons down both sides of the odd numbered buttresses to the top of base slab.
- i. Move scaffold to both sides of the even numbered buttresses (2, 4, 6).
- j. Stress the remaining tendons up both sides of the even numbered buttresses up to the bottom of the ring girder.

- 3:09.6 After stressing, the end anchorages and exposed portions of the tendons shall be coated with the corrosion-protection wax, specified in item 3:07.3 and the protective end cap with gasket installed.
- 3:09.7 Prior to installing the protective end cap, the CONTRACTOR shall install the 5'-0" long unstressed wire surveillance specimen, supplied by the VENDOR. This specimen shall be installed in one end of every tendon and shall be completely coated with the corrosion-protection wax specified in item 3:07.3.
- 3:09.8 The CONTRACTOR shall develop documentation records for the tendon stressing. The records shall, as a minimum, record tendon number, date of stressing, predicted wire elongation at each stressed end (to be supplied by the VENDOR), actual measured elongation at each stressed end at lock-off, jack pressure at lock-off. These records may be integrated with those developed as specified in item 3:08.7 and shall be kept up to date. Copies of these records shall be forwarded to the OWNER and the ENGINEER. Prior to stressing, the CONTRACTOR shall forward to the OWNER and the ENGINEER, for comments and approval, samples of his proposed records.
- 3:09.9 The CONTRACTOR shall develop work-procedures for showing the tendons and shall submit them to the OWNER and the ENGINEER for approval before commencement of the WORK.

3:10 Tendon Conduit Dry Air Purge

- 3:10.1 After completion of stressing and installing the protective end caps, the CONTRACTOR shall perform the following WORK in items 3:10.2 to 3:10.4 below. This WORK shall be completed within seven (7) months of tendon installation.
- 3:10.2 The CONTRACTOR shall then dry air purge the tendon conduit with -20 F dew point air at 50 psig and 100 F. The connections for air lines shall be made to the protective end caps. The dry air purge may be either a recirculation or total loss method and recirculation may be made through adjacent tendon conduits. The dry air purge of the conduit shall continue until the relative humidity (R.H.) at the discharge end is 10% or less. The maximum air pressure during any phase of the dry air purge shall be 50 psig. Upon reaching this humidity, purging shall stop and the tendon sealed against ingress of air. The maximum sealing pressure maintained in the conduit shall be 10 psig.
- 3:10.3 The CONTRACTOR shall develop documentation records for the tendon conduit dry air purging. The records shall, as a minimum, record tendon number, date, ambient temperature, ambient relative humidity, and conduit relative humidity. The records shall be kept up to date and copies shall be forwarded to the OWNER and the ENGINEER.
- 3:10.4 The CONTRACTOR shall develop work-procedures for the tendon conduit dry air purge. These procedures shall be submitted to the OWNER and the ENGINEER for approval.

3:11 Quality Control

The CONTRACTOR shall perform the following:

1. Develop documentation for, and carry out inspection of, tendons and anchorage components as they are delivered to the job site.
2. Develop written work-procedures for cleaning and coating the inside of the conduit with the corrosion-protection wax. Refer to item 3:07.1.
3. Develop written work-procedures for installing the tendons. Refer to items 3:07.7 and 3:07.10.
4. Develop documentation records for conduit cleaning and coating, tendon installation, and button-heading. Refer to item 3:08.7.
5. Develop written work-procedures for button-heading the tendons. Refer to item 3:08.8.

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6. Develop documentation records for the tendon stressing. Refer to item 3:09.8.
7. Develop written work-procedures for stressing the tendons. Refer to item 3:09.9.
8. Develop written work-procedures for dry air purging the conduit. Refer to item 3:10.4.
9. Develop documentation records for the dry air purging of the conduit. Refer to item 3:10.3.

SECTION IV

LIST OF BID DRAWINGS

The following ENGINEER'S and VENDOR'S drawings set forth the location and extent of the WORK to be performed under this Contract and are hereby expressly made a part of this Specification:

<u>Drawing No.</u>	<u>Rev.</u>	<u>Date</u>	<u>Title</u>
<u>ENGINEER'S DRAWINGS</u>			
A-101-111	2	3-26-71	Architectural Roof Plans and Sections
SC-400-007	0	6-16-70	Structural Outline - Plan
SC-400-008	0	6-16-70	Structural Outline - Sections
SC-400-009	0	6-16-70	Structural Outline - Sections
SC-400-015	0	6-16-70	Structural Outline - Plans
SC-400-017	A	5-12-71	Prestressing System - Clearances at Buttresses for Installation & Stressing of Tendons
SC-400-018	A	5-12-71	Reactor Building - Dome Tendon Stressing
SC-421-031	2	1-15-71	Reactor Building - Concrete Outline
<u>VENDOR'S DRAWINGS</u>			
A7	2	5-6-70	Anchor Detail at Buttress
A8	1	3-23-70	163 Wire Washer & Split Shim Details
A9	2	4-7-71	Protective End Cap - Stressing End
A9A	2	4-7-71	Protective End Cap for Bottom Verts
D8	0	12-14-70	Dome Tendon Layout
D12	1	1-18-71	Dome Section Detail

eral supervision to see that the final results of such work and labor comply with the above incorporated specifications. As such Independent Contractor, you will employ as your own and pay such workers as you may require to perform said work and labor, use your own equipment unless and to the extent otherwise permitted by said specifications, follow your own working methods in complying with said specifications, and superintend said work and labor personally; and, in the event any of said work or labor shall be performed by subcontractors, you will coordinate the work and labor of such subcontractors and the same shall constitute part of the common enterprise.

4. You shall be held fully accountable, and subject to inspection and audit at any time, for materials issued by us to be used by you in connection with work to be performed hereunder. You shall pay us the cost of any material not used or not returned to us, except that reasonable allowances will be made by us for normal loss and breakage incident to the type of construction involved.

5. You will assume full responsibility for the foregoing work and labor and will defend us and hold us harmless against and indemnify us for any and all accidents or damages or claims or costs whatsoever arising within the scope thereof or in carrying out this contract, irrespective of negligence actual or claimed on our part. If any member of the public, or any employee or agent of yours, or any employee or agent of a subcontractor is injured or killed, or if any property including ours or the public's is damaged in the course of work being performed under the provisions of this contract, you will notify our company personnel who is inspecting the work or in his absence, our company supervisor who originated the contract with you. Such notification will be made immediately in person or by telephone and promptly confirmed in writing, and will include all pertinent data such as name of injured party, location of accident, description of accident, nature of injuries, names of witnesses, disposition of injured or deceased person.

6. As a safeguard in respect of paragraph 5 above, you will carry Workmen's Compensation Insurance in the maximum amounts required by statute and will also carry policies of insurance acceptable to us with respect to (a) General Liability with Bodily Injury limits not less than \$200,000 each person and \$500,000 each occurrence and with Property Damage limits not less than \$50,000 each occurrence and \$100,000 aggregate, and (b) Automobile Liability with Bodily Injury limits not less than \$200,000 each person and \$500,000 each occurrence and with Property Damage limits not less than \$50,000 each occurrence. You will have the insurance policies mentioned in (a) and (b) above, respectively, endorsed by your insurance carrier to provide blanket contractual coverage, expressly with respect to paragraph 5 above, to the full limits of and for the liabilities insured under said policies; and, prior to the commencement of any work hereunder, you will furnish us with a certificate, in duplicate, on our form OD-17-C, completed by your insurance carrier showing that you carry the requisite insurance and that the specified policies insure the liability assumed by you under paragraph 5 above.

7. You are hereby advised that the generation, transmission and/or distribution of electrical energy involves the handling of a natural force which, when uncontrolled, is inherently hazardous to life and property. You are further hereby advised that, due to the nature of the work to be performed hereunder, other hazardous or dangerous conditions (not necessarily related to the inherent danger of electricity) may also be involved in the work. Accordingly, prior to the commencement of the work, you shall inspect the job site specifically to ascertain the actual and potential existence and extent of any hazardous or dangerous conditions, and instruct your employees with respect to said conditions and the safety measures to be taken in connection therewith; and, during the course of the work, you shall take all such measures as may be deemed necessary or advisable to protect and safeguard the person and property of your employees and of the general public against all hazardous or dangerous conditions as the same arise.

You and your duly authorized agents and employees shall, before climbing poles or structures, make certain that they are strong enough to safely sustain workmen's weight in the performance of the required work on the poles or structures. All work designated in any Letter Agreement or in any Authorization or Purchase Order given to you under this Agreement to be performed at or near or involving energized electrical conductors shall be performed under the conditions and at the place as stated, but only with the specific understanding that if you in your sole discretion regard the place where such work is to be performed, or where such work is being performed, as an unsafe place to work, either because the said conductors or other equipment are so energized, or because it is deemed unsafe for any other reason or condition or conditions then and there existing, you shall request us for a clearance to de-energize the said conductors or other equipment, or to make such other change or changes as may be necessary or desirable in your sole discretion, to render the place of performance at the job site a safe place to work for your employees. In the absence of any request by you to us it shall be conclusively presumed that the place where the work is to be performed is a safe place to work without the de-energization of such conductors or other equipment, and without making any changes whatsoever at the job site.

In the event that we have knowledge of any latent hazardous or dangerous conditions that exist within the job site, Appendix A will be attached hereto to warn you thereof. Any such notice shall not in any-wise or manner diminish or release you from your responsibilities set forth in this paragraph 7 above.

8. We shall provide all easements, trimming and clearing rights, and no work on land clearing or line construction shall be started by you until specifically authorized by us in writing.

If you are primarily a tree trimming contractor, you will obtain permission from property owners before trimming trees, and will perform the work in such a manner as to avoid complaints from property owners, members of the community, and city or county officials. You will obtain clearance to wires in their present position, or the position in which slack wires are to be pulled, in accordance with specifications furnished with this contract, or a satisfactory explanation for failure to obtain such clearance must be made by you.

9. The foregoing work and labor shall be performed under the applicable building trade wages and conditions; and you will comply with the requirements of and the regulations promulgated under the Fair Labor Standards Act of 1938 and the Social Security Act, including State and Federal Unemployment Compensation, and will file all reports and pay all taxes required thereunder.

10. All work to be performed by you hereunder shall be delivered to us free and clear of all labor, material and mechanics' liens, and any other encumbrances whatsoever, which might be occasioned by or permitted to be created by you. Such delivery shall be on our applicable contractor's affidavit (Form OD-33-A; OD-33-B; or OD-33-C).

11. Should you become insolvent, or refuse or neglect to supply a sufficiency of properly skilled workmen or equipment, or fail to make reasonable progress with the prosecution of the work, or otherwise fail in the performance of any obligation under this contract, then, in any such event, we shall have the right to terminate this contract upon forty-eight (48) hours' written notice served upon or delivered to you or your duly authorized representative.

12. This contract constitutes the full, complete and only agreement as of the date hereof between the parties hereto with respect to the foregoing work and labor; and, anything contained in the above incorporated specifications to the contrary notwithstanding, whenever there shall be any conflict, intent or otherwise, between the provisions therein set forth and the provisions set forth on this form, the latter shall prevail.

FLORIDA POWER CORPORATION

By: _____

Title: _____

I hereby undertake to perform the work and labor outlined in the foregoing in accordance with the terms thereof as of the date above stated. My Employer's Account Number under Federal Social Security is _____, and under State Unemployment Compensation is _____.

Date Accepted: _____ 19____

Name of Firm: _____

By: _____

Title: _____

CONTRACTOR'S AFFIDAVIT

To
FLORIDA POWER CORPORATION

STATE OF FLORIDA
COUNTY OF _____

} ss.

On this day before me, the undersigned authority duly authorized to take oath, personally appeared _____
_____ who, being by me
first duly sworn, on oath deposes and says that:

1. Affiant is the duly elected and acting Vice President of _____
(Company)
(herein called "Contractor"), a _____
Corporation, which performed the
hereinafter described contract for Florida Power Corporation (herein called "Owner"), with full authority to make
(State)
this affidavit for said corporation.

2. Contractor heretofore entered into a contract, dated _____ 19____
(herein called "Contract"), with Owner to furnish materials, machinery and equipment and/or to perform labor
necessary for the construction of buildings and/or repair or alteration of buildings, structures or machinery and
equipment and/or construction or installation of facilities, on the Owner's land and property, all as more specific-
ally described in the Contract, or in the Purchase and/or Work Order attached to the Contract, and the descriptions
therein contained are hereby incorporated herein by this reference thereto.

3. In connection with the request of the Contractor for final payment, under the Contract, it is hereby certified that
all work, labor, services, materials, machinery and equipment furnished by the Contractor have been fully paid for
by the Contractor and that there are no amounts unpaid in favor of any subcontractor or any other person furnishing
labor and materials to the Contractor and utilized in the performance of the obligations of the Contractor under
the Contract on the basis of which any lien (commonly called a mechanic's or materialman's lien) has been or
can be filed and/or perfected under the laws of Florida for work done or materials, machinery, or equipment
furnished to said land, building, structure, machinery, equipment, property or facilities or any part thereof of the
Owner, except as set forth in Item 8 hereinafter.

4. The Contractor does hereby agree to indemnify and hold harmless the Owner against any loss, cost or damage
arising out of the Contract by reason of the placing or filing or perfecting and enforcement of liens, against said real
estate and the structures thereon by subcontractors or by laborers or materialmen of the Contractor or of any
subcontractor of the Contractor.

5. It is further certified that all federal taxes required to be withheld from employees of the Contractor have been
withheld in the manner provided by law.

6. All vouchers, receipts and other evidence of payment with respect to claims of third persons against the Contractor,
arising out of, connected with or resulting from performance of the Contractor of his obligations under the Contract
are in the possession of the undersigned and cover all claims of every description, kind or nature forming the basis
for a mechanic's or materialman's lien against said property of Owner up to and including the date of this affidavit.

7. Receipt by the Contractor of the final payment under the Contract, or payments made in accordance with Item 8,
shall constitute a full release and discharge of the Owner by the Contractor from any and all claims of the Con-
tractor against the Owner, arising out of, connected with or resulting from performance of the obligations of the
Contractor pursuant to the Contract.

8. Unpaid claims and liens which Contractor consents to (Owner paying from amount due under Contract are: (Atta. h separate schedule, if necessary).

Nature of Labor, Services or Material Furnished	Amount Due	Name of Subcontractor, Laborer or Materialman
_____	\$ _____	_____
_____	\$ _____	_____
_____	\$ _____	_____
_____	\$ _____	_____

9. Contractor is making this affidavit for the purpose of inducing Owner to make final payment of \$ _____ (See amounts set forth in Item 8, if any) to Contractor under the Contract and Chapter 64, Florida Statutes.

(Contractor)
By _____
Vice-President

Sworn to and subscribed before me this _____ day of _____ 19____

Notary Public/State of Florida, at Large.

My Commission Expires _____

INSTRUCTIONS FOR COMPLETING THIS AFFIDAVIT

1. Insert name of County where affidavit is signed.
2. The name of person in the second line of the affidavit should be the first name, middle initial and last name of the individual signing this affidavit.
3. If affidavit is signed by the President, strike the word "Vice" in the first line of Item 1 and under the "By" line in the signature space.
4. In "Company" space of Item 1, insert full name of the corporation; and in "State" space, insert the name of the State of its incorporation.
5. On first line of Item 2, in the case of a specific job Contract, insert date shown in the upper right hand corner of the Form OD-17 (A or B) Contract, and, in the case of a blanket or continuing Contract, insert date of the Purchase Order covering the job for which final payment is requested.
6. If no claim or lien unpaid, write None in Item 8.
7. Insert amount of final payment in Item 9, less amounts set forth in Item 8, if any.
8. In the signature spaces the name on the "Contractor" line should be the name as the name of the "Company" in Item 1 and the signature on the "By" line should be the same as that appearing in the second line of the affidavit.
9. Have Notary Public fill in, sign and seal where indicated.

FLORIDA POWER CORPORATION

CERTIFICATE OF INSURANCE

THIS IS TO CERTIFY THAT THE _____
INSURANCE COMPANY

of _____ has issued policies of insurance, as described below and identified by a policy number, to the insured named below; and to certify that such policies are in full force and effect at this time. It is agreed that none of these policies will be cancelled or changed so as to affect this Certificate until twenty (20) days after written notice of such cancellation or change has been delivered to the Florida Power Corporation.

1. Insured _____

2. Address _____

3. Status of Insured Corporation Partnership Individual

4. Location of Operations Insured — State of Florida Limited to the following specific job location(s) _____

INSURANCE POLICIES IN FORCE		
FORM OF COVERAGE	POLICY NUMBER	EXPIRATION DATE
5. WORKMEN'S COMPENSATION		
6. MANUFACTURERS' OR CONTRACTORS' LIABILITY		
7. CONTRACTUAL LIABILITY (Liability Assumed by Insured)		
8. AUTOMOBILE LIABILITY		

- | Policy(ies) Includes Coverage For: | Yes | No |
|--|--------------------------|--------------------------|
| (5) Liability under the United States Longshoremen's and Harbor Workers' Compensation Act. | <input type="checkbox"/> | <input type="checkbox"/> |
| (6) Damage caused by blasting, collapse or structural injury, or damage to underground utilities. | <input type="checkbox"/> | <input type="checkbox"/> |
| (7) Liability assumed in construction agreements and other types of contracts or agreements in effect in connection with the insured operations being performed for the Florida Power Corporation. | <input type="checkbox"/> | <input type="checkbox"/> |
| (8) All owned, hired, or non-owned automotive equipment used in connection with the insured operations. | <input type="checkbox"/> | <input type="checkbox"/> |

FORM OF COVERAGE	LIMITS OF LIABILITY	
	BODILY INJURY	PROPERTY DAMAGE
9. WORKMEN'S COMPENSATION	STATUTORY	XXXXX
10. LIABILITY OTHER THAN AUTOMOBILE	\$ Each Person \$ Each Occurrence	\$ Each Occurrence \$ Aggregate
11. LIABILITY — AUTOMOBILE	\$ Each Person \$ Each Occurrence	\$ Each Occurrence

Date _____

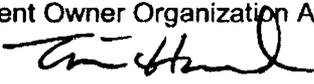
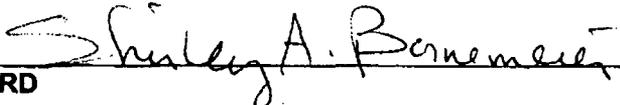
INSURANCE COMPANY

Issued at _____

AUTHORIZED REPRESENTATIVE

ATTACHMENT 4
 Sheet 1 of 1
 Administrative Hold Form

FORM RDC-NGGC-0002-4-15

L+P HOLD AUTHORIZATION	
1. Document Number: SP-182	2. Revision Number: 16
3. PRR/NCR/DRR/ECR Number (s): PRR 336366 NCR 336280	
4. Requestor Tim Howard	
5. Basis/Reason for HOLD Status Source document that justifies basis of L+P step 3.5.1.5 can not be located. This step specifies "No more than 3 adjacent tendons shall be detensioned ^{detensioned} at any given time without Engineering concurrence."	
6. Document Owner Organization Approval (Signature) 	7. Date 5/19/09.
8. Document Services Personnel (Signature) 	9. Date 5/22/09

QA RECORD

PROGRESS ENERGY
CRYSTAL RIVER UNIT 3
PLANT OPERATING MANUAL

SP-182

**REACTOR BUILDING STRUCTURAL INTEGRITY
TENDON SURVEILLANCE PROGRAM**

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These Enclosures are included for reference by the Surveillance Contractors Inspection Manual discussed in Section 4.0, Instructions.

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1.0 PURPOSE

The purpose of the Tendon Surveillance Program is to demonstrate the integrity of the containment prestressing system, including containment tendons, tendon end anchorage hardware, general and adjacent concrete integrity, and evaluation of the corrosion protective (grease) system. Individual inspections of selected tendons, as well as tendon wire and grease sample testing, are to be performed to the requirements of this procedure, to evaluate the overall integrity of the prestressing system.

2.0 REFERENCES

2.1 Developmental References

2.1.1 Technical Specification References

<u>Applicable References</u>	<u>Surveillance Performance During Modes</u>	<u>LCO/Other Requirements During Modes</u>
3.6.1	1 through 6	1, 2, 3, 4
SR 3.6.1.2	1 through 6	N/A
5.6.2.8	1 through 6	N/A
5.7.2	N/A	N/A

Frequency Notes:

Tendon surveillance was required at 1, 3, and 5 years after the Initial Containment Structural Integrity Test (SIT), and shall be performed every 5 years thereafter for the life of the plant. The 10 year and subsequent examinations shall commence not more than 1 year prior to the specified dates and shall be completed not more than 1 year after such dates.

2.1.2 Drawing References

2.1.2.1 Prescon Corporation - Tendons Drawings (series)

2.1.2.2 Swan Manufacturing Company - Conduit Drawings (series)

2.1.2.3 Reactor Building - Concrete Drawings (series)

2.1.3 Procedure References

2.1.3.1 CAP-NGGC-0200, Corrective Action Program

2.1.3.2 MNT-NGGC-0050, Measuring & Test Equipment Calibration Program

2.1.3.3 OPS-NGGC-1305, Operability Determinations

2.1.3.4 Compliance Procedure, CP-151, External Reporting Requirements

2.1.3.5 Administration Instruction, AI-400E, Performance and Transmittal of Procedures

2.1.3.6 Administration Instruction, AI-500, Conduct of Operations - Operations Department Organization and Administration

2.1.3.7 SAF-ESGX-00002, Energy Supply Fall Protection Procedure

- 2.1.3.8 Administration Instruction, AI-1803, Safety Standard for Ladders, Scaffolds, and Ancillary Equipment
- 2.1.3.9 Administration Instruction, AI-607, Pre-Job and Post-Job Briefings
- 2.1.4 Code and Standard References
 - 2.1.4.1 ASTM A421-65, Standard Specification for Uncoated Stress Relieved Wire for Prestressed Concrete
 - 2.1.4.2 ACI 201.1R-68, Revised 1984, Guide for Making a Condition Survey of Concrete Inservice
 - 2.1.4.3 ASTM D512, Standard Test Methods for Chloride Ion in Water
 - 2.1.4.4 ASTM D992, Standard Test Methods for Nitrite-Nitrate in Water
 - 2.1.4.5 APHA 427, Standard Methods for Examination of Water and Waste Water
 - 2.1.4.6 ASTM D95, Standard Test Method for Water in Petroleum Products and Bituminous Materials by Distillation
 - 2.1.4.7 ASTM D974 (Modified), Standard Test Method for Acid and Base Number by Color-Indicator Titration
- 2.1.5 Other References
 - 2.1.5.1 SAF-PGNF-00065, Accident Prevention Manual
 - 2.1.5.2 Surveillance Contractor operating manuals and calibration charts for hydraulic stressing jack, pumps, and controls.
 - 2.1.5.3 Dome, Vertical and Hoop Tendon History Sheets
 - 2.1.5.4 Precision Surveillance Corporation, Inservice Inspection Manual N1002 for Florida Power Corporation - Crystal River Unit 3 Nuclear Station.
 - 2.1.5.5 SP-182, Reactor Building Structural Integrity Tendon Surveillance Program, Revision 13, and past surveillance results.
 - 2.1.5.6 Information Notice 99-10, Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments.
- 2.1.6 Regulatory and Code Document References
 - 2.1.6.1 U.S. Regulatory Guide 1.35, Revision 3, July 1990, Inservice Inspection of UngROUTED Tendons in Prestressed Concrete Containments
 - 2.1.6.2 Section XI of the ASME Boiler and Pressure Vessel Code, Subsection IWL, Requirements for Class CC Concrete Components of Light-Water Cooled Plants, 1992 Addenda of the 1992 Edition as amended by 10CFR50.55a, Codes and Standards
- 2.1.7 Design Analysis/Calculation References
 - 2.1.7.1 Calculation S-95-0082, Preparation of Tendon Force Curves for 6th Tendon Surveillance

- 2.1.7.2 Calculation S-80-0002, Required Minimum Average Tendon Forces
- 2.1.7.3 Calculation S-01-0019, Preparation of Tendon Force Curves for the 7th Tendon Surveillance at Crystal River.
- 2.1.7.4 Calculation S-07-0033, Preparation of Tendon Force Curves for the 8th Tendon Surveillance at Crystal River

3.0 PERSONNEL INDOCTRINATION

3.1 Setpoints

None

3.2 Description

The Containment Tendon Surveillance Program defined in this SP-182, including inspection frequencies, and acceptance criteria, complies with the requirements from the 1992 addenda of the 1992 Edition of ASME Section XI, Subsection IWL and the applicable amendments as specified in 10CFR50.55a, Codes and Standards.

The Tendon Surveillance Program is usually conducted during an outage. However, it may be conducted periodically during plant operation. For the surveillance during plant operation, special precautions must be taken to avoid work in hazardous areas resulting from plant operating conditions. This includes the steam vent zone outside and between buttresses 1 and 3, and areas inside the plant where radiological or other safety hazards must be considered. Also, any potential impact or effects on safety related systems and equipment in the immediate vicinity of the surveillance activity must be considered.

For surveillance periods during plant outages, the effects of heavy load drops must be considered for all surveillance work performed over the fuel pool area during the period when fuel pool missile shields have been removed for fuel transfer.

3.2.1 Tendon Selection

Eleven tendons shall be selected for each surveillance period consisting of 5 hoop tendons, 3 vertical tendons, and 3 dome tendons.

Inspections performed at 1, 3, 5, 10, 15, 20 and 25 years after the initial SIT have indicated no abnormal degradation of the post-tensioning system. Therefore, the number of tendons selected for subsequent surveillances complies with ASME Section XI, Subsection IWL, in that at least 2% of the population of each group of tendons (hoop, vertical and dome), or 5 tendons, whichever is less, with a minimum of 3 tendons in each group, will be included.

It will not be necessary to enter the Reactor Building at any time during Tendon Surveillance Program activities. Access to the vertical tendon upper anchorage is from the top of the ring girder and access to the lower anchorage is from the tendon gallery. In instances where a tendon is not accessible or acceptable for lift-off tests, Engineering Technical Services will be notified. If the tendon was identified to be inspected it will be exempted from this surveillance and Engineering will select an alternate tendon as close as possible to the original tendon. The exempted tendon will be inspected per IWL-2524 and IWL-2525 to the extent that the anchorage areas are accessible either during operation or at an outage. If the tendon was an adjacent tendon, Engineering will select the closest neighboring tendon and adjacent (excluding the reduced force tendons, see Enclosure 6: Reduced Force Dome Tendons).

3.2.2 Hold Points

The "Hold Points" identify steps beyond which work will not proceed until an inspection is performed by a qualified Nuclear Quality Control Inspector. The Site Project Manager for the surveillance, or his designee, must notify the Nuclear Quality Control Supervisor, or his designee, at each "Hold Point".

3.2.3 End Cap Removal and Inspection

The end cap will be removed and inspected for any moisture or free water. If free water is present, samples will be taken for later testing. Two grease samples will be collected from each tendon end for the testing laboratory, see Section 3.2.9: Laboratory Testing. If the end cap shows signs of corrosion it will be cleaned of all grease and sent to the Site Paint Shop for cleaning and re-painting by CR3. The tendon anchorage areas, including the bearing plates and shims, will be inspected for corrosion or other signs of deterioration. The anchorage assembly will be inspected for missing buttonheads, missing, broken, and/or damaged wires or other obvious defects. The degree of corrosion will be compared with that noted at the time of installation or previous tendon surveillance inspections. The thickness of the shim pack will also be measured.

The concrete in the area surrounding the tendon anchorage assembly will be inspected for any large spall, severe scaling, D-cracking (as defined in ACI-201.1R-68), other surface deterioration or disintegration, or grease leakage. Engineering will be notified if any cracks are measured to be wider than 0.010 inch.

In addition to the end caps for the selected tendons, all accessible end caps of the remaining tendons shall be visually inspected for significant grease leakage or end cap deformation.

3.2.4 Lift-Off Measurements

Lift-off will be determined by the following method:

The jacking pressure will be applied to the anchor head until lift-off is achieved. (Note: The jacking force will not exceed 1721 kips based on 163 available wires.) After achieving lift-off 2 feeler gauges (0.030 inch) shall be inserted about 180 degrees apart, between the anchor head washer and the shim. The pressure will then be reduced to transfer the load back to the shim stack. Pressure will be applied to the tendon until the feeler gauges can be pulled out with some effort.

3.2.5 Detensioning

Tendons to be detensioned are listed in Enclosure 2: Identification of Surveillance Tendons - Inspection Period 8. The control tendon shall not be detensioned unless required due to failure to meet acceptance criteria. If it must be detensioned a new control tendon, of the same type, will be selected. The jacking pressure will be increased until the shims can be removed, not exceeding a force of 1721 kips (based on 163 available wires). All buttonheads will be visually inspected for off-size, cracked, and missing heads. Also the anchorage assembly will be inspected for missing, broken, and/or damaged wires. The degree of corrosion will be compared with that noted at the time of installation or previous tendon surveillance inspections.

3.2.6 Wire Removal

Tendons selected for a physical condition test are noted in Enclosure 2: Identification of Surveillance Tendons - Inspection Period 8. One random wire will be removed while the tendon is completely detensioned. Any wires identified as broken will be removed and handled the same as the random wire sample. The wire will be measured and inspected for pitting, corrosion, or other signs of deterioration. If there are areas of significant pitting or loss of area on any wire, Engineering will be notified and will determine the course of action. A minimum of 3 samples will be taken for the testing laboratory (see Section 3.2.9: Laboratory Testing). A sample from each end, and one from the middle will be obtained. A fourth sample will be cut from the area of most significant corrosion or pitting, if it exists. The length of each sample shall be the maximum length acceptable for the test apparatus to be used by the testing laboratory.

3.2.7 Retensioning

Tendons to be retensioned shall be stressed to 80% of the minimum ultimate tensile strength of the available wires in the tendon (1868 kips for a 163 available wire tendon). This is performed to minimize the frictional effects on the forces in the overall tendon. During retensioning of the tendon, the elongation of the tendon wires shall be measured and recorded along with the corresponding force at 3 equally spaced intervals. The stressing force will then be reduced to the accepted lift-off or BASE Value (100% value) for final lock-off with a tolerance of -0% to +6%.

At the conclusion of retensioning, all buttonheads will be visually inspected for cracked and/or missing heads. Also, the anchorage assembly will be inspected for broken and/or damaged wires.

3.2.8 Tendon Regreasing

Once all inspections are completed on a tendon the end cap will be replaced with a new O-ring. If any scratches, nicks, and other sharp depressions are present in the gasket bearing surface, a nonmetallic epoxy will be used to repair them prior to end cap installation. The tendon will then be filled with grease.

The grease will be pumped at a minimum temperature of 130°F, but not greater than 210°F. The pressure will not exceed 55 psi at the filler end of the hoop, dome and upper vertical tendon grease cap. The pressure at the lower vertical grease cap will not exceed 125 psi. Engineering will be notified when the absolute difference between the amount of grease removed and the amount of grease pumped is equal to 5% of the net duct volume for a given tendon. Pumping can continue up to 20 gallons beyond this point under Engineering approval.

3.2.9 Laboratory Testing

Testing laboratories qualified by the Surveillance Contractor's Quality Program will be required to perform the following services for this procedure:

- inspect wires for corrosion and other defects
- perform required tensile tests for yield strength, ultimate tensile strength, and elongation
- test bulk filler grease samples for chlorides, sulfides, nitrates, reserve alkalinity, and water content
- test free water samples for pH level

In the event that the testing laboratory finds a wire with significant pitting or loss of area, Engineering will determine the required course of action. An acceptable course of action would be to remove additional wires from the applicable surveillance tendons to be inspected to determine the extent and cause of change. However, each tendon shall have at least 155 wires which meet the acceptance criteria of Enclosure 8, Criteria and Categories for Rating Degrees of Corrosion on Tendon Anchorage Assemblies and Selected Wires, and Enclosure 9, Criteria for Missing, Broken, and/or Damaged Wires.

One grease sample will be sent to the testing laboratory while the remaining sample is held by the surveillance contractor or CR3 for possible confirmation testing.

3.3 Definitions

- 3.3.1 Adjacent Tendons - Adjacent or adjoining tendons are usually on each side of a selected tendon. Reduced Force Dome Tendons, Enclosure 6, are not considered adjacent tendons for a normal selected dome tendon. The next immediate normal tendon shall be considered the adjacent tendon. For hoop tendons located at the very bottom or top of a grouping, the next 2 tendons directly above or below, respectively, are considered the adjacent tendons.
- 3.3.2 Anchor Head (stressing washer) - round flat piece of steel that the tendon buttonheads bear.
- 3.3.3 Anchorage - components that distribute the forces in the tendon to the concrete containment structure.
- 3.3.4 BASE or BASE Curve (Predicted) - A plot of the predicted tendon force versus time accounting for prestress losses based on the criteria provided in Regulatory Guide 1.35.1, Revision 0.
- 3.3.5 Bearing Plate (baseplate) - steel plate embedded in the concrete containment that the anchor head transfer the tendon load to.
- 3.3.6 Buttonhead - the end of the tendon wire that transfers the tendon load to the anchor head.
- 3.3.7 Corrosion Protection Medium (grease, filler material) - wax and oil compound that fills the tendon cavity to protect against corrosion.
- 3.3.8 Elongation - the distance that a tendon wire stretches under load.
- 3.3.9 End Cap - steel container that protects the tendon anchorage and is bolted to the bearing plate.
- 3.3.10 Free Water - moisture of a quantity that is observed collected or draining out from the end cap during inspection.
- 3.3.11 Hold Point - point beyond which work will not proceed until an inspection is performed and sign-off by a qualified Nuclear Quality Control Inspector.
- 3.3.12 Lift-Off - the force (or pressure) required to separate the anchor head from the shim stack.
- 3.3.13 Lock-Off - the force (or pressure) when the tendon load is transferred to the shim stack.

- 3.3.14 Minimum Required Prestress Levels - Average prestress force levels which satisfy the design load conditions for maintaining the structural integrity of the containment. Force levels for this average prestress condition are 1215 kips for the dome tendon group, 1149 kips for the vertical tendon group, and 1252 kips for the hoop tendon group.
- 3.3.15 Normalization Factor - Factors for each individual tendon which are based upon the original tendon stressing sequence of installation. The normalization factor accounts for the effects of elastic shortening.
- 3.3.16 Overstress - the force (or pressure) that is approximately the yield strength of the tendon (80% of the minimum ultimate tensile strength).
- 3.3.17 Pit - An indentation visible to the unaided eye. A pit is caused by corrosion and is not the result of mechanical damage to the wire.
- 3.3.18 Ram - hydraulic jacking device used to apply force to a tendon.
- 3.3.19 Sheathing (cavity, conduit, duct, void) - thin-walled pipe in the concrete containment that the tendon wires pass through.
- 3.3.20 Shims - steel plates inserted between the anchor head and the bearing plate.
- 3.3.21 Stressing Adaptor (coupler) - threaded device that connects the ram to the anchor head.
- 3.3.22 Tendon - name for combination of wires and anchor heads.
- 3.3.23 Tendon Identification Number - the numbering convention for locating the tendons:
 Dome: D xxx where:
 Vert: y V xx xxx or xx = sequence numbers
 Hoop: yz H xx y or z = buttress numbers
- 3.3.24 Trumpet - the portion of the sheathing connected to the bearing plate (larger diameter than the sheathing).
- 3.3.25 Wire - 7 mm diameter wire.

3.4 Responsibilities

- 3.4.1 Surveillance Contractor - This procedure is designed and written for work to be performed by an experienced Surveillance Contractor. The Surveillance Contractor, Precision Surveillance Corporation for the 8th Tendon Surveillance shall be responsible for assuring that all individuals under its supervision are properly trained in the use of this procedure, their inspection manual and associated equipment. The work supervisor is responsible for performance of the step by step instructions of this procedure, and their inspection manual - and for assuring that work is completed satisfactorily and QC is notified for data collection/inspection steps.
- 3.4.2 Site Project Manager - Responsible for coordinating site support activities for the Surveillance Contractor.
- 3.4.3 Engineering Technical Services, or its designee - Is responsible for providing technical support and for the evaluation and disposition of problems as identified during the surveillance. This includes responsibility for the general walkdown and inspection of the containment, and for the documentation of the results of this inspection.

- 3.4.4 Nuclear Quality Control (NQC) Supervisor, or designee - Is to be notified at each "Hold Point" within this procedure and is responsible for providing the required QC inspection personnel.
- 3.4.5 Nuclear Quality Control Inspector - Is responsible for performing QC inspections as indicated within this procedure, and for the recording and documentation of all inspections. The QC Inspector is responsible for providing the documented approval to proceed at each "Hold Point".
- 3.4.6 Responsible Engineer (RE) - A Registered Professional Engineer experienced in evaluating the in-service condition of structural concrete. The RE is responsible for development of inspection procedures, approval of examination personnel, evaluation of results, and the preparation of repair procedures.

3.5 Limits & Precautions

3.5.1 General

- 3.5.1.1 Work must be in compliance with the safety requirements of OSHA, and CR3 procedures and policies.
- 3.5.1.2 Missile shields shall be in place over Spent Fuel Pool "A" during surveillance activities for applicable tendons, if any, as designated in Enclosure 2: Identification of Surveillance Tendons Inspection Period 8, unless all equipment has been secured/rigged in accordance with NUREG-0612.
- 3.5.1.3 Missile shields shall be in place when moving any platforms and/or stressing rams over Spent Fuel Pool "A", unless all equipment has been secured/rigged in accordance with NUREG-0612.
- 3.5.1.4 Dome tendons listed in Enclosure 6, Reduced Force Dome Tendons, are not acceptable for normal lift-off testing; therefore, they shall not be substituted as adjacent tendons.
- 3.5.1.5 No more than 3 adjacent tendons shall be detensioned at any given time without Engineering concurrence.
- 3.5.1.6 During plant operation, work cannot be performed in the area between buttress numbers 1 and 3 (see Enclosure 3: Dome Tendon Locations Plan - Inspection Period 8). This is to avoid potential exposure to high pressure steam from the steam vents.
- 3.5.1.7 For work located in Radiation Controlled areas, due consideration must be given to the ALARA program. This may result in a determination that special preparation and/or precautions are necessary.

3.5.2 Filler Material

- 3.5.2.1 A certified test report bearing 2 signatures for the grease specified in Step 3.7.1.25 is required. The water soluble chloride and sulfide content must not exceed 2 ppm. The water soluble nitrate content must not exceed 4 ppm.
- 3.5.2.2 The reuse of filler material in the end cap is acceptable provided a Surveillance Contractor supplied procedure for reuse is accepted by CR3. All grease drained or removed from the anchorage area and tendon cavity shall be disposed of as waste grease.
- 3.5.2.3 Care must be taken when removing the end cap since the filler material may drop off or drip as a medium viscous liquid.

- 3.5.2.4 At the lower anchorage, the entire column of filler material may drain from the tendon during end cap removal.
- 3.5.2.5 Samples of the grease shall be taken prior to cleaning of the anchorage area.
- 3.5.2.6 Do not use metal implements to remove filler material from around the anchorage. Wooden or plastic instruments may be used.
- 3.5.2.7 Grease temperatures within the 55-gallon drum must not exceed 210°F.
- 3.5.3 Equipment
 - 3.5.3.1 Calibration of all equipment used to measure tendon force shall be done in accordance with a calibration procedure prior to the first tendon force measurement and after the final tendon force measurement. Accuracy of the calibration shall be within 1.5% of the specified minimum ultimate strength of the tendon. Calibration of all measuring devices must be signed, dated, and traceable to the National Institute of Standards and Technology (NIST) documentation.
 - 3.5.3.2 Verification of calibration of the stressing jack-pressure gauge systems must be checked daily against a master pressure gauge which is used only for this purpose.
- 3.5.4 Inspection and Testing
 - 3.5.4.1 "Hold Points" must be verified by a qualified NQC Inspector(s) to comply with the requirements of Appendix B, Criterion X of 10CFR50.
 - 3.5.4.2 Provide sufficient manpower to remove the end caps. The weight of each end cap with grease is about 225 lbs.
 - 3.5.4.3 Once the inspection of a given tendon end has begun, it should be completed as soon as possible to avoid unnecessary exposure of the anchor head.
 - 3.5.4.4 Do not leave the anchorage area and the end cap unprotected when work is not being performed. Tendon anchorages which have been cleaned of grease for an inspection shall be protected by applying a coat of grease to all exposed surfaces prior to the temporary or permanent installation of the end cap.
 - 3.5.4.5 During inclement weather, provide protection to prevent moisture from entering the end anchorage.
 - 3.5.4.6 The Surveillance Contractor shall confirm that the proper stressing adaptor is attached to the anchor head prior to stressing the tendon.
 - 3.5.4.7 Do not stand behind hydraulic jack while stressing a tendon.
 - 3.5.4.8 Exercise extreme caution if fingers or hands are required near the tendon anchor head during testing.
 - 3.5.4.9 Do not exceed a jack force of 1721 kips (based on 163 available wires) during the tendon stressing without NPTS concurrence, except as stated in Step 3.2.7: Retensioning.
 - 3.5.4.10 Do not detension either tendon end until lift-off has been determined for both ends of a hoop or dome tendon (vertical tendons are detensioned at top end only). Lift-off for each end may be determined on separate days.

- 3.5.4.11 Detensioning of each tendon end may proceed independently of the other end. However, jacks must not be uncoupled until the tendon is completely detensioned. To alleviate holding jacks under pressure for periods of time, it is recommended that both ends of a tendon be detensioned in unison. This should assist in correct positioning of the anchor head washer.
- 3.5.4.12 Vertical tendons are detensioned from the top end only, which is the shop end of the tendons. All inspection requirements apply to both top and bottom anchorages.
- 3.5.5 Wire Removal
- 3.5.5.1 Verify that all lift-off force measurements and detensioning is complete prior to wire removal.
- 3.5.5.2 Perform necessary measures when removing and handling tendon wires to preclude wire damage such as scratches, kinks, etc., and to preclude the accumulation of dirt or other contaminants on the surface of the wire.
- 3.5.5.3 The Surveillance Contractor shall carefully clean removed tendon wires just prior to visual inspection and packaging for delivery to the testing laboratory.
- 3.5.5.4 Do not stand directly in front of either end of the tendon when a wire is to be cut since some tendons may not be completely detensioned.
- 3.5.6 Retensioning
- 3.5.6.1 The Surveillance Contractor shall confirm that the proper stressing adaptor is attached to the anchor head prior to stressing the tendon.
- 3.5.6.2 Both ends of a hoop or dome tendon shall be retensioned simultaneously in a controlled manner. Maintain approximately the same elongation on both ends of the tendon.
- 3.5.6.3 It is important that when stressing from both ends that the crew's operation in stressing be coordinated so that a rapid stressing unit does not outpace a slower stressing unit. Ideally, the target gauge pressures must meet at the same time.
- 3.5.6.4 Vertical tendons only require retensioning from the top of the tendon.
- 3.5.7 End Cap Installation
- 3.5.7.1 Detrimental foreign matter (if present) such as loose mill scale, loose rust, loose or flaking paint on the gasket bearing surface can be removed with power tools.
- 3.5.7.2 A thread chaser may be required to clean the grease cap mounting holes.
- 3.5.7.3 All temporary tubes used for filling the end cap with grease, shall be removed.
- 3.6 **Acceptance Criteria**

NOTE

Contingency actions for non-compliance with the following acceptance criteria are provided in Section 5.2: Contingencies.

- 3.6.1 All documentation has been satisfactorily completed, including all required signatures and dates.

- 3.6.2 Abnormal conditions determined as the result of a visual inspection of the exterior concrete surface of the containment shall be recorded and documented, and investigated by Engineering for possible degradation of the structure.
- Cracks found in concrete adjacent to the tendons (within 2 feet of the bearing plate) having widths greater than 0.010 inch shall be recorded and reported to Engineering for evaluation and resolution. Any crack widths greater than 0.050 inch shall be cause for investigation by Engineering to determine the cause and if there is any abnormal degradation of the structural integrity of the containment.
- 3.6.3 The wire tensile test shall have no failure below the minimum guaranteed ultimate stress of 240,000 psi. The breaking strength of the sample shall be greater than the minimum breaking strength for the wire diameter shown on Enclosure 11: Minimum Wire Break Strengths. Elongation shall meet or exceed the minimum required value for the tendon material. Wire corrosion indicative of metal reduction shall not be present.
- 3.6.4 Acceptance criteria for tendon force shall be as defined in Steps 3.6.4.1 through 3.6.4.6.
- 3.6.4.1 IF the measured prestressing force of the selected tendon in a group lies above the BASE value, or is equal to or greater than 95% of the BASE value (as defined in reference 2.1.7.3),
THEN the lift-off test is acceptable for that selected tendon.
- 3.6.4.2 IF the measured prestressing force of a selected tendon in a group is less than 95% but greater than or equal to 90% of the BASE value,
THEN two adjacent tendons shall be checked for their prestressing forces.
IF the measured prestressing forces of each of the second and third tested tendons are equal to or greater than 95% of their BASE value,
AND the measured prestressing force in all remaining tendons in a group are equal to or greater than 95% of their BASE value,
THEN all three tendons shall be restored to their required BASE value of prestress and the three tendons shall be considered acceptable.
- 3.6.4.3 IF the measured prestressing force of any two adjoining tendons falls below 95% of their BASE values,
THEN Engineering shall initiate an investigation into the causes of the occurrence. This condition is unacceptable.
- 3.6.4.4 IF the measured prestressing force of the selected tendon lies below 90% of the BASE value,
THEN the tendon shall be considered defective. Engineering shall initiate an investigation, and determine the extent and cause of such occurrence and the required course of action to be taken. This condition is unacceptable.
- 3.6.4.5 The normalized average of all measured tendon forces for each tendon group (i.e., dome, vertical, hoop) shall be greater than the minimum required prestress level for that group (as defined in Step 3.3.14). Engineering shall review and disposition any conditions where this is not met.
- 3.6.4.6 Engineering shall review the results and trends of the measured prestress forces from consecutive surveillances.
IF it is determined that the trend of prestress loss for individual tendons, or for any of the three groups of tendons is larger than expected,
THEN Engineering shall determine the cause and extent of such occurrence.
IF this trend indicates that the resulting prestress forces will be less than the minimum

required prestress forces prior to the next scheduled surveillance, THEN additional testing and evaluation shall be performed prior to the completion of the current surveillance to determine the cause and extent of such occurrence. This condition is unacceptable.

- 3.6.5 Acceptance criteria for sheathing filler samples shall be as defined in Steps 3.6.5.1 through 3.6.5.6.
- 3.6.5.1 Water content shall not exceed 10% by weight.
- 3.6.5.2 Water soluble chlorides, nitrates, and sulfides shall not exceed 10 ppm.
- 3.6.5.3 Reserve alkalinity (base numbers) shall not be less than 50% of the installed value or less than zero when the installed value was less than 5. If the tendon duct is filled with a mixture of materials having various as-installed base numbers, the lowest number shall govern acceptance.
- 3.6.5.4 The absolute difference between the amount of grease removed and the amount of grease replaced on a given tendon shall not exceed 10% of the net duct volume.
- 3.6.5.5 Any grease leakage determined as a result of surveillance inspection activities shall be investigated and repaired using an Engineering approved procedure.
- 3.6.5.6 Presence of free water shall be measured, sampled and documented and evaluated by Engineering.
- 3.6.6 During detensioning and retensioning of tendons, if the elongation corresponding to a specific load differs by more than +/- 10% from that recorded during installation an investigation shall be made by Engineering to ensure that the difference is not related to wire failures or wire slips in anchorages. This condition is unacceptable.

3.7 **Prerequisites**

3.7.1 Equipment

The equipment items listed in this section are recommended for implementation of this inspection.

- 3.7.1.1 Mobile crane with sufficient capacity and boom length to perform all necessary lifts of equipment and materials into position for surveillance activities.
- 3.7.1.2 All platforms and rigging, scaffolding, hoisting equipment, and accessories for access to the tendons and for performance of all surveillance work.
- 3.7.1.3 Two hydraulic stressing jacks (ram) having a loading capacity of 1000 tons with stressing pumps, pressure gauges, controls, and adjustable ram support device. The range and divisions of the pressure gages must be such as to permit reading of a 1000 ton force within an accuracy of +/- 2%.
- 3.7.1.4 Portable metal scaffolds as required.
- 3.7.1.5 Portable platform or plywood to be used for supporting the tendon end cap when removed (2 feet x 2 feet minimum).
- 3.7.1.6 Grease pump, transmission lines, various fittings, etc., connected to 55-gallon drum, equipped with heating system to heat grease to a temperature between 130°F and 210°F.

- 3.7.1.7 Containers, such as 55-gallon drums, to hold bulk filler grease removed from end anchorages during inspection.

NOTE

Permanent 480 volt electrical outlets exist on the top surface of the ring girder. There are five 480V, 3 phase receptacles on top of RB roof. Power provided by vent MCC 3a (MTMC-10) unit 5br located in IB119. See drawings 209-064, 209-131 sh 3 and 215 series for the one labeled RB160 South.

- 3.7.1.8 Electrical cables or heavy duty extension cords as necessary for lights, hydraulic stressing jack pumps, and other miscellaneous power tools.
- 3.7.1.9 Portable lights for illuminating tendon anchorage assemblies during check for corrosion and defects.
- 3.7.1.10 A set of portable communications equipment for communicating between crews at each end of the tendon being inspected.
- 3.7.1.11 Feeler gages (required range of blade sizes: 0.025 inch to 0.035 inch by 0.001 inch increments).
- 3.7.1.12 Optical comparators with 0.005 inch accuracy for measuring crack widths in concrete.
- 3.7.1.13 Grid paper for showing crack patterns.
- 3.7.1.14 Magnifying glass, 5X.
- 3.7.1.15 Temperature gauge(s) with a range of 0°F to 300°F and an accuracy of +/- 2% of full scale.
- 3.7.1.16 Wrenches to remove grease can hold down studs (3/4") and nuts.
- 3.7.1.17 Extraction tool for removing wires subject to tensile tests.
- 3.7.1.18 Come-along hoist for applying force to wire extraction tool in Step 3.7.1.17 (or similar device).
- 3.7.1.19 Torque wrench for end cap replacement, 40 ft-lb through 75 ft-lb minimum capacity.
- 3.7.1.20 Six-foot diameter wire coiler to coil the removed wire.
- 3.7.1.21 Small portable power tools (e.g., electric drill, saw, etc.) as required.
- 3.7.1.22 Wire cutters to cut wires 3/8" diameter (maximum).
- 3.7.1.23 Wire brush.
- 3.7.1.24 Steel hand hammer (approximately 24 oz.).

NOTE 1

The quantity is an estimate only; more or less may be required.

NOTE 2

The grease supplier must be acceptable to CR3 and qualified by the Surveillance Contractor's Quality Program for approving subcontractors and material suppliers.

NOTE 3

A certified test report bearing two signatures for the grease is required, indicating the water soluble chloride, sulfide, and nitrate content. The tests must be in accordance with the references specified in Section 2.1.1: Codes and Standard References. The water soluble chloride and sulfide content must not exceed 2 ppm and the water soluble nitrate content must not exceed 4 ppm.

NOTE 4

The reuse of grease from the end cap is acceptable provided a vendor-supplied procedure for reuse is accepted by CR3 in writing.

3.7.1.25

An appropriate quantity of certified filler grease (Visconorust 2090-P4 or latest approved compatible formulation, by Viscosity Oil Company).

NOTE

Chemical composition of solvent must be certified to meet requirements for Viscosity #16.

3.7.1.26

Solvent that can be used for removing grease from around tendon anchorage and cleaning any stained concrete (Viscosity #16 solvent by Viscosity Oil Company, or equal solvent certified to meet the requirements for Viscosity #16, as approved by CR3).

NOTE

Specifications of replacement materials delineated in Steps 3.7.1.27 through 3.7.1.31 shall be the same as those of the original items.

3.7.1.27

New O-rings for hoop, dome, and upper vertical tendon end caps (1/2" dia., 60 durometer, neoprene or nitrile base rubber, 14-1/2" ID x 15-1/2" OD).

3.7.1.28

New O-rings for lower vertical tendon end caps (5/8" dia. 60 durometer, neoprene or nitrile base rubber, 15-3/8" ID x 16-5/8" OD).

3.7.1.29

3/4" dia x 4-1/2", 10 TPI, material ASTM A193 Grade B7 studs, hex nuts (ASTM A194 Grade 2H), and washer assemblies.

3.7.1.30

3/4"-10 thread per inch thread chaser.

NOTE

Quantity is estimate only; more or less may be required.

- 3.7.1.31 Wire split increment shims of various thicknesses, recommended quantity and sizes: 30 sets 3/16", 25 sets 1/4", 20 sets 3/8", 20 sets 1/2". Material to be ARMCO VNT single normalized ASTM A633, Grade E or equal.
- 3.7.1.32 Supply of clean rags for cleanup with solvent around anchorages.
- 3.7.1.33 Wooden or plastic paddles or spatulas to scoop out bulk filler grease from around the anchorage assembly.
- 3.7.1.34 Carbo Zinc 11, zinc-filled inorganic coating (made by Carboline Co., or equal, as determined by the NPTS and the manufacturer).
- 3.7.1.35 Non-metallic Epoxy.
- 3.7.1.36 Any other miscellaneous material and tools as required.
- 3.7.2 Initial Conditions
 - 3.7.2.1 Perform a Pre-Job Briefing for each new crew/shift in accordance with AI-607, Pre-Job and Post-Job Briefings. This briefing is required once at the start of the work by that crew. Also, notify the Control Room Supervisor (or designee), at the beginning of each work day, that work is to begin on this procedure.
 - 3.7.2.2 Missile shields shall be in place over Spent Fuel Pool "A" during surveillance activities for those tendons indicated in Enclosure 2, Identification of Surveillance Tendons - Inspection Period 8, and as defined in Steps 3.5.1.2 and 3.5.1.3, unless all equipment has been secured/rigged in accordance with NUREG-0612. The Maintenance Manager or designee shall review all equipment setup and rigging to ensure NUREG-0612 requirements have been met prior to performing work activities which could impact the spent fuel pool without the missile shields installed.
 - 3.7.2.3 Read and understand the Limits & Precautions, Section 3.5.
 - 3.7.2.4 Read and understand the Description, Section 3.2.
 - 3.7.2.5 Ensure that all applicable equipment listed in Section 3.7.1, Equipment, is available and ready to be used.
 - 3.7.2.6 Ensure that there is adequate access to all tendon end caps of tendons that are to be tested (see Enclosure 2: Identification of Surveillance Tendons - Inspection Period 8).
 - 3.7.2.7 Ensure that the testing laboratory indicated in Step 3.2.9 is prepared to receive the wires.
 - 3.7.2.8 Ensure that the testing laboratory indicated in Step 3.2.9 is prepared to receive the grease and free water samples.
 - 3.7.2.9 Ensure references listed in Section 2.0, References, are available for use.
 - 3.7.2.10 Ensure that all personnel are familiar with the operating manuals of the equipment to be used during the inspection.

NOTE

Calibrated equipment must be re-calibrated at the end of the tendon surveillance program by the Post-Test Due Date in accordance with the requirements of that item.

3.7.2.11 Verify that stressing jacks, pressure gauges, comparators, and all other measuring devices have been calibrated per Step 3.5.3.1 and are in good working condition AND that calibrations are not expected to expire during the time period it will take to perform this surveillance.

IF the calibration is expected to expire prior to completing the surveillance, THEN have equipment re-calibrated prior to commencing the surveillance.

3.7.2.12 Notify the Radwaste Organization that waste grease will need proper disposal.

3.7.2.13 Notify the NQC Supervisor or his designee that work is to begin on this procedure.

4.0 INSTRUCTIONS

Refer to Precision Surveillance Corporation's Inservice Inspection Manual N1002 for the step-by-step instructions to be followed for the 8th Tendon Surveillance at Crystal River Unit #3.

Only "controlled" copies of PSC's In-Service Inspection Manual N1002 shall be used for the performance of this surveillance.

5.0 FOLLOW-UP ACTIONS

5.1 Restoration Instructions

5.1.1 System restoration is accomplished during performance of Section 4.0: Instructions.

5.1.2 Repair procedures shall be developed and performed in accordance with IWL-4000.

5.1.3 Post repair system pressure testing requirements shall be developed and performed in accordance with IWL-5000.

5.1.4 Reinstallation and replacement requirements of the post-tensioning system shall be developed and performed in accordance with IWL-7000.

5.2 Contingencies

5.2.1 IF the acceptance criteria of Step 3.6.4.5 is not met, AND engineering evaluation cannot ascertain acceptability of the containment tendons, THEN refer immediately to the "Action Statement" of Technical Specification 3.6.1, Containment, and Technical Specification 5.7.2, Special Reports.

5.2.2 IF any of the acceptance criteria of Steps 3.6.2, 3.6.3, 3.6.4.3, 3.6.4.4, 3.6.4.6, 3.6.5, and 3.6.6 are not met, THEN it shall be evaluated by Engineering per IWL-3300.

- 5.2.3 IF there is rejectable corrosion or pitting on the wire as defined in Enclosure 8, Criteria and Categories For Rating Degrees of Corrosion on Tendon Anchorage Assemblies and Selected Wires,
OR, if existing broken or unseated wires and/or detached buttonheads were not documented and accepted during a pre-service examination or during previous inspections,
OR, if the number of missing, broken, and/or damaged wires does not meet the criteria of Enclosure 9, Criteria For Missing, Broken, and/or Damaged Wires,
THEN each case shall be evaluated by Engineering per IWL-3300.
- 5.2.4 IF there is rejectable corrosion, pitting, or cracking, as defined in Enclosure 8, Criteria and Categories For Rating Degrees of Corrosion on Tendon Anchorage Assemblies and Selected Wires, on the tendon anchorage assembly,
THEN it shall be evaluated by Engineering per IWL-3300.
- 5.2.5 IF the post-test calibration of the equipment used to measure tendon force (Step 3.5.3.1) differs from the pretest calibration by more than the specified accuracy tolerance,
THEN the results of the examination shall be evaluated by Engineering.

5.3 Reports

5.3.1 Surveillance Contractors Report

A written report documenting the inspection results, laboratory test results and surveillance conclusions for each inspection period must be prepared and submitted to CR3 within 30 days of completion of the inspections and tests. The surveillance contractor's approved report and all data must be forwarded to Engineering.

5.3.2 Reportable Conditions

In the event that the acceptance criteria in Section 3.6 is not met, the Surveillance Contractor shall notify Engineering within 1 working day. Engineering shall follow the reporting process defined in CP-151: External Reporting Requirements (Step 2.1.3.5). If Engineering determines that there is abnormal degradation of the containment structure (based on the contingency actions in Section 5.2: Contingencies), CR3 shall submit a report to the NRC within 30 days of the current surveillance completion. This report shall include a description of the degradation, operability determination, root cause determination and the corrective action.

5.3.3 Procedure Closure

Upon completion of each Tendon Surveillance, Engineering is to ensure that SP-182 and Precision Surveillance Corporation Manual N1002 are transmitted to Records Management.

5.3.4 Evaluation Summary Report

A written summary report of the results and conclusions for each inspection period must be prepared within 90 days of the completion of the tests and inspections. The report shall also include items that did not meet the acceptance criteria and were evaluated by Engineering and address the following:

- the cause of the condition which did not meet the acceptance criteria
- the acceptability of the concrete containment without repair of the item
- whether or not repair or replacement is required and, if required, the extent, method, and completion date for the repair or replacement
- extent, nature, and frequency of additional examinations

This report shall be submitted to the NRC as part of the 90 ISI Summary Report.

IDENTIFICATION OF SURVEILLANCE TENDONS FROM PRIOR SURVEILLANCE PERIODS

	1ST SURVEILLANCE 11/77-2/78	2ND SURVEILLANCE 3/80-5/80	3RD SURVEILLANCE 9/81-12/81	4TH SURVEILLANCE 9/87-11/87	5TH SURVEILLANCE 11/93-1/94	6TH SURVEILLANCE 10/97-1/98	7TH SURVEILLANCE 08/01-12/01
DOME TENDONS 123 TOTAL 3 GROUPS OF 41 D100s, D200s, D300s	D139 D215 D221 D D228 D234 D340	D122 D140 D208 D D323 D331	D123 D125 D212 D322 D D329	D105 D D212 D328	D215 D231 D D224	D212 D304 D D113 D115 D311	D212 D339 D D126
VERTICAL TENDONS 144 TOTAL 6 GROUPS OF 24 12, 34, 56, 23, 45, 61	12V19 12V20 12V21 23V15 34V6 45V3 D 56V1	12V12 12V20 23V5 34V1 45V6 56V20 56V1 D	12V1 34V6 34V19 D 45V16 56V11 61V5	12V1 34V4 56V2 D	34V6 56V15 D 61V14	12V1 61V21 D 23V2	12V1 61V08 45V14 D
HORIZONTAL TENDONS 282 TOTAL 6 GROUPS @ 47 HIGH, 13, 24, 35, 46, 51, 62	13H10 13H19 13H37 13H47 51H11 62H9 64H21 64H29 64H37 D 64H46	13H22 13H32 D 13H43 51H10 51H23 51H37 53H24 53H28 53H44 64H42	13H19 13H46 42H20 42H40 51H26 51H45 53H35 53H40 62H34 64H10 D	13H20 13H40 D 51H26 51H41 64H19	34H1 42H1 46H21 46H28 46H29 D 46H30 D 46H47 62H8	51H26 42H18 42H32 42H44 53H2 62H41 D 62H46 53H46 42H49 42H30 42H31 42H33 42H34 42H35	46H21 46H36 53H16 D 62H02 62H13
TENDONS INSP.	23	22	21	11	14	22	11
TOTAL TENDONS = 549							
TOTAL TENDONS INSPECTED UP TO 7TH SURVEILLANCE = 124							

NOTE: For information only. These tendons were completed in past surveillance.
D – Designates a detensioned tendon.

IDENTIFICATION OF SURVEILLANCE TENDONS
INSPECTION PERIOD 8

SELECTED DOME TENDONS

D129 * **
D212 C
D238 D,*

ADJACENT TENDONS

D128, D130
D211, D213
D237, D239

SELECTED VERTICAL TENDONS

12V1 C **
45V20
61V17 D

ADJACENT TENDONS

61V24, 12V2
45V19, 45V21
61V16, 61V18

SELECTED HOOP TENDONS

46H21 C
42H46 **
13H36
62H30 **
51H34D **

ADJACENT TENDONS

46H20, 46H22
42H45, 42H47
13H35, 13H37
62H29, 62H31
51H33, 51H35

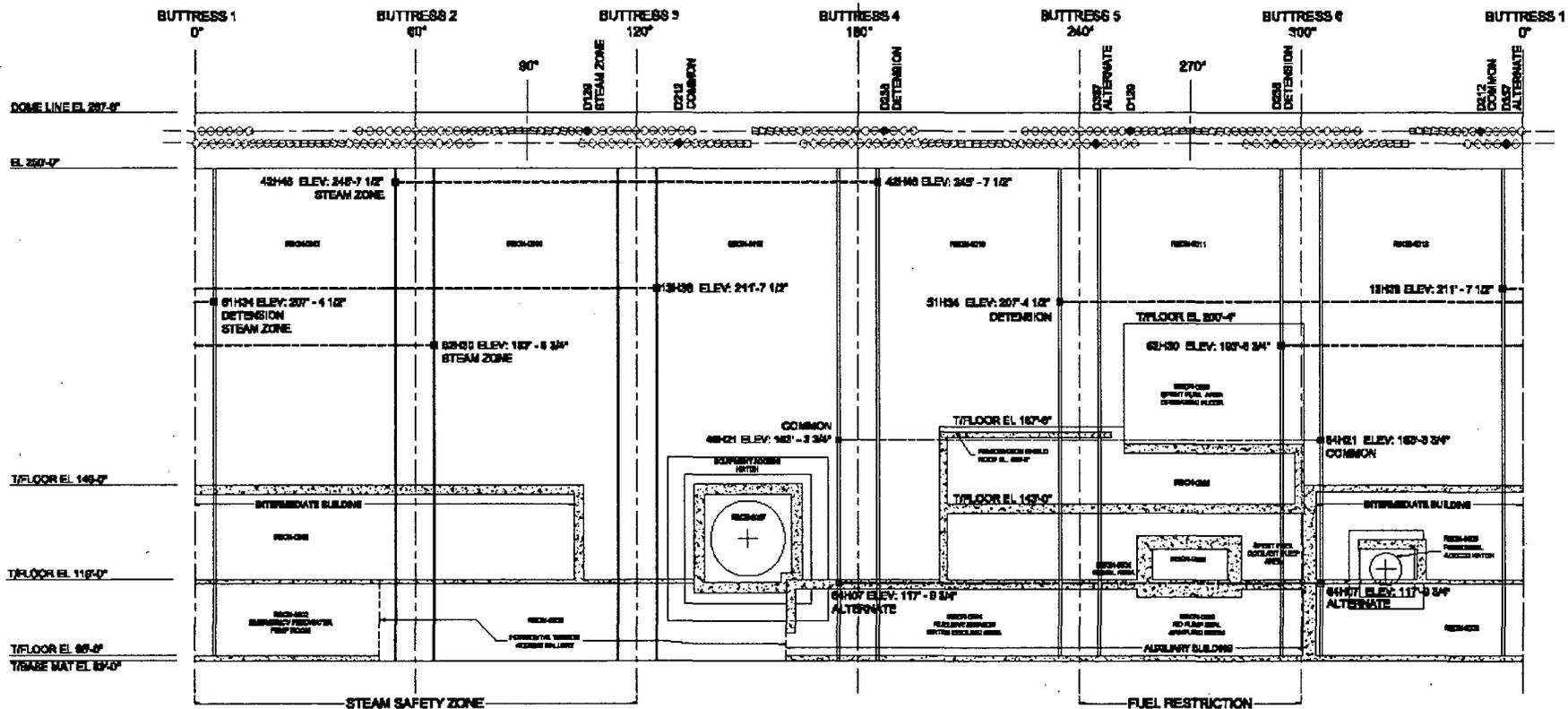
C Denotes selected control tendon.

D Denotes selected tendon for detensioning and wire removal. If removal of one wire from tendon would subject it to rejection per Enclosure 9, Criteria For Missing, Broken, and/or Damaged Wires, contact Engineering for a substitute tendon.

*Denotes tendons, if any, which must have missile shields in-place over Fuel Pool "A", per Step 3.7.2.2, unless all equipment has been secured/rigged in accordance with NUREG-0612.

**Denotes tendons, if any, located in the Steam Zone Region.

DOMES and HOOP TENDON LOCATION PLAN – INSPECTION PERIOD 8



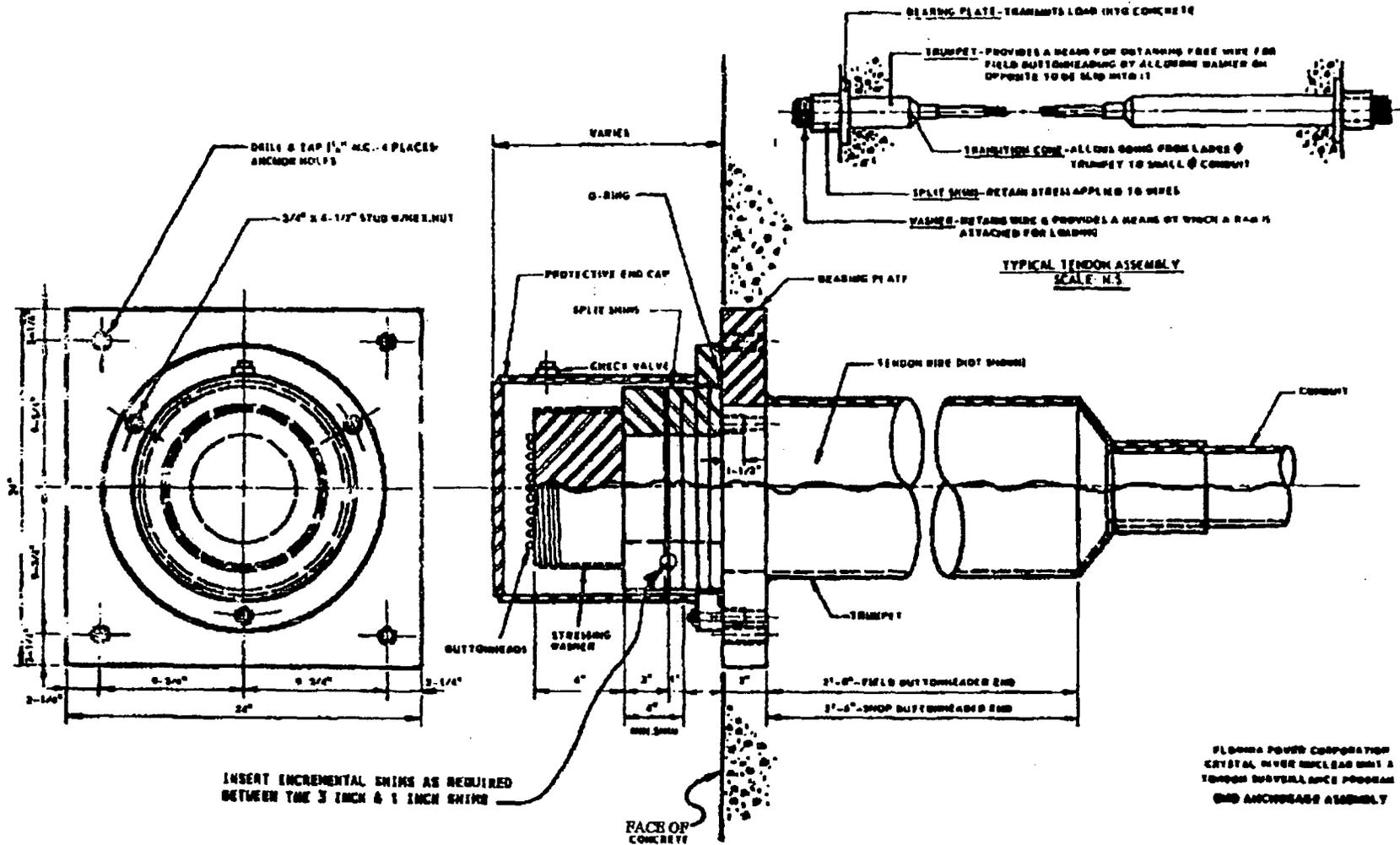
CRYSTAL RIVER UNIT 3
 8th Period (30th Year) Tendon Surveillance
 Tendon Layout Elevation

REDUCED FORCE DOME TENDONS

The following tendons are not acceptable for normal lift-off testing:

D 101	D 201	D 301
D 109	D 209	D 309
D 117	D 217	D 317
D 125	D 225	D 325
D 133	D 233	D 333
D 141	D 241	D 341

ANCHORAGE ASSEMBLY DETAIL



CRITERIA AND CATEGORIES FOR RATING DEGREES OF
CORROSION ON TENDON ANCHORAGE ASSEMBLIES AND SELECTED WIRES

CATEGORIES OF CORROSION

1. Bright metal; no visible oxidation.
2. Metal reddish brown color, no pitting.
3. Metal having patches of red oxide, removable but ready to start pitting.
4. Metal having patches of red oxide, not removable and/or leaving noticeable pits.
5. Metal having heavy rusting, dark red, and about to form an extremely hard crust which when removed leaves very noticeable pitting.
6. Conditions more severe than Category 5.

ACCEPTANCE CRITERIA

Anchorage assembly components in Category 1, 2, or 3 are acceptable.

Wire in Category 1 or 2 is acceptable.

Anchorage assembly components in Category 4, 5, or 6 and/or wires in Category 3, 4, 5, or 6 should be further evaluated by NPTS.

CRITERIA FOR VISUAL INSPECTION OF GREASE

Note that the original Visconorust 2090-P2 grease is no longer available. The new 2090-P4 grease will not be the exact color as the original 2090-P2 grease when it was new. Therefore, color comparisons of old grease against new grease must be made considering this basic difference.

Note if any of the following items are observed during visual inspection of the grease:

1. Extreme discoloration even when considering the above change in grease type.
2. Presence of corrosive particles and/or dirt mixed within the grease, indicating adjacent metal pitting and metal breakdown.
3. Signs of moisture within the bulk filler.
4. Other signs of grease deterioration.

CRITERIA FOR MISSING, BROKEN, AND/OR DAMAGED WIRES

1. Broken wires and unacceptable buttonheads shall not exceed 8 wires per individual tendon, nor more than 2 percent of the total number of wires in that group, nor more than 3 percent in any 10 consecutive tendons in a group. A group shall be defined as follows: Vertical tendons - one stressing sequence quadrant (36 tendons); Dome tendons - one series of layer (41 tendons); Hoop tendons - one side of a buttress (47 tendons).
2. An unseated wire, after stressing, that will move at one end of the tendon but is observed not to move at the other end is to be considered a broken wire.

CAUTION - Do not strike the buttonhead with any heavy object.

3. If an unseated wire, after stressing, will not move - document and notify Engineering.

NOTE: Missing, broken, and/or damaged wire criteria is based on original quantity of 163 wires per tendon.

ORIGINAL ACCEPTANCE CRITERIA FOR BUTTONHEADSPRECISION BUTTONHEADS – 0.275" ϕ / (7mm) WIRE

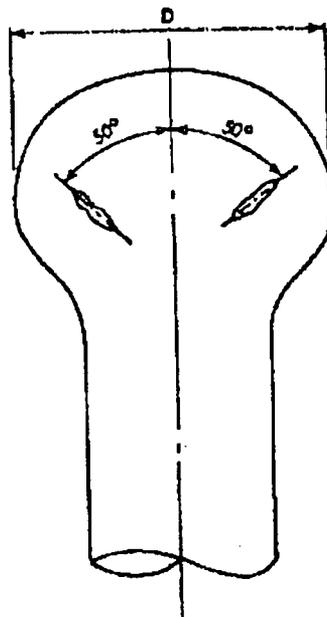
1. DIMENSIONS

Diameter – D	
Minimum	0.410"
Maximum	0.450"

2. SPLITS

Maximum admissible number	4
Maximum admissible width	0.060" Per Split
Maximum admissible length	0.350" Per Split
Maximum admissible angle to axis of wire	50°

NOTE: This is the criteria for new buttonheads and is given in this detail for reference only. The checks called for in Section 4.0, Instructions, of the procedure are not meant to verify these numbers, but they are meant to detect obvious gross deficiencies in any buttonhead.



MINIMUM WIRE BREAK STRENGTHS

(Tinius-Olson Direct Reading - High Scale or Equal)

<u>WIRE DIAMETER (inch)</u>	<u>CROSS SECTIONAL AREA (sq in)</u>	<u>ULTIMATE TENSILE STRENGTH</u>	<u>MINIMUM BREAK (kips) (1,000 lbs)</u>
0.27359 (-)	0.05879	240 ksi	14.110
0.27459 (-)	0.05922	240 ksi	14.213
0.27559 (7 mm)	0.05965	240 ksi	14.316
0.27659 (+)	0.06008	240 ksi	14.316+
0.27759 (+)	0.06052	240 ksi	14.316+

ORIGINAL STRESSING AVERAGE TENDON LIFT-OFF VALUES
VERTICAL TENDONS

<u>TENDON I.D.</u>	<u>LIFT-OFF</u>	<u>TENDON I.D.</u>	<u>LIFT-OFF</u>	<u>TENDON I.D.</u>	<u>LIFT-OFF</u>
12 V 1	1675	34 V 1	1651	56 V 1*	1784
12 V 2	1699	34 V 2	1588	56 V 2*	1603
12 V 3	1687	34 V 3	1597	56 V 3	1694
12 V 4	1651	34 V 4	1585	56 V 4	1658
12 V 5	1711	34 V 5	1633	56 V 5	1696
12 V 6	1586	34 V 6	1609	56 V 6	1622
12 V 7	1574	34 V 7	1646	56 V 7	1633
12 V 8	1615	34 V 8	1621	56 V 8	1602
12 V 9	1634	34 V 9	1605	56 V 9	1654
12 V 10	1615	34 V 10	1709	56 V 10	1598
12 V 11	1669	34 V 11	1605	56 V 11	1658
12 V 12	1670	34 V 12	1696	56 V 12	1646
12 V 13	1675	34 V 13	1644	56 V 13	1685
12 V 14	1687	34 V 14	1648	56 V 14	1687
12 V 15	1625	34 V 15	1655	56 V 15*	1638
12 V 16	1598	34 V 16	1639	56 V 16	1651
12 V 17	1650	34 V 17	1663	56 V 17	1617
12 V 18	1639	34 V 18	1633	56 V 18	1699
12 V 19	1654	34 V 19*	1573	56 V 19	1664
12 V 20	1598	34 V 20	1637	56 V 20	1687
12 V 21	1638	34 V 21	1660	56 V 21	1661
12 V 22	1655	34 V 22	1624	56 V 22	1665
12 V 23	1638	34 V 23	1646	56 V 23	1651
12 V 24	1624	34 V 24	1648	56 V 24	1675
23 V 1	1711	45 V 1	1686	61 V 1	1629
23 V 2	1598	45 V 2	1627	61 V 2	1629
23 V 3	1661	45 V 3*	1639	61 V 3	1627
23 V 4	1670	45 V 4	1610	61 V 4	1663
23 V 5	1711	45 V 5	1649	61 V 5	1643
23 V 6	1670	45 V 6	1614	61 V 6	1658
23 V 7	1636	45 V 7	1607	61 V 7	1675
23 V 8	1676	45 V 8	1675	61 V 8	1598
23 V 9	1627	45 V 9	1661	61 V 9	1625
23 V 10	1616	45 V 10	1677	61 V 10	1598
23 V 11	1673	45 V 11	1696	61 V 11	1643
23 V 12	1646	45 V 12	1603	61 V 12	1610
23 V 13	1687	45 V 13	1673	61 V 13	1711
23 V 14	1646	45 V 14*	1697	61 V 14	1646
23 V 15	1615	45 V 15	1625	61 V 15	1590
23 V 16	1598	45 V 16	1661	61 V 16	1628
23 V 17	1660	45 V 17	1683	61 V 17	1646
23 V 18	1598	45 V 18	1661	61 V 18	1598
23 V 19	1598	45 V 19	1624	61 V 19	1591
23 V 20	1633	45 V 20	1624	61 V 20	1634
23 V 21	1663	45 V 21	1629	61 V 21*	1622
23 V 22	1622	45 V 22	1672	61 V 22	1622
23 V 23	1639	45 V 23	1634	61 V 23	1663
23 V 24	1634	45 V 24	1684	61 V 24	1616

*Tendons detensioned and/or retensioned during previous inspections.

[All Lift-off Values in kips (1000#)]

ORIGINAL STRESSING AVERAGE TENDON LIFT-OFF VALUES (Cont'd)
DOME TENDONS

<u>TENDON I.D.</u>	<u>LIFT-OFF</u>	<u>TENDON I.D.</u>	<u>LIFT-OFF</u>	<u>TENDON I.D.</u>	<u>LIFT-OFF</u>
D101	643*	D201	652*	D301	660*
D102	1660	D202	1649	D302	1581
D103	1606	D203	1662	D303	1653
D104	1606	D204	1649	D304**	1610
D105**	1646	D205	1642	D305	1629
D106	1626	D206	1643	D306	1643
D107	1667	D207	1657	D307	1656
D108	1646	D208**	1648	D308	1646
D109	643*	D209	640*	D309	649*
D110	1622	D210	1616	D310	1636
D111	1673	D211	1689	D311	1682
D112	1676	D212	1600	D312	1640
D113	1676	D213	1646	D313	1636
D114	1670	D214	1642	D314	1621
D115	1700	D215	1666	D315	1607
D116	1646	D216	1614	D316	1604
D117	658*	D217	660*	D317	660*
D118	1563	D218	1626	D318	1635
D119	1642	D219	1639	D319	1697
D120	1652	D220	1619	D320	1653
D121	1633	D221**	1670	D321	1668
D122	1664	D222	1649	D322**	1628
D123	1610	D223	1655	D323	1670
D124	1634	D224	1598	D324	1664
D125	634*	D225	649*	D325	660*
D126	1634	D226	1625	D326	1640
D127	1634	D227	1649	D327	1661
D128	1660	D228	1669	D328	1670
D129	1619	D229	1650	D329	1645
D130	1635	D230	1665	D330	1634
D131	1600	D231**	1651	D331	1636
D132	1620	D232	1603	D332	1667
D133	652*	D233	652*	D333	660*
D134	1640	D234	1643	D334	1598
D135	1673	D235	1632	D335	1669
D136	1679	D236	1591	D336	1616
D137	1562	D237	1661	D337	1622
D138	1645	D238	1664	D338	1638
D139	1686	D239	1615	D339*	1639
D140	1669	D240	1615	D340	1634
D141	649*	D241	660*	D341	652*

*Reduced Force Tendons

**Tendons detensioned and/or retensioned during previous inspections.

[All Lift-off Values in kips (1000#)]

ORIGINAL STRESSING AVERAGE TENDON LIFT-OFF VALUES (Cont'd)
HOOP TENDONS

<u>TENDON I.D.</u>	<u>LIFT-OFF</u>	<u>TENDON I.D.</u>	<u>LIFT-OFF</u>	<u>TENDON I.D.</u>	<u>LIFT-OFF</u>
13 H 1	1629	53 H 1	1640	64 H 1	1642
13 H 2	1640	53 H 2	1555	64 H 2	1701
13 H 3	1630	53 H 3	1598	64 H 3	1649
13 H 4	1640	53 H 4	1645	64 H 4	1628
13 H 5	1643	53 H 5	1606	64 H 5	1579
13 H 6	1658	53 H 6	1627	64 H 6	1628
13 H 7	1630	53 H 7	1622	64 H 7	1643
13 H 8	1634	53 H 8	1673	64 H 8	1646
13 H 9	1593	53 H 9	1591	64 H 9	1623
13 H 10	1604	53 H 10	1650	64 H 10*	1646
13 H 11	1606	53 H 11	1584	64 H 11	1635
13 H 12	1598	53 H 12	1663	64 H 12	1616
13 H 13	1691	53 H 13	1615	64 H 13	1649
13 H 14	1604	53 H 14	1609	64 H 14	1680
13 H 15	1624	53 H 15	1651	64 H 15	1589
13 H 16	1595	53 H 16*	1639	64 H 16	1616
13 H 17	1630	53 H 17	1603	64 H 17	1617
13 H 18	1618	53 H 18	1657	64 H 18	1670
13 H 19	1625	53 H 19	1604	64 H 19	1617
13 H 20	1604	53 H 20	1633	64 H 20	1665
13 H 21	1642	53 H 21	1634	64 H 21	1653
13 H 22	1652	53 H 22	1651	64 H 22	1665
13 H 23	1649	53 H 23	1609	64 H 23	1637
13 H 24	1646	53 H 24	1621	64 H 24	1653
13 H 25	1643	53 H 25	1663	64 H 25	1657
13 H 26	1628	53 H 26	1650	64 H 26	1635
13 H 27	1618	53 H 27	1627	64 H 27	1655
13 H 28	1658	53 H 28	1626	64 H 28*	1690
13 H 29	1607	53 H 29	1669	64 H 29*	1667
13 H 30	1658	53 H 30	1704	64 H 30	1642
13 H 31	1635	53 H 31	1532	64 H 31	1655
13 H 32*	1653	53 H 32	1668	64 H 32	1635
13 H 33	1623	53 H 33	1646	64 H 33	1648
13 H 34	1641	53 H 34	1632	64 H 34	1702
13 H 35	1631	53 H 35	1604	64 H 35	1655
13 H 36	1650	53 H 36	1655	64 H 36	1678
13 H 37	1629	53 H 37	1664	64 H 37*	1617
13 H 38	1612	53 H 38	1643	64 H 38	1645
13 H 39	1671	53 H 39	1616	64 H 39	1665
13 H 40*	1623	53 H 40	1660	64 H 40	1586
13 H 41	1660	53 H 41	1634	64 H 41	1611
13 H 42	1660	53 H 42	1622	64 H 42	1599
13 H 43	1641	53 H 43	1646	64 H 43	1641
13 H 44	1654	53 H 44	1653	64 H 44	1641
13 H 45	1635	53 H 45	1634	64 H 45	1647
13 H 46	1623	53 H 46	1628	64 H 46	1644
13 H 47	1623	53 H 47	1688	64 H 47*	1623

*Tendons detensioned and/or retensioned during previous inspections.

[All Lift-off Values in kips (1000#)]

ORIGINAL STRESSING AVERAGE TENDON LIFT-OFF VALUES (Cont'd)
HOOP TENDONS

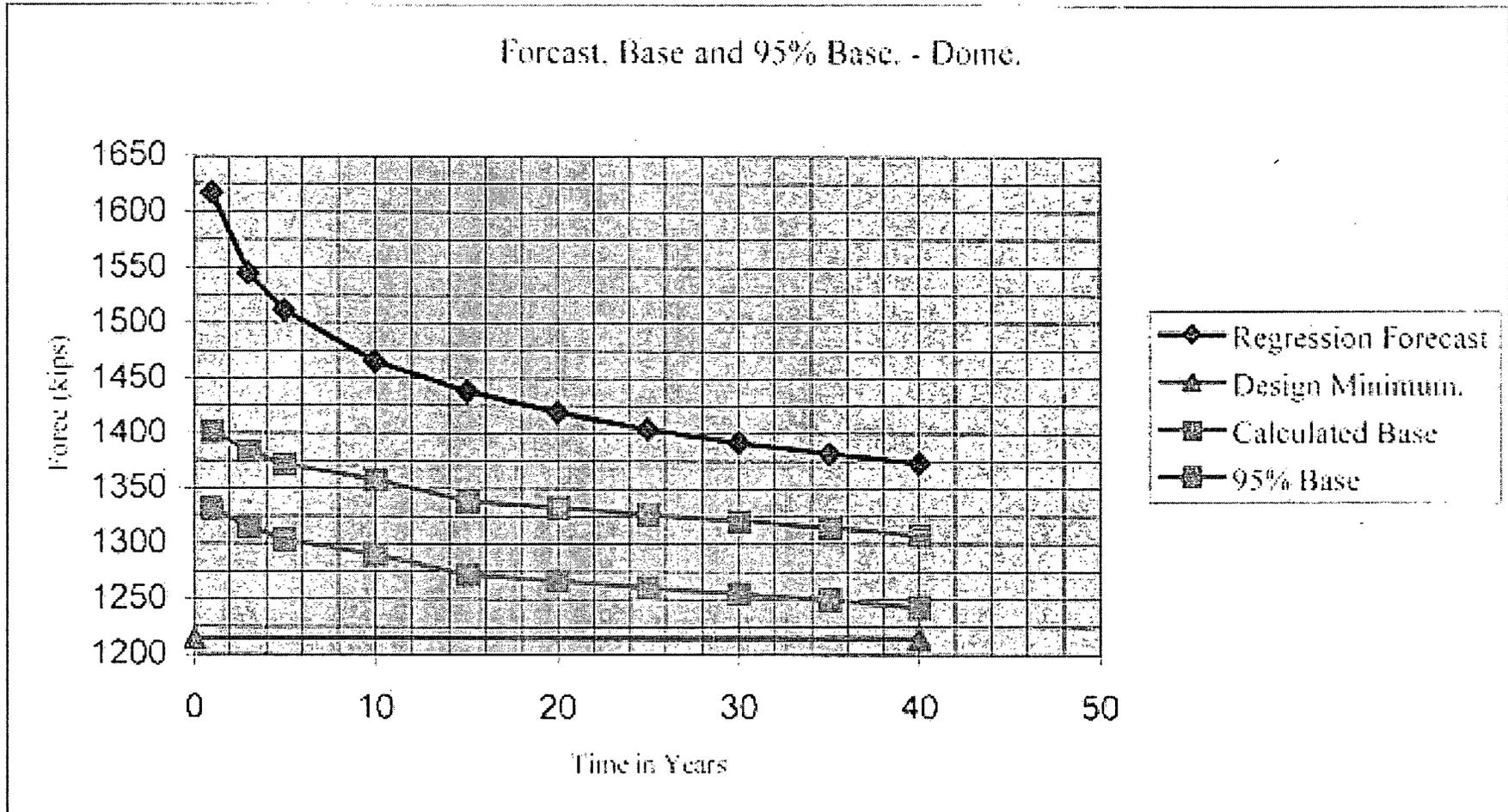
<u>TENDON I.D.</u>	<u>LIFT-OFF</u>	<u>TENDON I.D.</u>	<u>LIFT-OFF</u>	<u>TENDON I.D.</u>	<u>LIFT-OFF</u>
51 H 1	1639	42 H 1	1645	62 H 1	1603
51 H 2	1620	42 H 2	1650	62 H 2	**
51 H 3	1645	42 H 3	1653	62 H 3	1615
51 H 4	1625	42 H 4	1672	62 H 4	1631
51 H 5	1675	42 H 5	1605	62 H 5	1672
51 H 6	1608	42 H 6	1679	62 H 6	1603
51 H 7	1608	42 H 7	1647	62 H 7	1603
51 H 8	1644	42 H 8	1665	62 H 8	1624
51 H 9	1627	42 H 9	1641	62 H 9	1639
51 H 10	1674	42 H 10	1645	62 H 10	1604
51 H 11	1615	42 H 11	1599	62 H 11	1603
51 H 12	1668	42 H 12	1614	62 H 12	1675
51 H 13	1644	42 H 13	1597	62 H 13	1663
51 H 14	1644	42 H 14	1622	62 H 14	1603
51 H 15	1651	42 H 15	**	62 H 15	1681
51 H 16	1649	42 H 16	1635	62 H 16	1627
51 H 17	1663	42 H 17	1661	62 H 17	1675
51 H 18	1608	42 H 18	1664	62 H 18	1609
51 H 19	1669	42 H 19	1647	62 H 19	1640
51 H 20	1668	42 H 20	1662	62 H 20	1610
51 H 21	1669	42 H 21	1641	62 H 21	1640
51 H 22	1638	42 H 22	1668	62 H 22	1663
51 H 23	1609	42 H 23	1617	62 H 23	1639
51 H 24	1644	42 H 24	1617	62 H 24	1639
51 H 25	1639	42 H 25	1647	62 H 25	1627
51 H 26	1661	42 H 26	1614	62 H 26	1663
51 H 27	1612	42 H 27	1635	62 H 27	1669
51 H 28	1668	42 H 28	1632	62 H 28	1633
51 H 29	1629	42 H 29	1629	62 H 29	**
51 H 30	1657	42 H 30	1644	62 H 30	1597
51 H 31	1646	42 H 31	1653	62 H 31	1681
51 H 32	1658	42 H 32	1626	62 H 32	1639
51 H 33	1650	42 H 33	1665	62 H 33	1674
51 H 34	1651	42 H 34	1626	62 H 34	1626
51 H 35	1608	42 H 35	1657	62 H 35	1664
51 H 36	1616	42 H 36	1680	62 H 36	1639
51 H 37	1606	42 H 37	1641	62 H 37	1622
51 H 38	1628	42 H 38	1650	62 H 38	1639
51 H 39	1607	42 H 39	1623	62 H 39	**
51 H 40	1664	42 H 40	1651	62 H 40	1639
51 H 41	1631	42 H 41	1623	62 H 41*	1609
51 H 42	1610	42 H 42	1599	62 H 42	1609
51 H 43	1642	42 H 43	1611	62 H 43	1591
51 H 44	1646	42 H 44	1605	62 H 44	1651
51 H 45	1581	42 H 45	1665	62 H 45	1622
51 H 46	1657	42 H 46	1644	62 H 46	1645
51 H 47	1663	42 H 47	1615	62 H 47	1582

*Tendons detensioned and/or retensioned during previous inspections.

**Not Available.

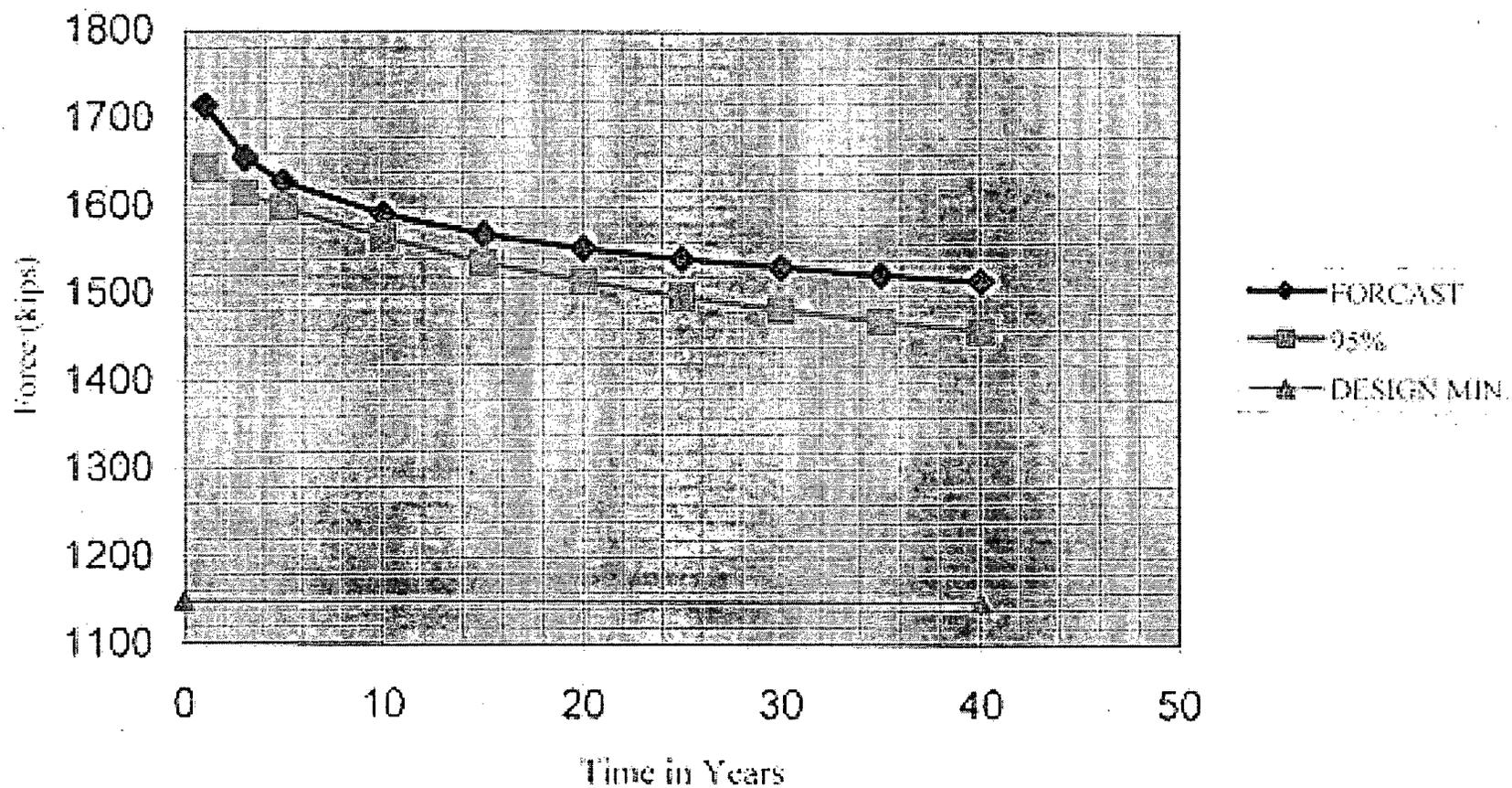
[All Lift-off Values in kips (1000#)]

TENDON HISTORICAL TRENDS
DOME TENDONS



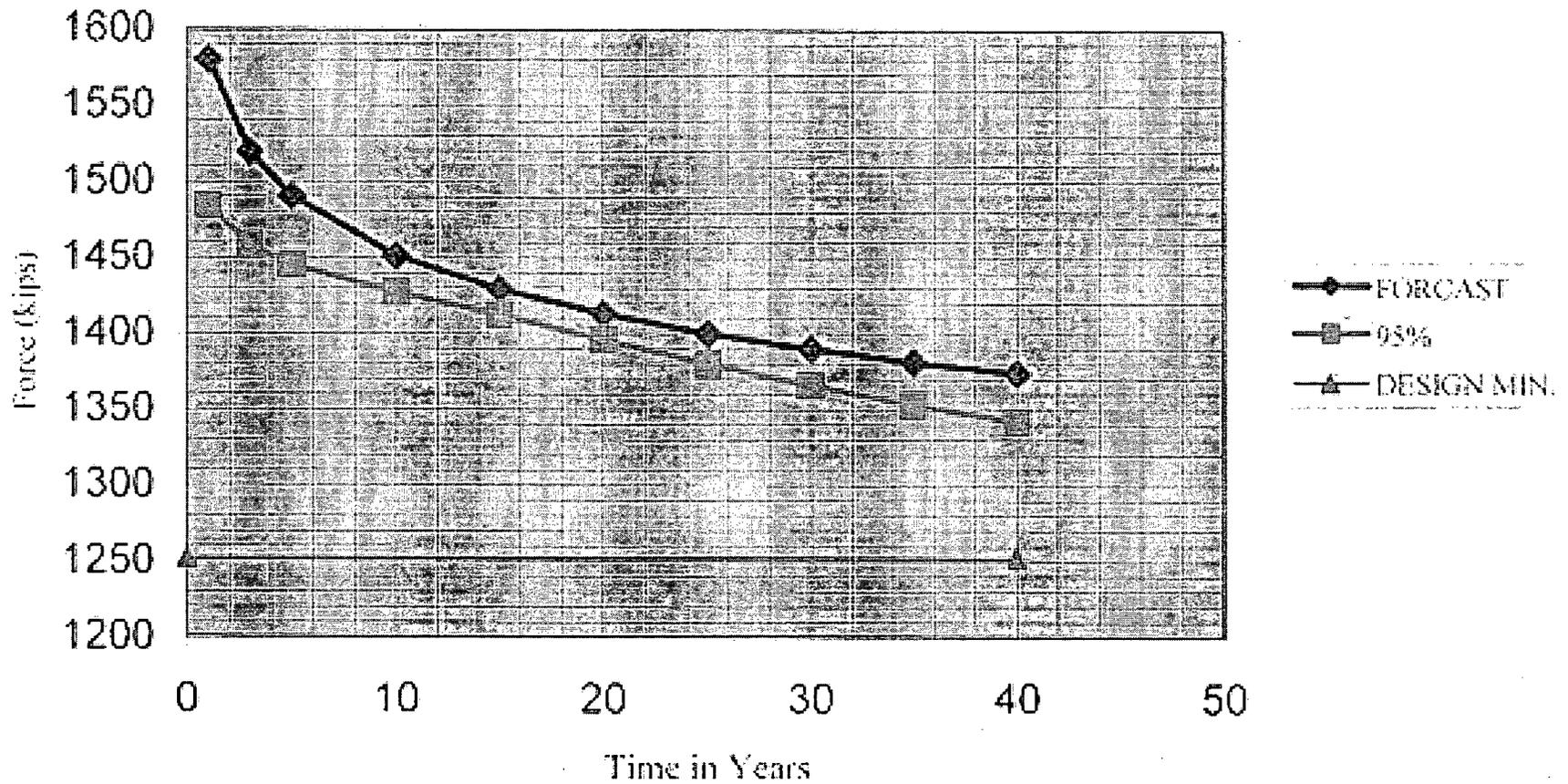
TENDON HISTORICAL TRENDS
VERTICAL TENDONS

Forecast and 95% Conf. - Vert.



TENDON HISTORICAL TRENDS
HOOP TENDONS

Forecast and 95% Conf. - Hoop.



REVISION SUMMARY

Section	Description
Enclosure 2	Delete the single asterisk identifier from Tendons 46H21 and 62H30.
Enclosure 2	Tendon 45V20 was mis-identified as being a "D" Detension Tendon, removed the "D" identifier and added it to the correct Tendon 61V17.
PRR's incorporated	249517