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10 CFR 50
10 CFR 51
10 CFR 54

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Three Mile Island Nuclear Station, Unit 1.
Facility Operating License No. DPR-50
NRC Docket No.50-289

Subject: Response to NRC Request for Additional Information related to Three Mile Island Nuclear Station, Unit 1, License Renewal Application

Reference: Letter from Mr. Jay Robinson (USNRC), to Mr. Michael P. Gallagher (AmerGen) "Request for additional information for Time Limited Aging Analysis, Three Mile Island Nuclear Station, Unit 1, License Renewal Application (TAC NO. MD7701)", dated September 30th, 2008. (TAC No. MD7701)

In the referenced letter, the NRC requested additional information related to Time Limited Aging Analysis of the Three Mile Island Nuclear Station, Unit 1, License Renewal Application (LRA). Enclosed are the responses to this request for additional information.

This letter and its enclosure contain no commitments.

If you have any questions, please contact Fred Polaski, Manager License Renewal, at 610-765-5935.

I declare under penalty of perjury that the foregoing is true and correct.

Respectfully,

Executed on 10-23-2008

Michael P. Gallagher
Michael P. Gallagher
Vice President, License Renewal
AmerGen Energy Company, LLC

A131
NRR

Enclosure A: Response to Request for Additional Information for Time Limited Aging Analysis, Three Mile Island Nuclear Station, Unit 1, License Renewal Application.

cc: Regional Administrator, USNRC Region I, w/Enclosure
USNRC Project Manager, NRR - License Renewal, Safety, w/ Enclosure
USNRC Project Manager, NRR - License Renewal, Environmental, w/o Enclosure
USNRC Project Manager, NRR - TMIGS, w/o Enclosure
USNRC Senior Resident Inspector, TMIGS, w/o Enclosure

File No. 08001

Enclosure – A

Response to Request for Additional Information for Time Limited Aging Analysis, Three Mile Island Nuclear Station, Unit 1, License Renewal Application.

Note: As a standard convention for AmerGen RAI responses, added text will be shown as ***bolded italics*** whereas deleted text will be shown as ~~strikethrough~~.

RAI # 4.3.2-1

LRA Section: 4.3.2, Evaluation of Reactor Water Environmental Effects on Fatigue Life of Piping and Components (Generic Safety Issue 190)

Background:

Under the sub-section titled "Reduced Transient Cycle Administrative Limits – Pressurizer Surge Line," on page 4-31 of the License Renewal Application (LRA), the last sentence in the third paragraph states that "The F_{en} environmental correction factors shown are the overall average for each analysis."

Issue:

It is unclear what is meant by "overall average for each analysis", for example, since it could mean the average of all transients together for a single location or the average of all transients together for all locations having the same material. Justification is necessary if the average involves data from multiple locations. Since fatigue is localized damage, cross location averaging of F_{en} is not conservative.

Request:

Provide additional information regarding the F_{en} environmental correction factors and explain how the correction factors shown are the overall average for each analysis.

AmerGen Response

The phrase "overall average for each analysis" means the average F_{en} multiplier for all of the transients together for a single location.

The referenced sentence on LRA page 4-31 only applies to the results from the refined fatigue analyses for Locations 3a and 3b in Table 4.3.2-2. The reported Cumulative Usage Factor (CUF) values were adjusted for the effects of Environmentally Assisted Fatigue (EAF). Each of these reported EAF-adjusted CUF values are associated with a single component location. The 0.951 CUF value identified as Location 3a is for the bounding elbow in the pressurizer surge line, which is the second elbow from the Reactor Coolant System hot leg piping. The 0.847 CUF value identified as Location 3b is for the bounding butt weld, located between the second elbow and the adjacent straight pipe section.

In these refined analyses for Locations 3a and 3b, an individual F_{en} correction factor was computed for selected load set ranges (transient pairings) based upon the equations provided in Section 4.1 of EPRI MRP-47, Revision 1. Each individual F_{en} correction factor was computed using only data appropriate for the location and for the transient pairing. There was no averaging of data from multiple locations in determining these individual F_{en} correction factors for Locations 3a and 3b.

As described in Note 2 of Table 4.3.2-2, the value reported as F_{en} Correction Factor is a composite of the overall average F_{en} correction factor for the fatigue analysis and the cycle reduction factor. It is computed by dividing the overall EAF-adjusted CUF value for the component by the current design CUF value for the component. It represents the combined effects of CUF increase due to reactor water environmental effects and CUF decrease due to the reduced numbers of cycles shown in Table 4.3.2-3.

RAI # 4.3.2-2

LRA Section: 4.3.2, Evaluation of Reactor Water Environmental Effects on Fatigue Life of Piping and Components (Generic Safety Issue 190)

Background:

In Tables 4.3.2-1 and 4.3.2-5, (and some other intermediate tables) in the LRA, a single value of F_{en} is used for low alloy/carbon steel and another single value of F_{en} is used for Alloy 600 material, disregarding the locations/components that they are associated with.

Issue:

F_{en} is a function of strain rate, dissolved oxygen concentration, and temperature. Therefore, F_{en} is expected to be different for each location because the strain rates are most likely different for each component and location.

Request:

Clarify how F_{en} is used for the various locations/components and materials.

AmerGen Response

Maximum F_{en} values were computed for each material type by using bounding assumptions for each input variable in the applicable F_{en} equations. These maximum F_{en} values were used as a first attempt to qualify each of the NUREG/CR-6260 locations for environmental fatigue effects. The maximum F_{en} value determined for Carbon Steel is 1.74; for Low Alloy Steel is 2.455; for Austenitic Stainless Steel is 15.35; and for Nickel Alloy 600 is 1.49. This bounding approach results in conservative values for F_{en} and is acceptable as long as the environmentally adjusted Cumulative Usage Factor (CUF) value for each component remains below the acceptance limit of 1.0.

This maximum F_{en} approach, in combination with reduced numbers of transient cycles, was successful for qualifying each location except Locations 3a and 3b, as shown in Table 4.3.2-5. Location 3a represents the stainless steel surge line elbows and Location 3b represents the stainless steel surge line piping (including welds). The initial results for these components exceeded 1.0, making a more refined F_{en} approach necessary. This refined approach is further described in AmerGens response to RAI 4.3.2-1, where an individual F_{en} multiplier was computed for selected load sets within the fatigue analysis rather than using the maximum F_{en} multiplier.

RAI #: 4.7-1

LRA Section: 4.7, Loss of Prestress in Concrete Containment Tendons

Background:

For the GALL Report AMP X.S1 "Concrete Containment Tendon Prestress," the "Monitoring and Trending" program element states that estimated and measured prestressing forces are plotted against time and the predicted lower limit (PLL), MRV, and trending lines developed for the period of extended operation.

Issue:

The plots or data for the historically inspected tendon forces, predicted forces, trend lines, and minimum required values (MRV) were not included in Section 4.7 of the LRA.

Request:

Provide log-year graphs of individual tendon forces versus 95% of the predicted force, and trend lines against MRV to confirm adequacy of the prestressing forces.

AmerGen Response

The log-year graphs reviewed and discussed with the reviewer during the AMP audit are shown as follows:

The first three graphs illustrate the individual measured tendon forces and MRV for each tendon group for vertical, hoop and dome. These graphs also indicate the measured tendon force trend lines and 95% lower confidence limit (LCL) projected through the period of extended operation.

The last three graphs illustrate the measured control tendon forces and MRV for each control tendon. Also indicated are the measured control tendon force trend lines and predicted force trend lines for each control tendon projected through the period of extended operation.

Also, the third paragraph in the analysis portion of Section 4.7 should have included the acceptance criteria per ASME Section XI, Subsection IWL, paragraphs IWL-3221.1(b)(1), (2) and (3). These criteria were used for one tendon in the year 10. All other measured tendon forces for years 10 through the last surveillance performed for year 35 have been greater than 95% of the predicted values. Prior to year 10 the acceptance criteria of ASME Section XI, Subsection IWL, paragraphs IWL-3221.1 did not apply.

LRA Section 4.7 should have read:

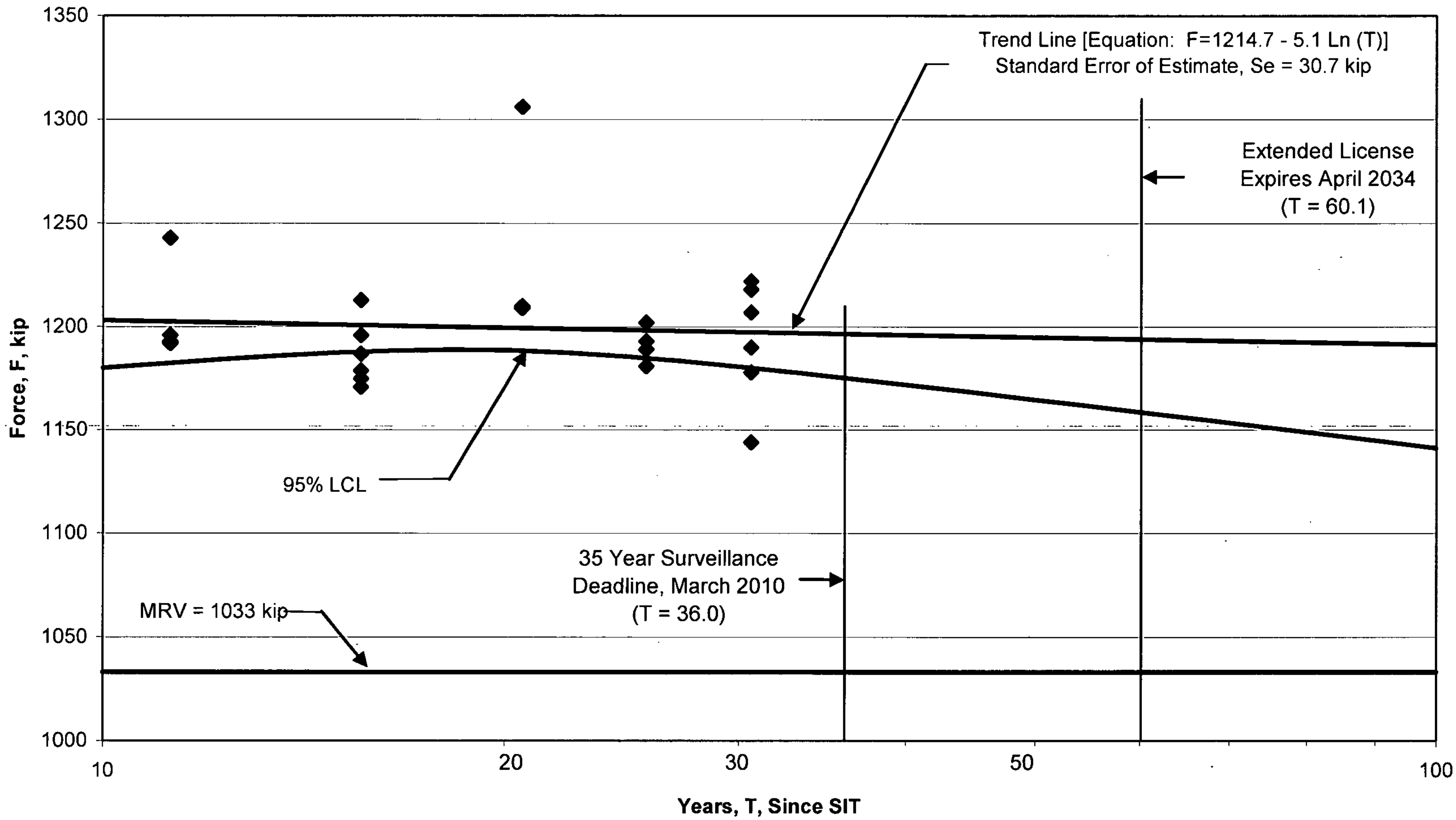
4.7 LOSS OF PRESTRESS IN CONCRETE CONTAINMENT TENDONS

Analysis

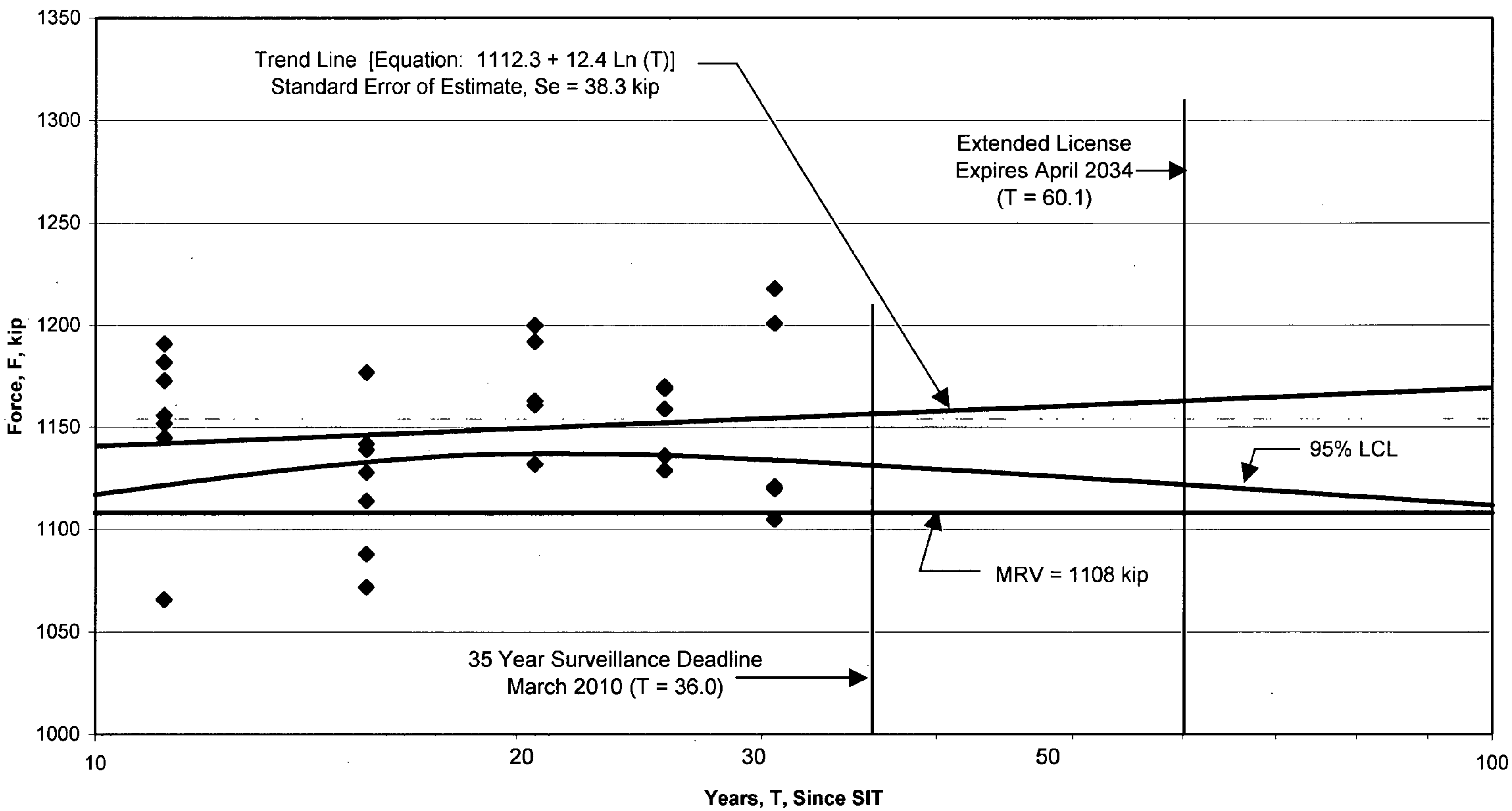
The measured forces meet acceptance criteria specified ASME Section XI, Sub-Section IWL, ***paragraphs IWL-3221.1(a) and (b),*** as follows:

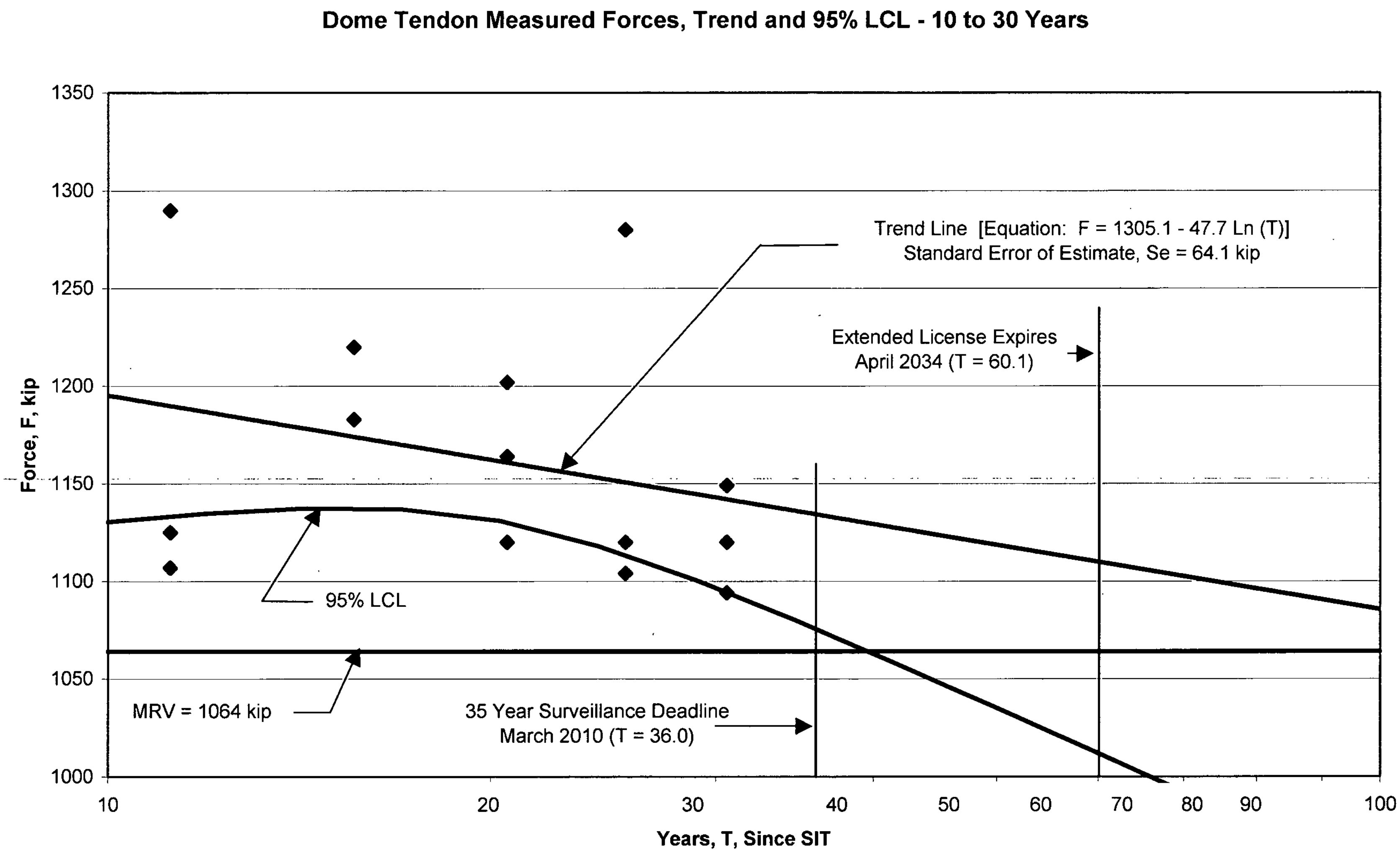
The force in each sample tendon is at least 95% of the force predicted for that tendon at the time of the measurement ***or the force is at least 90% of the predicted force and (1) the force in the 2 adjacent tendons is at least 95% of the force predicted for that tendon at the time of measurement and (2) the measured forces in all of the remaining tendons are not less than 95% of the predicted force.*** Vertical, hoop and dome sample mean forces are above the minimum required value (MRV) specified in UFSAR Section 5.7.5.2.3.

Vertical Tendon Measured Forces, Trend and 95% LCL - 10 to 30 Years

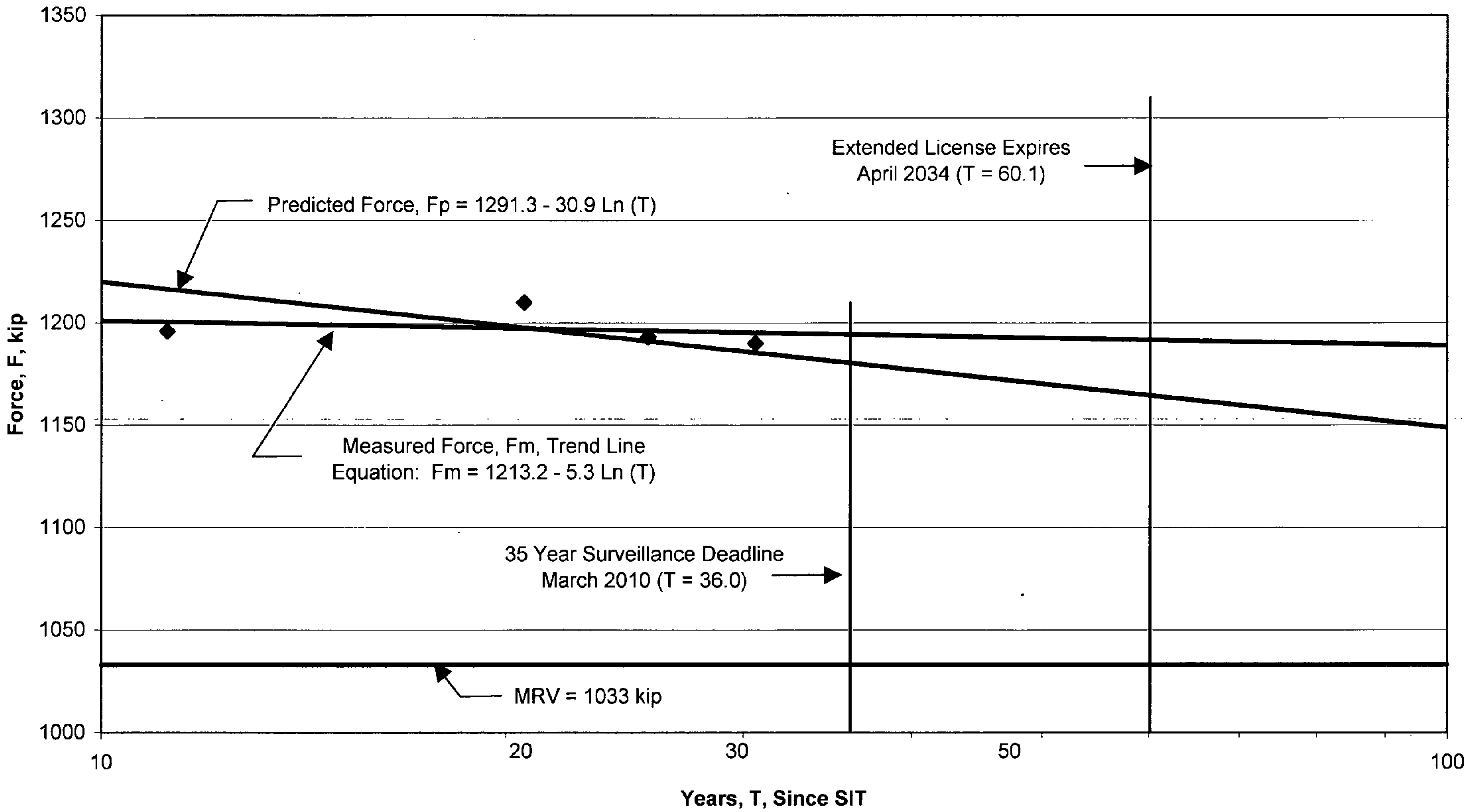


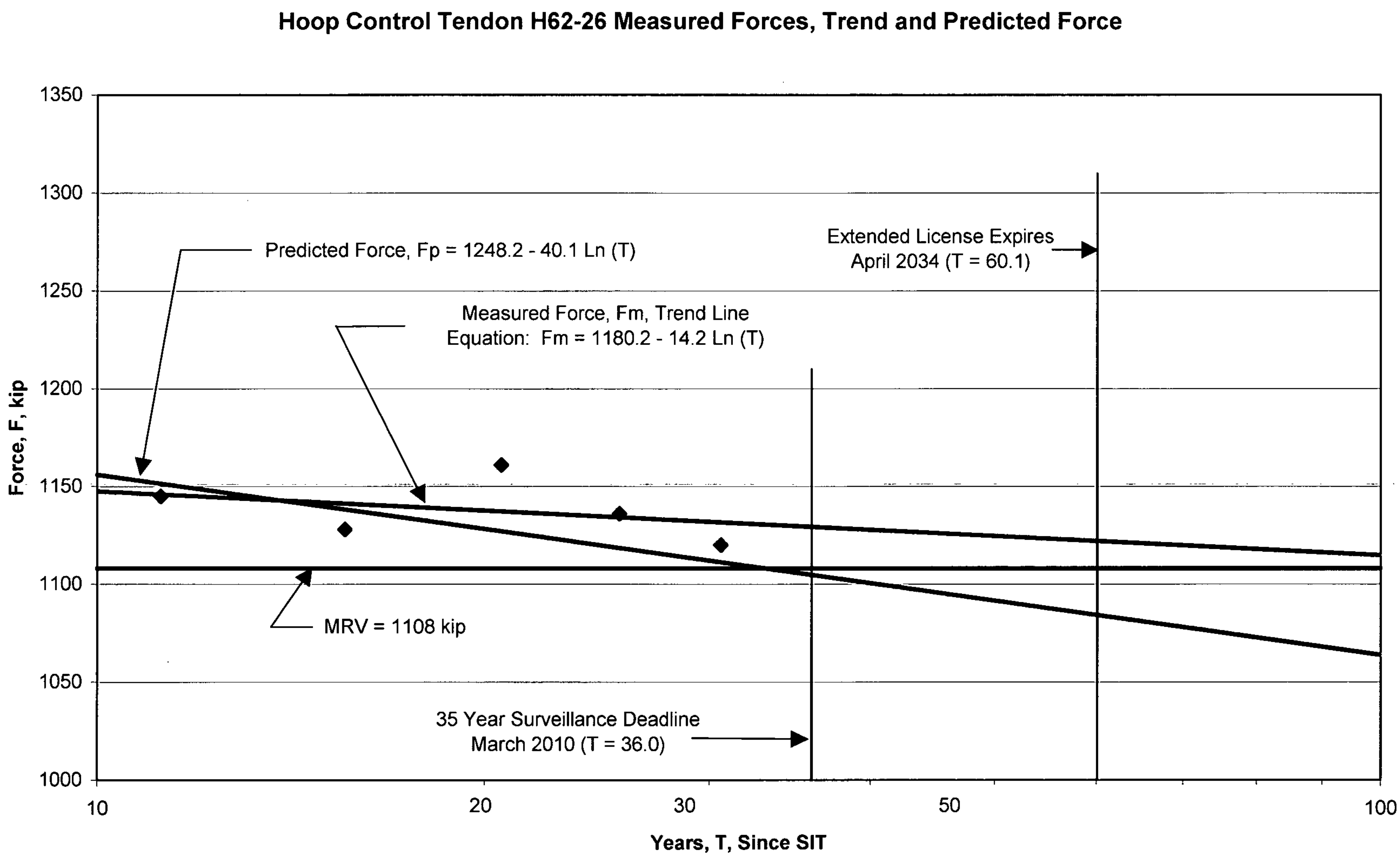
Hoop Tendon Measured Forces, Trend and 95% LCL - 10 to 30 Years




Dome Tendon Measured Forces, Trend and 95% LCL - 10 to 30 Years
Trend Line [Equation: F = 1305.1 - 47.7 Ln (T)]
Standard Error of Estimate, Se = 64.1 kip
Extended License Expires
April 2034 (T = 60.1)
95% LCL
MRV = 1064 kip
35 Year Surveillance Deadline
March 2010 (T = 36.0)
Force, F, kip
Years, T, Since SIT
1350
1300
1250
1200
1150
1100
1050
1000
10
20
30
40
50
60
70
80
90
100

Vertical Control Tendon V32 Measured Forces, Trend and Predicted Force




Hoop Control Tendon H62-26 Measured Forces, Trend and Predicted Force
1350
1300
1250
1200
1150
1100
1050
1000
Force, F, kip
Predicted Force, Fp = 1248.2 - 40.1 Ln (T)
Measured Force, Fm, Trend Line
Equation: Fm = 1180.2 - 14.2 Ln (T)
Extended License Expires
April 2034 (T = 60.1)
MRV = 1108 kip
35 Year Surveillance Deadline
March 2010 (T = 36.0)
10
20
30
50
100
Years, T, Since SIT

Dome Control Tendon D225 Measured Forces, Trend and Predicted Force