



UNITED STATES
 ATOMIC ENERGY COMMISSION
 DIVISION OF COMPLIANCE
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MAR 11 1970

J. P. O'Reilly, Chief, Reactor Inspection and
 Enforcement Branch, Division of Compliance, HQ

INQUIRY MEMORANDUM

PUBLIC SERVICE ELECTRIC & GAS COMPANY (SALEM 1 AND 2), 272/70-B & 311/70-B
 METHODS OF REBAR TESTING

During a recent inspection it was reported that PSE&G had rejected an additional 80 tons of No. 18 S ASTM-A432, Grade 60 rebar.* The rebar had failed to meet the ultimate tensile strength (UTS) specifications (90,000 psi) when full section tests were performed by the PSE&G Testing Laboratory. This heat had been certified by the U. S. Steel, Gary Indiana plant, at 68,200 psi yield and 90,700 psi UTS based on a reduced diameter (0.505 inch) test specimen. It was reported that the rebar suppliers normally only test a single sample for each heat produced.

Tabulated below are the recently obtained results of the PSE&G Testing Laboratory full diameter tests on the rejected rebar. The samples were selected at random.

Heat No. 80 R 568, Size 18 S

| <u>Test Sample</u> | <u>Yield (KSI)</u> | <u>UTS (KSI)</u> |
|--------------------|--------------------|------------------|
| 1 | 62.8 | 89.5 |
| 2 | 64.5 | 90.0 |
| 3 | 65.2 | 91.0 |
| 4 | 62.2 | 87.5 |
| 5 | 62.8 | 88.5 |
| 6 | 62.5 | 87.0 |

NOTE: Values are based on the nominal cross sectional area of the bars.

*CO Report No. 272/69-5 & 311/69-5

*18/12/70 } have seen
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The Testing Laboratory also prepared two reduced diameter (0.505) test specimens from test samples 3 and 4 above. These 0.505 specimens were machined from the area of the test bars that were within the bar gripper jaws used in the full section tests. The measurements made on these specimens are tabulated below.

Heat No. 80 R 568, Size 18 S

| <u>Test Sample</u> | <u>Yield (KSI)</u> | <u>UTS (KSI)</u> |
|--------------------|--------------------|------------------|
| 3 | 74.0 | 103.7 |
| 4 | 61.0 | 92.6 |

NOTE: Values are based on actual cross sectional areas of the reduced diameter bars.

Presented below for your information are the results of the PSE&G Testing Lab's experience with the 500 tons of 14 S and 18 S rebar from U. S. Steel that was previously rejected* because of low yield strength. The 500 tons consisted of the five heats listed

Heat No. D 64 186, 14 S Bars.

| | | |
|--|----------|-------|
| Mill Test (0.505 specimen) | 60.2 KSI | Yield |
| Pittsburgh Testing Lab (full size Bars.) | 58.6 | " |
| | 58.2 | " |
| Columbia University (full size bars) | 57.8 | " |
| | 58.5 | " |
| U. S. Testing Lab (full size bars) | 59.2 | " |
| | 58.5 | " |
| | 59.5 | " |

Three test bars were returned to U. S. Steel for retesting. Modifications were made to the test machine to prevent the slippage of the extensometer and the results of the retests on three 0.505 specimens were 64.7, 56.6 and 54.6 KSI.

Heat No. D 64 170, 18 S Bars

| | | |
|---|----------|-------|
| Mill Test (0.505 specimen) | 70.8 KSI | Yield |
| PSE&G Test Lab (full size bars) - 10 bars were tested and 4 were found to have yield strength < 60 KSI. The range of all bars tested was 56.8 - 60.8 KSI. | | |

Three test bars were returned to U. S. Steel for retesting. Modifications were made to the testing machine as stated above and retests were run on three 0.505 specimens. These gave yield strengths of 58.4, 63.9 and 62.9 KSI.

Heat No. 79 T 415, 18 S Bars

| | | |
|----------------------------|----------|-------|
| Mill Test (0.505 specimen) | 77.9 KSI | Yield |
|----------------------------|----------|-------|

PSE&G Test Lab (full size bars) - 12 bars were tested and 2 were found to be below 60. KSI. Results ranged from 57.2 - 68.8 KSI.

Three test bars were returned to U. S. Steel for retesting. Modifications were made to the testing machine as stated above and retests were run on three 0.505 specimens. These gave yield strengths of 63.2, 64.7 and 64.3 KSI.

Heat No. 80 T 507, 18 S Bars

| | | |
|----------------------------|----------|-------|
| Mill Test (0.505 specimen) | 67.9 KSI | Yield |
|----------------------------|----------|-------|

PSE&G Test Lab (full size bars) - 10 bars were tested and all 10 failed to meet the 60. KSI specification. Results ranged from 52.5 - 57.0 KSI.

Three test bars were returned to U. S. Steel for retesting. Modifications were made to the testing machine as stated above and retests were run on three 0.505 specimens. These gave yield strengths of 57.9, 56.1 and 57.1 KSI.

Heat No. 64149, 18 S Bars

| | | |
|----------------------------|----------|-------|
| Mill Test (0.505 specimen) | 71.9 KSI | Yield |
|----------------------------|----------|-------|

PSE&G Test Lab (full size bars) - 8 bars were tested and all failed to meet the 60. KSI specification. Results ranged from 53.5 - 56.0 KSI.

Three test bars were returned to U. S. Steel and retested. Retests indicated yield strengths of 57.6, 64.9 and 66.2 KSI.

Although we do not consider the results of these comparisons to be conclusive evidence that the code (ASTM-A432) permitted method of reduced diameter testing is unsatisfactory; we do feel that this may be a potential weakness in the code in that rebar tested by the method of reduced diameter may not actually perform to the measured values. In light of these observations, it is recom-

mended that this matter be directed to the appropriate organization(s) for resolution.

R. T. Carlson
for R. T. Carlson
Senior Reactor Inspector

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