RECONSTITUTION TECHNOLOGY OF CHARPY SURVEILLANCE SPECIMENS WITH SHORT INSERT LENGTH

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1 INTRODUCTION
As for the shortage of the surveillance specimens to monitor the effect of the irradiation embrittlement of RPV materials in case of longer-term operation than present surveillance program of nuclear power plants (NPPs), the reconstitution of them is considered to be the promising measures. Although the length of the specimen insert is required not less than 18 mm in ASTM E 1253-99 which is the technical standard to reconstitute Charpy specimens, the minimum length of the specimen insert required should be 10 mm when L-T direction Charpy specimens that have been applied to the early domestic NPPs are reconstituted into T-L direction specimens in order to test the upper shelf absorbed energy of T-L direction specimens.

This paper presents the current status of the research consigned by METI on the applicability of the reconstituted Charpy specimens with short insert length using the results obtained by Charpy impact tests of un-irradiated and irradiated materials.

2 OUTLINE OF TESTS
The correlation between the absorbed energy and the plastic deformation zone width \( W_p \) was obtained by measuring the hardness distribution near the V-notch of the tested un-irradiated Charpy specimens as Eq. (1). The reconstituted un-irradiated Charpy specimen showed that its absorbed energy was preserved if the evaluated plastic deformation zone width by Eq. (1) did not reach the heat affected zone (HAZ).

\[
W_p (mm) = 1.82 \cdot \ln\{\text{Absorbed energy (J) / 14.0}\}
\]

The irradiation of Charpy impact test specimens up to the fluence \( 10^{23} \text{ m}^{-2} \) was completed.

The post-irradiation Charpy impact tests have been started for the various purposes, which are principally to confirm the applicability of the test results with un-irradiated materials to the irradiated materials, and to measure the annealing effect by the short thermal transient during welding.

The results of the initial stage of the post-irradiation test to compare the absorbed energy of the after reconstitution with the before are reported.

3 CONCLUSIONS
1) It was confirmed that the absorbed energy was preserved, if the plastic deformation width evaluated by the developed correlation equation to the absorbed energy did not interact with HAZ near the joining surface. 2) If the length of insert including HAZ width is 10 mm, the maximum preserved absorbed energy of the insert is estimated to be 120 J, which is still enough higher than 68 J. 3) The initial stage of the post-irradiation test showed that the above results held true.