

Glossary

A

austenitize

The treatment of steel wherein it is raised in temperature until all the iron has transformed into austenite.

B

base metal

In steel pressure vessels, the material composition forming the main vessel plate.

beltline

The horizontal plane through a fuel core and extending out to a pressure vessel wall having the highest neutron flux.

C

cadmium ratio

The ratio of the number of neutrons of thermal and epithermal energies detected by a bare cobalt foil to the number of neutrons of epithermal energies detected by a cadmium-covered cobalt foil. Note that this yields a thermal neutron count for the ≥ 0.414 eV level rather than the 0.0253 eV level.

Charpy V-notch specimen

A test specimen for measuring the amount of energy absorbed during fracture upon impact with a standard moving weight. The specimen is 0.394 in. square by 2.165 in. long, having a 45-deg notch cut across one surface, the notch root being 0.001 in. radius; it is described by ASTM Standard Method for Notched Bar Impact Testing for Metallic Materials (E 23-66).

D

dynamic tear test

A test similar to the Charpy V-notch but incorporating the advantages of larger size (minimum used is 7 in. long by $1\frac{5}{8}$ in. wide by $\frac{5}{8}$ in. thick), more realistic notch (pressed notch or brittle weld), and greater crack run below the notch.

E

electroslag welding

A weld joining process wherein two plates to be joined are set vertically about 3 in. apart. Heavy, water cooled shoes cover the gap between plates and act as dams to hold molten weld filler metal used to fuse the plates together. The shoes also conduct electric current to heat and melt the filler wire as it feeds into the molten pool. Fluxing agents float on top of the molten pool to prevent continuous oxidation. Because of the large grain size inherent to the cooled weld joint, electroslag weldments must be quenched and tempered after welding.

epithermal neutrons

Neutrons of energies greater than thermal and below those of fast neutrons. Also referred to as resonance neutrons because of the many resonance peaks observed for the interactions in these energy levels.

F

fast neutrons

An arbitrary designation for neutrons of energies usually greater than 0.1 MeV. More correctly, they are those above 0.1 MeV for which individual resonances are not resolved in "typical" nuclei.

fission foil

A flux monitor that will undergo fission in the neutron flux field under consideration; fission products such as ^{140}Ba and ^{137}Cs are typical of the isotopes analyzed from the fission to yield flux values.

fission spectrum

A specific distribution of neutrons resulting from fission of ^{235}U . This spectrum is a plot of neutron populations within discrete energy levels or bands. At present, forms of the fission spectrum have been developed by Watt, Frye, Cranberg et al, and Grundl; all of these forms disagree somewhat with the fission spectrum described by multiple foil activation techniques.

flux monitor (foil)

A material (usually a metal) that has been placed in a neutron flux field for activation that can subsequently be measured and translated into an accurate neutron flux value. (Synonyms: flux detectors, foils, flux wires, detectors, dosimeters).

fracture toughness

Usually refers to K_{IC} or a measure of stress to denote inherent resistance to intensity for onset of unstable fracture under linear elastic-plane strain conditions.

H**half-life**

A specific length of time during which a specific radioisotope will decay to an activity level half that which existed at the start of the time period.

hard spectrum

A neutron spectrum wherein the average energy of the neutrons is relatively high (fast).

heat affected zone (HAZ)

A fusion region adjacent to the interface between weld metal and base metal of a weldment. (Its microstructure may be altered by the high heat input of the welding process.)

heat treatment

A series of operations involving heating and cooling at specified rates in order to develop specific mechanical properties and microstructure in steels.

L**longitudinal**

In rolled steel plate, the plate dimension parallel to the primary rolling direction.

N**neutron cross section**

That property of an element describing its relative probability for interaction with an impinging neutron. It is measured in units of area, usually the barn, being equal to 10^{-24} cm²; for convenience, the cross section of an element nucleus is just the target area presented by that nucleus to an approaching neutron. The target area or cross section is measured as area on a plane normal to the motion of the neutron and can be considered, in a simple sense, as the area of projection of the actual nucleus on the plane.

neutron dosimetry

The measurement of the neutrons present and in motion through a specific area in a unit of time.

neutron fluence

The neutron flux integrated over the time period of irradiation. This term recently was referred to as the dose or exposure or simply nvt. The International Committee for Radiological Units (ICRU) has recommended that neutron fluence be used exclusively as a descriptor for these other terms.

neutron flux

The product of the neutron density (n/cm^3) and velocity (cm/s); this translates to $n/\text{cm}^2 \cdot \text{s}$.

neutron spectrum

The distribution of neutrons at a specific reactor location indicating the population existing at discrete energy levels or within bands of specified upper and lower energy limits.

normalizing

A strengthening operation in steel wherein the material is heated until all the iron has transformed into austenite, then removed from the furnace and cooled in air.

notch ductility

The ability of a material that contains a notch-type flaw to deform plastically prior to failure thus absorbing a large amount of the energy input.

P**primary rolling direction**

The dimension of a plate that has received the greatest amount of extension due to passes beneath the rolls.

Q**quench**

Extremely rapid cooling of a steel plate which usually has just been removed from an austenitizing treatment furnace; it is effected by either spraying with water or total submergence in water.

R**rolling direction**

In the reduction of steel ingots into plate, the orientation of the steels with respect to its traverse beneath the rolls.

S

shear

A term indicative of ductility. Full shear energy absorption is the amount of energy absorbed by a notched bar impact specimen when the fracture is ductile,

shelf

For the upper shelf, the maximum energy that is absorbed by a notched bar impact specimen under test.

shell

A cylindrical section of pressure vessel wall used in conjunction with one or more others when all welded together form a complete pressure vessel.

soft spectrum

A neutron spectrum wherein the average energy of the neutrons is relatively low.

stress relief

A heating treatment following tempering and usually after significant mechanical working or welding. The steel is raised in temperature to a level below the tempering temperature for several hours to eliminate residual stresses.

subarc welding

A weld joining process wherein a mechanically driven electrode passes through a joint with the filler wire being fed into the arc which is under a constant blanket of flux agent. The fusing arc is thus "submerged" in flux.

T

temper

A heating treatment following quenching or normalizing wherein the steel is raised in temperature to a level below the austenitizing temperature for several hours in order to impart ductility. Tempering has the effect of simultaneously lowering strength while increasing ductility; it also reduces residual stresses.

thermal neutrons

Neutrons of velocities such that they are in thermal equilibrium with their environment. At 20 C, thermal neutrons of 0.0253 eV have a velocity of 2200 m/s. Measurements for most experimental irradiation

studies using bare and cadmium-shielded cobalt yield values for “thermal” neutrons of energies ≤ 0.41 eV. This is the highest energy level of neutrons that cadmium can effectively shield out.

threshold foil

A flux monitor that is activated only by neutrons equal to or greater than a certain energy level or threshold. Neutrons of energies below the threshold cannot interact to a significant degree.

transverse

In rolled steel plate, the plate dimension perpendicular to the primary rolling direction.

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