Radiographic Testing Classroom Training Book, second edition

Errata – 2nd Printing 04/18

The following text correction pertains to the second edition of the *Radiographic Testing Classroom Training Book*. Subsequent printings of this publication will incorporate the correction into the printed text.

The attached corrected page applies to the second printing. In order to verify the print run of your book, refer to the copyright page. Ebooks are updated as corrections are found.

Page	**Correction**
21	In Figure 5, the second instance of iridium in the sample dated decay curve should be 12.5 Ci.
147	The box in the top left corner of Figure 10 should read: Ir-192 exposure factors $T = EF$ x D^2/S T = time (min) for density 2.0 EF = exposure factor D = source-to-film distance (ft) S = souce strength (Ci)
148	In Figure 11, the thin section should be labeled: 0.5 in. (1.3 cm).

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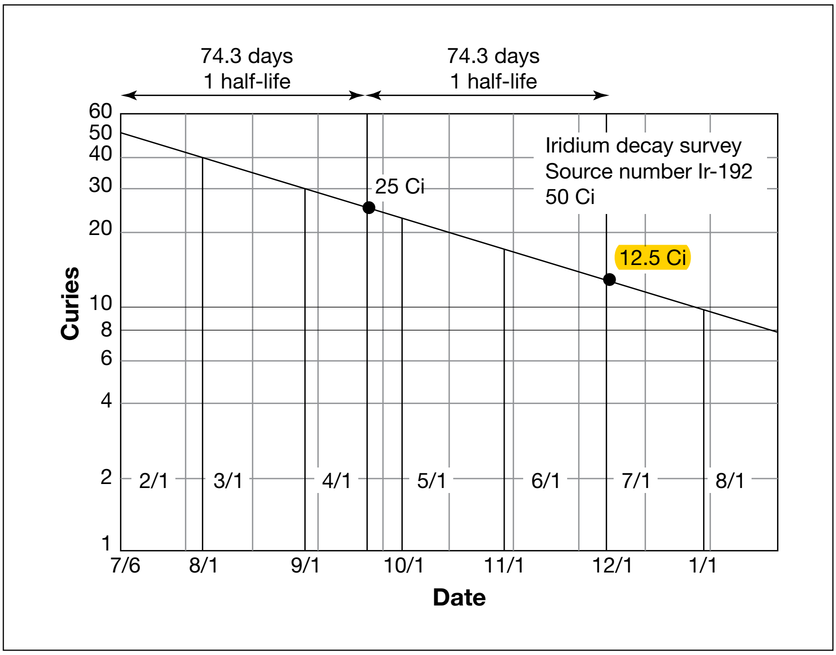


Figure 5: Sample dated decay curve.

and the energy of their gamma ray emissions. Note that several radioisotopes have multiple wavelengths. Many other radioisotopes that are radiographically useful are not considered here because in practical applications, one or another of the four discussed in this section is superior.

Gamma Ray Sources

The effective focal spot in X-radiography is the X-ray generating portion of the target as viewed from the test object. In contrast, in gamma radiography, because all of the radioactive material is producing gamma rays, the focal spot is the surface area of the material as viewed from the test object. For this reason, it is desirable that the dimensions of a gamma ray source be as small as possible. Most isotopes used in radiography are round wafers encapsulated in a stainless steel cylinder.

Table 2: Equivalent gamma ray energy.

Radioisotope	Equivalent Gamma Ray Energy (MeV)
Cobalt-60	1.33 1.17
Iridium-192	0.31 0.47 0.6
Cesium-137	0.66
Selenium-75	0.09 to 0.4

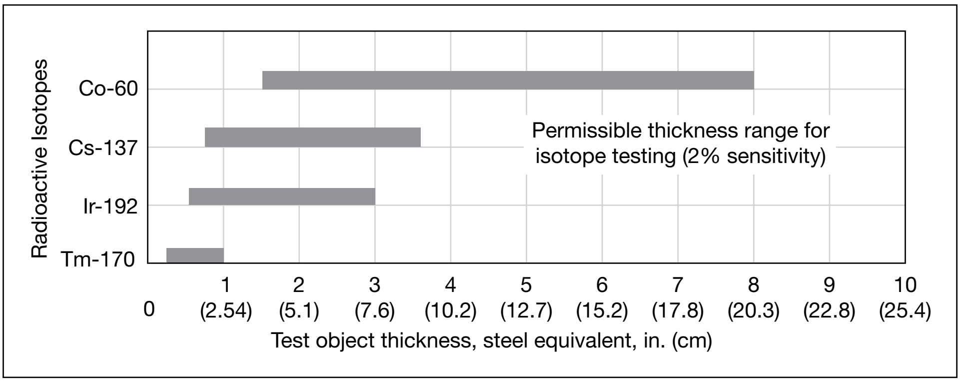
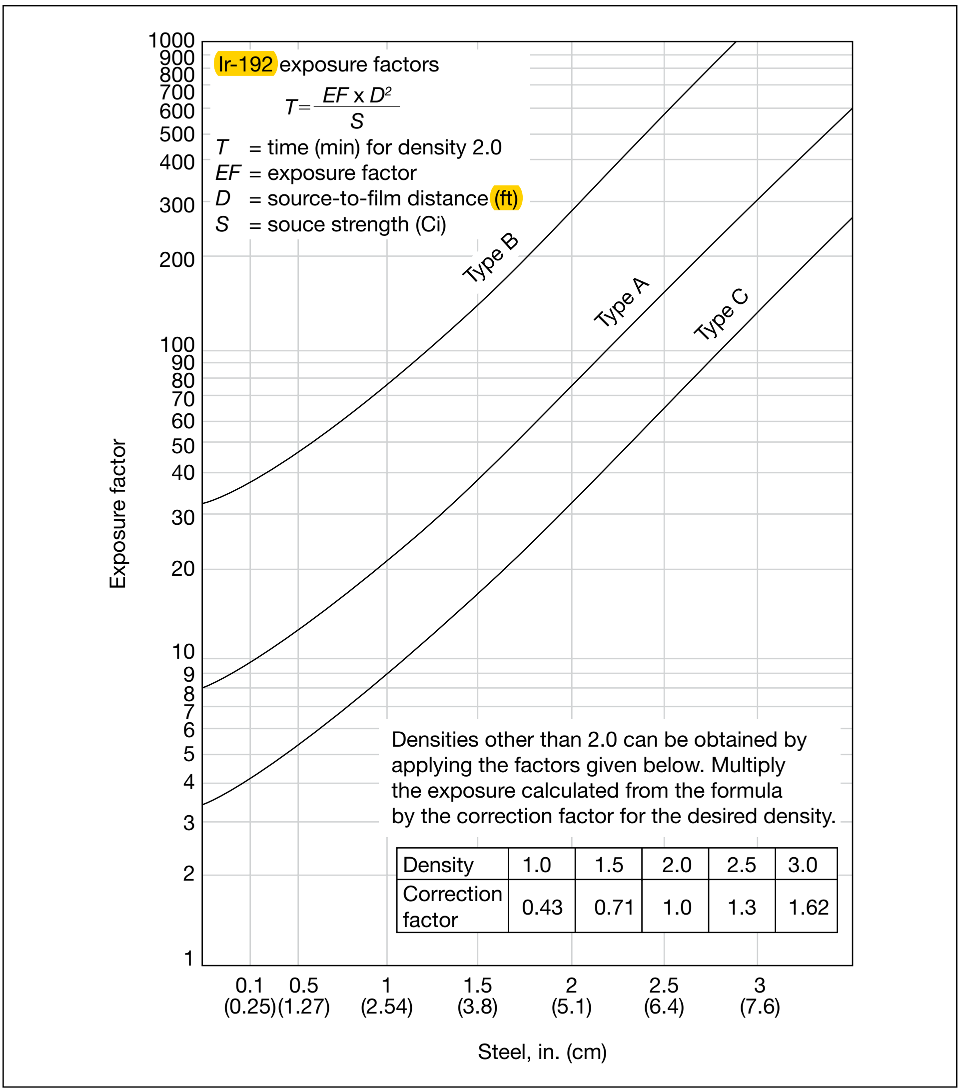


Figure 9: Isotope thickness ranges.



Density	1.0	1.5	2.0	2.5	3.0
Correction factor	0.43	0.71	1.0	1.3	1.62

Figure 10: Exposure chart for Ir-192 with film types A, B and C.

Table 3: Exposure chart for example 5, step 2.

Exposure steel thickness	140 kV	160 kV
0.25 in. (0.6 cm)	330 mAs	170 mAs
0.375 in. (1 cm)	1000 mAs	400 mAs

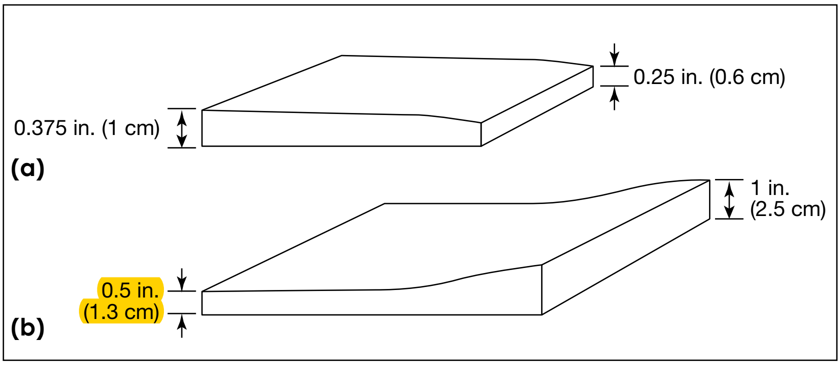


Figure 11: Steel test objects as referred to in (a) Example 5 and (b) Example 6.

Step 3: As previously shown in Figure 6, the log relative exposure with type II film for a 2.0 density is 1.91 and for a 3.3 density is 2.18. The difference between the log relative exposures is 0.27. The antilog of 0.27 is 1.83. Therefore, to obtain the exposure for 3.3 density, the exposure for 2.0 density is multiplied by 1.83.

Step 4: From Step 2, the exposure of 0.25 in. (0.6 cm) of steel for 2.0 density at 140 kV is 330 mAs, and at 160 kV is 170 mAs. Thus, an exposure of 604 mAs (330 mAs × 1.83) at 140 kV and 311 mAs (170 mAs × 1.83) at 160 kV will result in radiographs of 3.3 density.

Step 5: Exposures within the acceptable density range are shown in Table 4. With 140 kV, any exposure more than 604 mAs will result in a density greater than 3.3 at the thin portion of the test object, and any exposure less than 1000 mAs will result in a density of less than 2.0 at the thick portion of the test object. The same relative conditions hold true with 160 kV. It is impossible to obtain a radiograph of acceptable sensitivity and densities with a single exposure of type II film.

Example 6

The steel test object shown in Figure 11(b) must be radiographed with Ir-192. The available source measures 30 Ci. Required sensitivity is 2%, maximum acceptable density is 3.3, and minimum is 2.0. Determine if a radiograph of acceptable sensitivity and densities can be made with a single exposure of type A film.