Radioactive Materials Reference Sheet: Phosphorous–33

**Half-life**: 25.3 days
**Type of Emitter**: Beta
**Beta Energy**: 0.249 MeV
**Travel Distance in Air**: 0.89 m : 35 inches : 2.9 feet
**Travel Distance in Plexiglas/Lucite**: 0.089 cm : 0.035 inches

**Annual Intake Limits**
- **Inhalation**: 3 mCi
- **Ingestion**: 6 mCi

**CONCERNS**
Some of the energetic (not as high as with 32P) betas emitted from 33P can penetrate gloves and the outer dead layer of skin, creating an external exposure hazard. One should be careful not to contaminate the skin. Some 33P compounds may be incorporated in the skin causing very large skin doses and a pathway into the body.

**SHIELDING**
- None required for quantities less than a mCi.
- 1/8 inch thick plexiglas, acrylic, lucite, plastic or plywood is recommended for mCi quantities. This shielding requirement also applies to waste containers.

**DETECTION**
- GM survey meter with a pancake probe (has a detection efficiency of approximately 10% (under ideal conditions)). However, covering the window with plastic wrap or paraffin film will stop most or all of the betas from entering the detector.
- Liquid scintillation counting of wipes may be used to detect removable surface contamination. This is the preferred method for detecting 33P.

**SPECIFIC EQUIPMENT / SUPPLIES**
**In addition to general equipment, the following is recommended for specific use of 33P:**
- 1/8 inch thick plexiglas, acrylic, lucite, plastic or plywood shielding (for mCi amounts).
SAFETY RULES FOR $^{33}$P

- Follow General Safety Precautions for all isotopes.

Specific Recommendations:

WHILE WORKING

- Avoid skin exposure by using tools to indirectly handle unshielded sources and potentially contaminated vessels. Do not directly hold test tubes or micro-centrifuge tubes. Increasing distance lowers exposure. Also, employ plastic racks to minimize skin exposure.

- Suitable traps may be necessary to collect $^{33}$P if large gas or vapor releases are anticipated.

- For mCi amounts, do not work over open containers of $^{33}$P without shielding. Work with a Plexiglas shield (1/8 inch thickness) between you and the radioactive material.
- Shield all stock vials.

POST-USE

- Dispose of $^{33}$P waste according to the waste disposal guidelines. If by sink disposal, ensure that it is soluble in water and does not exceed the posted limit (50 μCi daily, if only one radionuclide is being disposed of). Do not exceed this limit, unless otherwise authorized by the Radiation Safety Committee in the permit.

- $^{33}$P waste, in mCi amounts, should be stored in a plexiglas (or acrylic, lucite, plastic or plywood) shielded (lined, etc...) container to minimize possible exposures. $^{33}$P waste must be segregated and kept separate from $^{125}$I, $^{32}$P, $^{35}$S and other radioactive wastes. The waste should be consolidated and stored in an isolated spot away from work and high traffic areas.