and contents of the disposal system. At a minimum, it is proposed that such measures will include: (1) Identification of the controlled area by markers that have been designed, fabricated and emplaced to be as permanent as practicable; and (2) placement of records in the archives and land record systems of local, state, and Federal Government agencies, and international archives, that would be likely to be consulted by individuals in search of unexploited resources.

The Agency proposes that the type of information contained in records shall include: The location of the controlled area and the disposal system; the design of the disposal system; the nature and hazard of the waste; geologic, geochemical, hydrologic, other site data pertinent to the containment of waste in the disposal system, and the results of tests, experiments, and other analyses relating to backfill of excavated areas, shaft sealing, waste interaction with the disposal system, and any other tests, experiments, or analyses pertinent to the containment of waste in the disposal system. EPA solicits comments on the appropriateness of this list and on whether additional or other items should be specified. Any application for certification of compliance shall include detailed descriptions of the proposed controls as well as information regarding the period of time those controls are expected to endure and be understood.

A question arises with regard to the extent to which the Agency should allow performance assessments to consider contributions from passive institutional controls in reducing the likelihood of human-initiated processes and events that may affect the disposal system. While the disposal regulations address contributions from active institutional controls (see above discussion of active institutional controls), they do not specifically address contributions from passive institutional controls. The Agency may be willing to consider such contributions if a persuasive case can be made that the passive institutional controls can be expected to endure and act as a deterrent to potential intruders. In no instance, however, will passive institutional controls be assumed to eliminate the likelihood of humaninitiated processes and events entirely. Furthermore, contributions from passive institutional controls may vary over time. For example, the effectiveness of passive institutional controls may decrease over the regulatory time frame. The Agency solicits comment on the extent-if any-to which contributions from passive institutional controls

should be considered in performance assessments.

Because of the uncertainty concerning the effectiveness of passive institutional controls in terms of influencing human activity, EPA must carefully scrutinize information about such controls. The Agency has considered the fact that markers exist in the world today that are thousands of years old. This would tend to support the view that passive institutional controls can survive for very long periods of time. Nevertheless, it is possible that markers have been created in the past and were destroyed or disintegrated. The actual percentage of surviving markers is thus unknown. It could be very small, meaning that an unrealistically large number of markers would have to be placed at the WIPP in order to assure survival. Further uncertainty in the effectiveness of markers derives from the possibility that even if markers survive, it does not mean they will necessarily be understood by future generations.

Institutional controls have been known to fail. The New Mexico Environmental Evaluation Group (EEG) has documented instances in the recent past where institutional controls have failed at the WIPP. According to EEG, both the DOE and the Department of the Interior's Bureau of Land Management "failed to implement the procedures described by the DOE as crucial to protecting the site from inadvertent human intrusion in twenty-two of the twenty-five applications to drill oil and gas wells filed while a Memorandum of Understanding was legally binding and the WIPP facility was in a state of full readiness to receive waste." (EEG letter to EPA dated February 23, 1994). This indicates that even today, and even with governmental entities responsible for implementation of controls, such controls are not, necessarily, reliable. The unknown nature of future societies and governmental institutions compounds the uncertainty.

Engineered Barriers

The assurance requirements of 40 CFR part 191 require that disposal systems 'use different types of barriers to isolate the wastes from the accessible environment." Additionally, the disposal standards mandate that "Both engineered and natural barriers shall be used." 40 CFR part 191 defines the term "barrier" as "any material or structure that prevents or substantially delays movement of water or radionuclides toward the accessible environment. For example, a barrier may be a geologic structure, a canister, a waste form with physical and chemical characteristics that significantly decrease the mobility

of radionuclides, or a material placed over and around waste, provided that the material or structure substantially delays movement of water or radionuclides."

If selected and designed properly, engineered barriers can significantly reduce the potential for waste migration away from the disposal system. They can be an effective mechanism for improving the performance of the WIPP and for reducing the uncertainty inherent in long-term projections about the ability of the disposal system to comply with the quantitative requirements of 40 CFR part 191.

While the disposal standards require use of engineered barriers, they do not specify how many or what kinds of engineered barriers must be used. The Agency is, therefore, proposing criteria for selecting engineered barriers.

In today's notice, EPA is proposing that DOE complete a study of engineered barrier alternatives and their benefits and costs. The results of such study shall be used to justify both the selection and rejection of engineered barriers at the WIPP. Moreover, the study shall be peer reviewed. For example, EPA believes that the National Academy of Sciences may be able to provide an appropriate forum for peer review of the study envisioned in today's proposed criteria. The Agency believes that the credibility of the study of engineered barrier alternatives and resulting selection of engineered barriers for the WIPP disposal system is critically important.

The specific engineered barriers proposed to be evaluated include, but are not limited to: Cementation, shredding, supercompaction, incineration, vitrification, improved waste canisters, grout and bentonite backfill, melting of metals, alternative configurations of waste placements in the disposal system, and alternative disposal system dimensions. These specific engineered barriers were selected by the Agency because they have already begun to be considered by DOE's Engineered Alternatives Task Force (EATF) (see July, 1991 EATF Report on Engineered Alternatives for the WIPP, DOE/WIPP 91-007) and appear to represent potentially promising alternatives. EPA solicits comment on the appropriateness of specifying the above-mentioned engineered barriers as the subject of the study and on whether alternative barriers should be specified.

The Agency is proposing that the following factors be considered in benefit/cost analysis of the abovementioned engineered barriers: the ability of the engineered barrier to