RECOMMENDED SPECIFICATIONS FOR
DESER T T O R TO I SE EXCLUSION FENCING
September 2005

These specifications were developed to standardize fence materials and construction procedures to confine tortoises or exclude them from harmful situations, primarily roads and highways. Prior to commencing any field work, all field workers should comply with all stipulations and measures developed by the jurisdictional land manager and the U.S. Fish and Wildlife Service for conducting such activities in desert tortoise habitat, which will include, at a minimum, completing a desert tortoise education program.

FENCE CONSTRUCTION

Materials
Fences should be constructed with durable materials (i.e., 16 gauge or heavier) suitable to resist desert environments, alkaline and acidic soils, wind, and erosion. Fence material should consist of 1-inch horizontal by 2-inch vertical, galvanized welded wire, 36 inches in width. Other materials include: Hog rings, steel T-posts, and smooth or barbed livestock wire. Hog rings should be used to attach the fence material to existing strand fence. Steel T-posts (5 to 6-foot) are used for new fence construction. If fence is constructed within the range of bighorn sheep, 6-foot T-posts should be used (see New Fence Construction below). Standard smooth livestock wire fencing should be used for new fence construction, on which tortoise-proof fencing would be attached.

Retrofitting Existing Livestock Fence

Option 1 (see enclosed drawing). Fence material should be buried a minimum of 12 inches below the ground surface, leaving 22-24 inches above ground. A trench should be dug or a cut made with a blade on heavy equipment to allow 12 inches of fence to be buried below the natural level of the ground. The top end of the tortoise fence should be secured to the livestock wire with hog rings at 12 to 18-inch intervals. Distances between T-posts should not exceed 10 feet, unless the tortoise fence is being attached to an existing right-of-way fence that has larger interspaces between posts. The fence must be perpendicular to the ground surface, or slightly angled away from the road, towards the side encountered by tortoises. After the fence has been installed and secured to the top wire and T-posts, excavated soil will be replaced and compacted to minimize soil erosion.

Option 2 (see enclosed drawing). In situations where burying the fence is not practical because of rocky or undigable substrate, the fence material should be bent at a 90° angle to produce a lower section approximately 14 inches wide which will be placed parallel to, and in direct contact with, the ground surface; the remaining 22-inch wide upper section should be placed vertically against the existing fence, perpendicular to the ground and attached to the existing fence with hog rings at 12 to18-inch intervals. The lower section in contact with the ground should be placed within the enclosure in the direction of potential tortoise encounters and level with the ground surface. Soil and cobble (approximately 2 to 4 inches in diameter; can use larger rocks where soil is shallow) should be placed on top of the lower section of fence material.
on the ground covering it with up to 4 inches of material, leaving a minimum of 18 inches of
open space between the cobble surface and the top of the tortoise-proof fence. Care should be
taken to ensure that the fence material parallel to the ground surface is adequately covered and is
flush with the ground surface.

New Fence Construction
Options 1 or 2 should be followed except in areas that require special construction and
engineering such as wash-out sections (see below). T-posts should be driven approximately
24 inches below the ground surface spaced approximately 10 feet apart. Livestock wire should
be stretched between the T-posts, 18 to 24 inches above the ground to match the top edge of the
fence material; desert tortoise-proof fencing should be attached to this wire with hog rings placed
at 12 to 18-inch intervals. Smooth (barb-less) livestock wire should be used except where
grazing occurs.

If fence is constructed within the range of bighorn sheep, two smooth-strand wires are required
at the top of the T-post, approximately 4 inches apart, to make the wire(s) more visible to sheep.
A 20 to 24-inch gap must exist between the top of the fence material and the lowest smooth-
strand wire at the top of the T-post. The lower of the top two smooth-strand wires must be at
least 43 inches above the ground surface.

(72-inch T-posts: 24 inches below ground + 18 inches of tortoise fence above ground + 20 to
24-inch gap to lower top wire + 4 inches to upper top wire = 66 to 70 inches).

INSPECTION OF DESERT TORTOISE BARRIERS

The risk level for a desert tortoise encountering a breach in the fence is greatest in the spring and
fall, particularly around the time of precipitation including the period during which precipitation
occurs and at least several days afterward. All desert tortoise fences and cattleguards should be
inspected on a regular basis sufficient to maintain an effective barrier to tortoise movement.
Inspections should be documented in writing and include any observations of entrapped animals;
repairs needed including bent T-posts, leaning or non-perpendicular fencing, cuts, breaks, and
gaps; cattleguards without escape paths for tortoises or needed maintenance; tortoises and
tortoise burrows including carcasses; and recommendations for supplies and equipment needed
to complete repairs and maintenance.

All fence and cattleguard inventories should be inspected at least twice per year. However,
during the first 2 to 3 years all inspections will be conducted quarterly at a minimum, to identify
and document breaches, and problem areas such as wash-outs, vandalism, and cattleguards that
fill-in with soil or gravel. GPS coordinates and mileages from existing highway markers should
be recorded in order to pinpoint problem locations and build a database of problem locations that
may require more frequent checking. Following 2 to 3 years of initial inspection, subsequent
inspections should focus on known problem areas which will be inspected more frequently than
twice per year. In addition to semi-annual inspections, problem areas prone to wash-outs should
be inspected following precipitation that produces potentially fence-damaging water flow. A database of problem areas will be established whereby checking fences in such areas can be done efficiently.

**REPAIR AND MAINTENANCE OF DESERT TORTOISE BARRIERS**

Repairs of fence wash-outs: (1) realign the fence out of the wash if possible to avoid the problem area, or (2) re-construct tortoise-proof fencing using techniques that will ensure that an effective desert tortoise barrier is established that will not require frequent repairs and maintenance.

Gaps and breaks will require either: (a) repairs to the existing fence in place, with similar diameter and composition of original material, (b) replacement of the damaged section to the nearest T-post, with new fence material that original fence standards, (c) burying fence, and/or (d) restoring zero ground clearance by filling in gaps or holes under the fence and replacing cobble over fence constructed under Option 2. Tortoise-proof fencing should be constructed and maintained at cattleguards to ensure that a desert tortoise barrier exists at all times.

All fence damage should be repaired in a timely manner to ensure that tortoises do not travel through damaged sections. Similarly, cattleguards will be cleaned out of deposited material underneath them in a timely manner. In addition to periodic inspections, debris should be removed that accumulates along the fence. All cattleguards that serve as tortoise barriers should be installed and maintained to ensure that any tortoise that falls underneath has a path of escape without crossing the intended barrier.