NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
ARIZONA

WATER-HARVESTING CATCHMENT
(No.)

CODE 636

DEFINITION

A facility for collecting and storing runoff from precipitation.

PURPOSE

Provide water for livestock, fish, wildlife, or other conservation purposes by creating impervious areas to increase, collect, and store runoff.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to resource conservation systems where there is a need for additional supply of water.

This practice applies to the sealing of the ground surface or the construction of elevated roof structures. It also applies to curbs and diversions constructed to collect and store runoff from existing impervious areas such as rock outcrops or existing pavement.

This practice does not apply to the collection and storage of runoff from existing roofed structures, which is addressed by NRCS Conservation Practice Standard, Roof Runoff Structure (558).

CRITERIA

Water harvesting catchments shall be part of an approved and overall engineering plan for livestock, drainage, wildlife, recreation, channel improvement, or similar purposes.

Water-harvesting catchment shall be designed *on an individual job basis, or applicable NRCS standard drawings,* according to the *functional requirements*, water requirements and the conditions of the site, in accordance with the following:

- The contributing drainage area shall be large enough to yield the quantity and quality of runoff water required for the intended use.
- Aprons on the ground surface shall be smooth and impervious, to insure that adequate runoff occurs. Compacted earth, treated earth, wax, rubber, plastic, asphalt, concrete, steel, and other suitable materials are acceptable for this purpose.
- Undesired runoff shall be diverted from the catchment area to prevent damage, contamination, or excessive sedimentation.
- An overflow pipe or auxiliary spillway shall be installed to prevent damage to the surface apron from runoff in excess of that needed to maintain the design capacity of the conveyance system. A sediment trap shall be installed between the surface apron and the storage facility.
- The storage facility shall be of adequate size, impermeable, and durable to hold water for the intended purpose. Earthen basins, or tanks constructed of steel, concrete, plastic, wood, or similar materials, are acceptable. Earthen reservoirs shall have a minimum 1 foot of freeboard above the design high water surface elevation. All storage facilities shall be protected from a minimum 10-year-frequency rainfall event. Overflow protection shall be provided for all storage facilities.
- Aprons on the ground surface and elevated roof structures shall be protected from damage by weather, animals, vandals, and traffic. Fencing shall be installed as necessary. *When fencing is necessary, use Arizona Conservation Practice 382, Fence.*
- *Maintenance of the apron, the conveyance system, the overflow device, and the storage basin shall be considered and evaluated during the planning and design process*

Design and implementation of subsidiary components and/or structures shall meet all applicable Natural Resource Conservation Service (NRCS) conservation practice standards. The criteria for the design of any

components not specifically addressed in NRCS practice standards or specifications shall be consistent with sound engineering principles and/or manufacturer recommendations.

***Laws and Regulations**. This practice must conform to all federal, state, tribal, and local laws, rules, or regulations. Laws and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species.*

The owner is responsible for securing necessary permits and water rights, complying with all laws and regulations, and meeting legal requirements applicable to the installation, operation, and maintenance of this practice and associated structures.

***Foundation Preparation**. The apron and dike foundation shall be cleared of all trees, stumps, roots, brush, rock, debris, and vegetation. Structures shall be placed on firm foundation to the limits and grades shown on the drawings or as staked in the field.*

Excavation for structures shall be accomplished to line and grade as shown on the drawings and to sufficient lengths and widths to allow forming, bracing and tying of embedded items. Where practical, the cutoff trench and wingwall trench shall be carefully excavated to allow the excavated trench walls to be brought to grade by compacting fill material to the same density as the undisturbed earth. All water or mud shall be removed from the excavated area prior to placement of the structure.

***Materials.** Surfacing materials used in association with this practice shall meet the following minimum quality criteria:*

- *Paraffin Wax shall have a melting point between 120°F to 140°F, per ASTM D87;*
- *Bituminous material shall meet the requirements of AASHTO M81, Grade RC-70;*
- *Latex-Asphalt shall have a minimum rubber solids content of 2-percent, by weight, and consist of a rubberized asphalt material (AR-4000 Series) blended with high temperature Styrene-Butadiene-Rubber (SBR). Monomer ratio(B:S) shall be 68:32;*
- *Fiberglass matting shall be multi-strand, bonded in matt with polymer polyester resin, weighing one ounce per square foot meeting specifications for (1) Owens Corning M-700, (2) Pittsburgh Plate Glass PPG-ABM, (3) Ferro Corporation HSB-1 or (4) an approved equal;*
- *Asphalt emulsions, either cationic or anionic for base coats and seal coats (asphalt-clay) shall contain a minimum solids content of 60 and 48-percent, respectively;*
- *Fabric shall have a grab strength of 110-pounds (ASTM D1682), puncture strength of 60-lbs (ASTM D751), be resistant to ultraviolet radiation, acids and alkalies, be chemically compatible with asphalt, and be temperature stable with less than 1-percent shrinkage.*

***Investigations, Surveys and Design Criteria.** Documentation requirements will be as outlined below, in additional to the documentation requirements of the practice components used in the system.*

Conduct a preliminary site assessment or investigation to determine the type, location and layout of the catchment. Additional information may include:

1. *Soil or geological investigation to determine soil and/or foundation condition (use the Unified Soil Classification System [SM, CL, etc.] and texture [silty sand, lean clay, etc.]).*
2. *Verify appropriate state or local laws for permitting and approval requirements and notify landowner of his/her responsibilities.*
3. *Verification or certification of used materials (if any).*

To adequately plan and layout this practice, a detailed topographic survey may be required, that adequately details:

1. *Site topography, as needed to show the physical features of the site, including existing features/practices, field elevations, location of any utilities or markers, etc.*
2. *Determine control elevations and distances. Where applicable, USGS 7.5-minute topographic Quadrangles combined with aerial photography may be used, provided design analysis verifies minimum hydraulic criteria (pressures and flows) are achievable at all locations.*
3. *If applicable, a permanent benchmark(s) shall be set and described. Preferably, the elevations and coordinates should be based on a local (assumed) or coordinate system (State or grid) and clearly stated on the plan. Datum may be in the form of Northing and*

Easting coordinates, or Longitude and Latitude.

The design of a practice is the application of Field Office Technical Guide practice standards, practical experience and judgment in the development of a solution to the problem or the objective. All computations and decisions made during the design of a practice are to be checked by another qualified individual and appropriate notations made. Design computations, calculations or analysis shall meet the following criteria:

1. *Determine the catchment area and runoff using TR-55 (land use, time of concentration, reach data, storm data, etc.) EFM-2 (drainage area, curve number, watershed length and slope, rainfall amount and distribution, etc.) or approved equivalent.*
2. *Determine the surfacing and stabilization materials, including size, capacity or impervious area.*
3. *Calculate material quantities (material volume), includes estimates of foundation work, surfacing materials, etc.*
4. *Subsidiary and applicable components shall be designed in accordance with applicable conservation practice standards (i.e., pipelines shall meet the requirements of Conservation Practice 516, Pipeline, etc.);*

***Installation and Basis of Acceptance**. For construction that does not meet State, OSHA, or Tribal criteria or requirements where deficient construction materials were used, NRCS may consider a waiver request for approval of construction after it has received a signed and sealed construction and/or material exemption from a licensed engineer. Required exemption shall be for installation of materials that do not meet minimum quality criteria as found in applicable Standards, Specifications, ASTM's, AWWA standards, etc.*

Contractors performing work under this practice shall abide by all Federal, State or Tribal laws or criteria, and must be licensed by the state board of technical registers where the work is being implemented.

CONSIDERATIONS

Consider the effects the practice has on the quantity and quality of surface and ground water resources. Factors may include changes in evaporation, timing of releases from the catchment, and the impact of the type of catchment on surface water versus ground water resources.

Evaporation control measures may be needed to reduce water losses.

Consider covered storage basins or tanks, to preserve water quality of the harvested runoff.

Consider the installation of animal exclusion or escape devices to protect against the accidental drowning of wildlife.

Elevated roof structures or storage tanks may require additional design criteria to meet state or local building codes/permit requirements.

Where aquatic weed is an issue, consider treating all surface areas under the water harvesting catchment system with a soil sterilant. Sterilant material shall be a type that is immobilized within the soil and will not contaminate runoff. It shall also be a product approved by Arizona Department of Environmental Quality (ADEQ) for control of aquatic weeds.

Design alternatives presented to the client should address economics, ecological concerns and acceptable level of risk for design criteria as it relates to hazards to life or property.

***Water Harvesting Catchment Types.** All materials, labor, equipment, and installation shall be per this standard and applicable drawings, specifications (NRCS, ACI or ASTM) and product manufacturer or supplier's recommendations, where applicable.*

The following catchments and/or materials shall be used under this practice:

- *Paraffin Wax Surfacing*
- *Latex-Asphalt Surfacing*
- *Asphalt-Fiberglass Surfacing*
- *Latex-Asphalt Fiberglass Surfacing*
- *Rock Outcroppings or Paved Areas*
- *Asphalt-Fabric Surfacing*
- *Elevated Roof Structures*

PLANS AND SPECIFICATIONS

Use Arizona standard drawings to the extent possible. These may be supplemented by additional drawings or specification notes on the drawings to provide full installation instructions.

Construction plans shall include all components needed for the safe operation of the proposed improvements such as railing, fencing, or warning signs as appropriate. The plans shall address operations near existing utilities, trench excavations and any other items related to construction of the structure that may pose a safety risk to those involved.

*Development of p*lans and specifications for water-harvesting catchments *will be guided by the National Engineering Handbook, Part 650, the Engineering Field Handbook, Chapter 5, and shall be in accordance with the National Engineering Manual, Parts 541 and 542, and* shall be in keeping with this standard, *prepared for each specific site* and shall describe the requirements for installing the practice to achieve its intended purpose.

The plan shall specify the location, grades, quantities, dimensions, materials, and hydraulic and structural requirements for the individual structure. The following minimum criteria shall also be addressed:

- *Project location map, including section, township and range, North arrow, cooperator/owner acknowledgement and certification signature blocks, engineering job class (cover sheet).*
- *References that the owner/cooperator are responsible for all permits, rights-of-way, easements and the contact, coordination and location determination of any existing utilities or clearances (buried utility disclaimer).*
- *If applicable, a map showing the location of the practice(s) or system in reference to a known or established benchmark or reference point with the location, description and elevation clearly shown. Topographical features and/or controls shall be shown, showing tie in with existing or other planned practices.*
- *Field surveys and notes, soil investigations or geologic soil boring locations and soil classifications, earthwork or material estimates/quantities (foundation or embankment materials and requirements).*
- *System overview and layout (i.e., location and orientation of practice in relation to existing or planned facilities; connections to tanks or facilities; overflow or drain locations; Fencing or soil stabilization requirements; construction/installation criteria, including State and Federal [OSHA] safety requirements, etc.).*
- *Section or detail view of catchment, including material type, thickness, and size (dimensions).*
- *Construction notes, details or specifications to clarify a component and furnish directions or site specific requirement, i.e. quantities of materials.*
- *Use Arizona Construction and Material Specifications for each item of work and material, as applicable and available. Additional specifications may need to be written to provide full material and installation instructions. Fill in blanks and add or delete items from the specifications to make them fit the job as needed.*

All designs completed by non-NRCS personal shall meet minimum State licensing board requirements and NRCS requirements and criteria as outlined in the General Manual, the National Engineering Manual (including Arizona Supplements), and the National Engineering Handbook.

ONCE ALL PARTIES HAVE ACCEPTED AND SIGNED THE PLANS AND SPECIFICATIONS, NO CHANGES SHALL BE MADE TO THE DRAWINGS OR SPECIFICATIONS WITHOUT PRIOR APPROVAL OF NRCS.

OPERATION AND MAINTENANCE

An *operation and maintenance (*O&M) plan specific to the type of installed water-harvesting catchment shall be provided to *and reviewed with* the landowner*, cooperator or operator responsible for operation and maintenance and shall be commensurate with the size and complexity of the project. The plan shall document needed actions, including reference to periodic inspections and the prompt repair or replacement of damaged components, and should provide specific instructions for operating and maintaining facilities to ensure they function properly and adequately throughout their expected life.* The plan shall *be site specific and* include, but not be limited to, the following provisions:

- Inspecting and testing valves, pumps, and other appurtenances;
- Maintaining protection from erosion at outlets;
- Inspecting for and removing debris, minerals, algae and other materials that may restrict system flow. *It shall be performed after major storms and at least semi-annually;*
- Draining or providing for cold weather operation of the system;

- Controlling vegetation, wildlife, rodents, or burrowing animals from damaging apron. *Immediately repair any damage caused by their activity*;
- Maintaining all fences to prevent unauthorized human or livestock access *where excessive trampling of banks or ditch may occur, and do not allow livestock near equipment during operation;*
- *Checking coatings on metal, fiberglass and plastic tanks and re-coating as needed to maintain effective ultraviolet resistance;*
- Inspecting the catchment area for signs of ultraviolet degradation of flexible materials;
- *Installed practices will be inspected periodically to ensure proper function.*
- *Immediately repair any damage resulting from vandalism, vehicles, livestock or wildlife; and*
- *Inspect for safety of people or animals using the area near the structure.*
- *Check all timber or lumber sections for decay and other damage, especially, sections in contact with earth or other materials. Promptly repair any damaged sections and apply protective coatings, as needed.*

REFERENCES

- USDA-ARS, Agriculture Handbook No. 600, Handbook of Water Harvesting.
- *USDA-NRCS, National Engineering Manual (NEM), 2nd Edition*
- *General Manual, Title 420-Part 401, Title 450-Part 401, Title 190-Parts 410.22 and 410.26*
- *National Engineering Handbook (NEH), Part 630 – Hydrologic Engineering; Part 634 – Hydraulic Engineering; Part 636 – Structural Engineering; Part 639 – Erosion Control Engineering; Part 531 – Geology; Part 652 – Irrigation Guide; USDA, Natural Resources Conservation Service*
- *USDA-NRCS, TR-62 – Engineering Layout, Notes, Staking and Calculations*
- *National Environmental Compliance Handbook*
- *National Planning Procedures Handbook*
- *National Cultural Resources Handbook*