Soil
Conservation
Service

United States
Department of
Agriculture

National

Engineering

Manual

Title 210

Foreword

This manual furnishes the policy needed to provide uniform high quality in SCS engineering. It is essential that SCS provide consistent quality engineering and that conservation practices be of the appropriate level of quality to insure proper functioning, with the planned maintenance, throughout their design life.

Quality does not depend on these policy statements alone, but on engineers and other SCS employees who possess a sound knowledge of engineering principles and who apply this policy with good judgment.

The policy in this National Engineering Manual is the result of the experience of many people over many years. Policy is dynamic and must continue to evolve and adapt to new technology, materials, and experiences. As we continue to examine this policy in the light of new developments, we must be satisfied that our decisions are appropriate and will strengthen and enhance engineering. To do so will uphold our tradition of quality engineering.

NORM A. BERG,
Chief

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PART 500 - INTRODUCTION

500.00 General

(a) The purpose of this manual is to present engineering policy clearly and completely so that engineering activities can be carried out efficiently.

(b) These policies are provided for the purpose of establishing and maintaining technical excellence in engineering which results from the knowledge of engineering principles, the ability to apply the knowledge effectively, and to coordinate an interdisciplinary team approach to the engineering activity.

500.01 Scope.

(a) It is NRCS policy to maintain a viable engineering staff, trained and experienced in the type of work needed to support the NRCS natural resources conservation program. NRCS recognizes that there will be situations for which sufficient staff or expertise is not available. Under these conditions, contracting is an alternative for expediting engineering activities. As such, all engineering work performed by or for NRCS is to be in conformance with the requirements stated in this manual.

(b) The policies stated in this manual apply to engineering work performed for others under cooperative working agreements, in memoranda of understanding, or under any other agreement entered into by NRCS.

500.02 Abbreviations.

The following abbreviations are used:

NEM - National Engineering Manual

NEH - National Engineering Handbook

NHCP - National Handbook of Conservation Practices.

RO - Regional Office

CED - Conservation Engineering Division

NRCS - Natural Resources Conservation Service

USDA - United States Department of Agriculture

PART 501 - AUTHORIZATIONS

SUBPART A – REVIEW AND APPROVAL

501.00 General.

(a) Conservation engineering practices have the potential, upon failure or malfunction, to affect public health and safety, cause loss of life, and/or cause significant property damage, depending on the size, location, and complexity of work. For this reason the practice of engineering is regulated by individual states through professional engineering certification as described in the General Manual 210-402.

(b) The development of engineering plans or engineering aspects of practices requires that the approving engineer be responsible for obtaining and integrating the needed assistance from an interdisciplinary team under the rules of professional conduct.

(c) Engineering job approval authority is the quality assurance process that ensures adequate considerations by competent NRCS employees to plan, design, and install conservation practices that, with proper operation and maintenance, will perform the intended functions for the planned life of the practices. The purposes of engineering job approval authority are: to maintain the accountability required by state certification of professional engineers; to provide competent and functional engineering in planning, design, and construction of conservation practices; and to maintain the credibility and public trust of NRCS engineering.

(d) All conservation engineering practice designs will be approved by a qualified person who has appropriate engineering job approval authority. Others may do some or all of the work under the direction of the qualified person. A conservation engineering practice is a conservation practice included in the National Handbook of Conservation Practices with engineering listed as the lead discipline.

501.01 Scope.

(a) Each NRCS employee providing engineering services is to be evaluated and assigned an appropriate engineering job approval authority based upon training, experience, and demonstrated competence. No more than one level of review is required.

(b) Non-NRCS employees operating under the technical supervision of an NRCS employee and providing engineering services are to be evaluated and assigned an appropriate engineering job approval authority based upon training, experience, and demonstrated competence. The engineering job

approval authority assigned, in addition to being based on technical competence, is dependent upon employment status as described in the following paragraphs.

(1) Non-NRCS employees who are federal employees may be assigned engineering job approval authority on the same basis as NRCS employees.

(2) Non-NRCS employees who are licensed to practice engineering in the same state in which the engineering services are offered may be assigned engineering job approval authority on the same basis as for NRCS employees.

(3) Non-NRCS employees who are not federal employees and are not licensed to practice engineering in the state in which the engineering services are offered may be assigned engineering job approval authority when such authority does not conflict with state law.

These employees include volunteers, employees of cooperative organizations or units of government, and other partners performing public services similarly to NRCS employees and therefore appearing to the public as NRCS employees.

Policy on the use of non-NRCS engineering services is contained in 505.

501.02 Technical Quality.

Engineering designs and installation assistance are to provide for engineering conservation practices that:

(a) Function as planned;

(b) Exhibit sound engineering principles;

(c) Perform safely;

(d) Are cost effective installations for which initial, operation, maintenance, and removal or replacement costs are considered;

(e) Meet the requirements of site specific conditions within an ecosystem;

(f) Comply with NRCS and industry established practice standards, technical criteria, and policies

501.03 Compliance of engineering work with laws and regulations.

(a) Engineering work is to meet applicable requirements of federal, state, and local laws, regulations, and codes. This is for all work that involves engineering activities during planning, design, construction, operations, maintenance, modification, rehabilitation, and removal or replacement.

(b) Registered professional engineers are encouraged to seal designs, construction plans, reports, and other engineering documents.

(c) The State Conservation Engineer is to develop policy and procedures for approving and sealing engineering plans:

(1) For works designed by NRCS and by non-NRCS employees working as partners with NRCS;

(2) Which are required to be sent to regulatory agencies for review, approval, or the granting of permits; and

(3) In states that have laws requiring the cooperating local organization to have plans for public works prepared under the direct supervision of a registered professional engineer.

501.04 Engineering job approval authority.

(a) The State Conservation Engineer is delegated the engineering job approval authority for all engineering jobs. Engineering jobs are classified with respect to hazard potential, complexity, and size, as shown in Exhibit 1 (501.08). The hazard potential is defined in 503. The type of review required varies by engineering job class as shown in 501.05.

(b) In-state engineering job approval authority (Classes I through V).

(1) Conservation engineering practices that are classified as Classes I through V jobs must be low hazard potential (such as class A dams or class III dikes) as defined in §503. For the practices with the potential for higher risk, limitations on selected controlling factors and hazard potential are to be used to further define the engineering jobs by higher classes.

(2) Each State Conservation Engineer is to develop policy and procedures for approval of engineering work carried out in the state. These are to apply to every individual providing

engineering services, both NRCS employees and non-NRCS employees operating under NRCS technical supervision. The procedure used to assign engineering job approval authority for non-NRCS employees is to be the same as that used for NRCS employees, except as noted in 501.01(b).

(3) Engineering job approval authority is to be delegated within a state according to the classes of jobs established in the state engineering job approval authority chart. Assigned individual engineering job approval authority is to be developed considering the employee's training, experience, and demonstrated competence. The practices applicable to the location are to be considered in assigning engineering job approval authority. Exhibit 2 (501.09) is a guide for developing engineering job approval authority charts. The practices listed are examples only. The State Conservation Engineer is to select, from Class V jobs, job type, controlling factors, units, and engineering job approval authority breakdowns appropriate for the conditions in the state. For the practices noted in Exhibit 1 (501.08), the same controlling factors should be use(d) Additional factors may be selected if needed.

(4) It is recommended that Professional Engineers registered in the state and working under NRCS technical supervision be routinely delegated either Class IV or V engineering job approval authority.

(5) The engineer technically responsible for engineering work (e.g., field or area engineer) is to delegate the engineering job approval authority for those working in her or his assigned are(a) The individual’s supervisor is to concur in the delegation of the engineering job approval authority. The engineering job approval authority delegation is not to be greater than that held by the delegating engineer. Individual engineering job approval authority is to be reviewed annually for those in their present position for less than three years and updated as necessary, but at least every three years for all others.

(6) The state engineering job approval authority chart is to be reviewed and concurred in by the Director of the Conservation Engineering Division.

(c) State Conservation Engineer's engineering job approval authority (Classes VI through VIII).

(1) The design review and, for Class VIII jobs, concurrence will be accomplished prior to engineering job approval by the State Conservation Engineer in accordance with 501.05. Design review encompasses the job design documentation, to include the design folder, construction

drawings, specifications, design report, quality assurance plan, operation and maintenance plan, and, when applicable, the instrumentation plan and contract provisions. See 511 for documentation requirements. Review also applies to all significant changes required during construction.

(2) Class VI engineering job approval authority may be delegated to NRCS Professional Engineers registered in the state if they have demonstrated competence for a particular practice and if the Director of the Conservation Engineering Division has determined that the state staff has the review capability for the job.

(3) Each State Conservation Engineer is to develop procedures for the design, review, and processing of Class VI through VIII jobs. This procedure is to indicate the staff specialists who are to participate in the design.

(d) Engineering job approval authority for additional work.

The engineering job approval authority for work to be done on an existing practice or structure is to be classified in accordance with procedures for classifying that practice or structure as listed in 501.07. This determination of engineering job approval authority applies to any additional work such as repair, modification, rehabilitation, or removal. The classification is determined by the highest category of any single most-limiting factor for the job.

(e) Documentation of design review and engineering job approval.

Review and approval of an engineering job, comprising the design, drawings, and specifications, is to be accomplished in one of the following ways:

(1) Signatures are to be placed on the design documentation/report and the cover or first sheet of the construction drawings, or

(2) Signatures are to be placed on an accompanying memorandum that describes the specific job and scope (including design documentation/report and plans).

(f) Associated plans and specifications.

Interdisciplinary design may produce associated drawings and specifications for erosion control, vegetative planting, final grading, and other components. All associated plans and specifications that may affect the performance of an engineering job are subject to the engineering job approval process.

501.05 Engineering job review.

(a) Design reviews.

(1) Classes I through V - No more than one level of design review of jobs in engineering job classes I through V is required to assure technical quality during design, as determined by the State Conservation Engineer.

(2) Classes VI through VIII - One level of design review of jobs in engineering job classes VI through VIII is require(d) The Director of the Conservation Engineering Division will determine the design review capability of the engineering staffs based on the demonstrated competence in these jobs and the sustained workload to maintain that proficiency. When a State Conservation Engineer or other key individual responsible for design is replaced, or when other conditions warrant, review capability is to be reviewed. The Director of the Conservation Engineering Division will initiate the review, will establish the level of review capability, and will notify the State Conservation Engineer in writing.

(3) Design reviews will be performed as follows:

Classes I - V:	As determined by the State Conservation
Class VI:	In-state staff review (if review capability established by the Director of the Conservation Engineering Division)
Class VII:	Independent staff review
Class VIII:	Director of Conservation Engineering Division review and concurrence

An independent staff review is a review conducted by a staff that is not supervised by the State Conservation Engineer and that did not participate in the design. The Director of the Conservation Engineering Division will concur in the selection of an independent reviewer if outside the NRCS.

(4) The policy on checking and reviewing engineering work is contained in 511.05.

(b) Post Reviews.

Post reviews are independent reviews made after installation of the practice or structure. Spot checks, as required by General Manual 450-407, are examples of post reviews. They are valuable for quality assurance,

determination of technical competence and experience, determination of the need for additional training, and determination of the need for revision of engineering procedures and criteria. Supporting data, drawings, and specifications for the jobs selected for post review are to be examined. The materials will be reviewed for conformance to national policy, standards, criteria, and sound engineering practice. Onsite reviews may be necessary, depending on the job's complexity, safety and health risks, or environmental risks. After each job is reviewed, the post reviewer is to make a written report to the State Conservation Engineer. A copy will be sent to the Director of the Conservation Engineering Division for class I through V jobs only if the findings impact changes in national policy or standards and for all class VI through VIII jobs.

(1) Classes I through V - The State Conservation Engineer will develop the procedure for post review of representative engineering jobs classes I through V to assure technical quality in conformance with General Manual 450-407.

(2) Classes VI-VIII - The Director of Conservation Engineering will determine the need for post reviews of engineering job classes VI through VIII.

501.06 Engineering work reviewed for other agencies.

(a) Engineering work reviewed for regulatory agencies.

(1) Approval procedures must also contain provisions for reviewing the engineering design parts of plans for cooperating regulatory agencies and determining if the plans comply with NRCS technical standards. The approval authority for this type of review is to be the same as assigned for engineering job approval authority.

(2) NRCS employees are not to review designs that are outside NRCS's area of technical expertise. For example, NRCS is not to review the structural strength of a building with rooftop storage used for runoff management. For this design, the review should be for the functional aspects of the plan, including storage and release rates. Any apparent deficiencies in specific designs noted during the review should be called to the attention of the responsible agency, even though they are outside the scope of the review.

(3) Review responses are to be expressed in terms of compliance or non-compliance of identified items and not in terms of approval or disapproval. Response comments are to indicate the extent or nature of the review, such as: "Review was conducted in accordance with practice standard ___ and the

following was determined. Review has been limited to the functional layout and size in accordance with the requirements of Regulation ___ ."

(4) In all cases, applicable requirements of federal, state, and local laws, regulations, and codes are to be met.

(b) Engineering work reviewed for state and other federal agencies.

If engineering work is reviewed for other federal or state agencies, the work is to be checked against NRCS criteria (practice standards) and sound engineering practices appropriate for the size and type of job. The report back to the agency is to indicate compliance or non-compliance to NRCS standards and criteria. The approval of the review report is to be at the same level as engineering job approval for similar NRCS designs.

501.07 Classification of engineering jobs.

(a) The engineering job classifications that utilize controlling factors are displayed by conservation engineering practice in Exhibit 1 (501.08). If the value of any one of the controlling factors is exceeded, the job becomes the next higher class.

(b) Approval authority for all of the conservation engineering practices listed as Class V may be delegated as Classes I through V and those listed as class VI may be delegated as Class VI by State Conservation Engineers. The listed values of the controlling factors are maximums; therefore, State Conservation Engineers may specify lower values of the controlling factors than those listed.

(c) Approval authority for those conservation engineering practices that are not listed in Exhibit 1 also may be delegated as Classes I through V by State Conservation Engineers unless the hazard classification is significant or high or unless classified differently by the Director of the Conservation Engineering Division.

(d) Those jobs covered by interim standards will be classified by the Director of the Conservation Engineering Division when the interim standards are approved.

(e) Exhibit 1 (501.08) is in the form that can be used for documenting the design review capability of engineers by the Director of the Conservation Engineering Division.

(f) Exhibit 2 (501.09) is a guide for a state engineering job approval authority chart. The practices listed are examples only. 501.04 describes the process by which the State Conservation Engineer is to delegate engineering job approval authority.

501.08 Exhibit 1 – Engineering job classifications that utilize controlling factors.

Review Capability Determination

Name _____ Title _____Grade_____Location_____
Determined by _____ Title Director, Conservation Engineering Division Date _____
Concurred _____Title_____Date_____
(Supervisor)

Practice Code	Practice Name	Controlling Factor	Units	Class V	Class VI	Class VII	Maximum Review Capability
	Any practice	Hazard potential as defined in §503	class	Low	Signif-icant	High	
	Any practice	Alters the visual resources of beaches and shorelines on oceans and the Great Lakes		None	All	All	
348	Dam, Diversion	Streamflow (25-yr) Flow diverted Height of drop	cfs cfs feet	2000 200 8	3000 500 15	All All All	
Dams and Structures							
402	Dam, Floodwater Retarding	Drainage area Effective height Embankment over active fault	sq. mi. feet	20 35 None	40 50 None	50 75 None	
349	Dam, Multiple-Purpose						
410	Grade Stabilization Structure						
436	Irrigation Storage Reservoir						
350	Sediment Basin						
587	Structure for Water Control						
400	Floodwater Diversion	Design capacity	cfs	500	All	All	
404	Floodway	Design capacity	cfs	1000	2000	All	
320	Irrigation Canal or Lateral	Capacity	cfs	500	1000	All	
430	Irrigation Water Conveyance	Pipeline capacity 50 psi < 50 psi	gpm gpm	3500 5000	All All	All All	
Land Reclamation							
451	Fire Control	Area	acres	1	All	All	
456	Highwall Treatment	Height with seepage Height without seepage	feet feet	35 50	75 100	All All	
453	Landslide Treatment	Area Depth Slope	acres feet percent	1 10 50	5 20 All	All All All	
452	Shaft and Adit Closing	Shaft depth Shaft span Adit barrier, permeable Adit barrier, impermeable	feet feet	50 16 All None	All All All None	All All All All	

501.08 Exhibit 1 – Engineering job classifications that utilize controlling factors (continued).

Practice Code	Practice Name	Controlling Factor	Units	Class V	Class VI	Class VII	Maximum Review Capability
454	Subsidence Treatment	Fill height	feet	20	All	All	
455	Toxic Discharge Control	Flow	cfs	100	1000	All	
582	Open Channel	Design capacity Design velocity	cfs fps	1000 10	2000 12	All All	
516	Pipeline	Pressure	psi	300	All	All	
533	Pumping Plant for Water Control	Axial flow pump capacity Centrifugal & turbine pump capacity Centrifical pump static head Turbine pump statichead	gpm gpm ft ft	50,000 3500 350 500	100,000 5000 500 1000	All All All All	
	Recreation facilities	Water supply or sewage treatment Onsite Offsite public	daily design capacity (people) (people)	 200 400	 400 800	 All All	
584	Stream Channel Stabilization	Design capacity Design velocity	cfs fps	1000 10	2000 12	All All	
580	Streambank and Shoreline Protection	Bankfull capacity Bankfull velocity Water height above shoreline	cfs fps feet	5000 10 3	20,000 12 5	All All All	
608	Surface Drain, Main or Lateral	Design capacity Design velocity	cfs fps	1000 10	2000 12	All All	
313	Waste Storage Facility	Storage capacity	cu. ft. (thous.)	2000	5000	All	
359	Waste Treatment Lagoon	Aerobic surface area Anaerobic volume	acres cu. ft. (thous.)	25 2000	50 5000	All All	

501.08 Exhibit 2 – Engineering job approval authority.

Name_____Title_____Grade_____Location_____
Delegated by_____Title_____Date_____
(Responsible Engineer)
Concurred _____Title_____Date_____
(Supervisor)

Practice Code	Practice Name	Controlling Factor	Units	Class I	Class II	Class III	Class IV	Class V	Class VI	Maximum Approval Authority
	Any practice	Hazard potential as defined in §503	class	Low	Low	Low	Low	Low	Signif-icant	
	Any practice	Alter the visual resources of beaches and shoreline on oceans and the Great Lakes		None	None	None	None	None	All	
560	Access Road	Surface Treatment	Kind	Soil	Gravel	Asphalt	Concrete	All	All	
		Length	feet	2000	5000	10,000	20,000	All	All	
		Maximum Grade	percent	8	10	15	20	All	All	
		Culvert Pipe	inches	18	24	48	50	72	84	
323	Agri-Chemical Handling Facility	Tank Storage Volume	gallons	250	500	1000	2500	5000	All	
310	Bedding	Area	acres	40	100	320	640	All	All	
317	Composting Facility	Capacity dead animals	cu. ft.	none	1250	2500	5000	All	All	
		Litter/Manure	cu. ft.	none	10,000	20,000	50,000	All	All	
326	Clearing & Snagging	Length of Reach	feet	1000	2500	5000	15,000	All	All	
397	Commercial Fishponds	Hazard class	class	A	A	A	A	A	B	
		Effective height	feet	15	20	25	30	35	50	
		Conduit	inches	12	24	36	42	48	60	
		Storage X height	ac. ft.	500	1000	2000	3000	All	All	
335	Controlled Drainage	Area Controlled	acres	5	10	50	160	All	All	
348	Dam, Diversion	Streamflow (25-yr)	cfs	100	500	1000	1500	2000	3000	
		Flow diverted	cfs	25	50	100	150	200	500	
		Height of drop	feet	3	3	5	7	8	15	
Dams and Structures										
402	Dam, Floodwater Retarding	Drainage area	acres	20	99	320	640	12,800	25,600	
		Effective height	feet	15	20	25	30	35	50	
349	Dam, Multiple-Purpose	Conduit	inches	12	24	36	42	48	60	
		Storage X height	ac. ft.	500	1000	2000	3000	All	All	
410	Grade Stabilization Structure	Embankment over active fault		None	None	None	None	None	All	
436	Irrigation Storage Reservoir									
350	Sediment Basin									
587	Structure for Water Control									

SUBPART B - REPAIR AND REHABILITATION

501.20 General.

Many engineering practices require repair or rehabilitation because of changing Technology and deterioration from age. A rehabilitated structure should be safe and functional for an extended period of time with normal maintenance. The application of sound engineering principles in the design of the repair or rehabilitation will result in continued satisfactory performance.

501.21 Scope.

Repair or rehabilitation of all engineering practices, whether originally installed with SCS assistance or not, is to be carried out in accordance with provisions of this subpart. These instructions do not apply to operation and maintenance activities.

501.22 Applicable standards.

(a) When it has been determined that assistance is to be provided for the repair or rehabilitation of a practice that was originally installed with SCS assistance, the applicable standards must be determined. Normally, these are the standards that were used in preparing the original design; however, the individual(s) with job approval authority (see 501.04) must determine whether the original standards are still acceptable in light of new engineering knowledge and current State and national criteria. If the original standards are unacceptable, current standards are to be used.

(b) If SCS assistance is provided for the repair or rehabilitation of a practice that was originally installed without SCS assistance, the practice or part of a system is to conform to current engineering standards when completed (see 501.23). This insures a durable, functional practice that justifies the use of SCS resources.

(c) If the practice is an interdependent part of a system or if an element of a practice is to be repaired or rehabilitated, the entire system or practice is to be carefully evaluated. The system must be sufficiently sound to permit the practice being repaired or rebuilt to function as designed.

501.23 Dams installed without SCS assistance.

(a) Because of the hazards associated with dams, a special approach is necessary when assistance is requested for the repair or rehabilitation of a dam that was built without SCS assistance. Before any commitment for assistance is made, the condition of the dam is to be analyzed and a comprehensive engineering report prepared. This report is to describe

the current physical condition of the dam, specify the repairs needed to meet SCS standards, and include an estimate of the costs for repair or rehabilitation. The report will be the basis for the decision to commit resources.

(b) If the dam exceeds Class V (see 501.04), the report is to be prepared by a non-SCS registered professional engineer who is experienced in the design and construction of dams. The report is to be reviewed by the state conservation engineer and the head of the TSC engineering Staff. Their technical acceptance of the report is necessary before resources can be committed.

(c) If the dam is of a size normally approved by the state conservation engineer or other employees within the state, the report may be prepared by the owner or sponsor or by SCS engineers. The report must be accepted or approved by an engineer with appropriate job approval authority before resources can be committed.

501.24 Special conditions.

(a) If urgent action is necessary to safeguard life and property against flood damage, structure failure, etc., SCS may provide technical assistance for temporary measures to lessen the immediate threat. If SCS subsequently makes permanent repairs, they are to be in conformance with 501.22.

(b) Repairs or rehabilitations under the Emergency Conservation Measures Program are to be carried out as specified by the Agricultural Stabilization and Conservation Service. The practices not restored to original or current criteria must be functional, but if the repaired or replaced practices would create a safety hazard, they are to be restored to meet standards.

(c) Repairs or rehabilitations under the Emergency Watershed Protection Program or any other emergency assistance program are to be carried out as specified for that program; but if the repaired or replaced practice would create a safety hazard, it is to be restored to meet SCS standards.

SUBPART C - VARIANCE AND CHANGE

501.30 General

Improvement in construction methods, equipment, and material, as well as findings of research and experience, makes occasional revision of standards necessary and desirable. However, because practice standards reflect minimum requirements, plans and designs must be site specific and provide for a structure that will safely and economically accomplish its intended purpose for the duration of its assumed economic life with reasonable maintenance. Frequently, site conditions require additional features or precautions. Less frequently, compensating conditions justify a request for a variance from a standard.

501.31 National Handbook of Conservation Practices (NHCP).

Variances from the requirements of the conservation practice standards in the NHCP are to be handled according to 450-401.14 (GM).

501.32 Channel Stability Criteria.

(a) The analysis of channel stability requires sound judgment. The best known design techniques and criteria are available in Technical Release No. 25, and Practice Standard 582, Open Channel (NHCP). However, there are situations in which channel and site conditions in association with the methods of construction and maintenance indicate that variations from minimum stability criteria are warranted.

(b) If the state conservation engineer determines that a variation from stability criteria is warranted, the results of the analysis and the proposed approach are to be submitted to the head of the NTC engineering staff. The NTC and the state will jointly study the data and proposal. The head of the NTC engineering staff can then approve, require adjustment before approval, or disapprove the variation. The head of the NTC engineering staff is to report variations approved to the Director, Engineering Division.

SUBPART D - ENGINEERING WORK ON NATIONAL FORESTS

501.40 General.

(a) The Forest Service (FS) has the responsibility for establishing the standards and criteria used for engineering works installed on national forests. SCS often assists in engineering works on these lands.

(b) Coordination of engineering criteria and procedures is necessary so that the completed practice will meet the requirements of both agencies and will function for its intended life with normal operation and maintenance.

501.41 Scope.

Engineering coordination for planning, designing, constructing, repairing, or rehabilitating water storage or transmission structures on or affecting lands administered by the FS is established by the Memorandum of Understanding between FS and SCS (see 501.70).

501.42 Water storage or transmission structures built on national forests.

(a) The FS has full authority and responsibility for establishing the standards for water storage or transmission structures to be built on national forests. "Title 7500 - Water Storage and Transmission" of the Forest Service Manual describes the responsibilities of the various levels of FS, its administrative procedures, and its basic criteria for design and construction. Structures on or affecting FS-administered lands are to be designed to meet or exceed FS criteria.

(b) FS procedures and criteria are found in the FS Manual, Title 7500. State conservation engineers who may have work on national forests should maintain a current copy of this manual.

SUBPART E - ASSISTANCE ON SHORE EROSION CONTROL

501.50 General.

(a) Because shoreline erosion is complex, erosion control measures for stabilization differ greatly from those used for upland erosion control and can be very costly.

(b) Effective installation of erosion control measures can be achieved by proper coordination with other Federal and State agencies. This coordination eliminates duplication of services and provides for sharing knowledge in a rapidly changing Technology.

501.5l Scope.

(a) SCS can provide assistance in controlling shoreline erosion if all the following conditions are met:

(l) The problem is not created by wave action on the open and unprotected shores of the ocean fronts or the Great Lakes.

(2) The problem can be solved with vegetation, normal upland erosion control practices, or minor structural measures such as gabions or riprap revetment, masonry or timber bulkheads, or rock or timber groins. All revetments, bulkheads, or groins are to be no higher than 3 feet above mean high tide or, in nontidal areas, no higher than 3 feet above mean high water. As used here, bulkheads are designed primarily to resist earth pressures; revetments are not. Bulkheads and revetments are generally placed parallel to the shore; groins are generally perpendicular to the shore.

(3) Failure of structural measures because of high intensity storms will not create an immediate hazard to life or result in serious damage to buildings, residences, roads, or other high-value property.

(4) Installation of the recommended measures will have no significant adverse effects on the environment or on adjacent lands, waters, or installations.

(5) Sponsors and cooperators understand the level of protection being provided and their responsibility for maintenance and repair.

(6) Plans and schedules for installing structures and establishing vegetation are acceptable to local, State, and Federal agencies that have jurisdiction.

(b) SCS is not to provide design or construction assistance to solve erosion problems created by wave action on the open and unprotected shores of major ocean fronts or the Great Lakes. Advice and counsel can

be provided on complementary erosion control practices used in conjunction with complex or expensive installations built by others at these locations. Assistance can be provided for normal erosion control on lands adjacent to these shorelines but only at elevations not affected by wave action.

501.52 Coordination with Corps of Engineers.

(a) The Corps of Engineers has responsibility for beach erosion control and shore protection on certain public lands and navigable waters. They have authority to provide technical and engineering assistance to nonfederal public interests for shore and streambank erosion. (See 501.72.) This may include assistance to soil conservation districts. The Corps of Engineers has defined "shore and streambank erosion" to apply to shorelines of oceans, bluffs, bays, estuaries, the Great Lakes, inland lakes and reservoirs, and along banks of navigable rivers and their tributaries. They also have responsibility for issuing permits for structures and work in or affecting navigable waters.

(b) The following kinds of work are to coordinated with the appropriate Corps of Engineers district engineer:

(1) Any work that will have offsite effects, such as entrapment or diversion of littoral drift;

(2) Any work that affects Corps of engineers jurisdictional waters;

(3) Any work that requires permits; or

(4) Any work that may be a duplication of effort.

501.53 Requirements for assistance.

(a) Assistance on shore erosion problems for individual landowners or groups of landowners is to be subject to the cooperator assistance priority controls established by the conservation district.

(b) Technical assistance is to be coordinated with the agencies issuing permits to insure conformance with their criteria. Sponsors and cooperators must obtain any required permits. Data that SCS has collected in the course of making an investigation can be used by cooperators in preparing their requests for permits.

(c) Special authorization will be considered for providing assistance during emergencies or for meeting the requirements of special legislation.

SUBPART F - SNOW SURVEYS AND WATER SUPPLY FORECASTING

501.60 General.

The National Resources Inventory And Snow Survey and Water Supply Forecasting Manual (RISS) presents SCS policies for carrying out snow survey and water supply forecast responsibilities.

501.61 SCS Responsibilities.

The Snow Survey and Water Supply Forecasting program is directed by the Deputy Chief For Technology. Program guidance is furnished by the Director of the Resources Inventory Division (RID) and the RID staff. Technical guidance for data collection facilities and hydrologic aspects are furnished by the Director, Engineering Division, and the Engineering Division staff. This responsibility and other SCS responsibilities are described in RISS, Part 501.

(THE NEXT PAGE IS 501-25)

501.70 SCS-FS Memorandum of Understanding.

UNITED STATES DEPARTMENT OF AGRICULTURE
MEMORANDUM OF UNDERSTANDING
between
FOREST SERVICE
and
SOIL CONSERVATION SERVICE

1. PURPOSE

The purpose of this agreement is to provided for coordination between the Soil Conservation Service (SCS) and the Forest Service (FS) when the SCS is involved in the planning, design, construction, repair, or rehabilitation of water storage or transmission structures on or affecting lands; administered by the FS. As an interdepartmental agency agreement, nothing in this document is meant to change delegations of authority or agency practice in regard to issuing permits and external relations.

2. SCOPE

This agreement applies to work under the following acts and subsequent amendments: PL 74-46, Soil Conservation Act; PL 78-534, Flood Control Act of 1944; PL 83-566, Watershed Protection and Flood Prevention Act; PL 89-90, Water Resources Planning Act (River Basins Program); and PL 87-703, Food and Agriculture Act of 1962 (RC&D Program).

Structures as used herein refers to facilities used for water storage, water transmission, and related improvements such as access roads, boat launching ramps and campgrounds.

3. RESPONSIBILITIES

A. Forest Service. The FS has responsibility for management of National Forest Land and will:

--approve the location of all water storage or transmission proposed thereon.

--assure projects are planned and designed to minimize adverse impacts on resource values and the environment, including coordination with State and local resource agencies.

--establish specific criteria covering the design of structures.

--authorize land use by the project proponent through issuance of an authorizing instrument in accordance with agency criteria and requirements.

--review individual water storage or transmission plans to assure environmental and forest resource values are adequately protected (FS engineering certification of design is not required for designs approved by the SCS State Conservation Engineer).

--assist SCS with the preparation of environmental assessments or impact statements when needed for structure construction involving RC&D, PL 566, and PL 534 structures.

--meet requirements of NEPA, the Endangered Species Act of 1973, cultural resource legislation and related Executive Orders for PL 46 projects.

--incorporate in the authorizing document suitable criteria to make the proponent responsible for property and GLO corner preservation and remonumentation.

--make periodic inspections of structure maintenance and safety.

B. Soil Conservation Service. The SCS has technical responsibility for the planning, design, and construction of certain water storage and transmission structures on or affecting National Forest lands. In carrying out this responsibility, the SCS will:

--obtain FS authorization prior to conducting any on-site surveys and investigations within the National Forest. Such authorization does not guarantee issuance of a Special Use Permit for construction. Issuance of such a permit is contingent on a favorable environmental assessment, compliance with PL 89-665, PL 93-291, E.O. 11593 and other cultural resource legislation, and the Endangered Species Act.

--design water storage and transmission structures in accord with FS criteria, whenever it is the most restrictive, and with other requirements needed to minimize the project's impact on forest resource values and the environment. Each design shall be approved by the SCS State Conservation Engineer.

--verify that the proponent has obtained required Federal, State or local water rights, permits or certifications. Verify that the proponent has a FS Special Use Permit or easement before proceeding with construction.

--meet requirements of NEPA, provisions of the Endangered Species Act of 1973, cultural resource legislation and related Executive Orders for RC&D, PL 566, and PL 534 structures.

--assure that construction drawings are provided for permanent access roads.

--assist the applicant to locate and protect during construction all existing General Land Office corner monumentation plus all boundary corners between FS and private land that may be disturbed. Notify the FS and proponent of those corners that need to be remonumented because of inundation or unavoidable disturbance.

-provide certification by an SCS engineer that the project has been constructed in accordance with the approved drawings and specifications and furnish "as built" drawings to the FS.

--develop with the proponent and furnish the FS an operation and maintenance plan for the completed project works. This plan should be discussed with the proponent at a meeting attended by a representative of the FS.

--provide FS a copy of all maintenance and safety inspection reports.

C. Joint Responsibilities.

In all programs of both Services which involve mutual interests, it is imperative that each agency inform the other at the first inception of a potential structure construction or rehabilitation so that on-going cooperation can be maintained.

In those programs where one agency has leadership, the other Service will be kept informed and invited to participate in (1) public information meetings, (2) meetings with proponents, (3) environmental meetings, (4) investigations, and (5) planning of the project.

The FS and SCS jointly will determine the project's hazard classification. However, final approval of hazard classification rests with FS.

The SCS will participate with FS in making periodic maintenance and safety inspections of RC&D, PL 566, and PL 534 structures.

The SCS and FS mutually will agree on location and design standards for work roads and temporary access roads.

SUPPLEMENTATION

As needed to cover local conditions, this agreement may be supplemented at the State level, by agreement between State Conservationists and Regional Foresters.

Local agreements may be desirable to cover individual situations involving recreation development and operation and other special needs and requirements.

DURATION

The working agreement shall become effective upon the date of the last affixed signature and shall continue in effect until terminated in writing: by either party upon giving 60 days' notice to the other.

/S/
R. M. DAVIS, Administrator
Soil Conservation Service

4/6/77
Date

/S/
JOHN R. McGUIRE, Chief
Forest Service, USDA

1/24/77
Date

Attachment:

Exhibit A
Exhibit B

501.71. Flow chart for engineering activities between SCS and FS.

RECOMMENDED FLOW CHART EXHIBIT A
for
ENGINEERING ACTIVITIES
between
SOIL CONSERVATION SERVICE & FOREST SERVICE
PL-46

SOIL CONSERVATION SERVICE	JOINT ACTION	FOREST SERVICE
(1) Notify FS of any potential new projects or projects involving rehabilitation measures.		(1) Notify SCS of any potential new projects or projects involving rehabilitation measures that NRCS is likely to be involved in.
	(2) Make joint field inspection and discuss needs related to the project. The preliminary hazard classification, hydrologic and basic design criteria, and/or rehabilitation needs are determined	(3) Issue letter of authorization to SCS for site investigations and preliminary surveys.
(4) Make preliminary surveys and site investigations to determine feasibility.		(4) Make preliminary archeological and historic examination and provide SCS with preliminary information.
(5) Prepare preliminary investigation report.	(6) Meet with proponent to present preliminary investigation report.	(7) Proponent applies for and is issued a special use permit conditioned on final approval construction plans and favorable project assessment. Give SCS authorization to proceed with final survey and design.
	(8) Determine hazard classification and establish final design criteria for the structure. Agree on location and design standards for work roads and access roads.	
(9) Prepare final plans and specifications for the project, including plans for work roads and access roads.		(9) Complete archeological and historic examinations and prepares an environmental impact assessment or EIS (if needed). Based on environmental assessment of EIS, advises SCS of special provisions that must be included in the plans and specs, including protection and preservation of cultural properties.
(10) Develop an O&M plan with the proponent and discuss it at a meeting attended by the FS.	(10) Jointly agree on an inspection frequency of each structure.	
(12) State Conservation Engineer approves plans and specifications and furnishes copies to FS.	(11) Make on-site review of the completed plans and specifications.	(12) Approve O&M plan and construction plans or advise SCS of additional measures needed to protect Forest resources or environmental values.
(13) Verify that the proponent has obtained any required State permits or certifications and advises FS.		(14) Authorizes permittee to proceed with construction and notify SCS (the permittee is responsible for construction).
(15) Provide for engineering inspection services.	(16) Make a semi-final inspection.	(15) Provide resource protection inspection services.
(17) Make final inspections and certify that the project was built in accordance with the approved plans and specs. Furnish "as-built" plans to the FS.		(18) Authorize the operation of the completed works.
(19) On request by the FS, the SCS will provide technical advice and assistance to the permittee on maintenance.		(19) Make periodic maintenance and safety inspection.

RECOMMENDED FLOW CHART
for
ENGINEERING ACTIVITIES
between
SOIL CONSERVATION SERVICE & FOREST SERVICE
PL-566, PL-534, and RC&D

EXHIBIT B

SOIL CONSERVATION SERVICE	JOINT ACTION	FOREST SERVICE
	(1) Preliminary discussion with prospective proponents on possible projects and alternatives.	
(2) After proponent makes a request for planning assistance, the responsible State agency assigns a priority. SCS notifies the FS of the planning priority and the legal sponsor.	(3) Field examination based on existing information.	(4) Issue letter of authorization to SCS for site investigation and preliminary surveys.
(5) Make additional field evaluations and prepare preliminary investigation report.	(5) Determine preliminary hazard class for individual structures.	(5) Provide input to SCS on the preliminary investigation report.
(6) Prepare watershed or measure plan according to Principals and Standards for Water Resource Projects. Prepares environmental assessment and EIS (if needed) and make archeological and historic examinations. (Note: many approved and active work plans predate NEPA. Where this is the case, an environmental assessment must be prepared for remaining structures prior to their construction.	(6) Determine final hazard class and establish design criteria for the individual structure. Agree on location and design standards for work roads and access roads	(6) Provide input to SCS on preparation of watershed and measure plans. Provide input to SCS on preparation of environmental assessment, EIS and on making archeological and historic examinations.
	(7) Prepare plan for survey recovery protection and preservation of cultural properties.	(8) Sponsor applies for and FS issues a special use permit for construction, operation and maintenance of the individual structure.
(9) Prepare plans and specifications for all project work including work roads and access roads. State Conservation Engineer approves plans and specifications and furnishes copies to FS.	(10) Make on-site review of the final plans and specifications.	(9) Provide assistance on the final location and on the design of the work roads and access roads.
(11) Verify that the proponent has obtained any required State permits or certifications and advises FS.		(11) Review and approve plans or advise SCS of additional measures needed to protect Forest environmental values and report results of cultural resource actions.
(13) Develop an O&M plan with the project and discuss it at a meeting attended by the FS.	(13) Jointly agree on an inspection frequency of each structure.	(13) Approve O&M plan.
		(14) Authorize construction.
(15) Provide for project construction and inspection services, including special features for environmental protection and preservation of cultural resources.	(16) Make semi-final inspection.	(15) Provide assistance to SCS on meeting resource protection needs during construction.
(17) Make final inspection.		
(18) Certify that the project was constructed in accordance with the approved drawings and specifications. Furnish "as-built" plans to FS.		(19) Authorizes permittee to commence operations.
	(20) Make joint or individual periodic maintenance and safety inspection.	
	(21) Follow up to see that the permittee performs the needed maintenance.	

501.72 Corps of Engineers Regulation 1110-2.

(To be supplied later.)

PART 503 - SAFETY

SUBPART A - ENGINEERING ACTIVITIES AFFECTING UTILITIES

503.00 General.

(a) Private and public utilities may be jeopardized and equipment operators and others may be injured during site investigations and construction of engineering structures if proper procedures are not followed.

(b) Established procedures for locating utilities and notifying owners are the first step in eliminating many potential accidents. These procedures, if followed, will reduce personal injuries, property damage, and interruption of utility service.

503.01 Scope.

(a) This subpart is concerned only with the minimal requirements for developing a plan to prevent damage to public or private utilities and injury to people from contact with utilities during engineering and construction activities.

(b) Public and private utilities include transmission lines, cables, and pipelines.

503.02 General considerations.

(a) SCS personnel are to take adequate precautions to minimize hazards from or damages to utilities, both overhead and underground, during location, investigation, design, and construction of any works carried out under SCS programs.

(b) Land owners or operators, sponsoring organizations and contractors are to be informed that they will be liable for any damage resulting from disruption of service caused by construction activities. They are to be informed that SCS makes no representation on the existence or nonexistence of any utilities. A letter may be used for this purpose. Absence of utilities on construction drawings is not assurance that no utilities are present at the site.

(c) SCS may be held responsible for damage done by its employees during site investigations.

(d) Indicate <u>known</u> utilities on construction drawing with appropriate symbols and identification.

(e) Each state office is to develop a procedure for carrying out its responsibilities within these guidelines.

503.03 Investigations.

If subsurface investigation or construction is proposed, the responsible SCS employee is to check with the land owner or operator or with the sponsoring organizations to determine if there are underground utilities in the work are. Also check records of known utilities on file in the field office. On field inspection, particular attention should be given to utility markers set in fence lines or elsewhere.

503.04 Buried utilities.

(a) If buried utilities are known to be in the vicinity of proposed work, the responsible SCS employee is to inform the land owner or operator or the sponsoring organizations of this fact and of the land owner or operator's responsibility to take the following actions:

(1) Notify the utility company of time, place, and type of work to be done.

(2) Request that the buried utility be located and staked on the ground both horizontally and vertically by the utility owner.

(3) Request that a representative of the utility company be present during any excavation operations.

(4) Notify the contractor of the location of the utility in relation to the job work area.

(5) Fill out lost card Form SCS-ENG-5, sign, and return to SCS after the required action has been completed. Failure to return completed postcard will result in termination of SCS assistance.

(b) The responsible SCS employee must make sure that the preceding steps have been carried out by the land owner or operator or the sponsoring organizations before beginning work in the vicinity of the buried utility.

503.05 Checklist.

The responsible SCS employee is to keep a checklist, recording action taken pertaining to work in the vicinity of buried utilities. The checklist is to be maintained in the SCS job file. See Form SCS-ENG-6.

503.06 State laws.

If State laws and regulations have different requirements, SCS is to comply with the laws and regulations. Procedures may vary from 503.04 if equivalent in effectiveness..

SUBPART B - PUBLIC SAFETY AT STRUCTURE SITES

503.10 General.

Many SCS-assisted structures, by nature, may be hazardous to the public. Features designed for recreation or fish and wildlife enhancement invite the public, and children especially are attracted to structures that provide an opportunity to play in water. Reservoirs and structures such as open-top spillway risers, high- or steep-walled channels and chutes, plunge pools, and stilling basins are especially hazardous and require special attention to safety measures.

503.11 Scope.

All SCS-assisted designs and structures, regardless of who is responsible for installation and maintenance of safety measures, are to include necessary safety measures.

503.12 Recommended safety measures.

All structures are to be designed to avoid hazardous conditions where possible and safeguards to protect the public are to be provided where hazards are unavoidable. Following are some specific safety measures that should be used where appropriate:

(a) Post warning signs where they are clearly visible but not visually degrading.

(b) Paint "DANGER - STAY OFF" on risers and highwalls. Use only if no other method is appropriate. Danger signs should be unobtrusive, if possible.

(c) Locate riser in reservoir rather than in embankment if climatic conditions permit.

(d) Use covered-top drop inlet.

(e) Use low-level inlets to keep normal water level below main inlet.

(f) Do not install permanent ladders.

(g) Use trash rack that cannot be easily entered.

(h) Use catwalks only where absolutely necessary and use guard rails or protective fences with a locked gate where they are necessary.

(i) Prevent access to deep stilling basins, drop structures, plunge pools, clutes, steep or vertical walled channels, etc., with protective chain-link fence and/or provide escape routes.

(j) Flatten side slopes of pools on at least one side.

(k) Install guard rails on the top of highwalls and steep cuts that cannot be protected with fences.

503.13 Maintenance of steep slopes.

(a) Advise farmers, maintenance personnel, and others against operating equipment on steep slopes.

(b) Recommend use of proper safety devices on equipment (protective frames, crush-resistant cabs, and seat belts).

(c) Call attention to hazards in maintenance plans and agreements.

(d) Specify safe procedures in maintenance plans and agreements that clearly exclude operation of equipment on steep slopes.

SUBPART C - SAFETY DURING GEOLOGIC INVESTIGATIONS

503.20 General.

Geologic investigations can be hazardous to the personnel involved because of the nature of site terrain and equipment used. These conditions require a careful analysis of the investigation process to anticipate and fully evaluate the potential safety hazard which may exist.

503.21 Scope.

All SCS geologic investigation plans are to include an assessment of anticipated safety hazards and a schedule of planned precautionary measures known as the Safety Plan. This plan shall include a schedule of safety meetings.

503.22 Hazard Potential.

The following potential hazards related to geologic investigations are cited for illustration. This listing is not intended to be all inclusive. Therefore, site specific safety evaluations must be made.

(a) Rock falls and avalanches.

(b) Landslides.

(c) Flash floods.

(d) Overhead utilities.

(e) Underground utilities

(f) Dead trees and snags.

(g) Pit and trench walls.

(h) Lighting.

(i) Hazards associated with equipment use.

(j) Snakebite.

(k) Open test pits or bore holes.

(l) Sinkholes.

(m) Subsidence.

(n) Weak bridges.

(o) Hazardous waste.

For additional guidance see "SCS safety guide for Geologic Investigations, December 1972," and "SCS Safety Manual for Geologic Investigations."

SUBPART D - DAM SAFETY

503.50 Involvement with dams.

(a) NRCS involvement with dams and dam safety includes activities in planning and design, and to some degree construction and operation and maintenance (O&M). NRCS is concerned about safety of dams and addresses the safety aspects at the appropriate stages of involvement. For this reason, consideration of dam safety issues is located in various places throughout the NRCS directives system. To locate the specific references consult the latest directives index (120-400).

(b) NRCS provides technical assistance on more dams than any other government agency or consulting firm. NRCS does not own these dams and most of them are nonfederal. For some, financial assistance is available through project programs. NRCS is involved in O&M activities through the preparation of O&M plans for all inventory dams (180-500.22 B and 180-500.30 D). In addition, NRCS receives inspection reports for dams installed under project activities (180-500.32). Additional technical assistance is provided for O&M as determined by the state conservationist.

(c) The Federal Guidelines for Dam Safety were prepared by the Ad Hoc Interagency Committee on Dam Safety of the Federal Coordinating Council for Science, Engineering and Technology. The guidelines were prepared in response to a Presidential memorandum of April 23, 1977, and were published on June 25, 1979. the guidelines were transmitted to the Federal agencies for implementation by the President's memorandum of October 4, 1979, which stated, "... I ask that the head of each Federal Agency responsible for or involved with planning, site selection, design, construction, certification or regulation, inspection, maintenance and operation, repair, financial or technical assistance, or ultimate disposition of dams adopt and implement the Federal guidelines, as applicable."

503.51 USDA involvement.

(a) USDA Departmental Regulation Number 1043-18 establishes a USDA Dam Safety Committee and requires the Farmers Home Administration (FmHA), Forest Services (FS), Rural Electrification Administration (REA), Agricultural Research Service (ARS), and NRCS each to designate a dam safety officer to make up the committee. This regulation was issued in implementing the Federal Guidelines for Dam Safety. See Exhibit 506.40.

(b) The Assistant Secretary for Natural Resources and Environment chairs the committe(e) The NRCS dam safety officer is the Executive Secretary of the committee.

(c) The Executive Secretary of the committee is the USDA contact with the Chief of Dam Safety of the Federal Emergency Management Agency (FEMA) on technical matters. The FS dam safety officer also fully participates.

503.52 NRCS Dam Safety Officer.

(a) The Director, Engineering Division, is the NRCS dam safety officer.

(b) The dam safety officer reports directly to the Chief on issues that affect dam safety. Directives and needed actions are implemented through normal channels.

(c) The dam safety officer has responsibility for—

(1) Ensuring that policy and procedures related to dam safety are adequate;

(2) Making reasonable and prudent efforts to ensure that dams installed with NRCS assistance are safe;

(3) Seeing that all levels of NRCS are aware of the need for actions to ensure that dams installed with NRCS assistance are safe;

(4) Evaluating safety-related administrative and technical practices concerning design, construction, operation, maintenance, periodic inspections, and rehabilitation of dams;

(5) Maintaining an inventory of NRCS-assisted dams; and

(6) Providing leadership in representing NRCS in Federal and other activities leading to the establishment of policy, procedure, and criteria for dam safety.

503.53 Interagency involvement.

(a) NRCS is involved with other Federal agencies at the national level in dam safety activities, both formally and informally. As Executive Secretary of the USDA Dam Safety Committee, the Director, Engineering Division, is the USDA member on the Interagency Committee on Dam Safety (ICODS).

(b) State conservationists are encouraged to work with other Federal agencies in dam safety activities.

503.54 Other (non-governmental) involvement.

NRCS encourages its employees to become involved at all levels with various technical and professional groups in dam safety activities.

503.55 NRCS/State Relationships.

NRCS supports strong State dam-safety programs. A strong State dam-safety program is imperative because NRCS lacks operation and maintenance (O&M) authority and does not have continuing responsibility for the nonfederal dams installed under NRCS programs. It is NRCS policy to complement and not compete with State dam safety programs.

503.56 Responsibility for dams.

The owner of a dam is responsible for potential hazards created by the dam. The States are responsible for safeguarding the lives and property of their citizens. NRCS is responsible for making sure that the assistance it provides for dams is technically sound and meets applicable state regulations and criteria.

506.57 NRCS assistance

(a) Each state conservationist is to assist the State to develop a strong dam-safety program as needed. The state conservationist is also to continue to work with others such as the State conservation committee, National Association of Conservation Districts (NACD), Land Improvement Contractors of America (LICA), Federal Emergency Management Agency (FEMA), Soil Conservation Society of America (NRCSA), American Society of Agricultural Engineers (ASAE), American Society of Civil Engineers (ASCE), National Society of Professional Engineers (NSPE), etc., to encourage strong State programs. The state conservationist should work with the State as appropriate at the policy level such as by providing model legislation and regulations and by Technology transfer. NRCS involvement in formal inspections could be limited to some percentage of the NRCS-assisted dams. This involvement, however, permits NRCS and the State to derive the benefits of mutual Technology exchange. NRCS participation in at least some of the initial inspections may also be particularly desirable to provide feedback to the design process.

(b) Each state conservationist is to establish needed working arrangement with the State for NRCS assistance in maintaining a strong State dam-safety program. It is recognized that a few years may be required for some States to implement such a program. State conservationists are to consider progress being made by their respective States in determining whether or not to continue technical and financial assistance for the installation of inventory-type dams (520.21 F) of this manual).

503.58 Key factors.

Several key factors should be considered in developing and maintaining the State program. Among them are:

(a) Consistency with the Federal guidelines for dam safety;

(b) Consistency with the model state law prepared by the United States Committee on Large Dams (USCOLD);

(c) Recognition that some classification system is desirable--all dams are not necessarily high-hazard dams;

(d) Assurance of proper engineering criteria through a State approval or certification system covering both design and construction;

(e) Requirements for adequate maintenance of dams;

(f) Procedures for adequate inspection, including appropriate participation by qualified personnel;

(g) Provisions for periodic reviews of hazard class and educational programs and regulations to discourage development downstream of class A and B dams that would change the classification;

(h) Provisions for emergency action plans for class C dams;

(i) Authority to take action to alleviate unsafe conditions, such as by modifying the dam or removing the hazard;

(j) Adequacy of staffing and funding on a continuing basis;

(k) Inclusion of all inventory-type dams (520.21 F of this manual) in the State-regulated program.

503.59 Interim assistance.

It is anticipated that State dam-safety programs should provide for adequate inspection of dams already in existence as

well as new ones that are built. Until a State implements its dam-safety program, the state conservationist may wish to assist by making inspection assistance available. NRCS assistance may also be desirable for the initial formal inspections of new class (b) and (c) dams. However, as a general rule, the state conservationist should encourage the State to eventually take on full responsibility and phase out the NRCS assistance.

503.60 Exhibit. USDA Dam Safety Committee.

U.S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D.(c) 20250

DEPARTMENTAL REGULATION	NUMBER: 1043-018
SUBJECT: USDA Dam Safety Committee	DATE: July 20, 1983
OPI: Soil Conservation Service	

1 PURPOSE
This regulation establishes a USDA Dam Safety Committee. Establishment is in the public's interest in that it will strengthen darn safety efforts in the Department and support the Executive Branch in the implementation of the "Federal Guidelines for Dam Safety."

2 SPECIAL INSTRUCTIONS
Secretary's Memorandum No. 2007, February 25, 1980, is canceled and is replaced by this regulation.

3 FUNCTIONS
This committee will coordinate and provide leadership to dam safety activities in the Department. It will assist in defining needs and in implementing procedures to enhance the safety of the dams under the agencies' jurisdiction. The committee will be concerned with the agencies' administrative and technical practices related to dam safety including design, construction, operation, maintenance, periodic inspections, and rehabilitation of dams. The committee will be advisory to the Secretary and to the agency heads.

4 MEMBERSHIP
The committee is to consist of the dam safety officers appointed by the agency heads of Farmers Home Administration (FmHA), Forest Service (FS), Rural Electrification Administration (REA), Agricultural Research Service (ARS), and the Soil Conservation Service (SCS).

The Assistant Secretary for Natural Resources and Environment is to be the Chairman. The Dam Safety Officer for SCS is to be Executive Secretary.

5 DAM SAFETY OFFICERS
Each of the member agencies is to name a dam safety officer. The responsibility of this position is to see that the agency, as a matter of policy and in actual practice, makes every reasonable and prudent effort to enhance the safety of the dams under the agency's jurisdiction. Duties should include surveillance and evaluation of the agency's administrative and technical practices related to dam safety concerning the design and construction of new damns and the operation, maintenance, periodic inspections, or rehabilitation of existing dams. Also, the officer is to make recommendations for strengthening safety practices and procedures and is to maintain an inventory of agency dams.

The dam safety officer is to report directly to the agency head on matters of dam safety. The officer is to function as an advisor to the head of the agency and through the head of the agency to the administrative and technical units.

6 FEDERAL EMERGENCY MANAGEMENT ADMINISTRATION (FEMA)
The Chairman is to he the primary contact with FEMA for dam safety. The Executive Secretary is to participate in FEMA's activities and to represent the Department in the Chairman's absence.

The Executive Secretary is to be the contact for FEMA's Chief of Dam Safety in technical matters. Also, FS's dam safety officer is to fully participate in technical activities with FEMA's Chief of Dam Safety.

PART 504 - SPECIAL; INVESTIGATIONS, STUDIES, AND REPORTS

SUBPART A - PROBLEMS AND DEFICIENCIES

504.00 General.

(a) Engineering activities must be carried out with a high level of technical competence if the results are to be of proper quality. The appropriate level of quality can be maintained only by engineers who use high quality specifications, criteria, standards, and procedures. These tools must be constantly updated because of changes in Technology and experience. Problems, deficiencies, and failures often reflect a breakdown in the quality control of engineering activities.

(b) Special investigations, studies, and reports of engineering problems and deficiencies are needed to define clearly the conditions that led to the problem or deficiency; describe in detail the situation that exists at the time of the study, including induced damages; define additional surveys or investigations needed; determine the cause of the problem; provide recommendations for resolving the problem or deficiency; provide recommendations or changes needed to avoid a recurrence; and fully document findings in an engineering report. These reports provide the information needed to improve future engineering work and resolve possible claims or litigations.

504.01 Scope.

(a) An investigation is to be made and report prepared whenever an engineering practice, system, structure, structural element, or material does not function as anticipated. Deficiencies or failures that become evident during construction are also to be investigated and reported.

(b) An investigation is to be initiated when signs of instability or serious distress are detected. Deterioration of concrete, severe erosion in channels, movement or cracking of the embankment, malfunction of pipelines, and excessive seepage are some examples of serious distress.

504.02 Reporting problems, deficiencies, and failures.

(a) The district, area, and state conservationists are to be notified immediately of a problem or deficiency that might create a serious emergency or a failure that has led or may lead to loss of life, serious offsite damages, disruption of public utilities, or major economic losses for owners, sponsors, contractors, and SCS. The state conservationist is to telephone the Chief promptly. The telephoned report is to include such critical information as identification of the structure, project, and location and a description of the situation at the time of the call. When a major dam, Class V or larger (501.04 of

this manual), is affected, the state conservationist is to see that the state conservation engineer provides the report required in paragraph (d) of this section.

(b) Normal lines of communication are to be used when reporting problems, deficiencies, or failures other than those described in paragraph (a) of this section. Political and social effects are to be considered in determining the urgency of the notification to line officers and the need for informing others. Jobs in Classes I through IV (501.04 of this manual) do not usually merit special reporting because they rarely have the potential to create significant damages.

(c) If there is a significant danger to life or property, the state conservationist is to insure that appropriate authorities and owners or sponsors are notified.

(d) If there is failure or potential failure of a Class V or larger dam or other structure that may cause major economic losses, the state conservation engineer is to telephone the Director of Engineering and report the situation. The Director is to provide engineering guidance on emergency or remedial measures and, if appropriate, arrange for special engineering assistance. The state conservation engineer is to keep the head of the NTC engineering Staff informed.

504.03 Committee assignments.

(a) An investigating committee is to be named as soon as possible after a problem, deficiency, or failure has been identified. An investigating engineer may be named in lieu of a committee if the cause of the problem is obvious and the practice or structure is minor. Jobs in Classes I through IV usually are considered minor. A committee may be named for these minor structures if the problem is unusually complex.

(b) Committee members or investigating engineers should not have had any significant prior participation in the design, construction, or approval of the practice or structure. State conservation engineers are not to be members of committees in their states. Non-SCS personnel are to be named to the committee only if specifically approved by the Director of Engineering. Sponsors, State agencies, etc, may have observers with the committee.

(c) The committee is to include appropriate specialists such as design, hydraulic, soil, or construction engineers, geologists, or others.

(d) For a minor practice or structure (Class I through IV) the state conservationist or the area conservationist, if so instructed, is to appoint the investigating committee or the investigating engineer. The state conservation engineer is to provide recommendations on membership for the committee.

(e) For Class V or VI jobs, the state conservationist is to appoint the committee, based upon the recommendations of the head of the NTC engineering Staff and the state conservation engineer. Depending on the nature of the issue, it may be necessary to arrange for engineers or other specialists from the NTC or from outside the state to serve on the committee.

(f) For Class VII or VIII jobs, the state conservationist and the head of the NTC engineering Staff are to determine the committee membership. The head of the NTC engineering Staff is to consult with the state conservation engineer and the Director of Engineering about the disciplines to be included and the membership of the committee. The state conservationist is to arrange for the participation of the members and issue the letter of appointment.

(g) If the problem is unusual, national in scope, or especially significant, the Chief may appoint a separate board to study the problem. The Director of Engineering is to make the recommendation for the board and its membership. The state conservationist and the NTC director are to be notified when a board is to be established. If an investigating committee has been established, its members are to submit their findings to the board and, as appropriate, serve as Staff for the board.

(h) The state conservation engineer is to provide general guidance and technical support and is to arrange for any assistance required by the committee or board.

(i) The appointment letter is to provide general guidance on the scope of the investigation and tentative schedule. If there are problems or questions about the assignment, the chairman or the investigating engineer is to resolve these issues as soon as possible.

504.04 Procedures.

(a) General guidance in conducting and reporting the investigation of a problem or deficiency is contained in Technical Release No. 24, Investigating Structure Failures.

(b) Because evidence may be obscured by subsequent flow of water, by continued deterioration of the structure, or by emergency repairs, the investigation must begin as soon as possible. Photographs should be made of the site at the earliest possible time by the district conservationist or anyone visiting the site.

(c) The investigating committee is to:

(1) Inspect the structure.

(2) Obtain photographs of the structure and affected areas.

(3) Determine the high-water level that prevailed.

(4) Interview eyewitnesses and record their statements. Give particular attention to the sequence and timing of events.

(5) Determine the time the deficiency was discovered and the time of the last inspection of the structure.

(6) Assemble and review construction records such as diaries, reports, test data, as-built plans and as-built reports on construction geology.

(7) Review the design file.

(8) Gather any other information regarding the event such as precipitation and stream flow records.

(9) Define field surveys required to record topography and physical changes.

(10) Specify any geologic investigations and soil Mechanics testing needed.

(11) Review all communications and staffing assignments during design and installation of structure.

(d) After compiling the necessary data, the committee or investigating engineer is to:

(1) Determine the cause(s) of the problem, deficiency, or failure. Support for each cause is to be presented carefully so as to define completely the conditions that led to the problem.

(2) Define and support conclusions.

(3) List, as appropriate, suggestions on how procedures, criteria, designs, staffing, et(c), need to be changed to avoid a recurrence.

(4) When directed by the appointing official, make suggestions for alternative treatments in descriptive concepts and not treatment designs details. This is a secondary purpose of the report.

504.05 Engineering report

(a) An engineering report is to be prepared for each investigation. The detail and composition of the report is to be consistent with the size, complexity, and significance of the problem, deficiency, or failure.

(b) The engineering report is to include:

(1) A brief description of the committee activities.

(2) A description of the structure with pertinent data on name, location, size, age, etc.

(3) Appropriate geologic and engineering information.

(4) A detailed description and explanation of the situation. Include photographs to enhance the explanation.

(5) Enough narrative and data to fully document facts and support findings and conclusions. The report is to discuss where standards, criteria, procedures, or practices failed or were improperly followed. The questions "What went wrong to permit the incident to occur and what would have prevented it?" must be answered to the best of the committee's ability.

(6) Pertinent drawings, specifications, reports, etc.

(c) An abstract is to be prepared for all engineering reports of measures that are Class V-VII. The abstract is used to inform other engineers so they can gain from the experience. The abstract should not be more than two pages and is to include:

(1) Data on location, size, etc.

(2) Description of the problem, deficiency, or failure.

(3) Statement of the cause and effect.

(4) Discussion of the findings and conclusions. This includes any identified procedure or practice which, if followed, would have prevented or alleviated the situation.

(5) Sketches as appropriate.

504.06 Report review and acceptance.

(a) The committee or the investigating engineer is to submit the report to the state conservationist through the state conservation engineer. The state conservation engineer will coordinate the reviews required and upon technical acceptance, forward the report with his recommendations to the state conservationist for distribution.

(b) The state conservation engineer is to solicit review comments by employees who were responsible for preparing the design and inspecting the construction. The state conservation engineer's and the employees' comments are to be attached to all copies of the report. Before the reports are released, they are to be reviewed and accepted as follows:

(1) Classes I through IV. The state conservation engineer will determine when the report is technically acceptable. The state conservation engineer will work with the committee to resolve all issues raised. If the report identifies problems resulting from inadequate national specifications, practice standards, or procedures or otherwise merits special attention, the state conservation engineer will request review comments from the head of the NTC engineering Staff. After issues are resolved and the state conservation engineer has determined that the report is acceptable, the state conservation engineer is to submit the report to the state conservationist and indicate its technical acceptance.

(2) Classes V through VIII. The head of the NTC engineering Staff will determine and advise the state conservation engineer and Director of Engineering when the report is technically acceptable. The report is to be submitted to the head of the TSC engineering Staff for review. The head of the NTC engineering Staff will review the report and indicate to the state conservation engineer that the report is accepted or request additional details, study, or other action needed for acceptance. After all issues are resolved and the report is accepted, the state conservation engineer is to submit the report to the state conservationist and indicate its technical acceptance.

504.07 Release and distribution of reports

(a) After technical acceptance and receipt by the state conservationist, the report can be released to others and may be used as supporting documentation for requesting funds to correct problems or deficiencies. Owners, sponsors, State agencies, and others may be given copies after the report is accepted.

(b) As a minimum, copies of the accepted report are to have the following distribution:

(1) Classes I through IV. One copy of the report is to be sent to the head of the NTC engineering Staff. If the report addresses problems resulting from inadequate national specifications, practice standards, or procedures or otherwise merits special attention, the head of the NTC engineering Staff is to forward a copy of the report to the Director of Engineering.

(2) Classes V through VIII. One copy of the report is to be sent to the Director of Engineering and one copy is to be sent to the head of the NTC engineering Staff.

SUBPART B - EMERGENCY SPILLWAY PERFORMANCE

504.10 General.

(a) Thousands of emergency spillways have been installed since 1954 when SCS began using the present procedure for design. Several hundred more are installed each year. Major spillway flows can be expected at several structures each year.

(b) Current emergency spillway criteria are determined by research results reported in Technical Publication 61 (Handbook of Channel Design for Soil and Water Conservation) procedural analyses described in Technical Release No. 52, and the judgment from experience gained over the years. However, most research and field evaluations to date have been on structures with drainage areas less than 10 square miles.

(c) Further research is needed, but laboratory model studies are not always directly applicable and large field models or prototype studies have not yet been undertaken. An alternative is to make field studies of the operation of existing structures.

(d) The purpose of emergency spillway performance studies is to carry out a continuing program to provide information that will be helpful in confirming or improving existing design criteria; give an indication of the upper limits of applicability of various types of spillways; and show the extent and cost of spillway maintenance required after flood flows.

504.11 Scope.

A study is to be made of any earth, rock (except massive, unweathered rock), or vegetated spillway built since 1954 when any of the following situations occur:

(a) The water surface in the reservoir has reached an elevation above the crest of the spillway of 3 feet or more;

(b) The spillway has suffered severe damage, has approached breaching, or has breached to any degree; or

(c) The spillway has sustained continuous discharge for 7 days or more.

504.12 Reporting major flows.

If conditions require a study (see 504.11), the Director of Engineering is to be notified. This notification may be in writing and is to include the site names and numbers, watershed names, and preliminary data on the flows. Send a copy to the head of the NTC engineering staff.

504.13 Assignments.

The study of an emergency spillway flow as described in this subpart is to be made by qualified engineers. The state conservation engineer is to recommend the members of the evaluation team to the state conservationist. Hydrologists, hydraulic engineers, and geologists are needed in various parts of the evaluation.

504.14 Procedures.

(a) A performance study is to be made as soon after the occurrence as practical. The study and the report are to consider and document the information listed below and any other pertinent information.

(1) Name of watershed.

(2) Name or number of structure and inventory number.

(3) Location (State and latitude and longitude to nearest degree and minute).

(4) Date built.

(5) Drainage area in square miles.

(6) Height of dam.

(7) Plan and profile along spillway centerline from entrance to streambed.

(8) Cross sections at control section and at selected points in the exit channel showing the depth and width of the constructed spillway.

(9) Geologic map and profiles of the control section and the exit channel.

(10) Statement regarding the condition of the spillway before the flood event including the density and type of vegetation.

(11) A copy of the last maintenance and inspection report before the storm.

(12) Photographs, if available, of prestorm spillway conditions.

(13) Date of flood.

(14) Rainfall--depths for various durations according to either official rain gages or a "bucket survey," and the related frequency for each duration.

(15) Runoff--if a stream gage is available, USGS "provisional" data should be included.

(16) Observed or reconstructed inflow and outflow hydrographs at the structure, including maximum reservoir stage and duration of emergency spillway flow.

(17) Physical factors of drainage area related to a weighted "curve number," including antecedent moisture and vegetative cover conditions immediately preceding the storm.

(18) Description of condition on damage in the emergency spillway, including location, depth, and severity of erosion.

(19) Photographs of post-storm conditions in spillway and downstream.

(20) Estimate of volume of soil and rock eroded from various sections of the spillway.

(21) An estimate of the cost to repair the spillway.

504.15 Report.

(a) A separate spillway flow report is required for every flood event meeting conditions in 504.11. If a storm event affects many structure over a wide area, a reconnaissance may be made to determine the need for making a field study on every structure. If this situation occurs, the state conservation engineer, after consultation with the head of the NTC engineering Staff, is to advise the Director of Engineering and reach agreement on the studies needed. An emergency spillway performance study does not in any way alter circumstances under which a problem or deficiency study may be required.

(b) A report is to be prepared for each site except as provided in the preceding paragraph. Two copies of each report are to be submitted to the Director of Engineering. A copy is to be submitted to the NTC director. After the report has been approved and accepted, a copy is to be submitted to the State agency responsible for dam safety and to the owner or sponsor of the structure.

504.16 Review and approval.

(a) The state conservation engineer is to approve the report before it is sent to Engineering or the NTC.

(b) The head of the NTC engineering Staff is to provide comments and suggestions to the Director of Engineering.

(c) The Director of Engineering is to notify the state conservationist of acceptance of the report or of additional data required.

SUBPART C - RESERVOIR SEDIMENTATION SURVEYS

504.20 General

(a) Sediment has a major impact on water quality, water and land use, environmental value, and structure performance. Sedimentation surveys will provide states with more reliable and defensible procedures for quantifying the off-farm impacts of sediment, assessing the effects of conservation practices on these off-farm impacts, and predicting sedimentation rates in ponds and reservoirs. Measurements of the sediment accumulating in reservoirs and determining the physical conditions influencing the sediment yield from the contributing watersheds provide some of the best data that can be obtained on erosion and deposition.

(b) In the early 1970's each state prepared a region-wide plan for sedimentation surveys of selected reservoirs. The plans identified the physiographic areas to be studied, the reservoirs to be surveyed, and the information desired.

(c) This procedure was established to provide a systematic, continuing accumulation of data from which sediment yield predictions could be accurately developed. Long-term records are necessary to establish valid average annual values. This is true because of the erratic nature of erosion and sediment deposition resulting from variations in vegetative cover and rainfall from season to season and from year to year.

(d) Selection of sites and interpretation and analysis of data are to be made by the state for local application. The NTC is to assist states in selecting sites and concur with the selection. The NTC is to develop regional correlations from the data.

504.21 Survey plans

(a) A survey plan for each state is to identify the areas of study, the reservoirs to be surveyed, a proposed schedule of surveys, and the type of information to be gathered. Plans should identify the purpose(s) for which each pond or reservoir is surveyed (e.g., improve farm pond design, sediment storage requirement at planned reservoirs, use of geomorphic variables in sediment yield prediction procedures, identify sedimentation and/or water quality problems, monitor effects of conservation treatment, or identify sediment sources). Ponds and reservoirs should be selected for survey on the basis of suitability to the purpose(s) identified. Installation assistance from SCS is not a requirement.

(b) State conservationists and NTC directors are to insure that the survey plans are current and that the surveys are scheduled as a part of ongoing activities. In order for the sediment surveys to provide meaningful information, and since land use and management change with time, a record of land use and treatment must be continuous and current. Plans should be reviewed periodically to determine if continued surveys would provide data useful to both state and national interests. If it becomes necessary to drop a site or to make a substitution, a request is to be made to the NTC Head of Engineering Staff. The request will describe the contributions requiring the change.

(c) These surveys are to be financed from the appropriations that will specifically benefit from the studies.

504.22 Procedures.

The detailed procedures for making these surveys are described in NEH-3, Chapter 7 and in ASTM/D4581.

504.23 Reports.

(a) Reservoir sedimentation reports are to be prepared by the state for each survey as described in "Outline of Report," NEH-3, Chapter 7. The reservoir sediment accumulation data collected are to be sufficient to complete form SCS-ENG-34 and provide the data on related watershed conditions (e.g., soils, surface geology, topography and land forms, land use and treatment, and all types of significant erosion).

(b) States should prepare non-technical summaries of the reports for in-house use and news releases for the general public.

(c) Each report, including completed form SCS-ENG-34, is to be submitted to the NTC for correlation with other reports to develop regional relationships. The NTC's are to assure technical adequacy of the completed forms.

(d) NTC's are to submit copies of completed forms SCS-ENG-34 to the Engineering Division as requested by the Director of the Engineering Division at 5-year intervals.

(e) The Engineering Division provides data from the completed form SCS-ENG-34 to the Subcommittee on Sedimentation, Interagency Advisory Committee on Water Data, which publishes a summary of "Sediment Deposition in U.S. Reservoirs" at 5-year intervals.

SUBPART D - FIELD TRIALS AND EVALUATIONS

504.30 General.

(a) New products, procedures, and techniques are essential in maintaining strong, current engineering activities. These new items become available from time to time. There are requests from industry and others to put these items into immediate use. Many of these items have great potential for use in engineering. Others, while appearing to have merit, may in fact be inferior and unacceptable. Before SCS adopts a product or procedure, it must be determined that it will function as designed and last for the design life. This may require detailed study and testing.

(b) Field trials and evaluations, in conjunction with test data, can provide the necessary support for approving a material or procedure for SCS use. Before a new product or procedure is included in standards or specifications, it must be documented that it will meet design need. Field trials and evaluations are frequently the only methods for developing acceptable data.

(c) Trials and evaluations are to conform to policy stated in 450-GM-403.

504.31 Scope.

Field trials and evaluations are to be considered if there is a need for determining if a product, procedure, or technique can be used to alter, replace, or supplement existing standards criteria, or procedures.

504.32 Approval procedures.

(a) Proposed field trials or evaluations that may change procedures, policy, standards, or criteria are to be submitted to the Director of Engineering. The head of the NTC engineering Staff is to provide comments and recommendations. Proposals are to be specific on the scope of the trial and on the materials or procedures to be tested.

(b) The Director of Engineering is to make a recommendation on each proposal. This may include guidance on the scope and intensity of the study to insure national application of results. This technical recommendation for a study does not constitute approval for expenditure of resources. If necessary, a request for funds and personnel should be made to the Chief.

(c) Proposed field trials or evaluations that do not require a variance from standards, criteria, specifications, policies, or procedures may be approved by the state conservationist.

504.33 Study plan.

(a) Generally, the brief statement describing the trial or test that accompanies the request for approval is not sufficiently detailed to define the scope, intensity, purpose, and plan for the study.

(b) The study plan needs to describe fully the need, the benefits, the approach to be taken, the anticipated schedule, and the resources required. These must be ion sufficient detail to permit a valid assessment of the potential for obtaining the needed data and of the potential demands for resources--personnel, equipment, and costs.

504.34 Reports.

(a) An index and a schedule for all field trials and evaluations are to be maintained in each state.

(b) At the time the study is approved, a schedule is to be established for progress reports. These reports are to be appropriate to the trials and evaluations.

(c) When the trial or evaluation is completed, a final report is to be prepared.

(d) Copies of all reports are to be submitted to the head of the NTC engineering Staff and the Director of Engineering. If additional copies are required, they are to be requested in the letter of approval for the study.

SUBPART E - TECHNICAL MANUSCRIPT PEER REVIEW

504.40 General.

Engineering Technology is disseminated to employees through references developed and distributed on a national, regional and state levels. The national distributed materials are itemized in Part 545. These reference materials have had technical review, usually at several SCS organizational levels, prior to their issue. These materials are available to the general public for use and represent the agency's technical papers written by SCS employees and distributed and published for reference by others, represent the agency's best technical capability. When employees prepare papers there is a need to assist them project SCS in the best possible image. There is also a need to assure that the content of papers distributed have high technical credibility. To meet these objectives, a peer review of technical manuscripts is suggested.

504.41 Scope.

Manuscripts containing information on existing or proposed policy, criteria and procedures for engineering (this includes geology and landscape architecture) should receive a peer review for technical adequacy. The state conservation engineers, NTC heads of engineering staffs, and the Director, Engineering Division are responsible for the use of a peer review process by their respective Staff to assure high quality technical manuscripts for presentations and publications.

504.42 Policy.

(a) Manuscripts prepared for distribution at a meeting, but not published in a bound book, proceeding, etc, should be peer reviewed as follows:

(i) Manuscripts prepared by employees in the state, should be peer reviewed by someone designated by the state conservation engineer. At his/her option, the state conservation engineer may request the peer review by a technical specialist in the respective NTC.

(ii) Manuscripts prepared by a state conservation engineer or an NTC technical specialist should be peer reviewed by a technical specialist at the NTC as designated by the head of NTC engineering staff.

(iii) Manuscripts prepared by NHQ Staff specialists should be peer reviewed by a technical specialist designated by the Director of Engineering.

(b) Manuscripts prepared by an employee for publication in a bound book, proceedings, trade magazine, etc, should be peer reviewed as follows:

(i) A manuscript prepared by an employee in the state should be peer reviewed. The state conservation engineer should consider obtaining this peer review at the NTC.

(ii) A manuscript prepared by an NTC technical specialist should be peer reviewed by a counterpart technical specialist at the NHQ.

(iii) A manuscript prepared by an NHQ specialist should be peer reviewed by another Staff specialist designated by the Director of Engineering.

(c) Employees are encouraged to have manuscripts reviewed for grammar and readability. Arrangements for this type of review should be made with an employee at their respective office location, i.e., state office, NTC office or NHQ.

(d) To facilitate Technology transfer, a copy of each manuscript should be forwarded to the Director of Engineering. The Director of Engineering will in turn distribute those manuscripts that provide information on applied Technology to all appropriate offices.

PART 505 - NON-NRCS ENGINEERING SERVICES

SUBPART A - INTRODUCTION

505.00 General.

(a) Non-NRCS engineering and other technical services may be used to meet NRCS workload demands, and technical and program needs. It is essential that NRCS not engage in engineering services and activities that are in direct conflict or competition with services available in the private sector. NRCS must maintain a quality, well trained engineering staff to support the administration of NRCS programs and work with non-NRCS employees called on to assist in our work. In using non-NRCS services, NRCS will strive to ensure:

1) professionalism and respect for others,
2) quality work,
3) excellence in customer service,
4) teamwork with others,
5) clearly defined responsibilities,
6) partnerships with State boards of registration,
7) engineering and ecological integrity, and
8) effective empowerment.

(b) For the purpose of this policy, non-NRCS engineering services means services provided by any engineer, landscape architect, geologist, or others employed by a consulting firm, sponsoring local organization, other unit of government, private individual land users, manufacturers of structural elements or components, and construction contractors.

(c) For the purpose of this policy, technical services means engineering related and construction support activities provided by private individuals such as individual landowners and users, conservation contractors, and others. Individuals providing these services are not under the supervision of an NRCS employee and may not be licensed to practice engineering. NRCS may use the documentation furnished by private individuals performing technical services for reporting and certifying conservation

practices. Non-NRCS engineers shall certify to NRCS that all work meets current NRCS standards. This certification may be the basis for NRCS acceptance.

(d) This policy does not apply to non-NRCS services for software development or maintenance.

505.01 State criteria.

Opportunities to use non-NRCS engineering services vary greatly from State to State. State conservationists are to periodically review the scope, type, and volume of engineering work in their states; consider the availability of non-NRCS engineering sources; and establish criteria in accordance with this policy for the kinds of jobs for which these sources are to be used. Each State is to maintain liaison with consulting engineering organizations in that State to ensure an understanding of the division of work.

505.02 Exchange of technical services between government agencies.

NRCS participates in the exchange of engineering services between government agencies to expedite and improve technical work of the agencies by sharing expertise and enhancing on-the-job training. An agreement for exchange of services may be formal or informal depending on the nature of the work. Generally, simple routine exchanges are arranged by correspondence between the agencies. More complex jobs require formal agreements. See 505.40, USDA Memorandum of Understanding Between the Natural Resources Conservation Service and the Forest Service.

505.03 Review of work performed by consultants and suppliers.

(a) Standard designs and drawings prepared by others. NRCS is often requested to approve standard drawings for measures such

as manure tanks or pre-fabricated structures. State conservation engineers are to use all appropriate means to handle this request efficiently.

(1) The state conservation engineer may perform the review and, if appropriate, provide approval using available NRCS resources.

(2) The state conservation engineer may request the firm to supply a peer review conducted by an independent engineering firm.

(3) The state conservation engineer will require the firm to supply NRCS with a certification that the measure meets all NRCS standards for the States where the measure is to be applied.

(4) Designs to be reviewed by NRCS shall be accompanied by all necessary substantiating data and calculations.

(5) The state conservation engineer will notify the Director of Conservation Engineering Division of all approved standard designs and drawings prepared by others.

(b) Site specific plans and specifications. Designs, drawings and specifications completed for NRCS, sponsors, or landowners by consultants and others can expedite implementation of NRCS administered programs.

(1) NRCS will provide the non-NRCS individual with the applicable NRCS standards and provide appropriat3~e pre-design support at the request of the landowner or sponsor.

(2) The individual will certify on the drawings that "to the best of my professional knowledge, judgment and belief, these plans meet applicable NRCS standards".

(3) An NRCS employee with the necessary job approval authority shall perform a functional review to ensure, as a minimum, that the work:

(i) achieves the objectives of the plan, programs,

(ii) meets the criteria in the applicable practice standards,

(iii) complies with the applicable State and Federal programs,

(iv) includes an Inspection Plan and Operation and Maintenance Plan, and

(v) does not require a technical review as defined in National Engineering Manual Section 511.05.

(c) Site specific installations. Landowners and sponsors are encouraged to use the designers to provide construction inspection.

(1) The landowner or sponsor will submit final as-built drawings with a certification by the responsible individual that "to the best of my professional knowledge, judgment, and belief this practice is installed in accordance with the plans and specifications and meets NRCS standards."

(2) NRCS may make a field visit to review the application.

(3) NRCS will make any necessary program certification for cost sharing.

SUBPART B - USE OF NON-NRCS ENGINEERING SERVICES

505.10 Non-project activities.

(a) Non-NRCS Engineering Services.

(1) Non-NRCS engineering services may be used to provide assistance to individual and groups on planning, design, and inspection services for conservation practices. Small individual and group jobs unattractive to non-NRCS sources have a priority for NRCS assistance. For the larger individual and group jobs, NRCS strongly encourages using non-NRCS engineering services to make field surveys, soil and geologic investigations, and other special investigations, to prepare plans and specifications, and to provide construction inspection services.

(2) State conservationists are to utilize non-NRCS sources to meet program needs and to satisfy appropriate interest expressed by non-NRCS sources. Generally, non-NRCS engineering services are used for larger jobs to free NRCS for other work for which non-NRCS engineering services cannot be obtained.

(i) The state engineering job approval classification can be used to delineate the upper limits, in size and complexity, of jobs NRCS regularly handles in the State or area. For example, the state conservationist may decide that in a given area NRCS will not handle jobs outside the approval authority of the responsible engineer and that non-NRCS engineering services should be used for such jobs.

(ii) If non-NRCS engineering services are used in NRCS programs, NRCS generally makes preliminary investigations and studies needed to support the development of the conservation plan and, as necessary, provides needs and feasibility determinations. NRCS also provides criteria and consultation and maintains contact with the work to ensure that it meets the conservation objectives of the program and that it is acceptable by NRCS standards.

(3) When a landowner elects to use non-NRCS engineering services to design or inspect the installation of a conservation

practice, the responsible NRCS employee must ensure that the landowner and consultant understand the responsibilities of all parties involved, especially if the practice involve~ cost-sharing. It is recommended that a letter like the sample shown in Subpart E - Exhibit 505.43, be used to ensure effective communications with all involved parties.

(b) Technical Services.

(1) Conservation contractors often provide technical services to landowners and land users in conjunction with the installation of terraces, diversions, grassed waterways, stabilization structures, on-farm drainage and irrigation systems, low hazard agricultural waste management systems, land grading and leveling, and other conservation practices. These services are considered support activities. To enhance the working relationship between conservation contractors and NRCS, a Memorandum of Understanding (MOU) has been signed between the Land Improvement Contractors of America (LICA) and NRCS. A copy of the MOU is located in Subpart E, Exhibit 505.41.

(2) NRCS is responsible for technical standards, conservation planning and application, and the certification and reporting of conservation practices. When technical services are provided during the installation phase, the field office staff will review the checkout and/or layout and other construction documentation provided by the contractors to ensure that the documentation submitted shows that the practices were installed in accordance with the approved drawings and specifications. Practice documentation is to comply with General Manual (GM) 450, Part 407 - Documentation, Certification, and Spot-Checking. Documentation aids may be developed by NRCS staff to assist contractors in providing the necessary documentation.

(3) NRCS will ensure that the quality of services provided by the contractor during the design phase meets NRCS program needs and technical standards. Contractor developed designs will be reviewed for technical adequacy by an individual having engineering job approval authority for the work.

(4) The state conservationist will establish procedures to make random, periodic field checks and quality reviews (330-GM, Part 405) to assure that practices were installed in accordance with the documentation furnished by the contractor and approved drawings and specifications. Records will be maintained in the field office to document that the contractor provides services meeting NRCS standards.

(5) In the event a deficiency exists with the contractor's documentation or installation, the policies expressed in GM-340, Part 405, apply. In addition to notifying the participant or owner, the field office staff shall work with the contractor to satisfactorily resolve the issues. A satisfactory resolution will range from correcting a simple error or misunderstanding to not accepting future documentation until such documentation is submitted in an accurate, acceptable manner.

(6) Upon request from a contractor, the field office staff will furnish to that contractor information related to acceptance of his or her work by NRCS. The sample letter shown in Subpart E - Exhibits 505.42, should be used in responding to the contractor. The practices and elements of work performed (construction of a practice and checkout, layout, and/or design documentation) are shown as examples only. Each letter will be tailored to identify the acceptance of construction and documentation for the individual contractor. This information is protected by the Privacy Act from unwarranted disclosure and may not be divulged by NRCS to any individual or organization other than the contractor to whom it pertains. Exceptions to this require approval of the Freedom of Information Officer.

505.11 Project activities.

(a) Scope. Engineering services for work in project activities are provided by NRCS or by non-NRCS engineering staffs, including sponsoring local organizations, State agencies, or other units of government; private engineers under contract with NRCS; and private engineers under contract with sponsoring local organizations.

(b) Staffing. NRCS must have an adequate staff of engineers and other personnel to maintain a technically sound program and rate of progress consistent with the intent Qf the Congress and the Administration. The engineering staff should be large enough for the normal workload of preparing plans, making field surveys and investigations, preparing construction drawings and specifications, and inspecting construction. For some projects, part of this workload is performed by non-NRCS sources. Sponsoring local organizations may elect to provide engineering services.

(c) Use of non-NRCS engineering services. Non-NRCS engineering services contracted by NRCS or sponsoring local organizations are used to perform:

(1) Engineering work in excess of the amounts NRCS and sponsoring local organizations can do because of peak loads greater than normal seasonal peaks.

(2) Unusual kinds of work for which NRCS and the sponsoring local organizations lack the necessary facilities or specialized knowledge.

(3) Engineering services for which sponsoring local organizations elect to employ private engineers.

(4) Consulting services and special studies such as review and evaluation of engineering data, independent safety reviews for design of dams, consultation in design of complex or unusual structures, and hydraulic model studies.

(5) Certain engineering and architectural services for basic facilities for recreation or fish and wildlife and for municipal and industrial water supply.

(d) Inspections. Local organizations provide for all inspections of features not paid for from NRCS funds. NRCS inspects features whose malfunction or failure could adversely affect portions of the work that are paid from NRCS funds. When inspection of construction paid from NRCS funds is performed by

other than NRCS personnel, the NRCS representative provides such supervision as necessary to ensure that the inspection is adequate and that the work meets the requirements of the construction contract. Inspection of construction in which NRCS-administered funds are invested is usually provided by NRCS. These services may be provided by others if one of the following circumstances prevails:

(1) Qualified NRCS personnel are not available.

(2) The work was designed by non-NRCS engineers because NRCS did not have the skills to do the design work.

(3) The work is principally financed by the sponsoring local organization or other non-NRCS interest.

(4) The work includes installations or parts of installations requiring specialized knowledge and experience not available in NRCS.

(e) Recreation and fish and wildlife facilities. Basic facilities for recreation or fish and wildlife are planned by sponsoring local organizations, by private engineers or other professionals, or by NRCS. These facilities are designed by sponsoring local organizations, by private engineers, or other professionals, not by NRCS.

(1) Standard plans developed by State or Federal agencies and approved by NRCS can be used as guides. Criteria for facilities for which no standards are available must be established by conference of the interested parties.

(2) Basic facility plans must be detailed enough to establish the general location and size of the major elements and the types and approximate quality and quantity of the various features and to provide reasonable estimates of costs.

(3) The general location and size of the major elements and the types, quality, and quantity of the various features of

basic facilities are to be designed in conformance with the information in the plan.

(4) NRCS review of the design documents, drawings and specifications is limited to that needed to determine that they clearly specify the work to be done; they are consistent and compatible with all other provisions of the contract document; the facilities conform to the details established in the work plan; and public health and safety are protected.

(f) Single-purpose municipal and industrial water supply. NRCS does not provide or contract for engineering services for planning, design or installation of single-purpose structures for municipal and industrial water supply.

(g) Multiple-purpose municipal and industrial water supply. Multiple-purpose structures for municipal and industrial water supply can have provisions for flood control, irrigation water management, recreation, fish and wildlife, water quality management, or any combination of these or other purposes. The division of engineering work among NRCS and others depends on which purposes are included.

(1) In the planning stage, if storage of water for municipal or industrial use is proposed in a multiple-purpose structure, the sponsoring local organization provides or contracts for engineering services at non-NRCS cost. This includes all surveys and investigations necessary to determine what storage volume is needed for municipal and industrial water, whether the water yield and quality are adequate, and whether the proposed structure will hold water without undue loss. The sponsoring local organization or a non-NRCS engineering source employed by the local organization also plans all water control features required exclusively for the municipal and industrial water and all other features for which NRCS cost sharing is not authorized.

(i) NRCS makes or contracts for studies of water yield and quality, and potential seepage loss or gain of reservoirs. The data are used to evaluate the feasibility of storing water

for irrigation, recreation, fish and wildlife, water quality management, or any other purpose for which NRCS cost sharing is provided.

(ii) To avoid duplication of effort, NECS and the sponsoring local organizations share and exchange information. If similar studies are needed for the various purposes, independent studies shall be made as each considers necessary.

(iii) NRCS makes or contracts for all foundation investigations and other needed studies in addition to those provided by the sponsoring local organization. This ensures that the proposed structure can be constructed at a reasonable cost, will be safe, and will perform the functions for which NRCS cost sharing is provided.

(2) In the design stage, non-NRCS engineering services are used for multiple-purpose structures with municipal or industrial water supply features. These services include, but are not limited to, field surveys, geologic and soil investigations, design studies and computations, and preparation of construction drawings and specifications.

(i) NRCS does not perform engineering work for the design of structures for municipal or industrial water; even if the work is paid for in part by NRCS funds.

(ii) The Chief may consider exceptions to this rule, at the request of sponsoring local organizations and on submission of justification, if the storage volume for municipal and industrial water is less than 20 percent of the total water storage volume.

505.12 River basin studies.

River basin studies are overall studies and assessments of water and related land resources, regional and river basin plans of a preliminary or reconnaissance nature, and implementation studies of program or project feasibility. In overall studies

and in regional and river basin planning, NRCS usually provides the engineering services or consultative assistance to others performing the work. In implementation studies of program or project feasibility, engineering services can be provided by NRCS and/or non-NRCS sources.

505.13 Engineering services not provided by NRCS.

(a) Frequently engineering services that NRCS does not provide are needed for carrying out NRCS programs. Cooperating individuals, groups, and organizations must arrange for such services from non-NRCS sources.

(b) Among the services NRCS engineers do not provide are the following:

(1) Boundary or location surveys for legal purposes, unless the state conservationist has determined that providing such service in a State meets the requirements of the State Professional Engineers and Land Surveyors Board.

(2) Representation of drainage or irrigation districts or similar enterprises in legal proceedings required by State laws, unless non-NRCS sources are not available and the state conservationist presents justification acceptable to the Chief.

(3) Obtaining water rights or filing applications with regulating agencies for pollution abatement facilities, except as provided in 130 (Agency General) Part 400.

SUBPART C - CRITERIA

505.20 Non-project activities.

NRCS encourages conservation district cooperators and others whom it assists to follow applicable NRCS standards when conservation work is done for them by private engineers. If Federal cost sharing or technical assistance is provided, the work must comply with NRCS standards.

505.21 Project activities.

(a) Non-NRCS engineering services provided under contract with NRCS usually require the use of NRCS standard drawings, specifications, and design criteria.

(b) Sponsoring local organizations that elect to furnish engineering services for work cost-shared by NRCS are to be encouraged to use applicable NRCS standard drawings, specifications, and design criteria, but may use other drawings, specifications, and design criteria acceptable to NRCS, as agreed to prior to a design start. The quality of all work (performance, durability, safety, and economy) must be equal to the quality required by the NRCS standards. Drawings and specifications must be compatible with the general provisions and special provisions to be used in the construction contract.

SUBPART D - PROCEDURES

505.30 Engineering services, contracts, and agreements.

(a) If NRCS contracts directly for engineering services, the appropriate Architect-Engineer Evaluation Board selects the best qualified sources and establishes the order of priority for negotiating purposes (NRCS Procurement Regulation 41-4.1004). The contracting officer negotiates the contract. If the sponsoring local organization is to pay a part of the cost of the work performed under an NRCS contract, an agreement for services is required.

(b) If NRCS provides funds for engineering performed by a sponsoring local organization or by a private source engaged by a sponsoring local organization, an agreement for services is required. If a sponsoring local organization elects to employ a private source whose services will be paid for with NRCS funds, the state administrative officer and the state conservation engineer assist in selection and negotiation.

(c) If higher level of approval for the practice or project is required, the specifications for engineering services contracts and agreements are to be prepared jointly and contractual negotiations are not to be initiated until concurrence is received.

(d) Instructions for preparing and negotiating engineering services contracts and agreements are given in the Administrative Services Handbook, Federal and NRCS procurement regulations. Detailed guidance in the engineering aspects of preparing and negotiating engineering services contracts is provided in the National Contracts, Grants, and Cooperative Agreements Manual.

505.31 Selection of non-NRCS engineering services.

(a) If non-NRCS engineering services are to be paid for by NRCS, whether the contract is negotiated by NRCS or by a sponsoring local organization, NRCS is responsible for proper expenditure of funds and will assist in the selection and negotiation. The cost of non-NRCS engineering services must be

reasonable compared to the cost of using NRCS engineering services, considering any differential between private and public costs.

(b) Non-NRCS engineering sources must be approved by the state administrative officer and the state conservation engineer and must meet the following requirements:

(1) Registration is necessary in the State in which the work is to be undertaken if registration is required by State law, and non-NRCS engineering sources must be properly authorized to practice in compliance with other State laws.

(2) They must have had satisfactory experience in the kind of engineering work to be undertaken and must be available to supervise the work directly.

(3) They must have the necessary facilities and staff to do the work in the specified time.

505.32 Responsibility for engineering services performed under engineering services, contracts, and agreements.

(a) Non-NRCS sources performing engineering services bear the primary responsibility for the soundness and adequacy of engineering services. NRCS and sponsoring local organizations also assume certain responsibilities in setting criteria for the work, in financing and sponsoring it, and in reviewing, approving, and accepting it.

(1) Approval and acceptance of the work by NRCS or by the local organization does not absolve the non-NRCS sources of responsibility. The extent of their responsibility depends on the nature of the services required. There are three general kinds of non-NRCS engineering services:

(i) Routine design and drafting or other routine work strictly following NRCS criteria, standards, and instructions. The non-NRCS source is responsible for errors or deficiencies in the prepared designs, drawings, and specifications.

(ii) Engineering services requiring professional experience and judgment. The contract may require that NRCS criteria and standards be followed insofar as they are applicable but the non-NRCS source is expected to make independent decisions. To the extent that the contract requires, the source furnishing services of this kind is held responsible for the soundness and adequacy of the designs, drawings, specifications, and other services performed under the contract. A professional is responsible to the public in general for safe and sound engineering services.

(iii) Engineering services outside the realm of NRCS knowledge and experience. A contract for design work of this kind usually provides for construction inspection by those responsible for the design. When this is the case, in accepting the work, NRCS relies largely on the competence and dependability of the professional.

(2) A contract for design work under 505.32(a)(1)(ii) or (iii) normally provides for services during construction, whether the non-NRCS source performs the inspection or not. These services include concurrence in any deviations from the design. The source must be permitted to retain control over the design if they are to be held responsible for it, and any changes made without their concurrence tend to relieve them of responsibility. Basic design changes are not to be made until approved by the professional responsible for the design. Approval of minor deviations and corrections that become necessary during construction is to be obtained as quickly as practical, but construction should not be delayed to await approval unless there is reason to doubt that the change will be approved.

(3) If engineering services are furnished by a sponsoring local organization under an agreement for services, the sponsoring local organization assumes responsibility for soundness and adequacy of the work. This applies to services performed by the local organization itself as well as to services performed by others under contract with the local organization. NRCS approval and acceptance of the work does not relieve the local organization of its responsibility. If problems caused by a deficiency in engineering services furnished by a sponsoring

local organization arise during or after construction of any works of improvement, NRCS holds the local organization liable for any damage to others that may result and for any additional construction costs to correct the situation.

(b) If NRCS-administered Federal construction funds are paid, or works of improvement paid by NRCS funds are affected, NRCS is responsible for protection of the government1s interest; namely, the works of improvement must satisfactorily and safely perform the functions for which funds are invested. The performance of engineering services and assumption of attendant responsibility by non-NRCS sources does not relieve NRCS of this responsibility.

(1) If the detailed construction inspection of work paid from NRCS funds is performed by other than NRCS personnel, the NRCS representative is to verify that the work complies with the requirements of the construction contract. Such verification requires spot checking of inspection procedures, continuous review of job records and reports, and periodic observation of the work.

(2) NRCS engineering job approval authority (Part 501, Subpart A) is the same for engineering work done by non-NRCS sources as for work done by NRCS.

(3) NRCS is not liable for damages or additional costs caused by deficient or improper investigations, designs, or other engineering services performed by others.

SUBPART E - EXHIBITS

505.40 Exchange of technical services between NRCS and FS.

USDA Memorandum of Understanding
For
Exchange of Technical Services
Between
Natural Resources Conservation Service
And
Forest Service

Signed January 17, 1979

1. PURPOSE

The purpose of this agreement is to establish procedures for an exchange of technical services between the Natural Resources Conservation Service (NRCS) and the Forest Service (FS). Either agency may provide technical assistance depending on the location, scope, and complexity of the work and the availability of necessary skills. This interdepartmental agreement will not alter and/or change the delegations of authority or agency policy of practice in the planning, design, installation, or maintenance of works of improvement. The intent of this exchange is to expedite and improve technical work of the agencies by utilizing the expertise of the personnel skills of both agencies and by enhancing on-the-job training.

2. SCOPE

This agreement applies to the exchange of technical services for training, consultation, and review relating to planning, design, installation, and maintenance of dams, roads, sanitary facilities, and other related natural resource protection activities. The exchange can include but is not limited to technical assistance in landscape architecture, geology, engineering, biology, plant sciences, and other natural resource discipline areas.

3. PROCEDURE

FS regional foresters and/or area directors and NRCS state conservationists are normally responsible for initiating and

coordinating agency requests for assistance. If assistance involves more than one State or more than one FS Region or Area, the coordination will include the Chief of the NRCS and the Chief of the FS.

Informal interagency consultation between technical specialists is currently encouraged and practiced. Assistance that may require a significant amount of time expenditure or obligation of other resources should be requested in writing. The request is to include sufficient information for the assisting agency to determine the scope of work and the extent of resources needed to complete the task. If reimbursement for actual costs is required, provisions for reimbursement are to be outlined in an exchange agreement for the task.

Work performed under the terms of the exchange agreement is to follow normal agency approval procedures. Each agency will coordinate for any required higher level reviews and approvals.

Assistance resulting from a written request is to be documented in the form of a technical report to identify the scope of work, report the results of studies or analyses, and make recommendations.

Work performed under exchange agreements is to be accomplished using the criteria of the assisting agency that are appropriate for the size and type of project. Generally, FS and NRCS criteria and standards are compatible. If during the course of the work, criteria variations become evident and/or normal practices are determined to not apply, the two agencies are to agree on their applicability before the final report is prepared. The final decision on the adequacy of the work And the adoption of recommendations is be made by the requesting agency.

4. SUPPLEMENTS

As necessary to adapt to local conditions, this memorandum of understanding may be supplemented at the State level by agreement between the state conservationist and the appropriate regional forester or area director.

5. DURATION

This memorandum of understanding becomes effective on the date of the last affixed signature and continues in effect until terminated in writing by either party after providing sixty (60) days' notice to the other.

/S/John R. McGuire, Chief
Forest Service, USDA

DATE: January 17, 1979

/s/J. w. Haas, acting for
R.M. Davis, Administrator
Soil Conservation Service, USDA

DATE: December 28, 1978

SUBPART E – EXHIBITS

505.41 Memorandum of Understanding between LICA and NRCS.

MEMORANDUM OF UNDERSTANDING
between
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE (NRCS)
and
LAND IMPROVEMENT CONTRACTORS OF AMERICA (LICA)

I. PURPOSE

This Memorandum of Understanding (MOU) is between the Natural Resources Conservation Service of the United States Department of Agriculture, hereinafter called NRCS; and the Land Improvement Contractors of America, hereinafter called LICA.

This MOU establishes the joint and individual interests of the two parties in the application of natural resources conservation practices. Effective cooperation can aid significantly in advancing the missions of both parties and in achieving increased efficiency in the application of conservation practices.

II. GENERAL

Under the provisions of Public Law 74-46, 49 Stat. 163, NRCS was established to provide technical assistance in controlling and preventing soil erosion. This assistance is provided through a variety of technical assistance and cost-share programs. It is essential that conservation practice application with NRCS assistance meet minimum NRCS standards.

NRCS is responsible for certifying that conservation practices meet minimum NRCS standards and specifications. NRCS cannot delegate this responsibility. To assist in the efficient application of conservation practices, NRCS can use documentation furnished by contractors to support the certification process.

III. RESPONSIBILITIES

A. NRCS AGREES TO:

1. Provide or assist with training contractors in surveying, design, layout, and construction checks of conservation practices in accordance with the availability of resources.

2. Furnish to any contractor, upon request, only such information as related to his/her acceptance by NRCS of previously submitted surveying, design, layout and/or construction check documentation of conservation practices. This information may be obtained from the local NRCS employee responsible for certifying that conservation practices have been installed in accordance with NRCS standards and specifications. The contractor may provide this information to LICA and others.

3. Approve all designs and randomly field check contractor's layout and/or construction checks. In the event that random field checks reveal a deficiency in the contractor's layout and/or construction check of a given conservation practice, the NRCS employee responsible for certifying conservation practices in his/her work area will notify the contractor that his/her documentation is no longer acceptable for NRCS certification of that specific practice.

B. LICA AGREES TO:

1. Promote and, where possible, participate in training contractors in surveying, design, layout, and construction checks of conservation practices.

2. Provide guidance and leadership to local chapters of LICA in the training of contractors.

3. Encourage contractors to provide designs for NRCS approval and to submit layout and construction check documentation to NRCS for certification of practices for programs and activities for which NRCS is responsible.

4. Promote a program among the local chapters of LICA that recognizes the knowledge and skills of contractors in surveying, design, layout, and/or c9nstruction check of conservation practices.

C. IT IS MUTUALLY AGREED THAT:

1. Training activities outlined in this MOU will be voluntary and available to LICA members and non-members alike. NRCS will accept contractor documentation from either LICA members or non-members. Participation in training sponsored by LICA, NRCS, or any other organization or group is not a requirement for accepting contractor documentation. NRCS accepted documentation is based on demonstrated competency of the contractor to furnish neat, accurate notes showing that the practices installed meet the design requirements and NRCS standards and specifications.

2. The program or activities conducted under MOU will be in compliance with the nondiscrimination provisions contained in the Titles VI and, VII of the Civil Rights Act of 1964, as amended; the Civil Rights Restoration Act of 1987 (Public Law 100-259); and other nondiscrimination statues: namely, Section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendments of 1972, and the Age Discrimination Act of 1975. They will also be in accordance with regulations of the Secretary of Agriculture (7 CFR-15, Subparts A & B), which provide that no person in the United States shall on the grounds of race, color, national origin, age, sex, religion, martial status, or handicap be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving Federal financial assistance from the Department of Agriculture or any agency thereof.

3. This MOU shall become effective upon the date of the last signature affixed hereto and remain in full force and effect indefinitely. It will be reviewed every five years from the effective date and amended, if necessary, by duly authorized officials of LICA and NRCS. This MOU may be terminated by either party hereto through a 30-calendar-day written notice to the other party.

4. The activities under this MOU will be in compliance with Title V of the Drug-Free Workplace Act of 1988, 41 U.S.C. 702, and 7 CFR, Part 3017, Subpart F

5. This MOU defines in general terms the basis on which the signatory agencies will cooperate, 'and as such, does not institute a financial obligation to serve as a basis for expenditures. Expenditure of funds, human resources, equipment, supplies, facilities, training, public information and expertise will be provided for by each signatory agency to the extent that their participation is required and resources are available. Any exchange of funds between the parties must be executed by a separate agreement.

LAND IMPROVEMENT CONTRACTORS OF AMERICA (LICA)	U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE (NRCS)
/s/PAUL SANDEFUR President	/S/PAUL W. JOHNSON Chief
DATE: 2/20/97	DATE: 2/15/97

SUBPART E - EXHIBITS

505.42 Conservation contractor - sample letter.

USDA
NATURAL RESOURCES CONSERVATION SERVICE
400 Water Street
Anytown, Anystate 00000

Current Date

Name
Address

Dear:

As you requested on November 5, 1997, I am furnishing you this office's acceptance of your construction and documentation of conservation practices installed by farmers and ranchers in this county. Our acceptance is based on a review of the documentation you submitted and our field review of your work. The practices are:

Ponds - Construction only
Terraces - Construction and checkout documentation
Grassed Waterways - Construction and checkout documentation
Diversions - Construction, layout, and checkout documentation
Land leveling - Construction, design, layout, and checkout documentation

We commend you and greatly appreciate your efforts and cooperation in promoting and installing high quality conservation practices in this county.

Thank you for your support in protecting our soil and water resources.

Sincerely,

District Conservationist

SUBPART E - EXHIBITS

505.43 Landowner use of a consultant - sample letter.

USDA
NATURAL RESOURCES CONSERVATION SERVICE
400 Water Street
Anytown, Anystate 00000

Current Date

Name
Address

Dear

You have requested cost sharing from the Farm Service Agency (FSA) for practice 313, Waste storage Facility. You have indicated that your system will be designed by a private consultant. The Natural Resources Conservation Service (NRCS) welcomes the involvement of your consultant. However, you need to be aware that the NRCS will require that the consultant be responsible for meeting NRCS standards and specifications and for certifying the work.

There are certain items which must be submitted to the NRCS to meet this requirement. These items are outlined in this letter. We hope this will provide a clear understanding for all parties involved and prevent any possible misunderstanding. The following items are needed.

Prior to construction

1. A waste utilization plan must be prepared. I will be able to assist you with this plan.

2. You need to submit the following items prepared by the consultant to the NRCS:

a. A copy of the signed engineering plans which meet NRCS standards. In addition to the Professional Engineer's certification, the plans shall contain the following statement: "To the best of my professional knowledge, judgment and belief, these plans meet applicable NRCS standards and specifications."

b. A copy of the design engineer's cost estimate.

c. A copy of an inspection plan which describes inspection items and qualifications of those doing the inspection.

3. You are responsible for obtaining all permits (State Pollution Control Agency, Watershed District, County zoning, etc.) and contacting all utility companies with facilities in the work area.

During Construction

1. You are responsible for hiring the contractor and ensuring that the inspection plan is carried out and that the structure is completed according to the approved plan and specifications.

2. Changes during construction will need to be approved by the consultant and noted on "as-built" drawings.

After Construction

1. Upon completion, you must submit to NRCS a copy of the "as-built" drawings, a certification statement signed by your consultant, and a copy of any construction documentation required in the inspection plan. The certification statement should read, "To the best of my professional knowledge, judgment and belief, the installed practice meets NRCS standards" and should be signed by the engineer who designed it.

2. NRCS will make a field visit to the site and will certify completion to FSA based on the consultants certification statement.

3. You will need to follow the Operation and Maintenance Plan for the system.

I hope this letter fully explains NRCS expectations. If you have any questions, please call me.

Sincerely,

District Conservationist

cc:

PART 506 - TECHNICAL MATERIALS

506.00 General.

National conservation engineering technical materials including, in generic terms, documents, drawings, and computer programs, have been developed and refined over many years. These materials reflect NRCS technical expertise, experience, and procedures in the engineering, geologic, and landscape architecture disciplines. Most of these engineering materials are developed to serve as permanent references for providing technical assistance across the range of agency programs. Other engineering materials are produced to provide information to the public on agency projects and practices.

506.01 Definition of Terms.

(a) Working definitions for elements of conservation engineering technical materials include,

(1) Policy- A statement of an adopted and definitive course of action.

(2) Criteria- A policy statement of specific quantitative technical requirements that can contain reference to procedures. As a policy statement, criteria by definition is a subset of policy.

(3) Standard- A statement of acceptable quality or technical excellence in terms of both form and function (performance), usually expressed in terms of limits, i.e. minimum or maximum.

(4) Conservation Practice- A structural measure, a vegetative measure, or a management activity used to protect, enhance, or manage soil, water, air, plant, or animal resources.

(5) Conservation Practice Standard- A set of statements (criteria) that establish the acceptable level of quality for planning, designing, constructing, operating, and maintaining conservation practices.

(6) Guide- A compendium of information or series of options that does not recommend a specific course of action.

(7) Procedure- A method of analysis that can be either a technical or administrative process methodology. It contains a series of steps to be taken to determine a result for a desired objective.

(8) Specification- An explicit set of requirements to be satisfied by a material, product, system, or service, such as construction. It also identifies the methods for determining whether each of the requirements is satisfied.

(9) Conservation Practice Specification- A general or site-specific document that establishes the technical details and workmanship required to install the practice in accordance with the practice standard.

506.02 Organization of Permanent Materials.

(a) Permanent National engineering materials have been issued in the past under a wide variety of titles, formats, and organizations, including National Engineering Handbook Sections (NEH), Technical Releases (TR), Field Manuals, Design Notes, Specification Notes, etc.

(b) NRCS currently utilizes an agency-wide, coordinated system to organize, issue, and manage all of its permanent documents. This system is detailed in the General Manual (120-403) under Subpart A - Directives.

(c) All materials in the Directives system are numbered. The terminology for the numbering system is:
ttt-ppp.ccss

where,

ttt = title number (210 for engineering, etc)
ppp = part number (5xx or V-xxx for topical manuals, etc)
cc = chapter number
ss = section number

(d) Within this NRCS Directives System, all permanent engineering materials will be organized into the following:

(1) General Manual (GM)- The GM is used to issue policy that applies to all offices within the scope of the issuing office. Engineering Parts of the GM are numbered as 210-4xx.

(2) National Engineering Manual (NEM)- The NEM is a topical manual used to issue policy for engineering work and is distributed to offices providing engineering assistance. Parts of the NEM are numbered as 210-5xx.

(3) National Engineering Handbook (NEH)- The NEH is a topical handbook used to issue detailed "how-to" instructions, (i.e. procedures, guides and specifications). Parts are distributed to offices that need the material. Parts of the NEH are numbered as 210-6xx.

(4) National Handbook of Conservation Practices (NHCP)- The NHCP is also a topical handbook used to issue National Conservation Practice Standards and Specifications. This material is established as agency policy and criteria via cross reference in the General Manual. The NHCP is numbered as 450-VI-NHCP.

(5) Automated Systems- This category is used to issue user guides and other documentation for NRCS developed software applications and databases to all offices that use the automated systems. Parts for engineering applications are numbered as 210-7xx.

(6) Instructions (3xx) are also available to issue information, but are seldom used for engineering technical materials. Refer to 120-403.

(e) The National Engineering Handbook (NEH) has been established to provide a unified topical handbook for all permanent conservation engineering procedures, guides and specifications, except those covered in the NHCP. The purpose is to provide a uniform framework for locating technical references, eliminating duplication of distributed materials, and managing the development of new materials. All new or revised technical

procedures and specifications shall be titled and developed as an integral part of the NEH.

(1) The primary table of contents for the NEH shall parallel the table of contents for this NEM in part names and Part numbers, except Part numbers will be 6xx. The primary table of contents for the NEH will also contain additional part names and part numbers for field handbooks which contain engineering material, but are intended primarily for use by non-engineers.

(2) The secondary table of contents for the NEH can be different from the NEM in Chapter titles and numbers, and will be adjusted as new procedures or specifications are added to any part.

506.03 Metrication

(a) The transition to the use of metric units in all government publications has been mandated by Acts of Congress and Presidential Orders.

(b) Approved metric units are referenced in ASTM E380 "Standard Practice for the Use of the International System of Units (SI)". The abbreviation SI is derived from the French "Système International d'Unités and is used in all languages.

(c) During this transition period, every new or revised engineering document shall include approved metric units. Documents should be prepared to either:

(1) use both approved metric units and common inch-pound units such that either set of units are acceptable for consistent use throughout the document, or

(2) use common inch-pound units and include acceptable metric units for information.

(d) Conversion between inch-pound and metric units may be hard or soft conversion depending on industry practice and available equipment or materials.

(1) Soft conversion is the process of changing the description of an existing measurement without a significant change in size or magnitude.

(2) Hard conversion is the process of changing the description of an existing measurement with a change in the size of an existing object or the magnitude of an existing quantity to obtain standard, convenient, rounded, or rationalized dimensions.

(e) Dual units should be shown as inch-pound units with metric units in (parenthesis) when the metric conversion is soft, and metric units in [brackets] when the metric conversion is hard.

506.04 Developing NEH Materials.

(a) The development or major revision of national engineering technical materials should follow an organized process in order to,

(1) focus efforts on priority Agency needs,

(2) involve appropriate disciplines and staffs,

(3) plan the scope of the final product, and

(4) assure organized integration into the NEH.

(b) Anyone working with national technical materials can propose development or revision of any NEH materials that are needed to provide technical assistance under Agency programs. Anyone that has developed technical materials for State or regional use can also propose refinement of the material for National use and inclusion into the NEH. All proposals should be directed to the State Conservation Engineer for consideration. The State Conservation Engineer should forward important proposals on to the Director of Conservation Engineering.

506.05 Distribution of Materials within NRCS.

Initial distribution of national technical material and distribution of amendments, revisions, etc, will be in accordance with distributions established from field needs.

506.06 Distribution of Materials outside NRCS.

NRCS offices at all levels are to respond to requests for engineering technical materials from non-NRCS individuals or organizations. Generally, requests are to be referenced to the National Technical Information Service (NTIS) where NRCS technical materials are available for sale. Copies may be made available to Federal, State, and local agencies, individuals with whom NRCS has established a professional relationship, contractors working with NRCS, and others who may be involved with NRCS programs and contracts.

SUBCHAPTER B - MANAGEMENT

PART 510 - PLANNING

PART 511 - DESIGN

SUBPART A - PROCEDURES

SUBPART B - DOCUMENTATION

SUBPART C - INSTRUMENTATION

PART 512 - CONSTRUCTION

SUBPART A - INTRODUCTION

PART 510 - PLANNING

510.00 General

Planning for the conservation and sustained use of natural resources will often require engineering input which should be provided early in the planning process. Planning should be in sufficient detail to ensure that decisions by the landuser or sponsor can be implemented without extensive changes in scope, purpose, or cost. All plans shall be formulated with consideration for their completeness, effectiveness, efficiency, and acceptability. Additional guidance on specific NRCS planning procedures can be found in the National Planning Procedures Handbook (NPPH).

510.01 Planning scope

(a) The approach taken during a planning study will vary according to the size and complexity of the issues involved.

(1) A simple practice, involving just one individual, may possibly proceed rapidly through planning, design, construction, and operation. However, even these measures must be planned with due consideration for their impact on the larger system or the plan for the area.

(2) More complex issues, involving a number of people and/or ecological components, require more intense planning and input from a number of individuals and organizations. For these complex issues, several approaches and multiple alternatives within those approaches may need to be developed and evaluated.

(b) The planning guidance in the NPPH is applicable to planning for all NRCS programs. Plan content and criteria may vary for each individual program or funding source.

(c) Preliminary engineering work may be needed during phases I and II of the planning process outlined in the NPPH. The land user or sponsor must understand the size, economics, and

operational obligations for the alternatives being considered before significant engineering resources are expended in more detailed studies.

(d) Site investigations conducted during planning for engineering measures are often less intense than those required for final design. Final design investigations may reveal some adverse conditions not identified during planning. Land users or sponsors should be informed by NRCS staff that it is possible that agreements reached on the details of planned measures, needed landrights, and estimated costs in the planning phase may require revision during final design and construction. Upstream and downstream development that takes place after planning can also greatly affect design.

(e) The data collected and the resulting analyses are to be detailed adequately to aid in selecting alternatives. Engineering job classes should be identified early to establish proper engineering job approval authorities and an appropriate review process. An individual having engineering job approval authority for the practices being considered shall be consulted during the planning process and shall sign the engineering plan.

(f) Expertise from all appropriate disciplines associated with natural resource management should be involved as early as possible in the planning process.

510.02 Documentation

Engineering investigations and analyses are to be documented. Computations and other data supporting engineering decisions are to be checked for accuracy and reasonableness by personnel with adequate levels of expertise. Documentation provides for expediting reviews, allows the work to progress smoothly into final design and construction, and aids in post reviews. The degree of supporting data should be commensurate with the specific situation and the type of project planned. The data are to be documented and filed in such a way that later investigations for detailed design can build on and not repeat

investigations and analyses accomplished during the planning phase. All supporting documentation shall include the project name and location, who performed the work, who checked the work, the date of the work, and be initialed as being checked.

510.03 Engineering data to support plans

a) Sufficient engineering analysis shall be performed to ensure that all engineering measures will function properly and produce the planned results. Surveys, investigations, and preliminary designs are to be detailed enough to prepare necessary cost estimates, landrights requirements, etc.

(b) The size and complexity of planned actions will dictate the detail required for the engineering report. The format and content of the report will be designed to fit the needs of the client. The report should clearly describe the problems, investigations, alternatives, and conclusions. Graphics are to be used as necessary to provide a clear understanding. The final planning report should be tailored to meet program requirements as appropriate. In all cases, the report must be sufficient to document decisions in a professional manner.

(c) Review and approval is required for planning reports containing engineering data and analysis. This review and approval includes technical approval of the overall system of engineering measures to ensure that they perform their planned functions.

510.04 Criteria

(a) Current engineering standards and procedures are to be used for planning all measures. The individual having engineering job approval authority is to ensure that the engineering measures included in the plan will function as planned throughout their design life expectancy.

(b) If revisions or modifications of plans are made, the current criteria shall be used for at least the following:

(1) New structural measures not included in the original plan.

(2) Structural measures modified enough to require a supplement to the plan.

(3) Structural measures included in the approved plan that, if built according to original criteria, would endanger either new structural measures, existing structures, or ones that are to be modified.

510.05 Cost estimates

All costs are to be determined, including installation costs and expected periodic costs. Costs are to be current according to the latest available information. The costs of engineering measures generally include the following:

(a) Engineering. The direct cost of engineers and other personnel for surveys, investigations, design, preparation of plans and specifications, preparation of the operation and maintenance plan, and the cost of inspection during construction.

(b) Landrights. The actual cost or value of land required for construction and operation of the measures, including changes to fixed improvements.

(c) Water rights. The actual cost or value of water rights required by local interests for carrying out the measure.

(d) Contract Administration. The expected cost of administering the contracts, cost of permits, and any legal costs.

(e) Construction. The expected cost of constructing the measure. Construction estimates during planning should include

specific estimates for all the identifiable components. Contingencies should be included to allow for unforeseen conditions and costs that are likely to be identified during the final design and construction phases. Contingencies are established according to the detail of planning. Higher contingencies should be allowed for less detailed planning.

(f) Operation, maintenance and replacement. The cost required to operate and maintain the measure including necessary inspections and repairs for the planned life of the project. Any items to be replaced during the evaluation period must be included.

510.06 Post Design Life Considerations

At the end of their design life, some practices may create safety, health and environmental concerns. Those issues should be considered when alternatives are formulated and discussed with the land users and/or sponsor. Costs for replacement, rehabilitation, or decommissioning of these practices should be anticipated, estimated to the extent possible, documented in the plan report, and communicated to the landowner or sponsor.

PART 511 - DESIGN

SUBPART A - PROCEDURES

511.00 General.

(a) Engineering design is an organized and rational process that applies the natural laws of science for the enhancement of human welfare. Engineering design should be sensitive to the needs of people, their activities, and the landscape.

(b) Engineering design is done at many organizational and geographic locations. The designs made are of varying complexity and are often performed at locations some distance from the construction site. The design is performed by personnel having various levels of knowledge and skill. The designs often require review and approval by someone at a location other than the construction site or design office. Designs need to be reviewed to insure adequate performance and safety. Because of the diverse nature of the design activities in SCS, some standardization of basic nomenclature and procedures is needed.

(c) The principles defined in this part apply to all sizes and complexities of designs. The detail to which the procedures are to be followed varies according to the need. The simplest conservation practice may require only a few notes, computations, and drawings. Larger and more complex works may require numerous notes, computations, and drawings to complete all stages of the design. Likewise, the complexity of site conditions and engineering along with the number of alternatives and organizational units affects the intensity and duration of work at each design stage.

511.01 Design objectives.

Engineering design is to provide structural improvements having the quality and durability required for the economic life of the structure at the least total cost consistent with functional requirements. Engineering designs are to be determined by comparative design studies and cost estimates prepared with full consideration of the landscape, topography, foundation, and other site conditions including environmental quality, and the economy and feasibility of construction, operation, and maintenance. Economic comparisons of alternative designs are to be determined by the amortized average annual cost of installation (including costs of landrights), operation, and maintenance. Environmental comparisons are to consider ecological, cultural, and aesthetic values.

511.02 Design stages.

(a) To provide standard terminology for orderly scheduling of work and coordination with work, three stages of design activity are defined. This terminology is to be used in all SCS correspondence, publications, and documents relating to design. The design activities included in these stages may be further subdivided into phases or subphases as necessary to control SCS work or to administer engineering services contracts and agreements.

(b) On small and simple structural measures, all three stages of design can be done in one brief period of time and in a manner such that they are nearly inseparable. On larger works, such as projects, much of the work in stages one and two may be done during planning (510.01). Items for which the final design data are known during planning, such as topographic, hydrologic, and hydraulic features, should be completed for final design purpose at that time. The planning data need then only be reviewed before design commences in order to verify accuracy and adequacy. In this manner, data gathered during planning can be used to avoid duplication of effort and ensure that there is little or no modification needed in the general layout during final design. Similarly, data should be gathered on the geology and foundation if assurance against significant cost changes is desired.

(c) Stage one includes data collection and evaluation for all information on:

(1) Physical data. Topographic, hydrologic, visual, biologic, geologic, and archeologic data.

(2) System and structure functional requirements and purpose. The capacity, controlled water level, and location.

(3) Site constraints. Information on ownership boundaries and water rights.

(d) Stage two is the preliminary design, which consists of developing the general features of the works of improvement. It includes selecting the most suitable types of structures, the optimum layout and arrangement of the elements of the structural system in the landscape, the types and locations of appurtenant mechanical equipment, and, if applicable, the most feasible power source. Also, cost studies and an economic feasibility examination are to be made.

(1) Hydraulic design is to be sufficient to select alignment, grade, size, and critical elevations for each evaluated alternative.

(2) Foundation conditions are to be analyzed and the embankments designed in enough detail to satisfy seepage control and stability requirements.

(3) Structural details of alternate designs are to be developed sufficiently to prepare reasonable quantity and cost estimates.

(4) Landscape resource objectives and preliminary landscape resource designs and conceptual plans are to be developed sufficiently to determine feasibility and prepare preliminary cost estimates.

(5) Specifications of material and work requirements are to be outlined, and a schedule of work and payment items is to be included.

(6) Cost estimates are to be determined by estimating construction costs. Alternate designs are to be compared according to the average annual cost of installation, operation, and maintenance, including costs of land, easements, rights-of-way, and relocation of roads and/or utilities.

(7) A report is to be compiled including all information necessary to permit reviewing.

(e) Stage three is the final design, which consists of:

(1) Checking the adequacy of the surveys and investigations and the accuracy of the layout chosen in the preliminary design.

(2) Refining and revising the preliminary design information.

(3) Detailing the layout and hydraulic design.

(4) Completing the structural design.

(5) Refining the landscape resources design.

(6) Preparing the construction drawings, contract specifications, bid schedule, engineer's estimate, and construction schedule.

(7) Preparing the design report.

(8) Preparing the operation and maintenance plan.

511.03 Operating procedures.

(a) The operating procedures to be followed depend on the organizational level at which the design is done. If design is done by many offices or by offices that are remote from one another, the need for an established documented procedure is greater. Designs made at field and area offices are usually processed by simple informal procedures.

(b) The more complex designs often require technical assistance and/or approval by the TSC. The design may be prepared:

(1) By the SCS state engineering staff (field, area, or state office)

(2) By the TSC design section using data collected by state staffs.

(3) By the engineering staff of a sponsoring local agency under an agreement for engineering services.

(4) By a private engineer under a contract for engineering services negotiated either by SCS or the sponsoring local agency.

(c) If it is anticipated that design will require assistance or approval by the TSC, the state conservation engineer is to evaluate the design scope of the engineering program in the state and prepare a realistic design and construction schedule. In addition, in cooperation with the head of the TSC engineering staff, the state conservation engineer is to develop operating procedures for preparing designs, construction drawings, and specifications and for accomplishing their orderly and timely review and approval (see 501.04). Each TSC is to keep the Director of Engineering informed about the operating procedures. Operating procedures are to comply with the following:

(1) The state engineering staff is responsible for all surveys and investigations. The TSC engineering staff is to provide technical assistance in planning the scope and nature of such surveys and investigations if the TSC is to prepare the final design.

(2) The work is to be done by the state engineering staff if qualified design engineers are available.

(3) If the TSC is requested to furnish design assistance, the state ordinarily is to complete the preliminary design.

(4) TSC assistance may be requested at any stage in the preparation of the design.

(5) If local sponsoring agencies or consultants participate in the preparation of design requiring TSC approval the specifications for engineering services contracts and agreements are to be prepared jointly by the state staff and the TSC engineering staff.

(i) Engineering services specifications, payment schedules, and performance time are to have TSC concurrence.

(ii) Performance time is to be adequate to permit timely reviews at state and TSC levels.

(iii) Reviews are to be scheduled so that the responsible state makes its review before the TSC review.

(6) Construction drawings and specifications are to be prepared concurrently so that they can be properly coordinated.

(7) Contract specifications are to be compiled by the office responsible for the design of the work.

(d) Operating procedures for continuity between employees performing site investigation, design, and construction are not complicated for small or simple jobs if the work is done at one or two offices. However, if there are several offices and employees involved or segments of the work are done by specialists, maintaining continuity is much more difficult. In these more complex operations, coordination and communication is to be facilitated between engineers, geologists, and others during stages

two and three of design and during construction. This is to be done by the designer and/or soil engineer assisting the geologist in planning and evaluating the site investigation. Field reviews during the investigation may be necessary to be sure all information needed for design is obtaind. Likewise, the designer is to arrange for transfer of information to the construction inspection staff. For more complex projects, the design and soil engineers, geologist, construction engineer, and inspector may meet to exchange information. This preconstruction meeting should cover critical interpretation and assumptions dealing with design features and those items that need verification during construction.

511.04 Design analysis.

(a) The design analysis defines the scope of the design and evaluates the relationships of the principles that determine the design. It consists of a step-by-step description of the procedures used. Each step is to be described concisely and completely.

(b) The design analysis is to include the data used, the criteria, and procedures. The design analysis is to be technically sound, performed in a logical manner, and documented.

511.05 Design checking and review.

(a) Checking during design is essential. Checking consists of an examination of narrative, computations, and drawings for accuracy, conformation with procedures, and consistency between the various parts of the design. The checker is to be experienced in the type of design, the criteria, and the procedures. The checker is to initial each sheet completed and verify:

(1) That the basic data and assumptions were used in the computations.

(2) That mathematic computations are accurate.

(3) That details are consistent from sheet to sheet.

(4) That drawings comply with the design.

(5) That drawings comply with the specifications.

(6) That computed critical elevations, costs, and quantities are accurate.

(7) That construction drawings are complete.

(b) Reviews are to be made during design to ensure technical quality. All designs, drawings, and specifications are to be reviewed (see Part 501). Reviews are to be made progressively by the responsible design office through an examination of narrative, computations, and drawings. The reviewer assumes responsibility with the designer for the functional

adequacy and structural soundness of the structure or structural system. The reviewer's capability is to be equal to that needed to do the design. The review is to determine whether:

(1) The design provides for the planned purpose.

(2) The basic data are adequate.

(3) The design assumptions are valid.

(4) The methods of analysis are valid.

(5) Alternatives evaluated are equal in meeting minimum performance requirements.

(6) The solution is appropriate to the problem or site condition.

(7) The design complies with policy and criteria.

(8) The design is consistent with sound engineering practice.

(c) The review procedures depend upon the operating procedures used for Class I through VIII jobs. The review procedures for Class VI, VII, and VIII jobs are to be agreed on by the state conservation engineer and the head of the TSC engineering staff. The state conservation engineer is to ensure that the design schedule provides enough time for review by the appropriate authorities at the various design stages. Review schedules are to reflect a realistic consideration of the locations of the reviewing offices, time needed to transmit material, and coordination of the work with the rest of the workload of the offices.

511.06 Independent reviews.

Consideration is to be given to the need for an independent review of dams and other engineering structures which, when installed, will become a potential hazard to human life in case of failure. See 520.26 for the procedure to be used for dams. When necessary, a similar procedure should be used for other structures.

§511.07 Design criteria.

(a) Design criteria established by policy directives are often of a general nature. The criteria provide guidance in obtaining the quality of work acceptable. Designs are to be prepared to satisfy the functional purpose in a safe and stable manner, which may often result in requiring more restrictive limits than the established minimum criteria. In other words, meeting minimum engineering criteria will not, in all cases, insure adequate designs.

(b) Minimum design criteria established by policy are to be met.

(c) Criteria used in preparing project plans are normally used in the design and construction of structural measures. At the time of final design, the individual having the engineering job approval authority (see 501.04) is to reaffirm that all aspects of the engineering plans are legally permissible and that the structure will perform its assigned function in a normal manner during its service life. The design criteria are to be changed from that used in planning if:

(1) The planned design is not acceptable in light of new engineering knowledge as reflected in the revised criteria. In this situation, the measure is to be designed to meet new criteria.

(2) Downstream development requires a change in structure classification before construction. In this situation, the structure is to be reclassified and designed in accordance with the latest criteria.

(d) The sponsors or landowners are to be informed of changes that increase the cost or require alterations in landrights.

511.08 Construction plans.

(a) The preparation of construction plans is the final step in the design process. The construction plans consist of drawings and specifications. The drawings are a graphical description and the specifications are the narrative description of the works to be constructed. The plans are to provide descriptive information on the quantity and quality of the completed work. The work is to be clearly described so that the owner and constructor will understand the requirements. This provides a mutual understanding when the requirements are met.

(b) Construction drawings are to be prepared and assembled in a clear and logical manner. The minimum requirements are contained in Part 541.

(c) Construction specifications are to include both materials and construction methods. The minimum requirements are contained in Part 542. Requirements are to be established in terms of a specified end product, not in terms of a method.

SUBPART B - DESIGN DOCUMENTATION

511.10 Scope.

Design folders are to be prepared for all designs within approval categories VI, VII, and VIII (see Part 501) and all dams that have importance for reasons of public safety (see 520.21 (f)).

511.11 Design folders.

(a) The folder is to contain the design analyses, design report, construction drawings, specifications, bid schedule, and plan for operation and maintenance. All notes, computations, drawings, sketches, and other data are to be recorded neatly and organized in a folder in a manner that allows reproduction and incorporation in reports with a minimum of editing. Design drawings, diagrams, graphs, sketches, or other pictorial representations should be incorporated into the computation file if the size and scale permit. Design drawings drawn on larger sheets that cannot be folded to computation sheet size are to be cited at the appropriate place in the computations by a notation that fully identifies the drawing and its file location. The design documents should be kept in a binder to keep them in order.

(1) Design records are to be kept orderly and current to allow for efficient review at any stage. They are to be complete and understandable because they may be used for later actions such as:

(i) Design changes required during construction.

(ii) Structural modification or addition during operation or maintenance.

(iii) Investigation of performance.

(2) Design records are to document completely:

(i) The data gathered to demonstrate the physical, chemical, and biological conditions at the site.

(ii) The purpose and function of works designed.

(iii) The standards, criteria, and limitations used as design guidance.

(iv) The problem conditions to be considered.

(v) The qualitative and quantitative design analysis.

(b) Design resorts summarize in narrative form the design objective, data, criteria, assumptions, procedures, and decisions used in design. Selected structure dimensions, elevations, capacities should be used to augment the narrative, but are not to serve as a replacement.

Previously developed requirements established during the planning phase are to be included by reference. Design reports may vary in length from a brief synopsis to an extensive review. A design report is to address the topics in the following list as appropriate. The report should be commensurate with the design complexity and significance; some items listed may not be relevant, and if not, need not be included.

(1) Summary. A concise statement of the history and status of design, previous reviews disposition of applicable policy items, justification for departure from standards, receipt of waivers, etc.

(2) Description of the job. A brief description of the major features, hazard classification, drainage area, storm frequencies, landscape resources, capacities, etc. Include any variance from project plans.

(3) Design objective. A brief, clear statement that may be a summary from a project plan. Differences identified from plans must be supported by proper approvals.

(4) Basis for design. A listing of reference documents used in design such as handbooks, codes, reports, studies, and criteria.

(5) General basic data. Hazard analyses, seismic assessment, and limiting conditions or restraints that may influence design, construction, or facility operation.

(6) Location and layout. Consideration of site configuration or landscape conditions that had an effect.

(7) Hydrology. The data reference, procedures, spillway operation frequency water yield, reservoir operational studies, and summary of precipitation amount and intensity.

(8) Hydraulic design. A summary of the hydraulic shape and proportioning selected. Include channel stability and sediment transport considerations.

(9) Foundations and/or embankment design. A summary of data, site conditions, assumptions, treatments selected, and design analyses used:

(i) To make seepage analyses and design control measures.

(ii) To make stability analyses and determine material quality and quantity.

(iii) To make foundation design analyses.

(iv) To permit planning instrumentation systems.

(10) Structural design. A summary of assumptions, loading conditions, and design procedures.

(11) Environmental considerations. Features or practices to provide for conservation of visual, biological, and surface and ground water resources that may be affected by the planned measures, both during and after construction.

(12) Construction drawings. Mention of standard detail drawings or any use of previously prepared special drawings.

(13) Specifications. Mention of special specifications and why they were needed. Explain special conditions or the need for special provisions in the construction contract.

(14) Bid schedule. Consideration for selection of lump sum or subsidiary items.

(15) Cost estimate. The considerations used that may be affected by the season or changes in size of contract.

(16) Construction schedule. Explanation of any critical starting, delay, or completion dates.

(17) Operation and maintenance. Explanation of conditions in which design assumptions depend on proper O&M and significant O&M activities are anticipated (for example, grasses in the emergency spillway to protect against erosion during flow). Items identified and evaluated during design that are planned for replacement during the evaluation period are to be noted and described.

(18) Construction review. A summary of those items, conditions, or features encountered during construction that require a field review by the design, geologist, soil engineer, or other specialist to ensure that conditions anticipated during design are verified and are consistent with the design assumptions. Include the request for timely notification. Note whether a preconstruction conference is needed.

(19) Authority. The name (with signature) and title of the designer and approving officer.

SUBPART C - INSTRUMENTATION

511.20 General.

(a) Structures, including foundations, abutments, and the surrounding area of influence, are instrumented to facilitate evaluation of their condition and performance during and after construction.

(b) Instruments are installed to measure water levels or pore pressures, earth or rock loads and pressures, settlements, deflections or other movements, ground motions during earthquakes, leakage rates or volumes, and other important items relating to safety and performance.

(c) Instruments are used if it is determined that information is needed for one or more of the following purposes:

(1) Determining safe rates of earth fill placement.

(2) Determining if structural strength is adequate for backfill placement or for shoring removal.

(3) Determining safe rates or limits of excavation.

(4) Determining water levels and pressures within soil and rock formations.

(5) Determining seepage rates or volumes.

(6) Determining safe rates of reservoir filling.

(7) Determining the instability of natural or constructed slopes.

511.21 Scope.

The use of instrumentation is to be considered for all Class (c) dams over 30 feet in height and any dam that has over 600 acre-feet of storage. Earth dams or other structures with unique or complex foundations, abutment problems, or uncertain soil conditions are to be considered for performance monitoring with instruments.

511.22 Need for reliable instruments.

Many types of instruments are commercially manufactured or can be assembled to perform the measurements needed. Designs are to include only those instruments proven to be reliable and serviceable. If SCS lacks experience in the use of an instrument, it is necessary to check with other users to determine its reliability.

511.23 Use of instrumentation.

(a) The decision on whether to monitor, with instruments depends on:

(1) Reliability and completeness of the investigation information;

(2) Whether soil and rock conditions or criteria used in analyses are sufficiently conservative; and

(3) The consequences of misjudging these items.

(b) In the design folder, document the process by which the decision to instrument or not to instrument was made and the rationale for that decision.

(c) Instrumentation is to be used in all situations in which the effects of treatment have any degree of uncertainty that would result in unsafe conditions or an inadequate structure. All safety conditions including safety to the construction force, are to be considered. The design is to include the details and specifications for the instruments and their installation.

(d) For earth structure, the design analyses are to determine the magnitude of water pressure, physical movement, soil pressure, or other measurable items where potentially unstable or undesirable conditions exist. This information is to be included in the design report and used in the development of a plan for reading the instruments.

511.24 Instrumentation plans.

(a) Instrumentation designs are to include a plan that describes the purpose, the layout and location, type of instruments to be used, and limits of loading, pressures, movement, or volumes for satisfactory structure performance. The plan is to include installation details and sequence. Instructions are to be included that indicate the timing and frequency of reading and recording both during and after construction. Special attention is to be given to the critical periods in the life of the structure such as during the first filling, any rapid raising or lowering of water, and after an earthquake or other disturbance. The plan is to be a part of the design documentation and is to have the same review and approval as the other design items.

(b) As the instruments are installed and reading procedures are started, the instrumentation plan is to be adjusted to include procedures for data reporting and reduction or plotting. Forms for recording data may be developed. Individuals responsible for interpreting the results are to be specified. Emergency procedures are to be developed that indicate those individuals to be notified when critical readings are approached and steps to be taken if necessary.

(c) When the project is completed and the structure is in operation, the plan may need to be supplemented for use by new personnel who will read and evaluate the instruments or for the different operating personnel and conditions. The plan should also include the location and method of data storage.

511.25 Instrumentation monitoring and reporting.

(a) The state conservationist is to provide assistance to ensure that the needed monitoring is performed, recorded, and reported. This can be made a part of the operation and maintenance agreement.

(b) An annual report of the monitoring is to be made to the state conservation engineer until monitoring is terminated. The head of the TSC engineering staff is to receive a copy of this report. The report is to be a summary to update the instrumentation plan.

(c) The monitoring program may be terminated on completion of the intended purpose with mutual consent of the state conservation engineer and the head of the TSC engineering staff for co-approved jobs. A completion report is to be prepared.

(d) A summary of the site condition and structure performance exhibited by the instrumentation readings is to be made on termination of the monitoring program. This summary is to include an appropriate graphical array of the readings and interpretations or conclusions regarding the performance. Additional conclusions and recommendations for improvement may be made regarding the instrument's location, performance, and installation.

PART 512 — CONSTRUCTION

SUBPART A - INTRODUCTION

512.00 General.

Installation of conservation practices and project structures in accordance with approved drawings and specifications are essential if the practice is to serve its intended purpose and expected service life with normal operation and maintenance. NRCS has standardized construction practices and procedures to ensure that engineering conservation practices and project structures are installed according to design. These procedures provide uniformity in NRCS activities and result in common understanding between all parties involved with the design and installation of an engineering practice. Quality assurance activities are an important part of NRCS standard construction practices.

512.01 Scope.

This policy applies to all conservation engineering practices, structures, and systems in all NRCS programs for Engineering Job Approval Classes I through VIII as defined in NEM Part 501. Quality assurance activities may vary in accordance with complexity and hazard class of the structure(s).

512.02 Definitions.

(a) Owner. For contracting purposes, the owner is defined as the party responsible for contracting for construction. The owner pays the contractor and accepts the completed works of improvement. The owner may be NRCS (Federal Government contract), a local contracting organization (project sponsor), or a private individual or group.

(b) Engineer. The engineer is responsible for project installation. The engineer is the project representative for the owner and is assigned technical and contract administration duties as outlined in the quality assurance plan (QAP) and appointment letter issued by the contracting officer. The engineer may be an NRCS employee, an architectural and engineering (A&E) firm employee that is providing professional

services under a contract with NRCS, or an employee of the local contracting organization or partnership agency.

(c) Government Representative. The Government Representative (GR) is a NRCS employee who has the responsibility to protect the Government's interest and maintain close working relations with the Contracting Local Organization (CLO) for all works of improvement. The GR is an engineer if NRCS has quality assurance responsibility for a construction contract. This appointment is not normally provided for contracts handled by private individuals or informal groups. The NRCS administrative officer will appoint a GR by letter for all construction contracts that are administered by others and utilize Federal funds.

(d) Contracting Officer's Technical Representative. The contracting officer's technical representative (COTR) is an engineer if procurement activity is engineering and/or construction contract related with the primary duties to ensure that the Government's interests are protected. For construction contracts administered by NRCS utilizing the administrative requirements of the Federal Acquisition Regulations (FAR), an NRCS engineer has quality assurance responsibility for installation of the works of improvement. The NRCS contracting officer will appoint, by letter, a COTR for A&E Contracts, professional services contracts, and construction contracts administered by NRCS.

(e) Construction Inspector. Duties of the construction inspector frequently involve quality assurance testing, engineering surveys, the daily documentation of project activities, coordination with the contractor's quality control personnel, and maintaining the As-Built drawings. The NRCS contracting officer will appoint, in writing, construction inspectors with the qualifications outlined in the quality assurance plan.

(f) Contractor. The contractor is the individual or firm that installs the works of improvement. The contract or agreement with the owner may be formal as in project installations, or informal as with an individual landowner or operator in the installation of an engineering conservation practice. Provisions are available for the project sponsor(s) to

function as a contractor under agreements that may include division of work, performance of work, or force account.

512.03 Value Engineering.

(a) Value engineering is a formal technique by which contractors may:

(1) Voluntarily suggest alternatives to the design that may be more economical or less costly to install and from which both the owner and contractor would benefit.

(2) Be required to identify and submit to the Government methods for performing work more economically. The FAR, Part 48, Value Engineering, provides the terms and conditions for Value Engineering Change Proposal (VECP). Consideration of any VECP must include the comparison of future costs of operation and maintenance and other costs that may be affected as a result of the change.

(b) Each state will establish internal guidelines for processing VECP's and procedures for funding the contractor's share of the collateral savings.

(c) Changes for conservation engineering practices proposed by the contractor should be handled similar to a VECP. When the change is technically acceptable (meets NRCS standards and specifications), the decision to accept the change remains with the landowner/operator. NRCS will provide adequate review of the proposal and provide the decisionmaker with the necessary information to support the acceptance or rejection of the proposal. Any proposed change to an engineering structure must be approved by a person with the appropriate job approval authority.

(NOTE: Sections 512.04 through 512.09 are reserved.)

SUBPART B - PRECONSTRUCTION ACTIVITIES

512.10 Selection of the contractor.

The submitted bid or proposal, which must comply with the instructions outlined in the solicitation package, must be complete in order to determine contractor responsibility. The contractor is responsible for understanding and being familiar with the procurement requirements, project location, material requirements, construction requirements, special provisions, construction site access, restrictions and limitations, local rules and regulations, and be familiar with the type of work.

512.11 Site showing.

(a) Where formal contracts or agreements are utilized to install conservation engineering practices or project elements, the following procedures shall be followed:

(1) Potential bidders will be shown the project site so that they may inspect the area, determine the scope of the work, and receive answers to questions that may occur. Stakes and/or flagging shall be used to identify the major items of work and their relationship to other elements of the proposed project.

(2) The engineer and contracting officer, or their authorized representative(s), are to show the site to interested contractors and identify physical elements on or near the site that will contribute to the submission of a responsible bid. The following items shall be identified and discussed, as appropriate: access roads, right-of-way and construction limits provided by the owner, clearing limits, location of known utilities, proposed structure(s) location, existing structures to be removed, proposed borrow and waste areas, location of geologic test holes/pits, the contractor’s responsibility for pollution control, construction safety, and other important features.

(3) The person conducting the site showing is not to express an opinion as to the difficulty or the ease of performing work elements. A site showing is intended to introduce potential bidders to the procurement contract documents and to provide responses to questions concerning those documents that may arise.

It is critical that all responses to questions that may affect a contractor's evaluation and potential bid proposal be shared with all solicitation package holders. This may require a written follow-up or an amendment to the solicitation as required by the Agriculture Acquisition Regulations (AGAR) 452.237-71.

(4) The site showing activities will be documented and shall include a list of attendees, outline of the site showing presentation, questions raised together with the responses, and any item or occurrence that could enter into a contractor's evaluation of the extent of work being solicited by the procurement activity. All attendees shall provide their name, company, mailing address, telephone number, and FAX number on a sign-in register. The job diary, or other permanent record for the project, shall be utilized to record basic information and to reference the site showing minutes.

(b) Where individual landowners/operators hire a contractor, site showings for engineering conservation practices may be less formal than following the guidelines listed in items (1) through (4) above. The landowner/operator may request that an NRCS employee be present to assist with the site showing. A job diary, assistance notes (SCS-CPA-6), or other permanent record shall be utilized to document construction activities. A job diary shall be used for job approval Class V - VIII engineering practices.

512.12 Evaluation of bidder(s).

Prior to awarding a construction contract, an evaluation of equipment and credentials must be conducted and responsibility of the bidder evaluated. Responsibility is defined as having the capacity, credit, integrity, tenacity, and perseverance to perform the job as specified. If a landowner/operator is installing a conservation practice, he/she will make the responsibility determination and negotiate the contract. NRCS may provide technical assistance (TA) to the landowner/operator in evaluation of bidders.

(a) Determining the lowest responsible bidder. Government agencies must award contracts to the lowest responsible bidder.
Project sponsors having contract administration duties have

similar responsibilities. Individual landowners have similar interests to ensure quality and timely installation of their works of improvement at a reasonable cost. The potential for timely installation shall be determined by reviewing the contractor's present workload and commitments. Responsibility can usually be determined by interviewing owners and individuals who have a first-hand knowledge of the contractor's past performance, reviewing the contractor's plant and equipment, and by performing a credit check and reviewing the contractor's financial statement. A critical element in determining responsibleness is the history of performance and authority of the contractor's project superintendent. Proposed subcontractors, especially those having a unique specialty, shall be evaluated to the same extent as the prime contractor. All information collected to determine responsiveness is to remain confidential with only those involved with awarding the contract having a need to know.

(b) Documentation. Information collected to determine if a potential contractor is responsible will be documented by the contracting officer to support the award of a contract.

512.13 Preconstruction conference.

(a) For Federal contracts under the Federal Acquisition Regulations, this meeting is titled the Post Award Conference. It is usually the first meeting between the owner and contractor following the issuance of the contract. The conference will be used to develop a positive working relationship and generate a discussion that centers on the procedures the contractor plans to implement to meet the terms and conditions of the contract. Individuals representing the contractor and subcontractor(s), the owner (sponsors), major suppliers, and others who will be working together in the execution of the contract should be present. The authorities and responsibilities of these individuals shall be jointly understood. A detailed review of the drawings, construction and material specifications, and contract provisions shall be a priority of this meeting. The contractor's construction schedule will be reviewed and any questions resolved prior to final approval by the contracting officer. Status of all land rights, permits, easements, and related items should be reviewed and any restrictions or limitations that could affect

performance by the contractor needs to be reviewed. Other items that shall be discussed will include: contractor's safety plan, emergency response plan, health and safety meetings schedule, schedule for partnering meetings, sanitary facilities, communication system, construction office space and equipment provided to the owner by the contractor, project layout and staking, public health and safety, utilities in the area including those that will provide service during construction, source of construction materials, contractor's quality control plan, removal of water and dewatering plan(s), weather clauses and time extensions, holidays that will be honored during the performance time provided, and any other item that could have an impact on the contractor's performance.

(b) The preconstruction conference minutes are to be recorded. Minutes are to be reviewed, finalized, and shared with all participants. Any questions and answers and any interpretations of contract documents provided at the pre-construction conference will be included in the minutes. Any questions that could not be answered by the contract documents, (where interpretation is provided), will be addressed and included in the minutes. A contract modification may be necessary to provide clarity or to provide a summary of a response that could affect the extent of the work or final cost of the contract. All basic information of the conference will be recorded in the Job Diary or other permanent record.

(c) Reviewing the extent of the work required of the contractor for the installation of engineering conservation practices to be installed for an individual landowner/operator is equally important. Documentation, to the extent listed previously, may not be required unless it is requested by one of the parties associated with the installation to support decisions made and provide necessary clarity. The use of the job dairy, SCS-CPA-6, or other permanent record and/or sharing in writing of agreed-to action items will usually suffice to document installation activities and associated items. The owner shall be involved in any decision that could affect the practice installation and/or final cost. Owner/operator involvement is particularly important for any changes requested by a contractor in which installation is being accomplished without a formal contract.

512.14 Partnering.

(a) Partnering is an attitude that leads to resolution of issues, at the lowest possible level of the parties to the contract, with the greatest amount of material benefits possible. It is a way of doing business with a contractor, cooperator, or other customer(s) that recognizes that they have common goals which can be achieved through cooperation and open communications. The philosophy of partnering is strongly encouraged in the daily activities of providing technical assistance. A primary benefit of partnering is the reduction of the threat of resolving issues through the legal process which is costly to all parties involved.

(b) The partnership for construction contracts may be established through a facilitated process, normally consisting of organized workshops that bring the participants together. The costs to conduct a partnering workshop shall be shared among all the participants to the contract. The participants shall represent all levels of each organization involved with the construction contract. A Partnering Charter or similar agreement should be developed and shared with all participants.

(c) When issues are not resolved to the satisfaction of those directly involved at one level, the issue is elevated to the next management level for resolution.

(d) Federal agencies, together with construction industry organizations, provide guidelines to the partnering process. Procedures to implement partnering vary significantly. Implementation of the partnering concept will vary with each contract. All individuals associated with a potential partnering arrangement need to be flexible.

(NOTE: Sections 512.15 through 512.19 are reserved.)

SUBPART C - EVALUATION OF CONSTRUCTION MATERIALS

512.20 General.

(a) Quality requirements for construction materials are contained in the National Handbook of Conservation Practices (NHCP) and the National Engineering Handbook (NEH). Many of these specifications and standards refer to standards and specifications used in industry and include: American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), USA Standards Institute, American Concrete Institute (ACI), Federal Supply Service (FSS), product standards published by the National Bureau of Standards (NBS), and others. These referenced standards and specifications set forth requirements for material performance, material testing, quality control, and quality assurance.

(b) To ensure that construction materials meet job requirements, an evaluation of material quality in relation to applicable industry standards and/or specifications must be made. The nature, time, and place of this evaluation depends on the type of material, the specifications, the kind of construction, and other factors that could affect the public's health and safety.

512.21 Evaluation procedures.

(a) Material quality will be evaluated by at least one of the following procedures:

(1) Laboratory testing by NRCS, by a consulting firm, or commercial laboratory under contract with NRCS; laboratory under contract with a sponsor or owner, or by another Government agency. (Example: concrete compressive strength testing)

(2) Testing by a consulting firm or commercial laboratory employed by the manufacturer under approved conditions and independent arrangements. (Example: structural steel)

(3) Certification in writing by the manufacturer that the material complies with the applicable specifications. Test

results showing compliance may be required and attached to the certification. (Example: steel reinforcement)

(4) Markings on material that identify the manufacturer and indicate compliance with the appropriate specification(s). Laboratory tests and current test reports are to be provided on request. (Example: plastic pipe)

(5) Examination and/or testing at the job site. (Example: drainfill)

(6) Prequalification of materials. (Example: water control valves)

(b) Used materials are acceptable if they are suitable for the proposed work, the expected service life is equal to or greater than the projected overall structure or system's designed service life, they are structurally adequate, and environmentally acceptable. State conservation engineers are to establish guidelines for accepting and incorporating used materials in systems for which NRCS provides technical or financial assistance. The owner must pay special attention to used items during operation and maintenance activities.

(c) New products that have not been used previously for conservation practice application must be evaluated and approved for use before being specified. Trial use of new products must be under the approval of the state conservation engineer and shall be supported by industry or applicable standards, specifications, evaluation data and/or reports.

(d) State conservation engineers are to designate materials that require certification and/or testing based on the quantity of the items used, the life of the item in relation to the life of structures in which it is used, the cost of the types of structures in which it is used, the difficulty of replacement, and the consequences of failure of the structures in which it is used. Acceptance of a material on the basis of the certification is permissible only if the material meets all of the following requirements:

(1) Its conformance to the specification requirements cannot be verified on site by visual inspection. (Example: Rock for riprap, the material durability)

(2) It is a commercially available or manufactured item or product, the quality of which is customarily controlled by the manufacturer within specified limits. (Example: Metal slide gates)

(3) Its quality is specified by reference to standards and/or specifications normally used in the construction industry such as ASTM, AWWA, ACI, etc. Such materials include: portland cement, air-entraining agents, set retarders and plasticizers, sealing compounds for joints, steel reinforcement, curing compounds, preformed expansion joint filler, and waterstops for concrete structures; asphaltic cements; concrete, corrugated steel, aluminum, ductile iron, steel, copper, and plastic pipe and fittings; rubber gaskets; preservative treatments for wood products; structural metals; steel piles; geotextiles; etc.

512.22 Waivers of material certifications.

(a) NRCS contracts require certification for all materials incorporated in the works of improvement unless specifically waived.

(b) Certification may be waived under the following conditions:

(1) The material is tested by NRCS.

(2) The material serves a minor role of a project that has no potential detrimental public health and safety impacts.

(i) Quantities are considered to be small in relation to the total structure;

(ii) The material is a commercially available, manufactured, or fabricated item and conformance with specifications can be reasonably determined by field examination; and,

(iii) The item's location within or on the structure or system allows for easy maintenance and/or replacement.

512.23 Prequalification of materials.

(a) Prequalification is the evaluation and determination of materials that may be used without further certifications. Prequalification eliminates the need for requesting and furnishing individual certifications and test results for each project or contract.

(1) Prequalification is an acceptable procedure to support quality installation of materials used in NRCS construction when items are manufactured under close quality control and consistently meet the applicable specifications. Several items frequently identified for use in NRCS construction include: cement; reinforcement steel; structural metals; concrete, metal, and plastic pipe; fittings and gaskets for pipe; waterstop, preformed expansion joint filler, sealing compound, air-entrainment agents, curing compound, set retarding, and water reducing agents for concrete; metal coatings; wood preservatives; water control gates and valves; pipeline protection valves; geotextiles and geomembranes; etc. Materials must be clearly marked by the manufacturer as to the size, grade, ASTM Standard, manufacturer, and other essential characteristics that further identifies the product and/or material. Quality assurance support for material quality can be provided by photographic documentation showing the manufacturer's label on the product or item.

(2) Local natural materials for which prequalification is a suitable procedure include aggregate for drainfill or concrete, and rock for riprap or rockfill. Prequalification of material is to support quality and should not be construed as a waiver from testing to provide support to document material gradation. For small projects and those in which adequate time is not available to complete a test, the use of prequalified materials is a viable alternative to insure material quality.

(b) Prequalified materials may be used in NRCS construction by referring to the certification and/or test data file. When a prequalified item or product is used, its use must be recorded on

the As-Built drawings, recorded in the job diary, or documented by other suitable methods as determined by the state conservation engineer.

(c) States have authority to prepare and maintain a list of materials approved for prequalification when the quantity of materials being used economically justifies its preparation.

(1) Each state conservation engineer is responsible for evaluation and prequalification of materials manufactured in their state and sharing the data with adjacent state conservation engineers.

(i) The state conservation engineer is to initiate the prequalification procedure. Methods that may be considered are: request written certification and supporting test results from the manufacturer; conduct material testing of the item or product; obtain material certification data from other Government agencies or organizations.

(ii) Each state conservation engineer is to evaluate certification and test data when received to determine if the material or product meets the applicable specification. The state conservation engineer will determine if additional inspection and testing is necessary.

(iii) When the state conservation engineer has determined that the product and/or material meets the requirements for prequalification, it is included on the state list for prequalified materials. The list shall include the name of the product, the manufacturer, the applicable specifications, and any other identifying information, as appropriate.

(2) The coordination and sharing of prequalified material lists between states shall be as determined by the appropriate state conservation engineers. It is strongly encouraged that prequalified lists be shared so time to develop proper support to prequalify a product or material will be minimized.

(d) Many factors affect the quality and acceptability of manufactured products. Prequalified products and/or materials may need to be reviewed occasionally to ensure minimum quality requirements are current. The frequency of this review will be

determined by the state conservation engineer who initially approved the material for entry on the list of prequalified materials.

(NOTE: Sections 512.24 through 512.29 are reserved.)

SUBPART D - QUALITY ASSURANCE ACTIVITIES

512.30 General.

(a) For formal construction contracts, the general and special provisions of the contract and the quality assurance plan (QAP) outline construction inspection requirements. The construction specifications outline the duties and responsibilities of the contractor's quality control program.

(b) Quality assurance activities may vary in accordance with complexity and hazard class of the structure(s). Quality Assurance Plans (QAP) will be prepared and utilized in accordance with Natural Resources Conservation Service Acquisition Regulations (NRCSAR) and the National Contracts, Grants, and Cooperative Agreements Manual (NCGCAM). QAP will outline the technical and administrative expertise required, identify the individuals with that expertise, outline the frequency and timing of technical assistance, estimate the contract completion date, and be co-approved by all responsible supervisors, state conservation engineer, and contracting officer.

(c) All manure (animal waste) management structures having moderate or high environmental risk must have a quality assurance (construction inspection) plan prepared and implemented in accordance with Sections 512.30(e) (1) and 512.32. To determine environmental risk, the current NRCS Form SCS-CPA-52 "Environmental Effects For Conservation Plans and Areawide Conservation Plans" shall be completed. If the evaluation of the Conservation Management System (CMS) on SCS-CPA-52 results in the number of adverse effects exceeding the beneficial effects or if any of the special environmental concerns are adverse or positive, a QAP will be developed and implemented.

(d) National Engineering Handbook (NEH) includes procedures for inspection of construction activities.

(e) The performance of quality assurance duties in an efficient and economical manner requires:

(1) Providing the proper number of qualified personnel with the knowledge, skills, and abilities (KSAs) necessary to conduct timely and effective technical assistance as outlined in

the Quality Assurance Plan (QAP) for the project. Preparation and content of the QAP is outlined in the National Contracts, Grants, and Cooperative Agreement Manual (NCGCAM) and in Natural Resources Conservation Service Acquisition Regulations (NRCSAR) 4I-46.70-6.

(2) Continuous coordination with the quality control representative of the contractor to insure NRCS quality assurance activities are effective.

(3) Minimizing interference with the contractor's production activities.

512.31 Definitions.

(a) Quality control - Activities performed by the contractor to document that the work installed meets the minimum requirements of the contract. This is a bid item for most contracts involving project type work and requirements are specified in NEH-20, Construction Specification 94, Contractor Quality Control. On less formalized construction activities, the contractor's quality control (QC) responsibilities shall be outlined in the construction specifications or contract, where applicable.

(b) Quality assurance - Activities performed by the owner including: observing construction methods and procedures, reviewing quality control testing activities of the contractor, conducting material testing to evaluate contractor's quality control system, and other measures to ensure compliance with the contract provisions. The duties and responsibilities for this activity are outlined in the quality assurance plan for the specific project being installed.

(c) Quality Assurance Plan - This plan is a major tool in defining NRCS quality assurance duties. The plan includes the following quality, quantity, and timeliness requirements: General Description of the Work, Items of Work Requiring Inspection, Timing of Inspections, Skills Needed by Inspectors, Number of Staff Hours, Equipment and Facilities Needed, Names and Qualifications of Personnel, and Supervisors Statement of

Availability (includes state conservationist, state conservation engineer and contracting officer for Engineering Job Approval Class V - VIII Projects). Policy for QAP content is located in NRCSAR 4I-46.70-6.

512.32 Quality assurance procedures.

(a) Quality assurance requires a uniform degree of implementation. It is to be applied equally to all projects that are similar. The extent of quality assurance testing by NRCS and/or its agents may vary depending on the contractor's quality control performance. All staff members assigned to construction contracts shall have the minimum KSAs outlined in the quality assurance plan.

(b) To ensure that engineering conservation practices with Engineering Job Approval Class I - IV are provided the minimum technical assistance needed for proper installation, the responsible line officer and the responsible technical staff person will determine the adequacy and availability of the technical resources required. This determination will be evaluated and established prior to practice layout. The line officer shall assign a staff member this responsibility and provide adequate time to insure quality installation.

(c) Quality assurance duties assigned for Engineering Job Class V - VIII will be outlined in the quality assurance plan for the project and be signed by the state conservation engineer, the contracting officer, and state conservationist. Quality Assurance Plans will be prepared by an individual that has an understanding of the project design and has knowledge of individuals with the quality assurance technical skills and are available for appointment for the project. Under no circumstances will certification stating that work has been accomplished in compliance with the drawings, specifications, and other contract provisions occur without a physical review and documentation of the work performed.

(1) Continuous inspection is required for any construction activity the quality of which cannot be verified by intermittent observations. Continuous inspection is also

required for work that cannot be readily removed and replaced if it fails to meet the requirements of the contract. Construction activities related to this type of situation may include: foundation, core trench, and structure excavation; placing and compacting earthfill, drainfill, and rock riprap; pipe installation; driving piles; mixing and placing concrete, concrete form removal, dental concrete grout, and pneumatically applied mortar; repairing concrete; correcting over excavations; fertilizing and seeding disturbed areas; contractor quality control testing; etc.

(2) Intermittent or periodic inspections may be adequate for certain phases of project activities depending on the complexity of the installation and the potential impacts upon the health and welfare of the public. Intermittent observation and its documentation may apply to the following types of construction activities: dewatering and removal of water; clearing, and clearing and grubbing; vegetation stripping; structure removal; excavations when the resulting finished grade will remain exposed; forming and placing of reinforcing steel for concrete structures; applying pigmented concrete curing compound; fabrication of project elements; installation of items that can be observed following project completion; painting; sodding and mulching; installing fences; and, other similar activities.

512.33 Inspection of materials.

Materials used in construction must be inspected before they are installed as part of the completed works of improvement. This requirement also includes material that is prequalified. Documentation of the material certification is to be accomplished by listing the associated information in the project job diary or recording data on the As-Built drawings.

(a) Quality assurance (formal construction inspection) at the factory and/or place of fabrication may be required for special items or specialty products. NRCS procurement procedures usually do not warrant having inspectors at factories, locations of fabrication, or other sources of supply. The extent of quality assurance required will be determined by the State Conservation Engineer and shall be compatible with the contractor’s quality control responsibilities.

(b) Quality assurance at or near the project site is normally required for all materials and work for which compliance with specification requirements must be verified by examination and/or testing. Quality assurance may include:

(1) Field verification of the material certification will be made including the size, dimensions, and other measurements required by the drawings and approved shop drawings. Information provided with the item needs to be verified and documented which may include reference to ASTM, ACI, AWWA, and/or other standards and specifications.

(2) Sampling and testing of materials that are provided by local suppliers.

(c) Some materials must be inspected at the work site. They shall be listed in the quality assurance plan for the project and may include:

(1) Earth fill materials, rock riprap, drainfill, filter materials, and bedding materials, aggregates for concrete, and other similar items.

(2) Materials manufactured and delivered to the site which could include: concrete, mortar, asphalt concrete, concrete for roller compacted concrete structures, and other similar type materials.

(NOTE: Sections 512.34 through 512.39 are reserved.)

SUBPART E - EQUIPMENT, RECORDS, AND COORDINATION

512.40 Engineering equipment.

(a) Engineering equipment must be available for assigned project and field staff to provide necessary quality assurance duties in accordance with the quality assurance plan. Each state conservation engineer shall develop a list that outlines the minimum equipment that will be permanently assigned to each field or technical service office. This list will be utilized to develop and maintain a statewide inventory of engineering equipment. Procedures shall be established to ensure that all engineering equipment is periodically inspected for accuracy and serviceability (See PART 544, EQUIPMENT).

(b) Specialty equipment will be assigned to qualified individuals that have the necessary skills and approvals to operate and maintain the equipment. This requirement applies to but is not limited to nuclear gauges that are used to determine soil moisture for irrigation associated technical assistance and soil moisture/density of earth fills normally used for project contracts. Qualifications to become a responsible user of nuclear gauges are as required by the Nuclear Regulatory Commission under an agreement with the U. S. Department of Agriculture, Agriculture Research Service.

512.41 Records.

(a) Job Diary. Where formal contracts or agreements are utilized to install conservation engineering practices or project elements and for all Engineering Job Class V - VIII practices, a job diary shall be maintained to document the daily activities of the project. The state conservation engineer (SCE), contracting officer (CO), government representative (GR), or contracting officer's technical representative (COTR), individually or jointly, will determine which quality assurance (QA) personnel will maintain a job diary to record the progress and other elements of the project. It may be beneficial on projects where construction activity is occurring at more than one location to have more than one diary to ensure important information is recorded. The job diary serves as a source of factual data

related to the contractor's performance in both quantity and quality. The National Contracts, Grants, and Cooperative Agreement Manual (NCGAM) section 120-517 provides guidance on proper use of the job diary for project type work. On less formalized construction activities, the level of detail to be recorded in the job diary shall be commensurate with the complexity of the work and potential impacts upon public health and safety.

(b) Construction contracts that include Construction Specification 94, Contractor Quality Control, will include specific testing and documentation and other requirements for the contractor. Coordination of the quality control and quality assurance activities will minimize duplication of effort to support compliance with contract requirements.

(c) Construction documentation will include the following:

(1) All quality control and quality assurance testing.

(2) A record keeping system that identifies the status of construction activities that meet and those that fail to meet the minimum contract requirements. The use of NRCS Job Diary provides the tools to record and document these daily activities.

(3) Photographic documentation of significant construction activities which may include: site conditions that may affect contractor performance, deficiencies, safety and health conditions, water quality protection system and its effectiveness, etc. Each picture and/or slide will be properly identified with the following minimum data: project name, subject of the picture, contractor, contract number, date, and photographer's name. Where necessary to provide a reference to scale, an item of known size shall be included in the photograph An index of all photographic documentation will be kept current.

(4) Video recording provides additional methods to document construction activities. Complete audio description should be included on the video to assist in communicating the intended message. The initial part of the recordings shall include the project name, contract number, subject being recorded, date, and the camera operator and others assisting with the video recording.

(5) The Quality Assurance Plan that outlines the quality assurance duties and construction documentation needed.

(6) Documentation required by procurement, safety, health, personnel, financial regulations, local laws and regulations, permitting requirements, etc.

(d) For Engineering Job Class I - IV conservation practices, the state conservation engineer is required to outline the extent of testing and record keeping required to support quality installation. The use of SCS-CPA-6 (Conservation Planning and Implementation Notes) is a viable option.

512.42 Coordination between disciplines.

(a) The design report contains technical information from several specialists: design engineer, geologist, soils engineer, landscape architect, and others who may recommend specific tests or examinations during construction. An individual with the appropriate level of approval must be responsible to ensure that items of the design report are addressed and that all recommended testing and examinations are properly completed as outlined in the QAP.

(b) The engineer and/or technician responsible for on-site quality assurance must detect variations from the design. The project design report shall be reviewed and understood by QC and QA personnel, and be available at the construction site. When differences exist, quality assurance personnel or other persons shall not alter or make design related changes in the work under the contract without review and concurrence of an individual with appropriate job approval authority. The appropriate discipline(s) necessary to review potential variations shall be contacted as early as possible to minimize delays for the contractor.

(NOTE: Sections 512.43 through 512.49 are reserved.)

SUBPART F - AS-BUILT DRAWINGS

512.50 General.

As-Built drawings are developed to document the final installation features of the structure and the final physical condition of the site. These drawings are important in providing critical information for those physical features of the structure that are not visible following completion of the project installation. The As-Built drawings are reviewed as needed to: evaluate the design; determine proper operation and maintenance items; provide support for any legal matters; provide support to evaluate problems if the structure fails to perform as designed; and facilitate efficient maintenance or modification.

512.51 Applicability.

(a) As-Built drawings must be prepared for all major (Class V - VIII) structural works of improvement and for all inventory size dams. As-Built documentation of changes during construction is also required, when: local organization provides the quality assurance duties; quality assurance activities are accomplished by a professional services contract; etc. As-Built drawings must also be prepared for structures:

(1) Built under formal contract by NRCS or a cooperating local sponsor;

(2) When another agency of Government requires the filing of As-Built plans (Example - statewide utility notification system for buried pipes);

(3) When the final installed plans are required to properly locate structural features and perform operation and maintenance; (Example - Pipeline system where the As-Built shows the final location of valves, drains and pipe sizes.); or

(4) When future plans could include additions and/or adaptations to the present structure (Example - Plans include the extension of the pipeline system).

(b) As-Built drawings for structures in the Engineering Job Class I - IV will be prepared as determined by the State Conservation Engineer.

512.52 Documentation.

(a) Recording changes.

(1) All changes during construction must be recorded on the drawings to indicate As-Built conditions. The state conservation engineer shall outline procedures for supplementing the design report to include analysis and supporting data. If a structure is altered at any time following initial completion, the As-Built plans must be retrieved and revised to indicate the alterations. After the drawings have been revised to include the additions and modifications, updated As-Built plans will be re-distributed in the same manner as the original As-Built plans.

(2) A complete set of full-size construction drawings must be maintained at the work site to make timely updates as the work progresses. Changes shall be recorded on these drawings in a manner that As-Built information is obvious. The noted changes must be neat and legible and of quality equal to the original drawings because the drawings may be camera copied and reduced in size. If changes are extensive, they may be re-drafted on new standard drawing sheets with adequate detail and cross referenced to define the changes that were incorporated. The original corrected drawings and any new drawings must be included as the revised As-Built drawings for the competed works of improvement. As-Built CAD drawings should clearly show both the original design and As-Built information using varying line weight, color, shading, hatching, dimensioning, notes, and separate layers as needed.

(3) Determination of when a change is significant, and when it should be recorded, depends on its effect on the functioning of the structure, whether it is visible and/or accessible after construction is complete, and if any planned future changes involve adaptation to the present structure that was affected by the change. All significant changes shall be described in writing by concise notes or by updating the

drawings. Notes describing the changes will be recorded on all sheets of the drawings where changes occurred.

(4) Structural and/or dimensional changes made in a conduit, drainage system, cutoff trench, foundation preparation, embankment zoning, geotextile material, dental concrete, outlet pipes, or any structural element that will not be visible following completion of the works of improvement must be illustrated in detail to provide complete, legible, and a true and final record of the As-Built conditions.

(5) Changes during construction that could affect the storage volume of a reservoir or structure are to be recorded as an As-Built condition. These changes could include: more or less borrow material being removed from the reservoir basin, deposition of waste material within the basin, and a significant change in a structure (like a roadway) within the storage area.

(b) Geology.

(1) Because pre-construction borrow and foundation investigations rely on a sampling and evaluation process to establish the geologic conditions at the proposed structure(s) site, excavations during construction may expose conditions not previously observed and reported. Actual conditions encountered shall be appropriately documented, with particular emphasis on those that vary significantly from information presented in the design reports. Significant variations may require a reevaluation by the original designer.

(2) All significant differences in the geologic information identified during construction shall be reported to the approving engineer on the As-Built drawings and geologic maps and sections to supplement the geologic report of the project and/or structure. Significant differences include structural or stratigraphy discontinuities in the geologic materials (any type of soil or rock) at the site, location of solution cavities and voids, ground water conditions, and any other geologic related condition that can adversely affect the engineering performance of the structure.

(c) Labeling. Each sheet of the As-Built drawings must be clearly identified as "AS-BUILT." The title sheet of the drawings shall list the contractor, contract number, construction completion date, name(s) of construction inspectors and final amount of the contract. The title sheet will also contain the GR or COTR name and signature to certify that all work under the contract was installed in accordance with the As-Built drawings and specifications, and that the As-Built drawings are a true and correct record.

(d) Checking. Following construction, the As-Built plans must be checked by the individual certifying completion in accordance with the contract provisions. The certifying official shall initial each sheet of the drawings together with signing the title sheet. The As-Built drawings must be submitted to the NRCS office that has the technical responsibility for the project work and be available for future reference.

(e) Reproduction. Each state office (including the Pacific Basin Area and Caribbean Basin Area) is responsible for the size reduction and reproduction of the As-Built drawings for project type work. Final size of the reproduced As-Built plans should be 11 to 12 inches by 15 to 18 inches. A reproducible copy will be properly filed at the state office and be available for developing additional copies in the future. Copies of the As-Built drawings shall have the following distribution:

(1) A negative or print copy for extended Federal Archives and Records Center (FARC) storage. (See GM Title 120, Section 408.63) For those projects where the National Archives has designated the records as PERMANENT, a negative copy must be provided.

(2) Each sponsor or owner of the project that requests a copy. The sponsor that has operation and maintenance responsibility shall receive and retain a copy for reference. Operation and maintenance information, including shop drawings for equipment that was installed for the project and/or practice, shall be included with the As-Built drawings for the sponsors/owner/operator.

(3) A copy shall remain on file at the local USDA Field Office.

(4) A copy of the As-Built construction drawings and specifications shall be provided to the sponsors f o r project work. This includes updated As-Built drawings for projects where additional work was performed. A copy of As-Built drawings prepared for conservation engineering practices, when required under Section NEM Part 512.51, shall be provided to the landowner/operator following completion and acceptance of the work.

(5) CADD generated drawings with As-Built updates may be used to reproduce drawings for sponsors/owners. The CADD electronic file shall be clearly identified and made a part of the file documentation.

(6) State and/or local regulatory authorities which issue permits, or as required by regulations.

512.53 Disposition.

For the disposition of As-Built files for structures installed as part of a total project, see General Manual Title 120, Section 408.63 under File Code 210-12-11.

(Note: Sections 512.54 through 512.59 are reserved)

SUBCHAPTER C - APPLICATIONS

PART 520 - SOIL AND WATER RESOURCE DEVELOPMENT

PART 521 - POLLUTION ABATEMENT AND WATER QUALITY IMPROVEMENT

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SUBCHAPTER C - APPLICATIONS

PART 520 - SOIL AND WATER RESOURCE DEVELOPMENT

SUBPART A - EROSION AND SEDIMENT CONTROL

520.00 General.

(a) Effective erosion and sediment control requires a comprehensive system of engineering and cultural practices applied to the land for the specific purpose of controlling erosion and preventing excessive sediment accumulation. Federal and State laws, regulations, and executive orders have emphasized the need to conserve natural resources and to improve the quality of the environment. Erosion and sediment control systems address this need.

(b) Erosion occurs in many areas other than cropland. Construction sites, parks, playgrounds, roads, and urban areas are major sources of erosion. SCS is often asked for assistance in the planning, design, and construction of erosion and sediment control systems.

520.0l Minimizing erosion and pollution during construction.

(a) SCS is to minimize erosion and pollution in construction operations carried out under all programs. The need for pollution abatement must be determined for each site by evaluating the pollution hazard and its relation to the pollution tolerance or standard for the area in question. A review of State and local standards established as a result of the Water Pollution Control Act (as amended) should be used in determining the control necessary for special sites.

(b) Pollution control measures are to be included as a part of all construction carried out by SCS through formal contract or force account procedures.

(c) Pollution control measures are to be included as a part of all construction carried out by local organizations, through formal contract or otherwise, with SCS providing the engineering design, installation services, or both.

(d) All construction that is carried out by local organizations, either with their own engineering organization or with engineering consultants retained by them with SCS financial assistance, must comply with the intent of this policy but not necessarily with the specific details.

(e) In addition, engineering done by SCS for individuals and groups is to include satisfactory control measures.

(f) Because the measures required to control erosion and pollution may be unique to each site, new national guide specifications on such measures will not be established. States are to develop plans and specifications for the specific measures that are required for individual structures or sites or by using appropriate National Guide Specifications (NEH-20) or the National Handbook of Conservation Practices.

(g) Field surveys and site investigations are to include the information required to properly plan and design the measures needed to provide an acceptable degree of pollution erosion control for a site. Requirements for vegetative control measures are to be included along with structural measures.

(h) Requirements for erosion and pollution control measures must be clearly outlined in construction contracts. In many contracts these requirements can be included in the items of work and construction details section.

(i) Control measures included in construction contracts are to be discussed with the contractors at the prebid site showing and at the preconstruction conference.

(j) If special pollution problems arise during construction or if special measures not in the contract are needed, they are to be brought to the attention of the contracting officer for contract modification or other appropriate action.

(k) In preparing plans and specifications for structures or projects at locations where pollution tolerances may be exceeded, consider that:

(1) The area and duration of exposure of erodible soils should be reduced to the greatest extent practicable.

(2) Soils should be protected by using temporary vegetation or mulch or by accelerated establishment of permanent vegetation. Segments of work should be completed and protected as rapidly as construction schedules allow.

(3) The rate of runoff from the construction site should be mechanically retarded and the disposal of runoff should be controlled.

(4) Sediment resulting from construction should be trapped in temporary or permanent debris basins.

(5) Dust should be kept within tolerable limits on haul roads and at the site by applying water or other dust suppressors.

(6) Temporary bridges or culverts should be used where fording of streams is objectionable. Borrow should not be taken from areas where pollution from the operation is inevitable.

(7) Temporary measures should be used to keep erosion under control if construction is suspended for any appreciable length of time.

(8) Protection against pollutants such as chemicals, fuels, lubricants, sewage, etc., should be provided.

(9) Construction should be timed to avoid rainy seasons if practical.

(l0) Sanitary facilities should not be located over or adjacent to live streams, wells, or springs.

(11) Grass or brush fires should be prevented.

SUBPART B - FLOOD PLAIN MANAGEMENT

520.10 General.

Flood plain management is essential in the development of plans to reduce flood damages. Flood plain management requires the application of sound engineering principles.

520.11 Scope.

Flood plain management includes structural and nonstructural measures to reduce flood damages and is subject to the rules and regulations in 7CFR 650.25. Flood plain management assistance programs are described in l50-Part 506.

520.12 Description.

(a) Flood plain management is a program designed to obtain a given set of objectives for reducing flood damage. A flood plain management system should:

(l) Avoid direct or indirect support of flood plain development if there is a feasible alternative;

(2) Insure that the risk of a flood plain use is compatible with the degree of flooding expected;

(3) Protect human safety, health, and welfare; and

(4) Preserve and restore important environmental values.

(b) he methods for meeting flood plain management goals may be grouped under those for "people control" that reduce the effect of and susceptibility to flooding and those for "flood control" that reduce the amount of flooding. Flood plain management includes both structural and nonstructural measures.

520.13 Types of measures.

(a) Structural measures such as dams, channels, and diversions that are included to modify the flood water are generally well understood and are not described in this subpart.

(b) Nonstructural measures include the following:

(l) Acquisition includes purchase in fee title or suitable easements for the purpose of precluding future uses that would be incompatible with the expected degree of flooding or setting time limits for which inhabitable buildings can be used.

(2) Relocation of residential, commercial, industrial, and other buildings to flood-free areas to reduce or prevent flood damages.

(3) Regulation includes actions by local government entities through zoning, building codes, etc., to keep land use compatible with the expected degree of flooding. Regulation may apply to a floodway, which is the part of the flood plain that can contain a flood without causing an excessive increase in the elevation of the water surface. Usually this increase is l foot but some communities have a lower limit. The flood fringe is the area of the flood plain below the increased elevation (as defined above) and outside the floodway. The floodway is to remain unobstructed. Development is normally allowed in the flood fringe is structures are elevated above the area of flooding. In these areas the need for ingress and egress as well as the possibility of larger floods occurring must be considered.

(4) Floodproofing consists of modifications of existing structures, their sites, and building contents to reduce the probability and adverse effects of water entry. Some general guidance on floodproofing is in Technical Release No. 57.

(5) Flood warning systems and emergency action plans provide information on the time of occurrence and magnitude of flooding to be expected. Features could include visual observations, stage recorders in streams, precipitation data in the uplands, continuous or periodic data collection, manual or automatic relay systems, flood warning markers, etc. The degree of sophistication varies with the needs of the local community and the hydrologic characteristics of the area. The warning system needs to be integrated with the emergency action plan. Both must be compatible with the local situation. It is desirable to provide a warning time of several hours--perhaps 10 to 12 hours. However, if only a 1- or 2-hour warning is possible, the emergency plan must be implemented with due consideration to the short time available.

(6) Information and education are essential to any flood plain management system. the development of needed technical information and its dissemination to the public, especially local government officials, planners, and affected landowners, are essential. Included are flood warning markers that designate, on the ground, areas subject to flooding so that the hazards can be recognized. these could be referenced to historic floods, percent chance floods, or the floodway location.

(7) Flood insurance is a method of spreading economic loss over time and among a relatively large number of people. It does not directly reduce damage.

(8) Flood emergency measures include contingency and emergency floodproofing that can be completed in anticipation of flooding. It should be recognized that one of the functions of overall flood plain management is to reduce the need for this type of emergency action.

520.14 Risk to life and property.

The risk to human life and property is considered in evaluating various flood plain management alternatives. Although risk is difficult to measure, certain physical parameters can be used to assess the potential risk for each structure.

(a) Frequency of flooding determines the probability of occurrence. The l00-year frequency flood (l percent chance in any l year) is the minimum acceptable if there is risk to human life. For certain critical facilities such as hospitals, schools, nursing homes, utilities, and facilities for producing or storing volatile, toxic, or water-reactive materials, the effects of the 500-year frequency flood should be considered.

(b) Depth of flooding is a crucial factor. Some areas may tolerate depths of from l to 3 feet without being considered hazardous to life.

(c) Estimated warning time for evacuation may be significant.

(d) Velocities should be considered either along or in combination with depth and other parameters.

(e) Combinations of depth (in feet) and velocity (in fps) can be used as indicators of risk. Products of 5 or 7 have been used as a limit for "people safety" and values of l5 or 20 for "structural safety."

(f) Duration of flooding may be a significant factor for some agricultural crops.

(g) Other factors may also be available to evaluate risk.

520.20 General.

(a) Dams are essential to soil and water resource development. Controls to insure safety of dams are needed to protect life and property.

(b) Uniform high quality standards must be used in planning, design, and construction of dams to ensure consistently safe, efficient performance.

520.2l Definition and classes.

(a) As used in this manual, a dam is an artificial barrier, together with any associated spillways and appurtenant works, that does or may impound or divert water.

(b) Storage is the capacity of the reservoir in acre-feet below the elevation of the crest of the lowest open channel emergency spillway or the elevation of the top of the dam if there is no open channel emergency spillway.

(c) Overall height is the difference in elevation in feet between the top of dam and the lowest elevation at the downstream toe.

(d) Effective height is the difference in elevation in feet between the lowest open channel emergency spillway crest and the lowest point in the original cross section on the centerline of the dam. If there is no open channel emergency spillway, the top of the dam becomes the upper limit.

(e) Dams are classified according to the potential hazard to life and property if the dam should suddenly breach or fail. Existing and future downstream development including controls for future development must be considered when classifying the dam. The classification of a dam is determined only by the potential hazard from failure, not by the criteria.

(l) Class (a)--Dams in rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and country roads.

(2) Class (b)--Dams in predominantly rural or agricultural areas where failure may damage isolated homes, main highways, or minor railroads or interrupt service of relatively important public utilities.

(3) Class (c)--Dams where failure may cause loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, main highways, or railroads.

(f) Some dams have greater significance than others because of their potential for affecting public safety. The public concern for safety of dams is often identified with the size of dam and reservoir. Because dams, even though small, initially may present no hazard in terms of loss of human life, their degree of hazard can change as a result of downstream development. Because of this and the need to manage an overall SCS program for dam safety, a national inventory of SCS assisted dams is to be maintained by the Director of Engineering. Each state conservationist is to develop the inventory in the state. Procedures for developing and maintaining the inventory are contained in 290-300. The following dams are to be included in the inventory and are considered as SCS inventory dams.

(l) All class (b) and (c) dams;

(2) Class (a) dams more than 6 feet in overall height and with a storage capacity of 50 acre-feet or more; and

(3)Class (a) dams with an overall height of 25 feet or more and a storage capacity of more then l5 acre-feet.

520.22 Design criteria.

(a) Class (a) earth dams with a product of storage times the effective height of the dam of less than 3,000 and with an effective height of the dam of 35 feet or less are to meet or exceed the requirements of Practice Standard 378, Pond (NHCP).

(b) Class (a) earth dams whose product of storage times the effective height of the dam is 3,000 or more; those more than 35 feet in effective height; and all Class (b) and (c) dams are to meet or exceed the requirements of Technical Release No. 60.

(c) Dams of materials other than earth are to comply with the applicable portions of Practice Standard 378 and Technical Release No.60. Other features are to meet or exceed the requirements as stated in other applicable SCS standards.

520.23 Classification.

(a) Classification of dams is to be determined at the time of inventory and evaluation and verified immediately prior to construction. The person having the engineering job approval authority (50l.04 of this manual) is responsible for the classification. For Class VII and VIII jobs, both the state conservation engineer and the head of the NTC engineering Staff are to concur in the classification. They are jointly responsible for the classification.

(b) Documentation of the classification of dams is required. Documentation is to include but is not limited to location and description of dam, configuration of the valley, description of existing development (houses, utilities, highways, railroads, farm or commercial buildings, and other pertinent improvements), potential for future development, recommended classification, and signatures of those performing and concurring in the classification. It is also to include results obtained from breach routings, if breach routings are used as part of the classification process.

(c) If there are indications that any existing dam is misclassified, including changes resulting from downstream development, proposals for reclassification are to be submitted to the state conservation engineer for action. If the state conservation engineer approves, the dam is officially reclassified. When this occurs, the case file is to be documented, proper notification made, and the updated information added to the inventory of SCS assisted dams. For further guidance see 440-300.

520.24 Special considerations.

(a) Most of the requirements in Practice Standard 378 and Technical Release No. 60 are stated as maximum and minimum limits and are not to be construed as satisfactory criteria for all dams.

(1) Special considerations are to be given to dams in series, to those with drainage areas of more than 10 square miles, and to those located in regions of high earthquake hazard.

(2) Class (a) dams for municipal or industrial water supplies are to be designed with minimum criteria equivalent to that for Class (b).

(3) Class (c) dams and those with permanent storage are not to be constructed over an active fault without the concurrence of the Director of Engineering.

(b) Local experience, State laws and regulations, site conditions, or other special features may require the use of more stringent criteria to insure a satisfactory dam.

520.25 Clearing reservoirs.

(a) Reservoir areas are cleared to facilitate the movement of water; to provide for the proper functioning of outlets and spillways; to provide convenient access to dams and related structures for operation and maintenance; and to comply with State and local laws and regulations.

(b) The following minimum standards are to be used to determine the clearing required for reservoir areas:

(l) Dry dams. Minimum requirements include:

(i) Reservoir areas are to be cleared to a distance of 200 feet upstream from the principal spillway inlet except that no clearing is necessary above the elevation of the top of the inlet.

(ii) Areas immediately upstream from emergency spillways are to be cleared to the extent required to permit spillways to function properly.

(2) Dams that retain water in a reservoir. This includes dams in which space is allocated for sediment storage and dams that provide water storage for beneficial use. Minimum requirements include:

(i) Reservoir areas are to be cleared at least up to the elevation of the crest of the lowest ungated principal spillway inlet.

(ii) Less clearing may be approved for a specific site if the structure incorporates fish and wildlife features and the sponsor or owner requests that the area not be cleared, or if the cost of clearing is disproportionate to the other costs of the structure and lack of clearing will not interfere with the functioning of the reservoir. The minimum area cleared must extend the full length of the dam for a distance of 400 feet upstream from the principal spillway and must include the area upstream from the emergency spillway to the extent required for it to function properly.

520.26 Independent reviews for dam safety.

(a) Definition of an independent review. An independent review is an examination and evaluation of procedures used and decisions made during the design and construction of a dam by peers from outside SCS or from an organizational unit other than the one responsible for the design and construction. "Design" is used here in the broad sense as defined in 511.02.

(b) Purpose of an independent review. Independent reviews are made to insure that design and construction procedures and decisions reflect safety considerations as well as economy. Dam safety considerations are directly related to the potential for loss of life, damage to valuable property, or disruption of transportation and utility facilities if the dam fails. The classification of dams is determined by the potential for such losses and damage (see 520.2l). The reviewer is to determine whether the methods of analyses are appropriate and the assumptions are justified by the site conditions, as well as whether the results are reasonable. An independent review is not a substitute for expertise needed during design and construction.

(c) Design reviews. Design reviews are made as established in 511.05. Designs that are coapproved are to be reviewed by the coapproving office as well as the office with primary responsibility. If the office responsible for the design and coapproving office collaborate on the design, the review made for coapproval purposes is not considered an independent review. The design review for coapproval purposes can be considered an independent review only if the coapproving office had little or no role in the design.

(d) Determination of need for an independent review. All dams proposed for construction, modification, or repair are to be evaluated by the state conservation engineer to determine the need for an independent review. For class (c) dams, factors to be considered are the degree of hazard, size of dam, reservoir volume, complexity of site geology, complexity and margin of safety reflected by the design layout and construction methods, and any other unique condition or complexity noted during planning, design, or construction. To determine the need for an independent review for all other dams, consider site complexity, unique design features, or other special conditions requiring special expertise. The need for an independent review is to be determined during preliminary design (See 5ll.02(c)). For projects, the determination is to be made during planning when the preliminary design is prepared.

(e) The procedure for establishing an independent review.

(l) The state conservation engineer and the head of the NTC Engineering Staff are to make a joint recommendation to the state conservationist on whether an independent review is needed. The recommendation is to be supported by a justification statement and include a brief description of the site, the proposed structure layout, composition of technical specialists making up the view team, and other essential data. This is to become a part of the design folder. An independent review may be initiated at any state of design or construction.

(2) The state conservationist is responsible for implementing the independent review. He or she is to advise the Director of Engineering of the plan to conduct an independent review.

(3) When an independent review is recommended, the state conservationist is to request from the NTC director a list of employees and others qualified to make the review. The Director of Engineering is to be consulted in compiling the list and provided a copy of the list.

(4) The state conservationist is to make the necessary arrangements for appointing the review board and assigning their responsibilities. If the board is composed of more than one member, a chairperson is to be designated.

(5) The review board is to be permitted to make reviews at the times they determine necessary. The review assignment is to require evaluation until construction is completed.

520.27 Emergency action plans--class (c) dams.

(a) Applicability. An emergency action plan is to be prepared for each class (c) dam for which SCS provides technical or financial assistance. The state conservationist is to determine that an emergency action plan is prepared prior to the initiation of construction.

(b) Inundation maps. SCS is to provide appropriate inundation maps. These maps define areas that would be affected in an emergency situation and provide other appropriate information. The inundation areas to be delineated on the maps are to show the following two conditions:

(l) Outflow from routing the emergency spillway hydrograph (or larger hydrograph) through the spillways and downstream; and

(2) Discharge due to sudden breach of dam. Unless otherwise determined by the state conservation engineer, the conditions at the time of breach may be water level in the reservoir at or above the crest elevation of the lowest open channel emergency spillway and "nonstorm" conditions downstream of the dam.

(i) For dams in series, an evaluation should be made to determine if breach of an upstream dam would endanger a downstream dam. If the downstream dam is endangered, the breach inundation map should be based on multiple failure.

(ii) For dams not in series but which would affect a common downstream area, it is usually adequate to consider the failure of each dam individually unless special circumstances would warrant multiple failures.

520.28 Potential impact area--class (a) dams of inventory size and all class (b) dams.

(a) Applicability. for each class (a) dam of inventory size and for each class (b) dam, the area that could be inundated in event of a breach is to be determined. This is done as part of the classification (520.2l(e)) and its ducumentation (520.23(b)).

(b) Requirements. (l) The potential impact area may be determined by performing breach routings or by other methods._

(2) The potential impact area is to be clearly described by the use of maps and/or narrative description. In addition to the description of the area, precautions s to future development within the area are to be included. These precautions may be specific (e.g., if based on breach inundation studies) or may point out the need for breach routings in the future if development is ever considered. The landowner or sponsor should be made aware of the potential impact area as early as practicable and before expending significant resources in design.

(c) Distribution. (1) As early as practicable but no later then initiation of construction, the state conservationist is to officially transmit the description of the potential impact area and precautions on development to the owner or sponsor. It is the responsibility of the owner or sponsor to transmit the description of the potential impact area and precautions on development to:

(i) The local land use control agency or county,

(ii) The State agency responsible for dam safety, and

(iii) The conservation districts and others as appropriate.

(2) If requested by the owner or sponsor or if the owner or sponsor fail to act, the state conservationist is to make the specified notification.

SUBPART D –OPEN CHANNELS

520.30 General.

(a) Channels are used for a variety of purposes. Excessive bank erosion and bed degradation and/or excessive sediment accumulation may cause channels to function improperly. It is important that channels be maintained to insure satisfactory performance for their anticipated life.

(b) The design of stable channels requires many analyses. Some of the principles are complex and must be applied with adequate data and sound judgment. The policy in this subpart results from sound SCS experience, and its application will result in sound channel design.

520.3l Definition.

An open channel is either a natural or a manmade channel, excavated in earth or built of structural components, in which water flows with a free surface.

520.32 Design criteria.

(a) Open earth channels are to meet or exceed the requirements of Practice Standard 582, Open Channel (NHCP) and Technical Release No. 25. Exceptions for small drainage areas or other practices are noted in the Standard.

(b) Open channels of material other than earth are to comply with the applicable portions of Practice Standard 582 and Technical Release No. 25. Other features are to meet or exceed the requirements as stated in other applicable SCS standards.

520.33 Special considerations.

(a) Channel measures installed for fish and wildlife habitat generally include deflectors, channel sills, and other devices that may be constructed of permanent materials such as concrete or semipermanent materials such as wire, logs, rock, and brush. See Fish and Wildlife Service - Soil Conservation Service Joint Channel Modification Guidelines.

(l) Measures for fish and wildlife habitat may be divided into two categories: Permanent measures designed according to engineering standards and requirements and semipermanent or temporary measures that do not meet these standards.

(2) Fish habitat improvement measures are to be installed so that they do not interfere with overall channel flow in a manner that will contribute to deterioration of the channel cross section.

(3) Biologists are responsible for approving the design of temporary fish habitat improvement measures. Engineers are to review the planned measures to evaluate their effects on channel design, operations, and maintenance.

(4) Engineers are to approve or prepare the design of permanent measures to insure that the anticipated operation is compatible with the planned overall functioning of the channel and in accordance with identified biological needs.

(5) If a watershed work plan includes measures described as temporary, the work plan must include a statement that these measures are temporary and will require frequent maintenance and replacement by the sponsors.

(b) Landscape architecture is an important factor of an open channel. Installed channels are to comply with the principles in Technical Release No. 65.

PART 521 - POLLUTION ABATEMENT AND WATER QUALITY IMPROVEMENT

521.00 General.

(a) Soil and water conservation practices should be planned and implemented to adequately reduce delivery of pollutants to surface and ground water in order to meet intended goals. SCS is authorized to provide assistance to reduce agriculture-related pollution and to improve water quality. It is the intent of SCS to integrate water quality considerations into all SCS activities and programs (see National Instruction No. 460-301, Dec. 1982). The primary pollutants to be considered, but not limited to, are sediment, nutrients, pesticides, suspended and dissolved solids, oxygen-demanding organic materials, toxic substance, and bacteria. Where appropriate, factors that contribute to marked changes in water temperature should also be considered.

(b) Pollution abatement and water-quality maintenance and improvement are to be considered in the planning, design, and construction phases of conservation operations and project activities.

521.01 Pollution abatement in conservation operations.

(a) Planning. Pollution abatement and proper management of wastes are to be considered in planning resource management systems and practices in agricultural areas. Individual practices are to be a part of an overall waste management plan for the enterprise.

(b) Design. Waste management and pollution abatement systems are to be designed in conformance with the National Handbook of Conservation Practices and applicable Federal, State, and local requirements.

(c) Installation. System components and practices are to be installed in a sequence that insures that each will function as intended without being hazardous to others or to the overall system.

(d) Operation and maintenance. The owner or operation is responsible for operating and maintaining systems and their component practices. A written plan for operation and maintenance is to be prepared and agreed to by owner and operator.

521.02 Pollution abatement in project activities.

Pollution abatement at structure sites and throughout the watershed is to be considered in planning, design, construction, operation, and maintenance of all project activities. The effect a project will have on pollution of impounded or downstream surface water and groundwater is to be evaluated. Appropriate provisions will be included to minimize pollution. Project water quality conditions must also be evaluated to assure that the existing quality is suitable for the intended project uses.

521.03 Effect of SCS activities on water quality.

(a) Conservation operations. The effect of recommended conservation practices and land use on the quality of surface and ground water is to be evaluated. Current and potential use of water as well as public health and established water quality standards are to be considered.

(b) Project activities. Water-quality investigations, analyses, and interpretations in project activities are to be carried out to establish baseline conditions and determine the effects of projects on the quality of surface and ground water (see Technical Release No. 58).

521.04 Effect of water quality on SCS activities.

The effect of the quality of impounded or managed water is to be considered in SCS-assisted practices and projects. Impoundments, in particular, are sensitive to nutrients and pesticides in the water delivered to them. Saline or strongly acid water can have an adverse effect on many practices. Water for recreation and many other uses must meet established criteria relative to pathogens, suspended and dissolved solids, taste and odor, etc. (See Technical Release No. 58).

SUBCHAPTER C - APPLICATIONS

PART 522 - SNOW SURVEY AND WATER SUPPLY FORECASTING

SUBPART A - RESERVOIR OPERATIONS GUIDE FOR SNOWMELT

522.00 General.

(a) Selecting appropriate storage levels and average release rates for reservoirs in snowmelt runoff environments is a prerequisite to sound water management. A number of impoundments, operated for single or multiple purpose use in the United States, lack adequate management tools to guide this process each year. The Reservoir Storage Volume Planning (RSVP) process in Technical Release 75 (TR-75) has been developed to use seasonal volume forecasts to improve water management at these reservoirs.

(b) A number of reservoir operation guides (ROG), formerly called reservoir operations plans, have been or are being developed as a result of requests for assistance. These guides are developed as decision support tools to help reservoir operators manage their facilities by using streamflow forecasts. The guides provide a means to optimize water use while minimizing flood damages. This policy has been developed to assure that operation guides are technically sound and meet the operators' needs.

522.01 Authority and Request for Assistance.

A ROG can be prepared for any reservoir upon receipt of a written request from the reservoir operator or owner. Requests shall be reviewed by the Soil and Water Conservation District before forwarding to the State Conservationist for approval.

522.02 Responsibility.

(a) The owner or operator responsibilities are outlined in the National Operation Maintenance Manual (NO&MM), Operation and Maintenance Subpart B, 500.14 Responsibilities, (a) Sponsor/land user, part (3).

(b) SCS responsibilities are outlined in NO&MM, Operation and Maintenance Subpart B, 500.14 Responsibilities, (b) parts (1) and (2), and include determination of feasibility and desirability of preparing a guide. This determination will be made jointly by the State Conservation Engineer and the Water Supply Specialist, or the Data Collection Office Supervisor. Their respective concurrence is required before proceeding with the development of the reservoir operation guide. The reservoir operation guide shall use the procedures in TR-75.

(c) Federal land or structure administering agency responsibilities: It is essential that full agreement be reached between the Federal agency (non-SCS), the sponsor/land user, and SCS regarding the establishment of a ROG on a Federally owned, operated or funded structure.

522.03 SCS Technical Review.

The State Conservation Engineer and the Engineering and Water Supply Forecasting Staffs, WNTC, will be actively involved in the development and review of the ROGs. A copy of the ROG should be sent to the state agency responsible for administering dam regulations during the SCS review process.

522.04 Reservoir Operation Guide Review.

There will be an annual review for the first 3 years of the ROG for a reservoir by the State Conservation Engineer to determine its effectiveness as a management tool for the reservoir. After the first 3 years, the frequency of review should be reevaluated.

522.05 Reservoir Operation Guide Contents.

The following outline is to be used in preparing a reservoir operation guide. Topics shown in each section are to be included only if they apply to the management of the reservoir. This standard format is intended to ensure comprehensive coverage of pertinent hydrologic factors and provide a consistent organization for completed guides. The outline is designed so that for actual operation of a structure, an operator would normally only need to refer to sections (e) and (f). The Reservoir Storage Volume Planning (RSVP) computer programs are a part of the Centralized Forecasting System (CFS) at the WNTC. These programs are to be used to generate the volume-outflow curves contained in each guide.

(a) Introduction

(1) Background for guide request

(i) Requesting sponsor

(ii) Cooperating agencies, if any

(iii) Guide is a decision support tool

(2) Reservoir operation guide objectives

(i) Water conservation

(ii) Flood management

(iii) Fisheries protection

(iv) Recreation

(v) Other

(b) Reservoir Characteristics

(1) History of structure

(i) Engineering firm or agency

(ii) Construction date

(iii) Type of dam

(2) Primary and secondary purposes of reservoir

(3) Structural dimensions of dam

(4) Storage characteristics of reservoir

- (i) Total storage capacity
- (ii) Conservation storage
- (iii) Recreation pool
- (iv) Dead storage
- (v) Flood storage
- (vi) Surcharge capacity
- (vii) Storage vs. elevation information
- (viii) Surface area

(5) Release capability

- (i) Principal spillway
- (ii) Auxiliary spillway
- (iii) Pump
- (iv) Gated outlet
- (v) Other

(6) Special operating characteristics

- (i) Radial and other crest control gates
- (ii) Use of flashboards
- (iii) Restriction on storage (regulatory, court orders, etc.)
- (iv) Seepage

(v) Dam deterioration

(vi) Other

(7) Storage/release pattern for reservoir

(i) Historical end-of-month storage analysis

(ii) Desirable storage pattern--low, average, and high years

(c) Watershed Characteristics

(1) Location and drainage area

(2) Topography

(i) Geology

(ii) Elevation range

(iii) Area vs. elevation relationship

(3) Climatology (cite references)

(i) Average annual precipitation

(ii) Seasonal distribution of precipitation

(iii) Snowpack accumulation and ablation pattern

(iv) Extremes and variability of precipitation

(4) Streamflow (cite references)

(i) Average annual flow

(ii) Runoff vs. elevation relationship

(iii) Extremes and variability

(iv) Seasonal distribution of streamflow

(v) Flow duration analysis

(d) Hydrologic and Meteorologic Data

(1) Streamflow and reservoir records

(i) Reference maps and tables in appendix

(ii) Explain any synthetic inflow calculations

(iii) Accuracy of records

(2) Precipitation and snowpack records

(i) Reference maps and tables in appendix

(ii) Climatological stations

(iii) SCS SNOTEL sites and snow courses

(3) Other data

(i) Diversions

(ii) Temperature data

(iii) Pumping data

(e) Reservoir Volume-Outflow Concept

(1) Theory of curves

(i) Relationship between hydrograph shape and flow volume

(ii) Evaporation-seepage losses are almost constant from year-to-year

(iii) Concept of volume-outflow curves with forecasts to set outflow

(iv) Use of forecasts at probability levels of 50, 10, 30, 70, and 90 percent chance of exceedance with volume-outflow curves

(v) Figure showing model volume-outflow curves

(2) Use of volume-outflow curves in a typical year

(i) Reference figure of flow, storage, releases

(ii) Explain how forecasts are used to set outflows

(iii) Determining maximum storage level desirable from upper range of desirable outflow

(3) Management considerations in various years

(i) Average

(ii) High years

(iii) Low years

(4) Desirable outflow range defined

(i) Low flow consideration, e.g., fisheries

(ii) Water rights

(iii) Irrigation demands

(iv) Flood flow threshold-where flood damage occurs

(f) Reservoir Operation

(1) Data needs

(i) Streamflow forecasts

(ii) Storage level in reservoir

(iii) Mid-month forecast updates

(2) Volume-outflow curves for primary forecast periods

(i) April-July

(ii) May-July

(iii) June-July

(3) Reservoir rule curves

(i) Use of rule curves with volume-outflow curves

(ii) Reservoir rule curves

(4) Low runoff year example - (actual year, if possible)

(5) Average runoff year example - (actual year, if possible)

(6) High runoff year example - (actual year, if possible)

(7) Timing of snowmelt runoff peak

(i) Relationship to snow pillow data

(ii) Variability from year to year

(8) Streamflow recession analysis

(i) Snowmelt recession curve

(ii) Influence of precipitation events

(9) Summary

(i) Guide is an operational tool for risk assessment and project regulation

(ii) Informed decisions based on probability of seasonal flows

(iii) Organizes planning process

(iv) Relevant information in one document

(v) Guide should be reviewed annually

(vi) SCS contacts for assistance and/or interpretations

(g) Annual Review

(1) Recommendations

(2) Record of review

(h) APPENDICES

(1) Watershed characteristics

(i) Location map, elevation map, data sites map, area vs. elevation curve

(ii) Average annual precipitation map

(iii) Seasonal precipitation map

(iv) Average annual runoff map

(2) Reservoir records

(i) Elevation vs. storage table

(ii) Principal spillway or gated outlet rating table

(iii) Auxiliary spillway rating table

(iv) Pumping plant rating

(v) Historical end-of-month reservoir records

(vi) Average reservoir storage hydrograph

(3) Streamflow records

(i) Historical monthly streamflow data

(ii) Annual inflow hydrographs

(iii) Mean annual inflow hydrograph

(iv) Frequency analysis of seasonal volumes

(4) Precipitation records

(5) Snowpack records

(i) Snow course and snow pillow monthly data

(ii) Snow pillow hydrographs

(i) Averages

(1) Monthly reservoir

(2) Monthly streamflow

(3) Monthly precipitation

(4) Monthly snow course

(j) Approval

(1) Example attached

SUBPART A - RESERVOIR OPERATION GUIDE FOR SNOWMELT

"We, the undersigned individuals, as authorized by the laws and regulations of the State of Anystate, have reviewed this Reservoir Operation Guide and find it acceptable for the operation of Anyplace Reservoir."

Operator	Soil and Water Conservation District
Date	Date
State Conservationist	State Conservation Engineer
Date	Date

PART 523 - IRRIGATION

523.00 General.

Irrigation is the efficient application of water to land areas for purposes of sustained agricultural crop production. This requires proper evaluation of the soil or land surface materials so they are compatible with the planned plantings; evaluation of water source for quality and quantity; evaluation of the land surface topography and water delivery and distribution system layout; and operation skill levels for proper management. Irrigation increases the capability to not only produce a variety of crops, but also allows for better control of quantity and quality of the crop. It allows land susceptible to excessive erosion to be taken out of row crops and returned to permanent vegetative cover. Increases in irrigation have accentuated the need to manage the application to water, minimize erosion, use the water resources wisely, and thus maintain the quality of surface and ground water. The objectives of a resource management system, which often includes irrigation, are to achieve acceptable levels of quality for sustained use of the resources, adequately protect the environment, and provide an acceptable standard of living.

523.01 Technical assistance.

SCS is a recognized leader in irrigation Technology, especially in plant, soil, and water management. The Service helps landowners develop resource conservation systems necessary to meet the conservation needs of the land; develop technical materials and standards; train landowners, contractors, manufacturers, and others in design and use of systems compatible with soil conditions and plant needs; and assists other federal agencies and foreign governments. SCS provides landowners direct technical assistance with on-farm irrigation water management. With limited resources, priorities for furnishing technical and financial assistance must be carefully assessed.

523.02 Irrigation guides.

Each state conservationist is responsible for preparing an irrigation guide setting forth the basic design and management criteria for all conservation irrigation methods applicable to local combinations of soils slopes, crops, water supply, and climatic conditions. The state conservationist may assign leadership responsibility to someone on his or her Staff for developing or updating the irrigation guide. Although SCS has the technical responsibility for preparing the irrigation guide, cooperation from others is desirable, such as representatives of the state university, state experiment stations, Extension Service, and Agricultural Research Service. A suggested outline for the Irrigation Guide is provided in the National Engineering Handbook, Section 15, Chapter 3, Planning Farm Irrigation Systems.

523.03 Assistance on irrigation projects.

SCS policy is to assist individual farmers, farmer groups, and legal entities to install irrigation practices that maximize the conservation uses of soil and water resources and minimize operation and management problems. SCS plans and designs conveyance systems that measure and control irrigation water deliveries to each water user. In irrigation land treatment projects, SCS plans and designs on-farm systems.

523.04 Water management for salinity control.

Water management recommendations will be made that will result in control of salinity both on and off site. Some soluble salts in the soil and irrigation water are toxic to plants. Water management recommendations will consider control of salinity within the root zone and in return flows (off site). The key to soil salinity control is a net downward movement of soil water in the crop root zone. Poor internal drainage may necessitate installation of improved drainage measures.

523.05 Irrigation training.

SCS will develop and maintain an adequately trained and informed Staff which understands the principles or irrigation system design, operation and management. SCS will maintain a coordinated training program that includes a series of courses covering soil-plant-water relationships, methods of estimating evapotranspiration, methods of scheduling irrigations, system design, system evaluation and management, and the use of the latest Technology and equipment. The Service also provides training and technical instructions to contractors and landowners who install and/or manage an irrigation system.

SUBCHAPTER D – TECHNOLOGY

PART 530 - HYDROLOGY

SUBPART A - HYDROLOGIC INVESTIGATIONS

SUBPART B - HYDROLOGIC PROCEDURES AND CRITERIA

PART 531 - GEOLOGY

SUBPART A - GEOLOGIC SITE INVESTIGATIONS

SUBPART B - GROUND WATER INVESTIGATIONS

PART 535 - LANDSCAPE ARCHITECTURE

PART 536 - STRUCTURAL ENGINEERING

SUBCHAPTER D - TECHNOLOGY

PART 530 - HYDROLOGY

SUBPART A - HYDROLOGIC INVESTIGATIONS

530.00 General.

Hydrologic investigations and analyses are essential for determining the location, quantity, timing, and availability of water resources in the planning and design of water related structures and projects, and for the project evaluation. Hydrologic investigations and analyses rely on available hydrologic data such as volumes and rates of stream flow, meteorological data such as precipitation rates and amounts, and watershed characteristics. If hydrometeorological data are inadequate, the installation of instruments for the collection of data may be necessary. Instrumentation may also be required for reservoir operation to make effective use of available storage to meet project objectives.

530.01 Available hydrologic information.

To the extent possible, available hydrologic information is to be used for planning, design, and operation of water-related structures and systems. Basic data on stream flow are available from the US Geological Survey (USGS) through its water data storage and retrieval system (WATSTORE) and the USGS homepage on the Internet. Precipitation and related climatological data are available from the National Water and Climate Center (NWCC) of NRCS and the National Climatic and Data Center (NCDC) and technical papers and reports of the National Weather Service (NWS). Other sources of hydrologic information include Agricultural Research Service (ARS); Forest Service (FS); and federal, state and local agencies having planning and/or operational responsibilities for water-related projects.

Hydrometeorological data may be found in various reports about the watershed, river basin or floodplain. These reports should be in the libraries of the various federal agencies involved in report preparation.

530.02 Hydrometeorological instrumentation.

(a) Definition. Hydrometeorological instruments include, but are not limited to, water stage recorders; devices for measuring snow depth and snow-water content; and instruments for collecting data on precipitation, soil moisture, maximum and minimum temperatures, wind direction and speed, relative humidity, evaporation, and solar radiation.

(b) Determining need. Hydrometeorological instrumentation is required for project planning if data are inadequate for making reliable estimates for project development. This requirement is particularly important for projects that include storage for irrigation or other beneficial use and for which accurate estimates of available water supply are essential to the project's performance and justification. If a statistically viable sample is needed for hydrologic analysis, a minimum of 10 years of data is required.

(c) Planning for hydrometeorological instrumentation.

(1) A plan for collecting needed hydrologic data is to be developed at the earliest possible date, consistent with project planning or project operation objectives. This plan is to include a statement of justification for the instrumentation; the type of instruments required including numbers, kind, and proposed location; a schedule for installation; and anticipated operation and maintenance costs.

(i) For planning and formulation. If additional hydrometeorological data are required for planning, instruments are to be installed as soon as practical after planning begins. Hydrometeorological instruments installed for planning may be temporary or permanent depending on their probable future usefulness.

(ii) For operation. If hydrometeorological data are required for operation, planning for hydrometeorological instrumentation is to proceed concurrently with other planning activities. The project plan is to include a justification for the instrumentation and describe the required instruments,

including numbers, kind, and location; a schedule for installation; and anticipated operation and maintenance costs. For operation and to ensure that the maximum length of record is available, hydrometeorological instruments are to be installed as soon as possible after the plan is approved.

(iii) For both planning and operation. Hydrometeorological instruments selected for planning purposes are usually as inexpensive as possible to keep planning costs to a minimum. If hydrometeorological instruments will be useful for both planning and operation, select a site that permits future installation of more sophisticated equipment and/or additional instruments at a later date, if needed.

(iv) Post project approval. Projects authorized for construction that did not include needed hydrometeorological instruments in the initial plan should be supplemented to include the needed instruments. The plan supplement should include items and details outlined in preceding paragraph (ii).

(2) In developing proposals that include hydrometeorological instrumentation, the guidelines established in Office of Management & Budget (OMB) Memorandum M-92-1, "Coordination of Water Resources Information," and Circular A-62, "Policies and Procedures for the Coordination of Federal Meteorological Services," are to be followed to avoid duplication of effort and to ensure efficiency of the data collection system. Instrumentation may be required for planning, operation, or both.

(d) Installing hydrometeorological instruments. For planning, hydrometeorological instruments are to be installed as soon as possible after planning is authorized to ensure that the maximum length of record is available.

(e) Operating and maintaining hydrometeorological instruments.

(1) Cost of operating and maintaining hydrometeorological stations used to operate the project reservoirs or other project measures are the responsibility of the sponsors. Funds are not to be used for sharing of operating and maintenance costs. Funds

may be used for instruments and for analysis of data needed for planning and designing a reservoir. These funds should be included as part of the engineering services cost of the structure. Snow survey or other appropriate federal funds may be used.

(2) If requested, and if the sponsors reimburse NRCS for the costs, NRCS can help operate and maintain hydrometeorological instruments including the collection and analysis of data. NRCS may share in operation and maintenance costs if installed hydrometeorological stations provide data used outside the project area and NRCS has responsibility to provide data.

(f) Inspection and follow up.Significant items to consider in inspection and follow up include evidence that: hydrometeorological instruments are maintained in good working order so that reliable data are obtained; data are collected and used in a timely manner according to the operating needs of the reservoir; forecast procedures are updated and accuracy improved as additional data are collected; and reservoir gates and other project features are operated so as to regulate the storage or release of water for project purposes in accordance with the operation and maintenance agreement.

(g) Funding hydrometeorological instruments. Costs of installing instruments required for project development are planning costs and should be charged to that activity. Approval to spend planning funds for hydrometeorological instruments shall be commensurate with the required type of monitoring. Influencing factors include cost and length of time monitoring will be required. If long-term monitoring is required, the likelihood of long-term funding should be considered. Requests for approval should include a description of the required instruments including numbers, kind, and location, a schedule for installation, and a statement of justification.

530.03 Hydrologic reports.

(a) Hydrologic reports provide:

(1) A record of investigations performed.

(2) Factors considered in selection of project alternatives.

(3) Information for future studies.

(4) A record of how a structure or system of structures operates under design conditions.

(b) Reports may include, but are not limited to, the following:

(1) Investigation of water supply for a water storage site.

(2) Effects of alternative systems of floodwater retarding structures on downstream discharges.

(3) Report on unusual storm or flood discharge.

(4) Report on field study of emergency spillway performance.

(5) Reservoir Operation Plans.

(6) Floodplain Management and Flood Insurance Reports.

(7) Dam breach and inundation studies for emergency action plans (EAP).

(8) Water budget analysis for wetland restoration, enhancement, and construction.

(c) Review and Approval of Reports

The preparation, review, and approval of these reports and investigations must be consistent with the job approval authority.

SUBPART B - HYDROLOGIC PROCEDURES AND CRITERIA

530.10 General.

Hydrologic procedures have been developed within NRCS to assist in the planning and design of on-farm conservation practices, including water control structures, and to solve hydrologic problems encountered in developing plans and designs for project activities. Because structure or project costs may range from several hundred to several million dollars, it is important that the most suitable hydrologic procedure be used for a particular problem. The procedure selected must provide the desired level of accuracy and complement other design procedures to ensure that the structure or project meets its functional objective. Hydrologic criteria for designing conservation practices and water control structures have been developed largely from field experience and represent minimum acceptable standards consistent with the objectives of the practice or structure.

530.11 Hydrologic procedures.

(a) Procedures in the Engineering Field Handbook, (EFH), Chapter 2, is the preferred methods for hydrologic analysis for on-farm conservation practices. It shall used unless specifically excepted by the approving engineer.

(b) Procedures in Part 630 of the Directives System and designated references are to be used for hydrologic analysis of soil and water conservation practices to the maximum extent practicable. These hydrologic procedures include Urban Hydrology for Small Watersheds (Part 728.50 formally TR-55) and Computer Program for Project Formulation - Hydrologic Investigations (Part 730.30 formally TR-20).

(c) Procedures outside the scope of the National Engineering Handbook, Section 4, Hydrology, (NEH-4) and other designated references may be used if prior approval has been obtained from the approving engineer.

530.12 Hydrologic criteria.

Hydrologic criteria established in standards and directives are to be used for designing conservation practices and water control structures. Exceptions to use of national criteria are to be obtained from the Director of the Conservation Engineering Division. Requests for such action are to include the recommendations of the approving engineer.

All engineers and technicians shall be trained in the use of NRCS hydrologic procedures needed for the planning, design, and installations of conservation measures.

PART 531 - GEOLOGY

SUBPART 531A - GEOLOGIC INVESTIGATIONS

531.00 General

Appropriate consideration of regional, local, and onsite geologic conditions is basic to sound conservation planning and engineering design in all NRCS programs. The NRCS geologist has responsibility for geologic investigations and interpretations for NRCS projects. Where state staffs lack a geologist, the state conservation engineer determines the need for and secures the services of a qualified geologist. However, depending on the needed intensity of investigation, there are conditions, as defined in this policy, under which it is appropriate for trained non-geologists to conduct site investigations.

531.01 Scope and intensity of geologic investigation

The scope and intensity of geologic investigation shall be consistent with the geologic and geomorphic complexity and stability of the site; pertinent social, economic and safety considerations; size and purpose of the structure, practice or project; kinds of construction materials to be used; and the potential for damage or loss of life if the structure or practice fails.

As a minimum, geologic investigations conducted by the NRCS shall conform to guidance in ASTM D 420, Standard Guide to Site Characterization for Engineering, Design, and Construction Purposes, to foster consistency of practice and to ensure rational, flexible planning of the investigation.

Types of geologic investigations include geologic reconnaissance, preliminary geologic investigation, detailed geologic investigation, and construction investigation (as-built).

A geologic reconnaissance described in 531.02 is required for all dam sites, and conservation practices, components of practices, or structures that involve significant ground construction activity, such as ponds, pond sealing, waste storage facilities, streambank and shoreline protection, stream channel stabilization, wetland development or restoration, and mine reclamation.

Investigations are conducted by a person holding the appropriate job-approval authority for the class of structure, as outlined in 501.04, and who is trained to recognize geologic hazards. A geologist shall conduct investigations in areas where experience or information is limited, where geologic conditions are complex or unstable; where the kinds of construction materials to be used are complex or questionable; and where the potential for damage or loss of life is high if the structure or practice fails.

531.02 Requirements for geologic reconnaissance

Geologic reconnaissance includes the collection and review of existing data; a site visit to assess engineering and geomorphic feasibility of the site; and consideration of how operation of the proposed project, structure, or practice might adversely impact local resources, particularly soil, surface waters (including the sediment-water balance), and ground water.

Before going to the field, all available pertinent technical materials, such as regional and state geologic maps, topographic maps, well logs, aerial photographs, satellite imagery, soil surveys, water quality reports, mineral resource surveys, and published and unpublished reports of the site or similar sites are reviewed.

A site visit shall be conducted to assess the engineering significance of the geologic setting, topography, site drainage, soil and rock materials, and other conditions in the area that can affect the suitability of the site for its intended use. The local physical resources in the area, including sediment, soils, surface waters, and ground water are identified, as well as offsite resources that may be impacted by project implementation. The resources are assessed in terms of the potential adverse impacts that operation of the proposed project, structure, or practice may have on them.

If the proposed structure is a dam, the reconnaissance shall include determination of whether any conditions listed in 531.25 will affect the site.

The results of the geologic reconnaissance are used to assess the need for more detailed investigation and whether additional technical expertise is needed. These needs are based on site complexity and experience of personnel in the project area. The findings, conclusions, and recommendations for additional investigation are documented as prescribed in 531.15.

Documentation includes a geologic map prepared according to 531.14. The map is filed with the geologic report.

531.03 Requirements for preliminary geologic investigations

Preliminary geologic investigation is conducted to provide sufficient information upon which reliable project cost estimates can be made in the planning phase of a project, and to determine the need for additional investigation.

All outcrops, cut banks, and other surface exposures are thoroughly inspected. Erosion conditions, landslides, seeps, springs, and other pertinent conditions in and adjacent to the watershed are examined. The information is gathered in the context of site feasibility for project implementation and engineering performance.

The need for detailed subsurface investigation must be determined. In areas of generally homogeneous soils and known geologic conditions, a detailed investigation may not be necessary for small, low-hazard structures such as farm ponds, drop structures, or chutes. For such structures, the relevant engineering characteristics of site materials and conditions need only be recognized and evaluated on the basis of experience in the area.

The investigation shall be sufficiently detailed to furnish the planning team with information for making sound preliminary designs and cost estimates.

The findings, conclusions, and recommendations for additional detailed subsurface investigations are documented as prescribed in 531.15.

A geologic evaluation map or sketch shall be included in the documentation and prepared according to 531.14. The location of all pertinent geologic features in the project area, such as rock outcrops, springs, seeps, water wells, landslides, streams, and gullies are documented.

531.04 Requirements for detailed geologic investigations

Detailed geologic investigation is conducted to provide detailed surface and subsurface information needed for sound project design, layout, construction, and safe operation of the structure or practice throughout its design life. Geologic investigations shall conform to meet all state laws and regulations.

A geologic investigation plan shall be prepared by the investigating geologist and design engineer prior to conducting a detailed investigation.

Detailed investigation includes any combination of the following:

- seismic evaluation;
- quantitative or semi-quantitative geomorphic evaluation;
- developing sediment budgets (including sediment production, transport, and yield); and
- subsurface investigation; and (5) obtaining samples for laboratory testing and performing *in situ* field tests.

All geologic conditions that may influence design, layout, construction, and safe functioning of the structure shall be investigated, characterized, and documented. Documentation shall include a geologic map prepared according to 531.14 and a geologic report that conforms to 531.15.
The tools used in subsurface investigation vary from site to site depending on local conditions, and may include geophysical surveys, such as electromagnetic, ground penetrating radar, and seismic refraction or reflection; power equipment, such as core drills, backhoes, bulldozers, and augers; cone penetrometers; and hand tools. The results of all geophysical surveys shall be verified by penetrative exploration or correlation with nearby outcrops and other physical features.

Seepage potential of the permanent pool area and dam site of water holding reservoir sites shall be evaluated.

Exploratory bore holes shall be not be left uncovered overnight. At completion of the investigation, all test pits, exploratory bore holes, and trenches are back filled in such a manner as to protect ground water quality and to remove the physical hazard to people, animals, and machinery.

531.05 Requirements for geologic investigation during construction and project implementation

Geologic investigation shall be conducted during construction and the project implementation phase on all Group I dams as defined in 531.20 to verify all assumptions and interpretations made in previous investigations and to identify differing conditions that may impact the long term performance of the structure. Differing geologic conditions that require design modification shall be documented in the as-built records.

If an unanticipated geologic condition that requires design modification is encountered during construction of any NRCS project, structure, practice, or component, the responsible field person shall notify and apprise the state conservation engineer as soon as possible. The state conservation engineer shall determine the need for and secure the services of a qualified geologist to conduct a site visit to assess the encountered geologic condition and provide interpretations and technical support for design or installation changes.

531.06 Geologic investigations of existing structures:

(a) Repair and rehabilitation

Engineering structures and practices requiring repair or rehabilitation may need additional geologic information to support design changes that may result from a change to a higher structure class, changes in criteria or standards, or a lack of specific information in the area of interest.

The determination of the adequacy of available geologic information is conducted as part of the design review process, explained in 501.05. The design engineer and geologist shall jointly determine the need for a geologic plan of investigation based on the results of the review.

Policies provided in Subpart B - Dam Site Investigations, and Subpart D - Erosion and Sedimentation Investigations, apply for geologic investigations for repair or rehabilitation of engineering structures and practices. Geologic information is gathered to address

- the needs for sound engineering design and
- the potential impacts on applicable local physical resources, including soil quality, sediment quality, ground water and surface water quality, and stream channel stability.

Investigations of impoundment structures and practices shall address the sediment pool in terms of:

- The location, type, and quality of sediment that will be affected by rehabilitation measures.
- The location, type, and quality of sediment that will be exposed to erosion and
- downstream transport.
- The location, type, and quality of sediment that will be dredged or excavated to reclaim designed water or sediment storage.
- The effects of changes in the sediment-water balance on the geomorphic stability of the stream channel downstream of the site.

The geologic report is filed with the engineering records for the repaired or rehabilitated structure or practice.

(b) Geologic investigations for decommissioning of structures

Engineering structures and practices selected for decommissioning may involve the complete or partial removal of a structure, or a change in its original design function.

The determination of the adequacy of available geologic information is conducted as part of the design review process, explained in 501.05. The design engineer and geologist shall jointly determine the need for a geologic plan of investigation based on the results of the review.

Policies provided in Subpart B - Dam Site Investigations, and Subpart D - Erosion and Sedimentation Investigations, apply for geologic investigations for decommissioning of engineering structures and practices. Geologic information is gathered to address:

- the needs for sound engineering design and
- the potential impacts on applicable local physical resources, including soil quality, sediment quality, ground water and surface water quality, and stream channel stability.

Investigations of impoundment structures and practices selected for decommissioning shall address the sediment pool in terms of:

- The location, type, and quality of sediment that will be affected by decommissioning measures.
- The location, type, and quality of sediment that will be exposed to erosion and downstream transport.
- The location, type, and quality of sediment that will be dredged or excavated.
- The effects of changes in the sediment-water balance on the geomorphic stability of the stream channel downstream of the site.

The geologic report is filed with the engineering records for the decommissioned structure or practice.

531.07 Cultural and scientific resources discovered at site

Materials discovered during site investigation or construction that may have historical, archeological, cultural, or scientific significance or value, are reported according to policy contained in GM-420, Part 401, Cultural Resources (Archeological and Historical Properties).

531.08 Erosion, sediment, and pollution control during site investigations

Criteria for erosion, sediment, and pollution control contained in 520.01 apply during geologic site investigations.

531.09 Classification of earth (geologic) materials

(a) Soil

Soil material shall be classified in the field according to the Unified Soil Classification System, ASTM D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Samples for laboratory testing and analysis are classified according to ASTM D 2487, Standard Test Method for Classification of Soils for Engineering Purposes, as explained in 533.01.

(b) Rock

Rock material is classified by common rock type names according to a simplified geologic scheme, such as NEH Part 628, Chapter 52, table 52-1. Rock used for specific engineering purposes in NRCS work is classified by TR-71, Rock Material Field Classification System.

(c) Transitional materials

Earth material that is transitional between soil and rock is classified by its genetic category and unconfined compressive strength. Strength is estimated in the field by hardness tests given in NEH Part 628, Chapter 52, tables 52-2, 52-3, and 52-4. Transitional material that can be classified by criteria in ASTM D 2488 is considered soil for classification purposes.

531.10 Logging soil and rock

Field logs and documentation of geologic investigations should conform to guidance in ASTM D 5434, Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock; and ASTM D 2113, Standard Practice for Diamond Core Drilling for Site Investigation.

531.11 Preserving, transporting, and storing soil and rock samples

Requirements conform to ASTM D 4220, Standard Practices for Preserving and Transporting Soil Samples; ASTM D 5079, Standard Practices for Preserving and Transporting Rock Core Samples; and ASTM D 2113, Standard Practice for Diamond Core Drilling for Site Investigation.

All rock cores are labeled and photographed according to ASTM D 5079 and ENG Geology Note 5. Photographs are annotated and filed with the project design folder. Policy provided in 533.11, Soil Mechanics Data Collection, applies during geologic investigation.

531.12 Disposition of soil and rock samples

The storage and maintenance of soil and rock samples cannot be continued indefinitely. However, their engineering significance and replacement costs need to be carefully considered prior to disposal.

Soil samples stored at project locations for purposes of site showings and material classification may be disposed of after completion of the construction contract.

Rock core stored at project locations for purposes of site showings and material classification may be disposed of after photographic documentation and logging of the core are completed or after completion of the construction contract.

Soil and rock samples tested at NRCS facilities may be disposed of at the discretion of the facility.

For sites with special construction or material problems, the submitting NRCS office may request the testing facility to hold the samples for a specified period. Such samples are disposed of by the facility with the concurrence of the submitting office. All soil and rock samples are stored and discarded in compliance with all applicable pest control regulations, as explained in 531.13.

Before soil samples and rock cores are discarded, they may be offered to a state geological survey or geological repository; school, college, or university geology, engineering, archaeology, or anthropology department; or any interested civil or cultural organization.

531.13 Quarantines on movement of soil samples, and soil sampling and moving equipment.

Soil movement regulations are designed to stop the human-assisted spread of agricultural pests, such as imported fire ant, corn cyst nematode, golden nematode, witchweed, and Mexican Fruit Fly. The shipping or transport of all soil samples and soil moving equipment under any NRCS activity or program shall conform to regulations of the Animal and Plant Health Inspection Service (APHIS), USDA.

Soil samples from regulated areas, shall be shipped only to USDA approved facilities for processing, testing, or analysis. The current list of regulated areas is available from APHIS:

US Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine Programs, Permit Unit
4700 River Road
Riverdale, MD 20737
Telephone 301-734-8896
Internet Location: Http://www.aphis.usda.gov

Soil samples from regulated areas are not sent or transported to any facility without first determining whether the receiving facility is approved by APHIS. The following NRCS facilities are approved by APHIS to receive soil samples:

National Soil Mechanics Center (NSMC) - Lincoln, NE
NSMC - Ft. Worth, TX
National Soil Survey Center - Lincoln, NE

The NSMC, Lincoln, NE is the only NRCS facility that accepts Pacific Basin and foreign soil materials.

Private facilities shall apply to the appropriate APHIS headquarters for approval in order to receive NRCS soil samples.

Land owners and operators who receive NRCS technical assistance but ship their own soil samples to private facilities must be informed of these regulations.

(a) Packaging

All soil samples from regulated areas must be shipped so that no spillage or breakage occurs in transit. Undisturbed samples in moisture-proof containers may be shipped in the usual manner. Other samples must be shipped in containers that resist tearing and puncturing. Canvas bags inside wooden or metal boxes are most desirable. Small samples may be shipped inside heavy plastic bags inside strong canvas bags, each tied separately and securely.

Soil samples taken from below a depth of 3 ft in regulated areas may be shipped as UNREGULATED samples if care is taken not to contaminate them while collecting and preparing them for shipment. If there is any question of contamination, ship as REGULATED.

(b) Labeling of samples. All samples shall be labeled with the following information: date of sample, project location (project name, county, state) depth interval of sample, sampling location number, name of securing sample.

(c) Shipment. The exterior of each shipping carton containing regulated soil samples must be clearly marked CONTENTS: SOIL SAMPLES.

(1) Domestic samples. Each sample is identified by stamping or printing the word REGULATED in red on both the inside and outside tags. Samples sent to the National Soil Mechanics Center Labs shall be identified as REGULATED on Form NRCS-ENG-534, Soil Sample List, and Form NRCS-ENG-356, Request for Soil Mechanics Laboratory Test.

(2) Overseas samples. All soil samples from any foreign source, offshore possession, or Hawaii shall be shipped under permit. Form PPQ-525 is required and is obtained from APHIS (address given in 321.14 above)

(d) Equipment used to sample or move soil

Equipment and hand tools used to collect soil samples in regulated areas shall be thoroughly cleaned of all soil residues at the collection site before removal to unregulated areas.

Soil-moving equipment being moved from regulated areas to unregulated areas shall be cleaned of all soil residues at the work site from which it is being moved. These regulations shall apply to NRCS-owned and operated equipment, as well as to the tools and equipment of drilling and earth-moving contractors.

Contractors shall be advised of quarantine requirements through the applicable clause in bid notifications and contracts as covered under GENERAL or SPECIAL PROVISIONS.

(e) Regulated counties and APHIS district offices

Contact APHIS (address above) for the current list of counties under Federal domestic plant quarantine, including address and phone number of APHIS headquarters in each state.

531.14 Geologic maps

An engineering geologic map is drawn to identify and spatially represent zones of geologic material that meet similar engineering performance criteria. In some cases, a geomorphic map, showing landforms, slope stability, and topography is appropriate. The map shows the locations of all measurements, samples, or observations, as well as the data collected. Supplements may include structural contour maps showing elevations on geologic contacts, tops of key beds, or other surfaces of interest; and isopach maps showing contoured thickness of a mapped unit. Cross-sections, profiles, fence diagrams, columnar sections, perspective drawings, and other illustrations may be used to represent geologic features.

A geologic evaluation map is a plan view diagram or drawing, representing a given area, depicting the orientation and location of key geologic and related features that could significantly affect the performance of a proposed or existing structure or practice. It may include profiles, cross-sections, or other supplemental figures to help illustrate the information. A geologic evaluation map is used to support planning documents, such as an environmental assessment or environmental impact statement.

Maps are prepared on the best available topographic base map or aerial photograph using standard signs and symbols, at a chosen scale and projection. Plane table, air photo, GPS, and conventional surveying techniques may be applied to develop a detailed geologic map.

For small structures at low hazard sites, a site sketch is considered adequate. A site sketch is drawn free-hand from observation or uncontrolled surveys showing only approximate space, scale, and orientation relationships of the main features of an area.

The accuracy and scale of a map shall be commensurate with the scope of the project and complexity of the site.

Maps drawn to scale include a graphic scale and a verbal statement using different units such as 1 inch equals 1 mile or a representative fraction such as 1:200. Maps with exaggerated vertical scales are explained with a verbal statement such as, vertical scale 10x horizontal scale.

All maps and sketches shall include a key to symbols used and a north arrow.

531.15 Geologic reports

All geologic reports of investigation are prepared, signed, and dated by the investigating geologist or person holding the appropriate engineering job-approval authority for the class of structure, as outlined in 501.04.

The general outline and contents of the report should conform to guidance presented in ASTM D 420. As a minimum, the report shall include the following headings.

Location of the area investigated. The location is given in terms pertinent to the project, and may include maps, sketches, and photographs on which test pits, bore holes, and sample areas are plotted.

Procedures. This section includes a description of the investigating procedures used, including field and laboratory testing.

Factual findings. Factual findings are clearly separated from interpretations of results. All borings and test hole logs, graphic presentation of geophysical measurements, and laboratory test results are presented. Cross sections presented with basic data from the investigation are limited to the ground surface profile and factual subsurface data obtained at specific exploration locations. Stratigraphic units between locations of intrusive locations are indicated on cross sections only if supported by continuous geophysical profiles. Cross sections that show interpretive information, such as correlation lines between locations of intrusive explorations, shall be presented separately from factual findings, and supported by explanatory notes. Potential contractors shall be provided only with factual findings.

Interpretation of results. This section includes appropriate recommendations and disclaimers for the use of the report. Recommendations for design parameters are subject to restrictions imposed by state licensing law, and shall be made only by professional engineers and geologists specializing in the field of geotechnical engineering and familiar with the purpose, conditions, and requirements of the study.

Geologic terms and symbols not specifically defined in NRCS literature shall conform to ASTM D 653, Standard Terminology Relating to Soil, Rock, and Contained Fluids; the American Geological Institute (AGI) Glossary of Geology; or current AGI Data Sheets.

531.16 Resource planning investigations and reports

In support of the conservation, development, and management of physical natural resources in Service programs, the NRCS geologist shall be responsible for:

- Providing information pertinent to resource issues of concern such as topography, soils, erosion, sedimentation, drainage, ground water quality, ground water quantity, geomorphology, geologic hazards, and mineral resources. Geologic evaluation maps are prepared as part of the documentation process.
- Determining location, quantity, suitability, and excavation characteristics of potential sand, gravel, and quarry rock resources within a project area (ASTM D 4992 provides guidance on field examination).
- Cooperating with other technical specialists and planners in locating, mapping, and documenting undeveloped geologic resources within the project area to avoid their damage, contamination, and destruction by project activities.
- Assisting in the preparation of the geology sections of soil survey reports. The geologist supports soil survey activities as explained in 533.22.
- Identifying geologic resources within a project area, including ground water, building stone, sand and gravel deposits, quarry stone, and related geologic materials.
- Identifying the potential for geologic attractions that may have scenic, educational, scientific, or similar intangible values.

SUBPART 531B - DAM SITE INVESTIGATIONS

531.20 Classification of dam sites for geologic investigation

To establish criteria for geologic investigation and sampling, dam sites are categorized into two groups according to the fill height of the structure, construction materials, purpose of structure, and structure class.

Group I dam sites include:

- All structure class c dams.
- All structure class b dams.
- All structure class a dams with a maximum fill height equal to or greater than 35 feet, as measured from low point on centerline.
- All structures greater than 20 ft high of the following types: concrete or masonry arch or gravity dams, drop spillways, box-inlet drop spillways, and chutes.
- All dams with a maximum fill height equal to or greater than 20 feet, as measured from low point on centerline, where the principal purpose is forming storage reservoirs for recreation, municipal water supply, or irrigation and where the product of the storage (ac-ft) times the height (ft) of the dam is equal to or greater than 3,000.

Group II dam sites include all other types of dams that do not classify as Group I, such as embankment structures of Conservation Practice Standards 378, Pond; Waste Storage Facility, 313; and Grade Stabilization Structure, 410.

531.21 Requirements for geologic investigation of Group I dam sites

All preliminary, detailed, and construction (as-built) site investigations shall be conducted under the supervision of a qualified geologist.

A qualified geologist is defined as an individual who meets the minimum requirements for the practice of geology as defined by the State Board of Registration of the state in which the individual resides. In the absence of state registration requirements or a state definition of geologist for the practice of geology, a qualified geologist shall meet the requirements for the title of Certified Professional Geologist, as defined by the American Institute of Professional Geologists.

Subsurface exploration shall be of sufficient intensity to determine all conditions that can influence the design, layout, construction, and functioning of the proposed structure.

Before the investigation is completed, the geologist, the engineer designated for soil mechanics leadership, and the design engineer shall jointly review the findings of the investigation to determine the adequacy of the sampling program for testing. The data are reviewed for adequacy for use in all stages of design and construction.

An engineering geologic map of the site shall be prepared according to 531.14.

All soil and rock units shall be characterized beneath the entire base of the structure and abutments. For all earth fill dams in Group I, borings at all stations within the footprint of the structure shall be extended to depths equal to or greater than the equivalent proposed height of fill associated with the points of boring, or to hard, massive, unaltered rock or similar limiting layer. Borings shall be extended deep enough into rock to establish whether it is *in situ*.

For all concrete dams, borings shall extend to depths equivalent to at least 1.5 times the proposed effective height of the dam as measured from the maximum proposed depth of excavation.

All geologic materials and features with engineering significance at or near the site are characterized, documented, and assessed according to current industry standards. Characterization includes classification and determination of material properties and mass properties, especially stratigraphic and structural discontinuities, such as faults, joints, and fractures with engineering significance.

Sufficient borings are made along the proposed centerlines of drop inlets or other conduits to provide correlation of geologic materials from the riser to the outlet and to a depth equal to the zone of influence of the structure.

Sufficient borings are made along the proposed centerline of dams to provide correlation of geologic materials and to define the rock surface profile.

At least one bore hole is placed at the riser, at the intersection of the centerlines of the dam and conduit, and at the outlet.

Delineate the incompressible rock surface where it occurs within the depth of influence of the structure.

Locate earth material proposed for use as fill and determine its quantity and engineering suitability using appropriate soil mechanics tests, as needed.

Determine the depth to ground water, seasonal variation of water table, and extent and character of aquifers within the zone of influence of the structure.

Evaluate the need for controlling ground water during construction and determine the need for controlling moisture content in borrow material.

Evaluate whether economic mineral deposits, including sand and gravel, occur within the area of influence, or would be preempted or otherwise impacted by the project.

Evaluate excavation characteristics of materials in proposed open spillway cuts.

Assess the influence of rock mass properties on the slope stability of rock materials in the spillway cut slopes.

Investigate earth auxiliary spillways according to 531.25 d.

Evaluate the need for hydraulic pressure testing in rock foundations and abutments of proposed dams for water storage reservoirs.

531.22 Requirements for geologic investigation during construction of all Group I dam sites.

Requirements for geologic investigation during construction and project implementation, explained in 531.05, apply to all Group I dam sites.

A geologic investigation is conducted by a geologist during construction of all Group I dam sites, defined in 531.20. Throughout construction the project engineer shall notify the geologist as geologic materials become exposed during excavation of pipeline trenches, structure foundations, core trenches, auxiliary spillway cuts, and borrow areas. The geologist shall visit the site as often as necessary to assess the engineering significance of all differing conditions encountered during construction excavation.

The geologist shall prepare an as-built geologic report. All findings and interpretations that differ from those reported in previous geologic investigations shall be identified and explained. Differing conditions with engineering and geomorphic significance are, to the extent possible, measured and assessed in the field, and documented in the report. The report shall include logs, cross-sections, engineering geologic maps, and photographs, as needed, to support the documentation. Maps and report shall conform to 531.14 and 531.15, respectively. The report is filed as a supplement to the engineering design folder of the project (explained in 512.52 b).

Documentation includes revising as-built drawings, geologic maps, and structure sections prepared in earlier investigations. The documentation process may include photographic or video recordings, hand sketches, or supplemental topographic or GPS surveys, as appropriate.

531.23 Requirements for geologic investigation of Group II Dam Sites

Requirements for geologic investigation are determined by a person holding the appropriate job-approval authority for the class of structure, as outlined in 501.04, and who is trained to recognize geologic hazards. A geologist is consulted in areas where experience or information is limited, or geologic conditions are complex.

531.24 Requirements for logging soil and rock at Group I dam sites

(a) All Group I dam sites for sampling soil and rock at all Group I dam sites:

- Representative samples are obtained for classification purposes of all geologic materials identified in the foundation, borrow, relief well, principal spillway, and auxiliary spillway areas.

- Undisturbed samples for shear tests are obtained from all strata of fine grained soils of questionable stability in the foundation within a depth equivalent to one-half the maximum fill height of the dam, as measured from low point on centerline.

(b) All Group I dam sites that have permanent storage. For all Group I dam sites in which storage other than sediment pool storage is to be incorporated into the design and in which significant leakage is suspected:

- Samples are obtained of materials underlying the permanent pool area to determine reservoir sealing requirements.

(c) Structure class a, b, and c dam sites. For all structure class a dam site that have a maximum fill height equal to or greater than 35 ft, and for all structure class b and c dam sites:

- Samples for compaction and shear tests are obtained from the borrow areas and auxiliary spillway areas.
- Undisturbed samples for consolidation tests are obtained of all compressible fine grained materials from the foundation within a depth equivalent to the maximum height of the dam (as measured from low point on centerline). If compressible materials are suspected to occur at greater depths, drilling and sampling of the compressible materials are conducted to depths within the zone of influence.

(d) Group I dam sites that have a maximum fill height greater than 20 ft Undisturbed samples for compaction tests are obtained for all materials of questionable shear strength, such as soft clays and soft silts, in the foundation of the dam.

(e) Other Group I dam sites for any other type of Group I dam site not listed in 521 (a-d):

- Samples for compaction tests are obtained from borrow and auxiliary spillway areas if information and experience in the area are inadequate to conclusively predict the engineering behavior of the materials.

531.25 Requirements for logging soil and rock at Group II dam sites

For all Group II dam sites, samples are not required if adequate information and experience in the area are available. If such information and experience are unavailable or if questionable conditions occur, sampling is conducted the same as for Group I dam sites.

531.26 Conditions that require investigation for all dam sites

A geologic investigation is required if any of the following conditions occur, regardless of dam site classification. The intensity of investigation explained in 531.01 and detail of the report shall be consistent with the structure class of the dam, complexity of site geology, and data needed for design.

(a) Seismic Assessment. All dams in seismic zones 3 and 4, Alaska, Puerto Rico, Virgin Islands, and Hawaii, and all structure class c dams in seismic zone 2 require special investigations to determine liquefaction potential of cohesionless strata, including very thin layers, and the presence at the site of any faults determined to be active in Holocene time. The potential for earthquake induced seiches of the reservoir pool shall be evaluated. A map shall be prepared indicating the location of all intensity V or magnitude 4 or greater earthquakes of record, and any historically active faults within a 100 km (65 mi) radius of the site. The geologic report also shall summarize any other possible earthquake hazards, such as ground compaction, landslides, and excessive shaking of unconsolidated materials. For slope stability analysis, earthquake information, including acceleration, duration, and recurrence interval, is collected from the US Geological Survey

(USGS internet address is http://www-nmd.usgs.gov). Seismic hazard maps for certain regions are available in printout form by contacting:

National Geophysical Data Center
NOAA, Mail Code E/GC
325 Broadway,
Boulder, CO 80303
Telephone (303) 497-6215
Internet Address: info@ngdc.noaa.gov

(b) Subsidence. Assess the potential for ground surface subsidence caused by past or future extraction of solid minerals or fluids, including ground water and natural gas.

(c) Collapsible Soils. Evaluate the potential for collapse upon saturation or wetting of certain unconsolidated materials associated with deposits such as, alluvial fans, terraces, and eolian materials in arid and semiarid regions. If the potential exists, investigate and conduct appropriate sampling for laboratory analysis to provide quantitative information for design and construction.

(d) Earth Spillways. For all Group I dams as defined in 531.20, the geologist provides specific geologic information to the design engineer for the stability analysis and integrity analysis of auxiliary spillways, as explained in NEH Part 628, Chapters 50 (Earth Spillway Design) and 51 (Earth Spillway Erosion Model, SITES program). All earth materials occurring beneath the spillway down to the elevation of the flood plain are mapped by the headcut erodibility index according to NEH Part 628, Chapter 52, Field Procedures Guide for the Headcut Erodibility Index. The investigation shall be sufficiently detailed to provide all input parameters for the index, and shall include a plan view map and longitudinal sections. The investigating geologist and responsible engineer jointly determine the engineering significance of all material that has a headcut erodibility index less than or equal to 10.

(e) Mass Movements. Assess landslides and landslide potential at dam and reservoir sites and summarize the history of mass movements in the project area.

(f) Karst Areas. Evaluate limestone, dolomite, gypsum, and other soluble rocks at dam and reservoir sites for subsidence potential and leakage potential.

(g) Multipurpose Dams. Evaluate the ground water regime and hydraulic characteristics of the entire reservoir area of water storage dams to determine leakage potential and the need for reservoir sealing.

(h) Other. Evaluate other geologic conditions or materials that have engineering significance. These include, but are not limited to, dispersive soil; soil containing highly soluble sodium salts; expansive soil; gypsiferous soil; soil that has vertic properties; gap-graded soil, sensitive clay; highly compressible soil; pyritic shale; fissile shale; stress relief and rebound joints; and shallow artesian ground water.

531.27 Investigation of water storage reservoir sites

Geologic investigation shall be conducted in the proposed reservoir area, abutments, and embankment foundation to evaluate leakage potential.

Evaluate anticipated changes in the ground water regime with respect to the intended function of the structure.

Evaluate potential effects, including damages, of seepage from a reservoir on lands adjacent to or downstream from the structure.

531.28 Dams subject to deep subsidence

Special investigations are required for the planning and design of dams and spillways subject to deep foundation subsidence that can result from collapse of underground mines, or extraction of fluids, such as water, oil, and natural gas from beneath the Earth's surface. The required foundation supports established in this subpart are essential to the design of safe embankments.

This policy applies where foundation subsidence is or could be a threat to the safety of all structure class b and c dams and all class a dams for which the product of storage (ac-ft) times effective height (ft) of dam is greater than 3,000.

(a) Geologic formations containing layered mineral deposits

At all dam sites underlain by layered mineral deposits that may be mined in the future, certain minimum foundation support shall be provided for earth embankments and associated spillways. Provision for such support may be accomplished through fee simple title or subordination agreements that insure the legal right to:

- Prevent the development or removal of such minerals from unmined areas that would cause subsidence of the structure, or
- Preserve or build and maintain adequate support to ensure against future subsidence of the structure foundation for mined areas.

At the ground surface, surface and subsurface landrights shall encompass an area that extends outward beyond the base of the dam a horizontal distance equivalent to the depth of the deepest mineral deposit below ground surface. This requirement may be modified as a result of a detailed site specific study by, and at the consequent recommendation of, a qualified consulting mining engineer.

Fee simple title or subordination agreements may or may not be required for the area of the reservoir upstream of the dam that is beyond the area required for the stability of the dam. The need for the legal right to control the mining of the reservoir area depends on the following types of evaluation:

- An evaluation by the sponsors or owners of their possible liability for damage to:
  - the mine or mining operation caused by flooding, increased pumping costs, a reduction in amount of the mineral that can be removed, or other possible damage; or
  - surface areas and improvements on the periphery of the reservoir that may subside and thereby suffer increased damage, such as, from inundation or increased flood flow in inlet channels.

If any of the problems listed above occur, NRCS will advise the sponsors or owners in writing to:

- Seek legal counsel and a qualified mining engineer to help determine the extent of the risk the sponsors or owners should assume;
- Consider purchasing necessary landrights to protect against possible damage suits;
- Consider the feasibility of taking easements to an elevation higher than normal by an amount equal to or greater than the anticipated subsidence. NRCS shall make available to the sponsors or owners all of its data pertinent to the subsidence problem and the proposed dam.

(b) Geologic formations containing fluids

During the planning phase of projects involving dams to be designed and constructed under NRCS programs, a geologist shall determine whether removal of fluids such as petroleum, water, and natural gas could impact the design, function, and safety of the dams, particularly by abrupt differential settlement. The geologist shall provide recommendations to the design engineer on identified geologic concerns that need to be addressed in the operations and management plan for the structure. Subordination of mineral rights within a limited area at the site does not necessarily prevent subsidence of the structure.

If studies indicate that the predicted subsidence cannot be remedied, the site shall be abandoned.

SUBPART C - HYDROGEOLOGIC INVESTIGATIONS

531.30 General

Appropriate consideration of project hydrogeology is essential in the conservation planning, development, operation, and maintenance phases of many NRCS programs. Investigations for the development of ground water resources, the management of ground water quality, and engineering control or management of underground water are conducted under the supervision of the NRCS geologist and coordinated with other disciplines, as appropriate. Depending on the needed intensity of investigation and complexity of the site, there are conditions, as defined in this policy, under which it is appropriate for a person holding appropriate engineering job-approval authority for the class of structure, as explained in 501.4, to conduct site investigations.

531.31 Investigations for ground water resources development

Technical guidance for ground water development is contained in NEH 18, Ground Water; NEH 631.33, Investigations for Ground Water Resources Development; EFH, Chapter 12, Springs and Wells, Ground Water Manual (Bureau of Reclamation, 2nd ed., 1995). Other methods not described in these references may be considered at the discretion of the investigating geologist.

The NRCS geologist has responsibility for the following types of investigations and evaluations:

- Evaluating ground water development potential of aquifers.
- Conducting ground water budget analyses in watersheds and evaluating ground water overdraft potential.
- Evaluating ground water quantity, quality, and geologic factors that influence design and construction of production wells, and well head protection measures.
- Estimating ground water consumption or demand in watersheds.
- Evaluating potential for underground disposal of surface waters.
- Evaluating potential for conjunctive use of ground water with surface water supplies.
- Determining aquifer boundary conditions and potential for well interference.
- Determining aquifer recharge potential.

531.32 Investigations for ground water quality management

Guidance on ground water quality investigations is in NEH 651, Agricultural Waste Management Field Handbook.

The NRCS geologist has responsibility for the following types of investigations and evaluations to provide sufficient information for planning or design:

- Aquifer restoration or enhancement.
- Location, construction, rehabilitation, decommissioning, and problem investigations of water wells.
- Ground water pollution potential relative to agricultural point and nonpoint sources.
- Potential for ground water pollution by components of agricultural waste management systems.
- Influence of karst terrace on construction and performance of conservation practices and structures.
- Well head protection zones.
- Areas having ground water recharge potential.
- Location of ground water divides and delimiting recharge areas in karst terrane and other highly pervious geologic materials.
- Saline seeps.
- Saltwater intrusion.

531.33 Ground water investigations for conservation engineering

The NRCS person holding the appropriate engineering job-approval authority for the class of structure, as outlined in 501.04, is responsible for conducting the following types of investigations and evaluations to provide sufficient information in the planning or design phases of a project:

- Investigations for controlling the water table with respect to:
  - agricultural drainage and irrigation water management activities;
  - engineering drainage for excavation de-watering of foundations, borrow areas, quarries, buildings, and mines;
  - seepage evaluations for blankets, drains, filters, and grouting;
  - engineering subdrainage for slope stability.

Technical guidance for investigation of the water table are in EFM Chapter 14, Drainage; NEH 16, Drainage.

A geologist is responsible for:

- Evaluating engineering performance of conservation practices or components by employing ground water quality monitoring, sampling, and testing methods, practices, or geophysical techniques according to current standards in:
  - ASTM, Section 04, Construction, Volumes 04.08 and 04.09 on Soil and Rock;
  - ASTM, Section 11, Water and Environmental Technology, Volumes 11.01 and 11.02 on Water.
- Investigations for the treatment or remediation of sinkholes and other karst
- features.
- Evaluating ground subsidence associated with ground water withdrawal.

SUBPART 531D – GEOMORPHIC, EROSION, AND SEDIMENTATION INVESTIGATIONS

531.40 General

Appropriate consideration of geomorphic processes, including sediment production, transport, and deposition, is essential to sound natural resources conservation planning and engineering. It also is essential to the proper installation and performance of many conservation practices and structures. The effects of natural and anthropogenic sources of erosion and sedimentation, both onsite and offsite, are assessed in all NRCS programs. Geomorphic processes and their impacts on resource conservation activities that are assessed by the geologist include, but are not limited to:

- Sediment storage design for reservoirs and ponds
- Sediment yield and sediment budgets of watersheds
- Reservoir sedimentation
- Surface water quality degradation by sediment
- Structural deficiencies caused by sedimentation and erosion
- Stream channel and stream corridor function including erosion and deposition
- Evaluation of rock for erosion control.

531.41 Responsibility for erosion and sedimentation investigations

The state conservationist is responsible for ensuring that interdisciplinary study teams include specialists for the geomorphic issues under consideration.

A qualified geologist is responsible for the survey, and analysis and interpretation of data related to geomorphic processes. These processes include detachment, transport, deposition, consolidation, cementation, and lithification of soil and rock particles.

Because of the complexity of geomorphic processes, particularly those pertaining to sedimentation and erosion, many modern field procedures and predictive

models are still under development or refinement. Sound technical judgment, therefore, is requisite in the consideration of process relationships, the selection of field techniques to be used in studies, and the formulation of hypotheses.

The NRCS geologist shall, in collaboration with related technical specialists, develop supplemental guidelines and geomorphology field procedures consistent with the state's needs, as determined by the state conservation engineer.

531.42 Sediment storage design for reservoirs and ponds

Design criteria for the allocation of sediment storage in all reservoirs impounded by Group I dams as defined in 531.20, shall be determined by a geologist. For Group II sites, the determinations may be made by others who have been trained by a qualified geologist in recognizing and evaluating the effects of sedimentation on pond performance. A specialist with expertise in sedimentation is consulted for Group II dams with complex sedimentation problems or for Group II sites where data are to be applied to another area or site.

Methods to be used are provided in NEH-3, Ch. 8, Sediment --Storage Design and Criteria. These methods include the gross erosion/sediment delivery ratio, measurement of sediment in similar ponds and reservoirs, suspended load records of gauged streams, and direct predictive equations. Other methods not described in NEH-3 may be considered at the discretion of the investigating geologist.

Reservoir trap efficiency is calculated using procedures outlined in NEH-3, Ch. 8. Other methods not described in NEH-3 may be considered at the discretion of the investigating geologist.

531.43 Watershed sediment yield studies

Watershed sediment yield and sediment budget studies are conducted to evaluate the effectiveness of land treatment and structural measures in reducing erosion and sediment yield in the treated area. They also are conducted to provide basic data for planning and design of soil and water conservation measures.

Methods for determining watershed sediment yield are provided in NEH-3, Ch. 8. Other methods not described in NEH-3 may be considered at the discretion of the investigating geologist.

531.44 Reservoir sedimentation surveys

Reservoir sedimentation surveys are conducted on selected reservoirs for specific purposes determined by the state conservation engineer.

Sedimentation surveys for Conservation Practice Standard 378, Pond, are conducted by personnel trained in sedimentation surveys. Sedimentation surveys for Conservation Practice Standard 402, Dams, are conducted by a geologist.

Sedimentation surveys conform to procedures in NEH-3, Chapter 7, Field Investigations and Surveys. Other proven methods are used at the discretion of the investigating geologist. The data collection format conforms to ASTM D 4581, Standard Guide for Measurement of Morphologic Characteristics of Surface Water Bodies.

Reports for each reservoir sedimentation survey are prepared according to requirements in NEH-3, Chapter 7, and are filed at the state office with a copy sent to the Director, CED.

The report includes data on watershed conditions that affect sediment yield, for examples, soils, surface geology, topography and land forms, land use and treatment, and all types of significant erosion. The report includes information about land use management changes through time in the contributing watershed.

The state conservation engineer is responsible for the technical adequacy of the report.

531.45 Sedimentation investigations related to quality of surface waters

A qualified geologist is responsible for the development of sediment budgets that identify sources and sinks and allocate sediment by sources. Sediment budgets identify sediment particle size ranges by source. Problem identification is specific as to the sediment particle sizes causing problems.

Water quality standards as they pertain to turbidity have been established by the states for interstate and coastal waters under provisions of the Water Quality Act of 1965.

Related policy on sedimentation as it pertains to surface water quality is contained in USDA nonpoint source water quality policy, Department Regulation 9500-7 (460-GM, Apr. 1987).

Guidelines and standards for investigating, analyzing, and evaluating sediment as related to quality of surface waters are provided in consensus industry sources, including:

- National Handbook of Recommended Methods for Water-data Acquisition, and
- ASTM, Section 11--Water and Environmental Technology, Volumes 11.01 and 11.02 on Water.

Other pollutants associated with sediment-related water quality are investigated, analyzed, and evaluated by a specialist that has appropriate expertise.

The state conservation engineer collaborates with other technical disciplines and is responsible for developing supplemental guidelines and field procedures consistent with program needs of the state.

531.46 Investigation of structural problems caused by sedimentation or erosion

Policy contained in 504, Subpart A provides requirements for investigation of structural problems caused by sedimentation and erosion, and provides for committee assignments; procedures; and engineering reports.

If sediment accumulation in a pond, reservoir, or other sediment retaining structure appears to significantly exceed the design rate and may result in functional limitation during its design life, a sedimentation investigation is conducted at the discretion of the state conservation engineer. The investigation addresses the extent of the problem and causes of the increased sedimentation rate, and outlines possible solutions.

A sedimentation study is part of investigations made of structural problems caused wholly, or in part, by channel instability as presented in 531.47.

531.47 Geologic investigation of sedimentation and erosion processes in the stream channel and stream corridor

Geologic investigations may include analyzing sediment transport capacity of the channel, determining change in transport capacity caused by the planned modification, and determining bedload sediment sources. Stream channel investigations may consider the dimension, pattern, profile and other pertinent geomorphic factors of the stream, as well as activities in the watershed that can affect sediment supply and subsequent stream channel behavior and stability.

Investigations are conducted under the supervision of a qualified geologist. Investigations consist of logging, mapping, sampling, testing, and analysis of bed and bank material, and collection of specific fluvial geomorphic data according to policy contained in Subpart A - Geologic Investigations.

Intensity of investigation shall conform to policy outlined in 531.01. Stream channel classification, analyses, and interpretations for predicting the behavior of the channel and riparian area that have alternative designs take into full consideration fundamental principles and modern theories of fluvial geomorphology. Recommendations for design give full consideration to channel stability concepts for natural streams that allow a stream to develop a dimension, pattern, and profile that will be in dynamic equilibrium over the life of the project.

Technical guidance is contained in NEH Part 653, Stream Corridor Restoration Handbook; EFH, Chapter 16, Streambank and Shoreline Protection; and NEH-3, Sedimentation.

531.48 Evaluation of rock for erosion control

Rock material is commonly used in erosion control applications as filter bedding stone, riprap stone, armor stone, and breakwater stone, and in groin and gabion structures.

The intensity of evaluation of rock material to be used for erosion control depends on the size and design requirements of the individual project, the quantity and quality of rock required, and the potential risk for property damage or loss of human life.

The acceptability of an identified source of rock material may be based on experience and previous performance of use for similar applications under comparable performance conditions.

The assessment of questionable sources of rock to be used for erosion control is conducted according to ASTM D 4992, Standard Practice for Evaluation of Rock to Be Used for Erosion Control and other related ASTM standards.

531.49 Special erosion and sedimentation studies

A geologist or other appropriate technical specialist is consulted for certain events that typically occur infrequently and that may present either opportunities or problems associated with, but not necessarily limited to, physical damages caused by erosion and sedimentation on coastal, estuarine, flood plain, and wetland areas, and reservoir rehabilitation or decommissioning. They may be associated with wind action, surface and underground mining, irrigation, and gullies, including ephemeral gullies. Damages may be related to sediment intrusion into fish-spawning gravel beds. Damages may occur in urban and rural areas due to uncontrolled storm water runoff from recently burned wildfire areas.

Special erosion and sedimentation studies are conducted according to policy contained in Subpart A - Geologic Investigations.

PART 532 - BIOLOGICAL AND AGRICULTURAL ENGINEERING

532.00 General.

Biological and agricultural engineering is the application of physical, ecological, and biological sciences to develop engineering solutions that conserve, improve and sustain the environment and natural resources. Biological and agricultural engineering combines conventional engineering principles and design with the applied biological sciences. The purpose of biological and agricultural engineering is to develop engineering solutions that recognize and address the natural processes occurring due to biological organisms and their surroundings. The designer will consider the effect of the proposed solution on plants, animals and other biological organisms as well as assessing how the organisms will impact the effectiveness of the engineering solution.

NRCS engineering assistance can result in both temporary and permanent changes to the ecological resource on millions of acres. The application of biological and agricultural engineering to these changes will result in changes that are more harmonious with the natural ecosystem.

The basic principles of biological and agricultural engineering are to be applied as an integral part of engineering work. They must be considered early in planning and continued through design, construction, operation and maintenance as necessary to insure appropriate, functional, and efficient results.

532.01 NRCS Biological and Agricultural engineering assistance.

NRCS will provide technical assistance that includes the basic principles of biological and agricultural engineering. NRCS is to provide technical information, guidelines, and standards together with planning and design assistance to ensure that proposed solutions conserve, improve and sustain air, plant, animal, soil, and water resources. Appropriate specialists such as biologists, biological engineers, microbiologists and organic chemists may be involved, as necessary, to resolve anticipated interactions with biological organisms. Assistance shall be

provided in conformance with the National Conservation Planning Handbook, Field Office Technical Guide and provisions of the General Manual.

Biological and agricultural engineering principles, as appropriate, will be included in new or revised NRCS practice standards and conservation practice physical effects. The agricultural engineer on the national conservation engineering division staff will provide guidance and leadership in biological and agricultural engineering. Each state shall assign leadership in biological and agricultural engineering to an engineer trained in the basic biological and agricultural engineering principles. Biological and agricultural engineering will be incorporated into planning, design, layout and construction training.

532.02 Non-NRCS Biological and Agricultural engineering services.

The services of other Government agencies, educational institutions, and private firms or other qualified individuals can be included for planning, design, and supervision of construction.

PART 533 – SOIL ENGINEERING

SUBPART A - ENGINEERING CLASSIFICATION OF SOILS

533.00 General

(a) Soils are used as construction materials and foundations for engineering structures. The wide range of soil properties and conditions affect their performance and use.

(b) An engineering soil classification system indicates engineering soil properties and provides a preliminary understanding of the behavior of soils under various engineering conditions. It is used to communicate this information in simple notations and brief descriptions. Soil engineers and geologists, for example, frequently communicate this information. Soil engineers perform soil testing programs, engineering designs, and soil engineering related construction activities. Geologists perform site investigations to gather information on soil properties and conditions to be used by soil engineers.

533.01 Scope

This policy establishes the soil classification systems that will be used in NRCS engineering activities, including the engineering sections of soil survey reports.

533.02 Soil classification systems

(a) The Unified Soil Classification System (USCS), is to be used in NRCS engineering activities. The Unified System is the standard accepted by the American Society for Testing and Materials (ASTM), Designation D2487: Classification of Soils for Engineering Purposes; and Designation D2488: Description and Identification of Soils (Visual-Manual Procedure).

(b) The USDA National System of Soil Classification (Soil Taxonomy) is the pedological classification used in the National

Cooperative Soil Survey. Additional information can be obtained from the National Soil Survey Handbook. The engineering sections of soil survey reports include both the USDA and the USCS soil classification systems.

(c) Soil classes determined by the Unified Soil Classification System and the USDA textural classes in the pedological system provide information on the nature and size of soil particles. If the full combination of characteristics denoted by pedological soil names is used, additional information such as natural drainage condition can also be deduced. Soil surveys show the location and extent of different soils; however, site specific identification or classification determined by soil testing is needed for designing engineering structures. Soil classification for engineering uses is best interpreted by the Unified Soil Classification System.

(d) Data contained in available soil survey reports can be used and should be supplemented as necessary to classify soils at specific sites. For some small farm-type structures, soil survey information properly interpreted may provide much of the soil information needed for planning and installation.

(e) All engineers and geologists shall be trained to use both the Unified and the USDA textural systems with competence. Construction inspectors, engineering and physical science technicians, and conservation technicians shall also be trained in these soil classification systems needed for planning, design, and installation of conservation practices.

SUBPART B - OPERATIONS

533.10 General

(a) Soil mechanics is that part of physical science which deals with the action of forces on soil bodies. These actions are usually measured in testing laboratories. Soil engineering is the practice of engineering which involves the action of forces on soil masses.

(b) Collection and analysis of soil engineering data are essential in the investigation and design of engineering structures. The examination and verification of soil properties during construction are also critical. Special training and experience usually are needed because many factors depend on interpretation and judgment. Close coordination is needed between the investigation, soil testing, design, and construction functions.

(c) Soil mechanics testing provides data for evaluating soil and rock as engineering materials for planning, design, and construction. Test results identify the index, chemical, and engineering properties used in the analyses and design of foundations and earth or earth-supported structures.

§533.11 Data collection

(a) The state conservation engineer is responsible for all site investigations and the collection of samples. The engineering staff or team that prepares the final design shall assist in planning the site investigation, sample selection, and final testing program.

(b) All data needed for analyzing soil conditions pertinent to planning, designing, and constructing engineering structures shall be obtained for each phase. Field tests and interpretation procedures in Part 531, Subpart A, are to be used to determine as many in situ soil properties as practical. If further testing is needed or verification of field conditions is in order, appropriate representative samples shall be obtained for laboratory testing.

(c) Before completion of the geologic investigation, the geologist, the engineer designated for soils mechanics leadership, and/or the project engineer shall jointly review the results of the investigation and the adequacy of sampling for testing. The data shall be examined to determine that it is adequate to be used for all stages of design and construction.

§533.12 Testing

(a) Soil mechanics testing shall conform to established NRCS standards and procedures. The testing shall be completed at appropriate times during the investigation, design, and construction phases. To facilitate field investigations and construction operations, index and chemical tests may be performed in either local NRCS or commercial facilities. Laboratory tests for engineering properties (shear, consolidation, permeability, etc.) shall be performed in laboratories supervised by engineers with soil engineering expertise.

(b) For designs prepared through engineering services contracts, the testing may be performed as a phase of the total design contract. (See Part 505.) Soil mechanics testing facilities may also use engineering services contracts with commercial geotechnical facilities to supplement their own forces, redistribute peak workloads, and provide more efficient operation. Testing by non-NRCS facilities shall be reviewed and checked for accuracy and proper procedures by NRCS engineers with soil engineering expertise.

(c) NRCS soil mechanics testing services are provided through the National Soil Mechanics Center (NSMC) in Lincoln, Nebraska. The center has two testing laboratories available to perform the testing services: the laboratory at the center in Lincoln, Nebraska, to serve the West, Northern Plains, Midwest, and East Regions; and a satellite laboratory in Fort Worth, Texas, to serve the Southeast and South Central Regions.

(d) Both facilities have the equipment and personnel to run all tests routinely required for NRCS work. The testing laboratories assist each other by providing testing services during peak workload periods, when special testing is required, and other activities as their resources permit.

(e) NRCS laboratory testing will be accomplished on a first-come-first-served basis. Testing services may be requested by letter, fax, or electronic mail. The request shall include name and address of sender, name of site or project, financial project code, name of watershed or location, type of project and brief description, list of samples and type (disturbed or undisturbed), hazard class (for dams), testing requested, and any other pertinent information. States are not charged directly for testing services or assistance.

(f) If the NSMC is to perform engineering analyses, samples submitted shall be accompanied by geologic and engineering reports commensurate with the complexity of the structure. The reports shall be submitted to the head of the testing laboratory by the state conservation engineer, or others with delegated authority from the state conservation engineer.

(g) The engineering report shall include the preliminary design and other information required for setting up a testing program, establishing testing pressures, rates, and other details for completing soil tests. The report shall also explain the purpose for which samples were obtained, the potential use of the soil represented by the samples, and the expected use for the test results.

(h) The state conservation engineer shall maintain close contact with the testing facility on needed changes in the testing program as it progresses. On jobs requiring design assistance from other engineering staffs or teams, the state conservation engineer will keep that staff informed of any proposed changes in the testing.

(i) A report from the testing facility is to be submitted to the state conservation engineer and shall include all requested test data with a narrative giving details of the testing work, soil classifications, descriptions of soils, condition of samples, and observed test performances.

(j) Soil mechanics testing standards shall be established by the Director of the Conservation Engineering Division. Inspection of NRCS soil mechanics testing facilities that are national, regional, or multistate in scope shall be under the direction of the Director of the Conservation Engineering Division. The Director of the National Soil Mechanics Center shall direct the inspection of state soil mechanics testing facilities and other soil mechanics testing facilities under contract or agreement with NRCS.

(k) NRCS soil mechanics testing facilities that receive soil samples from areas where quarantine regulations are imposed, shall obtain the requirements from the Animal and Plant Health Inspection Service (APHIS), USDA, for receiving and disposing of soil samples. Each facility shall obtain a permit for receiving these samples. Requirements for taking and shipping samples under quarantine regulations are included in Part 531, Subpart F.

§533.13 Soil engineering analyses

(a) Soil engineering analyses shall be made by the engineer closest to the field who has the necessary expertise and training. If possible, this work is done concurrently with other design work. One staff engineer shall be designated to provide soil engineering leadership in each state that has significant earth dam or other activity requiring soil engineering expertise. This engineer shall be trained in soil engineering principles. Engineers with specialized training and broad experience are usually required to make judgments and analyses for structures that require extensive soil engineering expertise, such as large earth dams and foundations with complex conditions. States that do not have the necessary expertise can obtain this assistance from another state within their region, a multistate design

staff, or an outside source. If this expertise is not available within their region, the state conservation engineer can make arrangements for assistance from the National Soil Mechanics Center.

(b) Each state conservation engineer shall evaluate workload and staff capabilities with regard to soil engineering expertise and develop an operational plan that defines the scope of assistance or staffing needed and the training required.

(c) If soil engineering analyses by the National Soil Mechanics Center are requested in conjunction with the soil mechanics testing, the state conservation engineer will arrange for the assistance and analyses. (See Part §533.13(a)) The engineer responsible for the analyses shall participate in the soil engineering phases of investigation, soil testing, design, and soil related problems during construction.

(d) The soils engineering analyses report shall be provided to the state conservation engineer documenting site conditions, preliminary design assumptions, engineering properties of soils used in the analyses, and other factors pertinent to the design and construction of the works of improvement. Appropriate recommendations for design features shall be included.

(e) If site investigations, sampling, testing, or soil engineering analyses are carried out by local sponsoring agencies or consultants, the state conservation engineer shall see that the work is reviewed by NRCS personnel that have the necessary expertise. States that regularly request soil engineering assistance from another state on designs completed by in-state NRCS personnel, shall also obtain that state's assistance on preparing contracts and reviewing soil engineering work completed by local sponsoring agencies or consultants.

533.14 National benefit activities

(a) The National Soil Mechanics Center provides assistance to the Conservation Engineering Division for a variety of activities of National Benefit, including the following:

(1) Training engineers and geologists in soil mechanics. This includes short-term staff position assignments.

(2) Developing or refining new or specialized testing techniques and equipment.

(3) Developing technical references in soil mechanics.

(4) Maintaining a testing data base and preparing correlations for design reference.

(5) Laboratory testing for correlation of test results.

(6) Investigating behavior and performance of soil as related to engineering use.

(b) The Director of the Conservation Engineering Division and the Director of the National Soil Mechanics Center will jointly develop annual and long-range plans of the kinds of activities that can be accomplished, as work force resources permit, and the priorities of national benefit work.

SUBPART C - ENGINEERING INTERPRETATIONS OF SOIL SURVEYS

533.20 General

Soil scientists have been assigned leadership for seeing that engineering interpretations are made and for completing the engineering sections of soil survey reports and other forms or documents in connection with the National Cooperative Soil Survey. These interpretations, reports, and narrative sections shall be made by or with the assistance of technical staff personnel.

533.21 Scope

(a) This policy establishes the role of engineers and engineering geologists in soil survey activities.

(b) The policies, guidelines, and procedures relating to soil survey work are in GM 430-402.

533.22 Engineering responsibilities

(a) Engineers and geologists are to assist in soil survey engineering interpretations. They are to participate fully in decisions on the following:

(1) Whether engineering interpretations are to be made for a given use.

(2) Criteria and guides for making soil engineering interpretations for specific uses.

(3) The quality of soil engineering interpretations for published soil surveys, special reports, or special planning efforts.

(4) The method of presentation of data dealing with interpretations and narrative reports on engineering uses of soil.

(5) Training of soil scientists and engineers to make engineering interpretations.

(b) Engineers and geologists shall participate in making soil potential ratings. They shall assist in determining realistic corrective measures, costs, and continuing limitations for agricultural uses that require engineering practices. For nonagricultural uses, experts from outside NRCS shall be invited to participate in determining corrective measures, costs, and continuing limitations with final acceptance by NRCS engineers. Engineers are to determine if adequate data are being used to determine soil potential ratings. If certain soils are not normally used for the purpose being rated, the outside experts may need to complete more investigations and engineering testing to determine the types of corrective measures that are appropriate. NRCS engineers and geologists shall act as advisors to personnel responsible for providing leadership in making soil potential ratings. In this advisory capacity, they shall assist in the work, make recommendations, and point out deficiencies or incorrect procedures.

(c) National office personnel from the Conservation Engineering Division and Soil Survey Division shall work jointly to develop guidelines and criteria for soil survey work that requires engineering interpretations. All engineering interpretation work for soil surveys shall be prepared in accordance with established guidelines and criteria.

(d) The state conservation engineer is responsible for providing assistance in engineering interpretation work for soil survey activities in the State and shall work closely with the responsible soil scientist. This authority may be delegated to a staff engineer who has been assigned leadership in soil engineering, or to a geologist or field engineer, with sufficient training and experience.

(e) Engineers and geologists are expected to keep themselves informed on the development and use of engineering interpretations for soil surveys. Engineering training programs shall include appropriate instruction.

PART 535 - LANDSCAPE ARCHITECTURE

535.00 General.

(a) SCS work results in apparent and permanent changes to the landscape resource on millions of acres. The majority of these changes are beneficial, but some changes have occurred without consideration of all landscape resources, especially the visual resource. On a national scale, the public need for conservation of landscape resources becomes more important as development, population, and management pressures increase. In recent years, legislation has recognized the public need for landscape resource conservation. The National Environmental Policy Act of 1969, the Soil and Water Resources Conservation Act of 1977, and the Surface Mining Control and Reclamation Act of 1977 require SCS to consider landscape resources.

(b) SCS policy is to maintain or enhance the landscape resource, abide by legislative intent, and meet the public need. This commitment is accomplished by maintaining leadership in conservation Technology and dealing with landscape resources in all conservation activities.

(c) The objective of landscape architecture is to provide the technical procedures, training guidance, and management tools to conserve or rehabilitate the landscape resource in all programs, project, and activities through conservation technical assistance.

(d) The basic principles of landscape architecture are to be applied as an integral part of all engineering work. They must be considered early in planning and continued through design, construction, operation, and maintenance to ensure safe, appropriate, functional, and efficient results.

535.01 Definitions.

Ecological resource. The function of the landscape in sustaining life-cycle processes.

Landscape architecture. The art and science of planning and designing the landscape for purposeful human use and the conservation of landscape resources. Landscape architecture considers the landscape resource as a composite of its ecological, social, and visual resources.

Social resource. The use of the landscape for economic, functional, and cultural purposes.

Visual resource. The classifiable appearance of a landscape unit.

535.02 Services.

(a) Landscape resources factors are to receive equal consideration with other factors in conservation work.

(b) The need for landscape architectural services is to be determined according to Technical Release No. 65, "Procedure To Establish Priorities in Landscape Architecture."

(c) SCS landscape architects or the landscape architectural services of private firms or individuals are to be used for both planning and design. Sponsors and governmental or educational institutions may also
be used.

(d) An initial planning phase of landscape architectural investigation (see Technical Release No. 65) is to be made on all conservation work to determine priorities and the need for further investigations.

(e) Detailed investigations may be necessary. Procedures for making detailed landscape architectural investigations are being developed; meanwhile, guidance is to be provided by the NTC landscape architect.

(f) Landscape architectural site investigations for channel design are to conform to the procedures cited in Technical Release No. 25, Chapters 1 and 2.

(g) Other inventories, investigations, and studies of the landscape resource may be required in special situations. Guidance for these special studies is to be provided by the National Landscape Architect.

(h) Landscape resource objectives are to be established in planning and developed during design. Procedures for establishing these objectives are being developed; meanwhile, the NTC is to provide guidance in these activities.

535.03 Technical quality.

(a) To advance professional growth and maintain technical competence, SCS landscape architects are encouraged to become registered, to maintain liaisons with universities and professional societies, and to enroll in continuing technical education if feasible.

(b) The quality standard for landscape architecture used in technical training and materials is to:

(1) Include a full range of landscape architectural expertise, not only on the visual resources.

(2) Be determined by established landscape architectural principles and meet established landscape resource objectives.

(3) Be according to the best available research.

(4) Be flexible so that it can be modified according to new experience and research.

(5) State clearly the scale and type of landscape designated for application by the defined technique.

(6) Be workable in field situations.

(7) Be understandable by field staffs.

(8) Demonstrate quality that is as good as or better than the standard achievable by the profession as a whole.

PART 536 - STRUCTURAL ENGINEERING

536.00 General.

(a) Technical assistance is provided in a variety of applications, but the structural features used are often repetitive and serve similar hydraulic purpose. The size range of the structural components frequently used is limited.

(b) Developing a series of construction drawings for structural components frequently used is an efficient way of providing technical assistance. The use of standard detail drawings based on conservative design assumptions to permit adapting to widely varying site conditions does not usually affect the total construction cost significantly.

(c) Standards of quality for engineering structures are established in structural detail drawings for construction plans. One of the ways the general quality of SCS construction can be maintained in a uniform manner and at an acceptable level is through the development and use of standard detail drawings.

536.01 Standard detail drawings.

(a) Standard detail drawings are detailed construction drawings according to standardized design assumptions. The design assumptions are to be selected so that the design and detail drawings for structures, spillways, and appurtenances will provide for the requirements of many sites.

(b) Standard detail drawings are essentially complete and are to be used directly in preparing construction drawings for contract purposes. They are to be complete in construction or fabrication detail.

(c) The structures in the drawings are to be designed to perform satisfactorily within the range of conditions assumed in their development. The assumed range of conditions is to be indicated in reference drawings, technical releases, or design notes. Include design assumptions and notes on material quality on the drawings.

(d) Portions of the drawings may provide for changes in size or length and thus require some additions for completion. These changes are not to affect the performance capability of the structure and are to be considered in the design. The provisions for these adaptations are to be incorporated into the drawings to facilitate their use. By including provisions for such adaptations, the coverage of a range of sizes may be completed with fewer drawings.

(e) Standards for reinforced-concrete drop-inlet spillway are to be consistent with Drawings Nos. ES-150, -151, -152, -154, -155, and -156.

(f) Each standard detail drawing is to be supported by design notes, computations, drawings, sketches, and other data. It is to be recorded and organized in a folder in a manner that allows reproduction and incorporation into a design folder (511.10 and 511.11(a)of this manual) for the entire job.

536.02 Use of standard detail drawings.

(a) Standard detail drawings are to be used when appropriate during the development of construction plans. The designer analyzes the site conditions, structure function, and hydraulic and structural requirements; examines the applicability of a standard detail drawing; and includes in the design notes the verification for the selection of a standard detail drawing or, if conditions differ significantly, the need for a special design.

(b) The approving engineer is to determine the appropriate use of standard detail drawings by considering:

(1) Acceptability of performance;

(2) Overall efficiency of design preparation and installation costs; and

(3) Risk of making errors during extensive modifications.

(c) Standard detail drawings are not to be developed by the state office or NTC if the drawings are available at the NTC or national level, respectively, for the same size and kind of structure, component, or appurtenance.

536.03 Adaptation of standard detail drawings.

(a) It is sometimes necessary to make additions to standard detail drawings by including reference-drawing numbers, notes, or details to minimize construction error. These additions usually should not affect the hydraulic or structural performance as originally designed.

(b) If an adaptation of the standard detail drawing affects the hydraulic or structural performance of the original design, document the effects if the adaptation by amending the original design notes and computation from the drawing and incorporating the amendments into the design folder for the entire job. This documentation is to include the new or differing design assumptions, the adaptations and modifications, the effect of the modification on the original design assumptions, and the analysis and design of the structure to insure adequate performance.

536.04 Revision of standard detail drawings.

Standard detail drawings need periodic review and revision to meet current design needs and to be compatible with current construction practices. The use of the drawings provides for such a review. Identified errors and suggestions for improvement are to be forwarded to the office responsible for preparing the drawing.

536.05 Availability of standard detail drawings to the public.

(a) Requirements of the Freedom of Information Act make copies of standard detail drawings available to the public on demand. Copies of the drawings are to be made available, when requested, in accordance with the procedures in 120-408--Subpart (c)

(b) Each drawing provided is to include the following information:

(1) A precautionary statement: STANDARDIZED DESIGNS - Must be Adapted to the Specific Site

(2) The material design strength and quality assumptions.

(3) The site conditions assumed in the design.

(4) The name and address of the office in which the folder containing design notes and computations is available.

536.06 National standard detail drawings.

(a) Standard detail drawings are prepared for structures, spillways, and appurtenances. These drawings are prepared according to hydraulic and structural design criteria in the NEH, technical releases, or design notes. The drawings are prepared to permit direct use without any significant change.

(b) The drawings may be prepared as a series to provide the range of sizes frequently needed. The kind of structure and range of sizes is to be determined by the Director of Engineering.

(c) Drawings are available to the state design offices and NTC's for use in preparing plans for specific structures. Polyester transparencies of the detail drawings are to be requested only as needed for each job. The original drawings are to be kept on file in the Design Unit, Engineering Technology Development Staff, National Headquarters. A duplicate set of drawings, as listed in Technical Release No. 40, is to be maintained on file in each NTC. Indexes of available standard detail drawings are in Design Note 18.

536.07 NTC standard detail drawings.

(a) As approved by the Director of Engineering, NTC standard detail drawings are to be prepared for structures and appurtenances that would

be usable by more than one state. These drawings are to be complementary and supplementary to those provided nationally (i.e., not replaced in kind). The drawings are to be prepared as requested by state offices or initiated by the head of the NTC engineering Staff to meet a common need.

(b) The folder containing the design notes and computations made during the preparation of standard detail drawings is to be kept on file for reference as long as the drawings are available.

(c) The NTC is to provide to the state offices a current index of approved drawings.

536.08 4100 Series standard drop-spillway drawings.

(a) The 4100 Series standard drop spillway is an alternative to the Type B series standard in NEH-11. The 4100 Series reference is from index drawing 3-L-4100, issued by the Milwaukee Regional Office and later reissued as drawing 5-N-4100.

(b) After the 4100 Series was issued, research revealed that the tendency for scour to occur downstream from the apron increases as the ratio of the depth of the weir to the height of the headwall increases. Therefore, the 4100 Series is to be used only if the ratio of weir depth to headwall height is lower than 0.5. (See NEH-11, Chapter 5, page 5.1.)

(c) Some 4100 Series structures have headwall extension lengths less than that required by the criteria for Type B structures in NEH-11. If metal is used as an alternative material for this type of structure, the headwall extension lengths must meet the minimum standards established for the Type B structure.

(d) The requirements of the site and the suitability of the structure are to be verified before use.

536.09 State standard detail drawings.

(a) Standard detail drawings are to be prepared only for structural appurtenances and details that are frequently used and for which such drawings are not available nationally or through the NTC. The design supporting the drawings is to be in accordance with all SCS design procedures, criteria, and materials specifications. The quality of drafting is to be consistent with national and NTC drawings. Standard detail drawings are not to be prepared to duplicate the kind or size of either the national or the NTC drawings or to be equivalent to them in purpose and function.

(b) The folder containing the design notes and computations made during the preparation of these drawings is to be kept on file for reference as long as the drawings are available.

(c) A current index of standard detail drawings prepared by a state is to be maintained by that state. The head of the NTC engineering Staff is to receive a copy of the index from each state and distribute a consolidated index to the states in the NTC work area, other NTC's, and the Director of Engineering.

(d) The index of state standard detail drawings is to contain the following:

(1) Name or type of structure, structure element, or appurtenance.

(2) State responsible for the design.

(3) Data of design.

(4) Location of folder containing design notes and computations.

(5) Types of materials used in the structure or element, size ranges, general application, and significant limiting assumptions.

(6) Indication of whether or not the head of the NTC engineering Staff has reviewed and concurred in the drawing.

(e) The state conservation engineer should review the NTC consolidated index and, as appropriate, request from the responsible state a copy of the desired standard detail drawing When a standard detail drawing prepared by another state is selected for use, a copy of the folder with design notes and computation is to be obtained to support the use of the drawing.

(f) The use of state standard detail drawings in Class VI and VII jobs is to be concurred in by the head of the NTC engineering Staff. Concurrence may be obtained through agreements reached during the designing of individual jobs (501.04 (c) of this manual) or by a special review requested by the state conservation engineer. A request for a special review is to be accompanied by documentation indicating the frequency of the drawings' use in Class VI and VII jobs.

536.10 Standard detail drawings prepared by non-SCS engineers.

(a) Standard detail drawings are prepared by other engineering organizations, vendors, or fabricators. The drawings are for structures and structural elements or appurtenances frequently used in construction drawings for conservation practices and systems but not portrayed in SCS standard detail drawings. The design documentation supporting the drawings and the materials used in the structures or appurtenances are to meet minimum SCS criteria and should be of professional quality. Drafting is to be professional.

(b) A folder of design notes and computations is to be completed during the design and preparation of the drawing. The folder is to be

prepared professionally and must be of professional quality. The folder is to be kept on file for reference as long as the drawing is available for use.

(c) The state conservation engineer is to review and concur in any use of standard detail drawings prepared by non-SCS engineers. In conducting the review, the state conservation engineer may request assistance from the NTC. Such requests are to be accompanied by documentation indicating the frequency of use and an estimate of the regional application of the drawing. All drawings must be accompanied by a folder containing design notes and computations.

(d) Use of standard detail drawings prepared by non-SCS engineers in Class VI and VII jobs is to be concurred in by the head of the NTC engineering Staff. Concurrence may be obtained through agreements reached during the design process of the individual job (501.04 (c) of this manual) or by a special review requested by the state conservation engineer.

(e) An index of currently use standard detail drawings prepared by non-SCS engineers is to be maintained by the state conservation engineer. The head of the NTC engineering Staff is to receive a copy of the index from each state and distribute a consolidated index to states in the NTC areas, other NTC's, and the Director of Engineering.

(f) The NTC's index of standard detail drawings prepared by non-SCS engineers is to contain the following information:

(1) Name and type of structure, structural element, or appurtenance.

(2) Name and address of designer.

(3) Name and address of the vendor, distributor, or fabricator.

(4) Identifying name and number of the drawing.

(5) Date of original design and all revisions.

(6) Location of the folder containing design notes and computations.

(7) Type of materials used in the structure or element, size ranges, general application, and significant limiting assumptions.

(8) Indication of whether or not the head of the NTC engineering Staff has reviewed and concurred in the use of the drawing.

(g) The state conservation engineer should review the NTC consolidated index and, as appropriate, request from the state, vendor, or fabricator a copy of the desired standard detail drawing. When a standard detail drawing so obtained is to be used, the state conservation engineer is to

obtain a copy of the folder containing the design notes and computations, including design assumptions that identify the limitations for use of the structure or elements.

536.11 (Reserved.)
536.12 (Reserved.)
536.13 (Reserved.)
536.14 (Reserved.)
536.15 (Reserved.)
536.16 (Reserved.)
536.17 (Reserved.)
536.18 (Reserved.)
536.19 (Reserved.)

536.20 Design criteria for reinforced concrete.

(a) The structural design of reinforced concrete structures is commonly guided by the ACI Standard, Building Code Requirements for Reinforced Concrete (ACI 318) developed by Committee 318 of the American Concrete Institute. This code covers the design and construction of buildings. The code provides minimum requirements and contains several precautions about special attention needed when corrosive environments or other severe exposure conditions exist. SCS uses reinforced concrete in hydraulic structures for components of water resource projects. These structures are often subject to severe exposure. Because of the type of structure usually involved, design must often exceed the minimums required by building codes.

(b) Concrete is to be designated by class. The class corresponds to the compressive strength assumed in the design and specified in construction. The class selected for use is to be determined by evaluating the requirements for strength and durability. The availability of materials and construction quality control must also be recognized in making the determination. The strength values normally used are 2,500, 3,000, 4,000, and 5,000 pounds per square inch (psi).

(c) With one exception contained in the criteria for waste storage structures, structural design in reinforced concrete may be carried out by either strength design or working stress design methods.

(1) For waste storage structures, design is to be in accordance with Practice Standard 313, Waste Storage Structure, contained in the National Handbook of Conservation Practices.

(2) For Service hydraulic structures, the design yield strength, fy, is to be taken as 40 kips per square inch (ksi) for grade 40, grade 50, or grade 60 steels. The only exception to this general requirement is for a special design at critical locations where higher yield strengths will reduce excessive congestion of reinforcement and the potential for accelerated deterioration due to increased flexural cracking is acceptable.

(i) The strength design method is to be in accordance with the requirements of Technical Release No. 67, Reinforced Concrete Strength Design.

(ii) The working stress design method is to be in accordance with requirements of NEH Section 6, Structural Design, subsection 4, Reinforced Concrete, as updated by National Engineering Handbook Notice 6-4.

(3) For other structures--with uncontrolled environments, the design yield strength, fy, may be taken in accordance with the grade of steel specified for construction.

(i) The strength design method is to be in accordance with the requirements of Technical Release No. 67, Reinforced Concrete Strength Design, except that temperature and shrinkage steel may be in accordance with ACI Standard, Building Code Requirements for Reinforced Concrete (ACI 318-77).

(ii) The working stress design method is to be in accordance with the ACI Standard, Building Code Requirements for Reinforced Concrete (ACI 318-77), Appendix B - Alternate Design Methods, except that the allowable extreme fiber stress in compression is to be f'c = 0.40 fc and the Z factor controlling flexural crack widths is not to exceed 145.

(4) For other structures--with controlled environments, design is to be in accordance with the ACI Standard, Building Code Requirements for Reinforced Concrete (ACI 318-77).

(d) The following additional criteria are to be used in the design of Service hydraulic structures.

(1) Reinforcing steel is required in both faces and in both (orthogonal) directions in all concrete slabs and walls, except that only one grid of reinforcing steel is required in:

(i) concrete linings of trapezoidal channels, and

(ii) structures of Class V or less, as defined in 501.04 of this manual, if authorized by the state conservation engineer (SCE). If authorized by the SCE under this exception, a single grid of steel reinforcement is permitted in slabs or walls having a maximum thickness of 8 inches, provided the steel is positioned approximately in the middle of the wall and strength and durability requirements are satisfied.

(2) Redistribution of moments in continuous members is not permitted in either:

(i) The strength design method when grade 50 or grade 60 steels are specified for construction and the design yield strength, f_y, is taken as 40 ksi, or

(ii) The working stress design method.

PART 537 - ENVIRONMENTAL ENGINEERING

537.00 General.

Environmental engineering is the application of engineering, physical, and biological sciences to the protection and improvement of air, land, and water resources to provide a clean and healthful environment. Primary concerns are surface and ground water quality waste management, and pollution abatement in agricultural areas. Environmental engineering assistance is to help land owners and operators comply with Federal, State, and local laws, rules, and regulations governing air, land, and water resources. SCS is not to assume a regulatory function.

537.01 SCS technical assistance for environmental engineering.

SCS is to provide technical information, guidelines, and standards together with planning and design assistance to insure that SCS activities protect and improve air, land, and water resources. The effect of the quality of these resources on SCS-assisted practices and projects is to be evaluated also. (See Technical Release No. 58.) Assistance provided is to be in conformance with the National Handbook of Conservation Practices, National Conservation Manual, and provisions of the General Manual.

(a) National Office. Engineering is to provide overall guidance and leadership in environmental engineering through the services of an environmental engineer at the National Office and an environmental engineer on the National Engineering Staff.

(b) National Technical Centers. The NTC conservation Technology staffs are to provide training, guidance, and environmental engineering assistance to the states.

(c) State. States are to incorporate environmental engineering principles in their planning, design, installation, operation and maintenance, and environmental assessment procedures on all SCS program. Each state is to assign leadership in waste management activities to a member of the state Staff. Each state is to assign water-quality coordination responsibility to a member of the state Staff.

537.02 Non-SCS Environmental engineering services.

If SCS environmental engineers are not available, specialized knowledge and experience not possessed by available personnel are needed, or the environmental engineering workload is too large for available personnel, the services of other government agencies, educational institutions, and private firms or individuals can be used for planning, design, supervision of construction, and environmental assessments. This assistance is to be in conformance with Part 505.

SUBCHAPTER E – SUPPORT SERVICES

PART 540 - FIELD SURVEYS

PART 541 - DRAFTING AND DRAWINGS

SUBPART A - DRAWINGS

SUBPART B – EXHIBITS

PART 542 - SPECIFICATIONS

SUBPART A - CONSTRUCTION SPECIFICATIONS

PART 540 – FIELD SURVEYS

540.00 General.

Concise, accurate, and legible engineering notes are necessary to document planning, design, and construction. They support expenditure of Federal and other funds for conservation installations. Technical Release No. 62, Engineering Layout, Notes, Staking and Calculations and Engineering Field Handbook, Chapter 1, “Engineering Surveys” provide the recommended format for engineering notes and related staking.

540.01 Format.

Each state conservationist is to establish, within this framework, the format and minimum requirements for engineering notekeeping. Engineering records are to be uniform to simplify training and to improve clarity and overall efficiency. If local contracting organizations elect to use their own engineering staffs or if consulting engineers or other qualified persons do the engineering, notekeeping must be of comparable quality and similar content to the sample format in Technical Release No. 62. When using electronic data collection systems to record survey data, a method shall be developed to provide hardcopy documentation of the recorded data.

(a) For Class V - VIII jobs and other major projects in which work is usually performed by formal contract; or, if the notes may be needed as supporting data in potential legal actions:

(1) Bound field notebooks shall be used to record engineering surveys and notes when electronic data collection systems are not used.

(2) When electronic data collection systems are used to record the engineering surveys, an unaltered hardcopy of the survey data shall be downloaded from the data collector and permanently filed with the bound field notebook which contains other important project survey information for that project.

(b) Loose-leaf notebooks, special forms, or hardcopies of downloaded electronic data may be used for recording engineering surveys, notes, and design data for on-farm conservation practices (Class I - V jobs) such as ponds, terraces, diversions, waterways, and animal waste management facilities. The documentation for the engineering surveys for conservation practices shall provide the minimum information as outlined in the sample notes in Technical Release No. 62 in a format similar to the sample.

540.02 Precision and accuracy.

The required precision and accuracy of each survey will vary with its purpose; therefore, each state conservationist shall establish the minimum requirements for precision and accuracy within the framework outlined in Engineering Field Handbook.

§40.03 Staking.

(a) Basic stakes. Basic staking is defined as alignment and grade stakes for structures other than embankments and channels. For channels and embankments, basic staking includes alignment and grade stakes plus slope stakes at the normal interval for the work. Normal interval is 100-foot stations on tangents and may decrease to as little as 25 feet on sharp curves. When construction pay quantities are determined from basic staking, a fair and equitable description of the ground surface is needed for the calculation of performance quantities.

(b) Construction stakes. Additional stakes necessary for forming the structure, constructing the slopes of embankments above the slope stakes, or constructing the sides of channels below the slope stakes or between stations are “construction” stakes. They are the responsibility of the construction contractor.

540.04 Contractor Surveys.

Contractor surveys are applicable to construction contracts and conservation operations that require the Contractor to provide basic staking; quantity surveys, measurements, and computations for progress payments; and when authorized, provide original and final surveys for final quantity determinations. The National Engineering Handbook, Section 20, shall be used to provide contract requirements for contractor surveys. Surveys completed under conservation operations shall follow the requirements of the Engineering Field Handbook, Chapter 1, “Engineering Surveys”. Primary Controls, which include items such as baselines, control points, and bench marks, shall be sufficiently defined to allow the contractor to perform the required surveys.

540.05 Checking.

NRCS employees or individuals under contract with NRCS are to conduct quality assurance checking. Checking shall include the visual review of survey markings, notes, and random surveys to check for accuracy.

540.06 Responsibility.

The information from basic staking of embankments and channels normally becomes the basis for measurement of quantities of earthwork; therefore, it is to be done by NRCS, an A-E, the local contracting organization, the owner, or the contractor as prescribed within appropriate construction contracts, or the General Manual.

PART 541 - DRAFTING

SUBPART A - DRAWINGS

541.00 General.

(a) Engineering designs are documented and presented to the owner and contractor in several forms. One of the forms used is the construction drawing. The drawing provides details on location, shape, and size that are more readily documented through this format than by other means.

(b) Drawings express to the landowner, contractor, and general public the quality of engineering services being provided by NRCS. Therefore, to provide the best image possible, drawings are to be clear, legible, accurate, and complete. They are also to display quality in organization and format.

(c) Engineering drawings in NRCS shall be uniform in format to facilitate exchange of a drawing's basic content. The basic content consists of the sheet size, margins, scale, line thickness, and symbols. Detail recommendations for computer-aided drawings are contained in Technical Release No. 73.

(d) The arrangement of views, tables, details, and notes on drawings is to be in accordance with standard NRCS drafting conventions; the most frequent consist of orthographic projections for structural elements and, for earthwork, views of the plan, profile, and cross section. Geologic mapping conventions are to be used for geological work. Symbols and abbreviations used are to be identified.

(e) Sufficient views, dimensions, and symbols for the various kinds of construction materials are to be included to fully describe the work. Terminology in descriptions is to be consistent with that contained in the specifications; therefore, the draftsperson as well as the engineer is to be very familiar with the specifications.

(f) Standard details are to be used to the maximum extent possible to provide efficiency, but not to the extent of resulting in a poor quality drawing. To insure uniformity, modifications made to any drawing are to be uniform with the original line thickness, line styles, text fonts, text sizes, scale, etc.

(g) Standards of drafting within the industry are to be used to the maximum extent possible. Some of the available reference standards are:

(1) The American Concrete Institute (ACI) Detailing Manual. This consists of three parts (1) ACI Standard: Details and Detailing of Concrete Reinforcement (ACI 315), (2) ACI Standard: Manual of Engineering and Placing Drawings for Reinforced Concrete Structures (ACI 315R), and (3) supporting reference data.

(2) The American Institute of Steel Construction (AISC) Manual of Steel Construction. This includes steel member shape designations, dimensions, and properties. Included is a brief discussion on the content of drawings and the responsibility of its owner. Standard welding symbols are displayed.

(3) The American National Standards for drafting practices (ANSI Y14.1 through Y14.5) published by the American Society of Mechanical Engineers.

541.01 Media and technique.

(a) Drawings are to be prepared on the media appropriate to the purpose. For smaller jobs requiring the use of only a couple of sheets, use of the drawings is limited to the owner and contractor, and the time for completion of the planned work is within the year, paper is the most appropriate. For larger projects the use of paper may also be appropriate. However, for standard details and for standard detail drawings that require repetitive use of the drawings to make copies and that will be retained for use over a period of several years, a medium more durable than paper such as vellum or polyester film should be used. Polyester film is the most stable against shrinking and stretching with changes in humidity and should be used when distortions in the drawings are unacceptable.

(b) All lines and letters must be clear, sharp, and dense to ensure clear copies of both contact prints and one-half scale reductions. Letters are to be single stroke types. Lettering may be written freehand, by use of lettering guides, typed, or by computer-driven printers or plotters.

541.02 Sheet size.

Drawings are to be prepared on sheet sizes appropriate to provide for a neat and uncluttered appearance. For small jobs involving a limited land area, number of features, and number of details a small sheet size is adequate. Paper forms are provided and stocked by NRCS with a preprinted border, title

block, and background guidelines (i.e., profile and cross section) in a size of 10-1/2 inches by 15 inches. For larger projects involving extensive land area and a large number of features and details, sheet sizes in the range of 21 inches by 30 inches to 24 inches by 36 inches should be used. Paper forms are provided and stocked by NRCS with a preprinted border, title block, and background guidelines (i.e., grid, profile, and cross section) in a size of 21 inches by 30 inches. The standard NRCS sheet sizes and their respective designations B, D, E, L, and N are shown in 541.20. Sheet sizes B and D are not stocked by NRCS as a standard form.

541.03 Title blocks.

Each sheet in a set of construction drawings is to have a title block to identify the originator and contents of the drawing. The format and arrangement of a title block on a drawing will vary according to the origin of the design. The title block is to be for that agency or organization preparing the design and, in turn, drafting the drawing. The NRCS title blocks shown in 541.21 are to be used on the drawings drafted by NRCS, based on an NRCS design. The title block normally used by a consulting firm or sponsoring agency should be placed on a drawing prepared by that firm or organization when they also have done the design. The number and arrangement of supplementary approval blocks will vary according to the local and state requirements.

541.04 Cover sheet.

Each set of construction drawings consisting of more than five sheets is to have a cover sheet showing the name and location of the project; the names of the sponsoring agencies, or owners; an index of the drawings; space for approval signatures; and, if appropriate, the seal of the engineer. If space permits, it may also include the location map and such general notes and design data as may apply to the drawings.

541.05 Geographical reference.

Construction drawings for all dams that are significant for reasons of public safety (see 520.21) and major engineering works are to contain structure reference lines and right-of-way limits referenced to fixed and readily identifiable geographical points. Smaller jobs are to include at least a simple location map containing readily identifiable landmarks.

541.06 Orientation of views.

The views required on the drawings are to be oriented in the following manner:

(a) Maps should be drawn with the north toward the top of the sheet. If this orientation is not feasible, the map should be drawn with north toward the left. A north arrow is to be provided.

(b) Layout drawings of reservoirs and spillways are to be drawn so that the direction of streamflow is from left to right or bottom to top of the sheet. Arrows should indicate the direction of flow and the north direction.

(c) Elevations, sections, and plan views for earth dams, reservoirs, and spillways are to be drawn as follows:

(1) Sections representing surfaces essentially parallel to the direction of the streamflow are to be drawn so that the upstream end of the sections are on the left-hand side, so that flow is from left to right.

(2) Plan views are to be drawn so that flow is toward the right side or top of the sheet.

(3) Elevations and sections representing surfaces essentially normal to streamflow are to be drawn so that they are viewed from upstream (observer looking downstream). If the purpose of the section would be violated by such an orientation, it may be changed if the true aspect of the section is indicated on the drawings by section identification or if the position of the viewer is stated in the title of the view (for example, "Looking Upstream").

(d) Except for drainage structures, structure reference lines parallel to the direction of streamflow are to be stationed so that the station numbers increase in a downstream direction. Reference lines for drainage structures may be stationed so that the station numbers increase in an upstream direction if the drainage channel is similarly stationed. Structure reference lines normal to the direction of streamflow are to be stationed from left to right as viewed in the direction of increasing stations.

(e) Flood and irrigation channels are to be stationed so the station numbers increase in the downstream direction. If drainage channels form a part of the miltiple-purpose complex of channels, they are to be stationed in the same way as flood

and irrigation channels; otherwise, they may be stationed in an upstream direction. For all channels, profiles are to be drawn so that the stations increase from left to right and cross sections are to be drawn as though viewed in the direction of increasing stations.

541.07 Detailing.

Detailing of structural drawings is to conform to ACI 315 and the AISC Manual of Steel Construction. Structural details for concrete structures may be shown on the layout drawings if the structure has a simple system of reinforcing and the structural details and layout dimensions of the structure and appurtenances can be shown on the same drawings without confusion. The drawings will be so prepared that all dimensions and sizes of materials and appurtenances may be determined without reference to the specifications. Construction drawings are to include structural details as described in ACI 315 Part B.

541.08 Scale.

Scales of drawings must be carefully selected to insure clarity of details. The manner of reproducing copies must be fully considered in setting the scales to be used. The minimum scale of structural layout sheets will be 1/4 inch equals 1 foot. Except for simple reinforcing systems, the minimum scale for structural detail will be 3/8 inch equals 1foot. If possible, drawings that may be copied at reduced size should have graphic scales and be drawn to a minimum scale of 1/2 inch equals one foot. When drawings lacking graphic scales must be copied at reduced size, each reduced sheet must bear a prominent warning note that the drawing is of reduced size and the indicated scales are not accurate. Care must be taken to insure that such notes are not copied on contact prints of the original drawing.

541.09 Notes.

Notes on the drawings are to be limited to those required for complete and accurate interpretation of the drawings and those required to supplement and the contract specifications. Except for standard notes (such as General Notes, Structural Notes, and Design Data) that generally apply to all drawings within a set, each note is to be placed on the sheet to which it directly applies.

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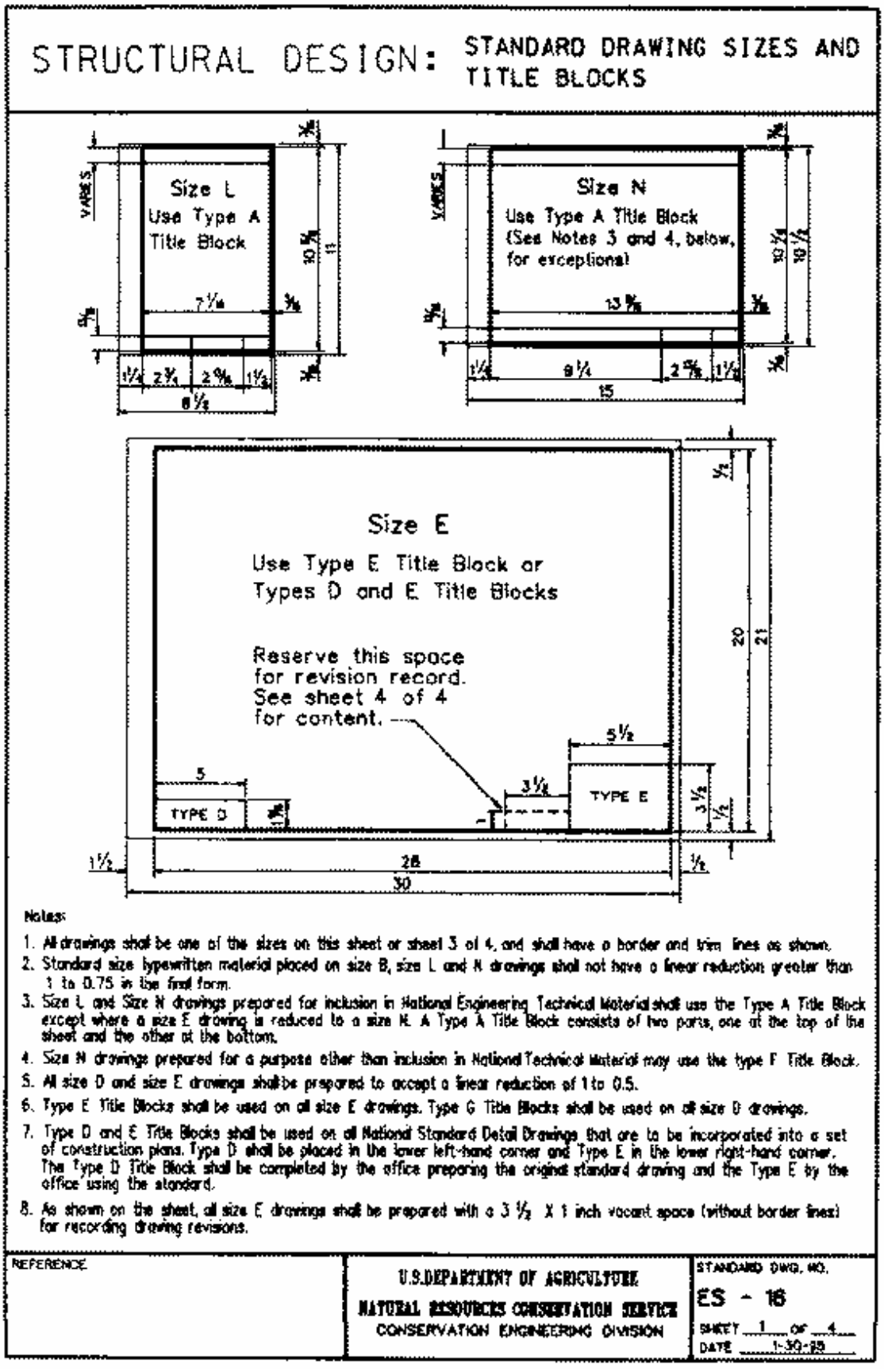
541.20 Standard size sheets

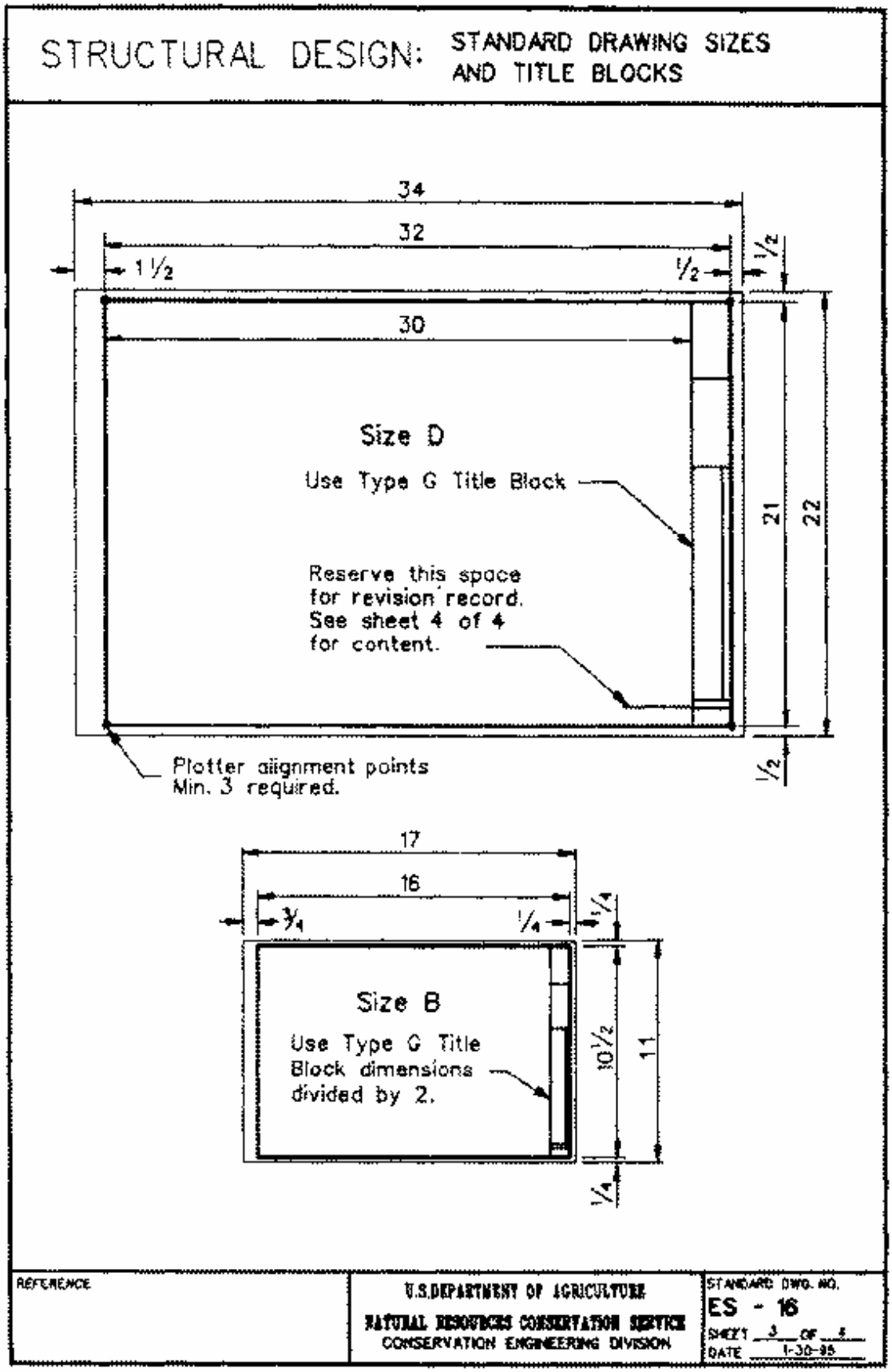
(a) Standard size for NRCS stocked preprinted drafting media



(210-V-NEM, Amend. 20, Jan. 1995)

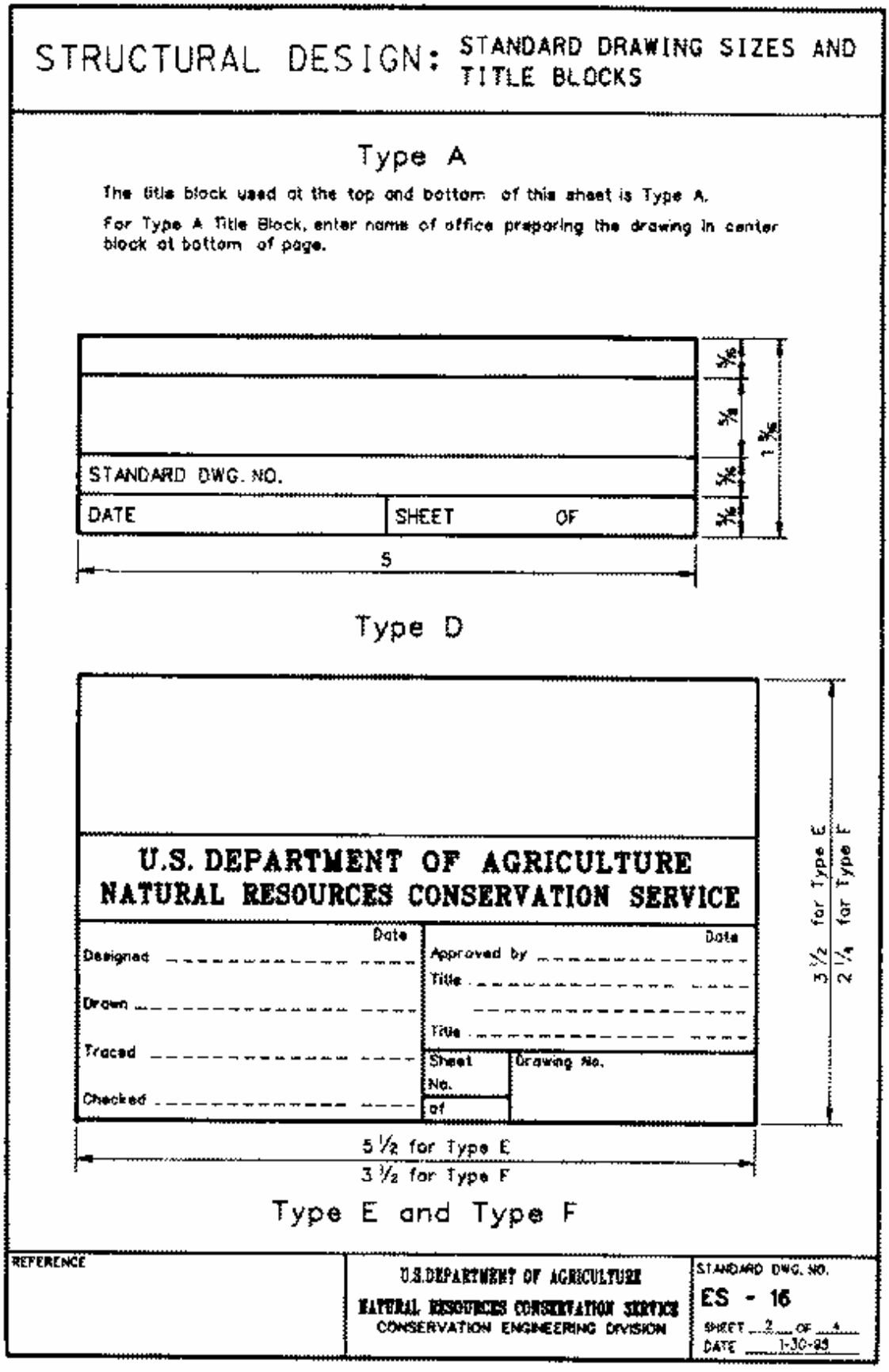
541.20 (b)

(b) Alternate sheet size for CADD drawings

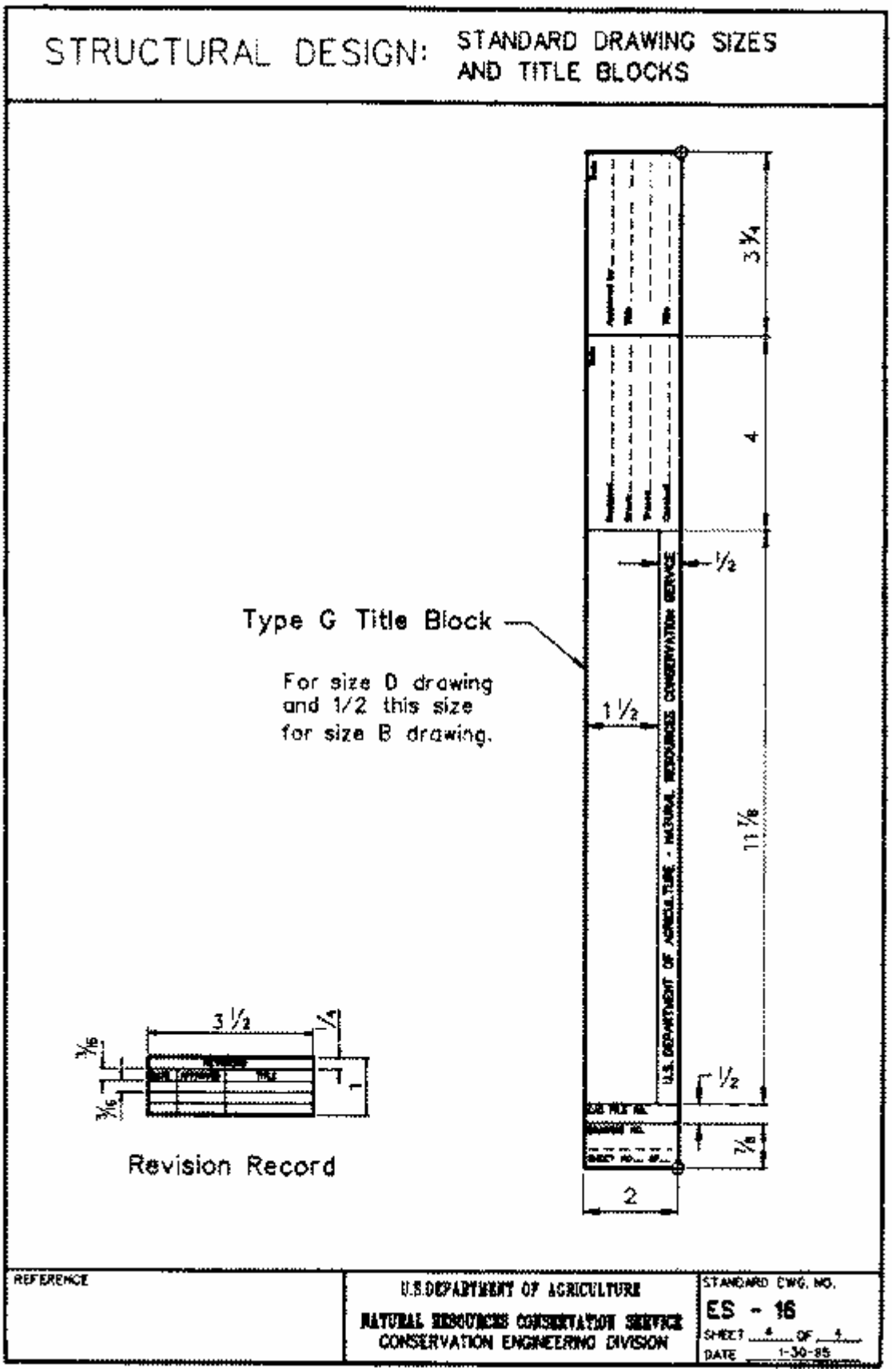


541.21 Standard sheet sizes

(a) Title block for NRCS stocked preprinted drafting media



541.21(b)
(b) Title block for alternate sheet sizes for CADD drawings



PART 542 - SPECIFICATIONS

SUBPART A - CONSTRUCTION SPECIFICATIONS

542.00 General.

(a) NRCS uses standard construction specifications as a tool to ensure consistency and efficiency with the many contracts administered through various programs.

(b) Many types of engineering works have elements that recur as an installation or material quality requirement. These elements can be incorporated into a standard specification that can be supplemented for a specific project and be included as part of the contract. The content of the standard specification will be developed and maintained in a manner that ensures adherence to state laws and NRCS regulations and prevents conflict with other contract provisions.

542.01 Scope.

(a) Specifications are to be developed as outlined in NEH-20 and incorporated in all contracts prepared for installing works of improvement when the NRCS provides assistance, except:

(1) Contracts for basic recreation facilities.

(2) Separate contracts for seeding, sodding, or fencing.

(3) Contracts for less complex works of improvement shall have design drawings and specifications of sufficient detail to support quality installation and reflect the intent of the designer in solving resource concerns. The adequacy of the drawings and specifications shall be as determined by the responsible engineer or employee with the level of engineering approval authority necessary for the conservation practice or structure to be applied.

(4) Contracts for works of improvement not designed by NRCS and installed under contracts administered by the project sponsors without using standard NRCS Construction and Material Specifications. This arrangement may occur when sponsors design or hire the engineering design and the NRCS retains quality assurance responsibilities.

(b) Sponsoring local organizations that prepare their own designs for NRCS assisted projects are encouraged to use the NRCS standard specifications. The specifications must be compatible with all other provisions in the contract document. The specifications selected or developed for a specific contract must provide the necessary construction details that result in the installation of a quality product equivalent to that expected from using the NRCS standard specifications.

(c) Agreements and contracts for engineering services for preparing designs must include the applicable requirements pertaining to the construction and material specifications.

§542.02 Preparation of standard specifications.

(a) Procedures for preparing specifications for construction contracts are outlined in NEH-20, Chapter 1, Discussion. Standard specifications for construction are located NEH-20 in Chapter 2 and those for materials in Chapter 3.

(b) The standard specifications are to be utilized verbatim, except for the deletion of alternative methods that do not apply to the project as described in NEH-20 Instructions.

(c) Standard specifications will be revised and issued through the NRCS Conservation Engineering Division and will be effective immediately. The State Conservation Engineer will determine applicability of specifications developed.

(d) The development of a new specification at the state level is the responsibility of the State Conservation Engineer and will be issued as an interim specification. All interim

specifications have a use life of three (3) years following their issue date. After the use life has elapsed, interim specifications are to be evaluated for issuance as a national specification. State experience and recommendations are to be provided for evaluation and acceptance as national specification by the NRCS Conservation Engineering Division.

542.03 Reference specifications.

(a) Reference specifications are those specifications developed and issued by other agencies, associations, societies, or institutes, and are cited in NRCS Standard Specifications, National Handbook of Conservation Practices, and the National Engineering Handbook Section 19, Construction Inspection.

(b) The State Conservation Engineer shall develop a system to maintain all current reference specifications cited in NRCS Standard Specifications, National Handbook of Conservation Practices, and NEH-Section 19, as noted in Part 210-542.40.

(c) Other NRCS engineering staffs designated by the State Conservation Engineer are to maintain, or have direct access to, copies of reference specifications as noted in Part 210-542.40.

(d) The National Cartographic and Geospacial Center (NCGC) Staff at the NRCS Fort Worth, Texas office will annually coordinate the delivery of current ASTM reference specifications to all States, the Caribbean Area, and the Pacific Basin Area. Each year a revised index of updated and new ASTM reference specifications will be made available.

(1) Each State Conservation Engineer will maintain a file of current reference specifications that have been identified for use in NRCS assistance projects.

(2) Copies of ASTM reference specifications not on the current index, will be available upon request from the NCGC in Fort Worth, Texas.

(3) Guidance to obtain other reference specifications, AWWA, ACI, etc. will be developed and provided in a manner similar to ASTM Reference Specifications.

(e) Additional copies of reference specifications for non-NRCS use should be obtained from the organization that owns the specification or from other sources that may be available.

(f) Reference specifications that are outdated shall be removed from the reference file at the time a revised or updated version is received. All specific construction contract reference specifications should remain with the completed “As-Built” file where they were utilized.

SUBPART B - ENGINEERING SERVICES SPECIFICATIONS

542.10 General

(a) The NRCS provides engineering assistance for many programs. The need to obtain technical assistance from other sources occasionally occurs for various reasons, including:

(1) Resources are not available to meet commitments; and

(2) A specialty area expertise is not available within the agency.

542.11 Technical Services

(a) Technical expertise in differing subject areas may be needed to assist the NRCS in meeting program commitments. This assistance would generally be considered in one of the following:

(1) Professional services; or

(2) Architectural and Engineering (A&E) services.

(b) Procurement for the above listed services shall be in accordance with the Federal Acquisition Regulations, the Department of Agriculture Acquisition Regulations, and the Natural Resources Conservation Service Acquisition Regulations (formally SCSAR's), as applicable. Technical requirements for the procurement shall be developed and included in the contract provisions and/or specifications.

(c) For service contracts, clear and concise requirements must be outlined.

(d) The State Conservation Engineer, together with the Contracting Officer, shall develop review procedures for A & E Contracts.

SUBPART C - EXHIBIT

542.40 List of Reference Specifications

An index that includes the designation, current issue date, and title of reference specifications will be maintained by each state conservation engineer. These are the specifications referenced in NRCS NEH Section 19, Construction Inspection; and NEH Section 20, Construction and Material Specifications; and the National Handbook of Conservation Practices.

Each State Conservation Engineer shall provide a current Index of Reference Specifications to all offices and individuals assigned a National Engineering Manual. Copies of the specifications are to be distributed as needed to provide guidance on installation procedures and to establish minimum material quality requirements.

Only the most current copy of each reference specification should be used for contract purposes. Care should be taken to avoid the potential use of obsolete or out-of-date specifications.

Reference Specifications that may be listed in this section could include, but not limited to:

American Society for Testing and Materials - ASTM
American Concrete Institute - ACI
American National Standards Institute - ANSI
American Water Works Association - AWWA
American Welding Society - AWS
Military Specifications
Product Standards
Steel Structures Painting Council
United States Department of the Interior, Bureau of Reclamation

PART 543 – MATERIALS

543.00 General.

A variety of materials are used to install NRCS assisted works of improvement. The quality of the materials used must be adequate to ensure satisfactory performance for the project's expected service life. The selection of materials shall include the public's health and welfare as a consideration.

543.01 Scope

The total cost of installing, operating, and maintaining a conservation practice and/or system should be compared to the benefits expected to be generated. All materials used must be compatible with site conditions, intended purpose, and normal expected O&M so that installations will provide satisfactory service to the owner.

543.02 Preparation of Material Specifications

(a) In the absence of standard material specifications, the preparation of project specific material specifications may be required. Industry is continuing to develop new materials and to improve on existing materials. The need to maintain our technical skills will include the incorporation of new methods and materials in the service provided by the NRCS.

(b) Special material specifications should describe the minimum physical, quality, and/or functional requirements expected of the product or material. The functional requirements may include minimum test data results necessary to conform to the specification. The inclusion of a material product by name or other similar type of identification should be avoided. If the product name is included, it should be specifically noted that the reference by product name is intended to establish minimum material requirements only and not intended to support and promote a specific company or product by name.

543.03 Use of New Materials

(a) New materials are available for incorporation into conservation practices and project works of improvement. The decision to use a new material that may impact the cost or design life of a structure or practice shall be documented. Responsibility for the selection, evaluation, and decision to use a new material shall be as follows:

(1) Low and Intermediate Hazard Structures - The engineer with engineering design approval authority.

(2) High Hazard Structures - The State Conservation Engineer.

(b) When a new material may have regional or national applicability, an evaluation team should be assembled. The request for an evaluation team should be made by the State Conservation Engineer to the Regional Conservationist or Director of the Conservation Engineering Division, as appropriate. Evaluation teams shall make recommendations for the use of new materials, including any limitations or restrictions. Trial installations and monitoring plans may be recommended.

(c) It is important that information regarding the use of a new material be made available to others within NRCS and to agency partners. Dissemination of information shall be coordinated by the State Conservation Engineer, regional specialist, or the Director of the Conservation Engineering Division, as appropriate.

PART 544 - EQUIPMENT

544.00 General.

Much of the equipment utilized to collect data, test materials, and store samples is sensitive to vibration, weather or other environmental conditions. It is essential that all equipment be maintained, transported, and stored properly. Extra care to handle equipment properly and in accordance with the manufacturer's recommendations will help to ensure data is collected accurately, test results are correct, and down time because of inoperable equipment is reduced. Special training in the proper handling of specialty equipment, such as nuclear moisture and moisture/density gauges, may be required by agreements with regulatory agencies.

544.01 Transporting equipment.

Sensitive equipment, such as levels, transits, theodolites and especially the modern electronic survey equipment requires special handling and transporting. It is essential that all equipment be maintained, transported, and stored properly and in accordance with the manufacturer's recommendations. All equipment should be transported in proper containers in order to minimize problems associated with vibration and sudden stops. Special arrangements need to be followed in the handling and transporting of equipment that contain nuclear energy sources. The requirements provided by the equipment manufacturer and all terms and conditions of applicable agreements in the acquisition and utilization of nuclear gauges shall be followed.

544.02 Adjustment and calibration.

All equipment utilized to collect data for designs and to provide installation quality assurance shall be checked frequently to ensure accurate information is being obtained. All engineering survey equipment shall be checked, calibrated, and adjusted at least annually. Adjustment of equipment should be made only by those who have a full understanding of the care and maintenance of the equipment. Checking of instruments shall be

in accordance with procedures outlined in the Engineering Field Handbook, Chapter 1, and/or the manufacturer’s recommendations.

544.03 Maintenance.

All equipment shall be kept in good working order. Maintenance instructions provided by the manufacturer and other pertinent information shall be located in the Engineering Field Handbook and must be followed.

544.04 Storage

All equipment is to be stored in a clean, dry condition as recommended by the manufacturer. Specialty equipment, such as nuclear gauges, may have further requirements that may concern location, security, and signage.

544.05 State procedures.

(a) Each state is to develop specific procedures for ensuring proper care and maintenance of engineering equipment, including storage and carrying cases. The procedures should outline the minimum skills needed to operate the equipment and what specific guidelines must be follow during usage.

(b) Information about the proper cleaning, maintenance, and repairs should be provided each office. If the state has an individual(s) with equipment operation and maintenance responsibilities, his/her name(s) and telephone number should be provided to the appropriate offices within the state.