

Part 504 – Special Investigations, Studies, and Reports

Subpart A – Problems and Deficiencies

504.0 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 advancements 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 must clearly define the conditions that led to the problem or deficiency. These studies should—

- (1) Describe the situation that existed at the time of the study, in detail, including induced damages.
- (2) Define additional survey or investigation needs.
- (3) Determine the cause of the problem.
- (4) Provide recommendations for resolving the problem or deficiency.
- (5) Provide recommendations or changes needed to avoid a recurrence.
- (6) Fully document findings in an engineering report, providing the information needed to improve future engineering work and resolve possible claims or litigation.

504.1 Scope

A. An investigation is required and a report is prepared whenever an engineering practice, system, structure, structural element, or material does not function as planned. Deficiencies or failures that become evident during construction must also be investigated and reported.

B. An investigation must be initiated as soon as signs of instability or serious distress are detected in engineering practices. Deterioration of concrete, severe erosion in channels, movement or cracking of an embankment, malfunction of pipelines, and excessive seepage are some examples of serious distress.

504.2 Reporting Problems, Deficiencies, and Failures

A. The State Conservationist and Regional Conservationist must be notified immediately of a problem or deficiency that might create a serious emergency or a failure that has led or might lead to loss of life, serious offsite damages, disruption of public utilities, or major economic losses for owners, sponsors, contractors, or NRCS. The State Conservationist must telephone and email the Chief promptly. The telephoned report must 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 (see section 501.4 of this manual) is affected, the State Conservationist must see that the State conservation engineer (SCE) provides the report required in paragraph D of this section.

B. Normal lines of communication are used when reporting problems, deficiencies, or failures other than those described in paragraph A of this section. Political and social effects must be considered in determining the urgency of the notification to line officers and the need for informing others. Jobs in classes I through IV (see section 501.4 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 must ensure that appropriate authorities, owners, and 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 SCE must telephone and email the Director, Conservation Engineering Division (CED), and report the situation. The Director, CED, must provide engineering guidance on emergency or remedial measures and, if appropriate, arrange for special engineering assistance. The SCE must keep the Director, CED, informed of changes in the situation.

504.3 Committee Assignments

- A. An investigating committee must 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 are usually 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. SCEs may not be members of committees in their States. Non-NRCS personnel will be named to the committee only if specifically approved by the Director, CED. The committee may also include sponsors, State agencies, or others as observers.
- C. The committee must include specialists in appropriate disciplines, such as design, hydraulics, soil mechanics, construction engineering, geology, or others.
- D. For a minor practice or structure (class I through IV) the State Conservationist, if so instructed, appoints the investigating committee or the investigating engineer. The SCE provides recommendations on membership for the committee.
- E. For class V or VI jobs, the State Conservationist must appoint the committee based upon the recommendations from the Director, CED, and the SCE. Depending on the nature of the issue, it may be necessary to arrange for engineers or other specialists from the National Design Construction and Soil Mechanics Center, other centers, or from outside the State to serve on the committee.
- F. For class VII or VIII jobs, the State Conservationist and the Director, CED, will determine the committee membership and the disciplines to be included. The State Conservationist must 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, CED, will make the recommendation for the board and its membership. The State Conservationist must be notified when a board will be established. If an investigating committee has been established, its members will submit their findings to the board and, as appropriate, serve as staff for the board.
- H. The SCE provides general guidance and technical support and arranges for any assistance required by the committee or board.
- I. The appointment letter provides general guidance on the scope of the investigation and tentative schedule. If there are problems or questions about the assignment, the chairperson or the investigating engineer must resolve these issues as soon as possible.

504.4 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, continued deterioration of the structure, or emergency repairs, the investigation must begin as soon as possible. The district conservationist (or anyone visiting the site) should photograph the site as soon as possible.
- C. The investigating committee must—
 - (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, giving particular attention to the sequence and timing of events.
 - (5) Determine when the deficiency was discovered and when the structure was last inspected.
 - (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 streamflow 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 the design and installation of the structure.
- D. After compiling the necessary data, the committee or investigating engineer must—
 - (1) Determine the causes of the problem, deficiency, or failure. Support for each cause must 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, etc., should be changed to avoid a recurrence.
 - (4) When directed by the appointing official, make suggestions for alternative treatments in descriptive concepts and not treatment design details. This is a secondary purpose of the report.

504.5 Engineering Report

- A. An engineering report must be prepared for each investigation. The detail and composition of the report must be consistent with the size, complexity, and significance of the problem, deficiency, or failure.
- B. The engineering report must 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) Sufficient narrative and data to fully document facts and support findings and conclusions. The report must 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 must be prepared for all engineering reports of measures that are class V to VIII. 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 must 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, including any identified procedure or practice that, if followed, would have prevented or alleviated the situation.
 - (5) Sketches, as appropriate.

504.6 Report Review and Acceptance

- A. The committee or the investigating engineer must submit the report to the State Conservationist through the SCE. The SCE will coordinate the reviews required and upon technical acceptance, forward the report with his recommendations to the State Conservationist for distribution.
- B. The SCE must solicit review comments by employees who were responsible for preparing the design and inspecting the construction. The SCE and the employees’ comments must be attached to all copies of the report. Before the reports are released, they must be reviewed and accepted, as follows:
- (1) Classes I to IV.—The SCE determines when the report is technically acceptable. The SCE 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 SCE will request review comments from the Director, CED. After all issues are resolved and the SCE has determined that the report is acceptable, the SCE must submit the report to the State Conservationist and indicate its technical acceptance.
 - (2) Classes V to VIII.—The report must be submitted to the Director, CED. The Director, CED will review the report and indicate that the report is acceptable or request additional details, study, or other action needed for acceptance. After all issues are resolved and the report is accepted, the SCE must submit the report to the State Conservationist and indicate its technical acceptance.

504.7 Release and Distribution of Reports

- A. After technical acceptance and receipt by the State Conservationist, the report may 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, a copy of the accepted report must be forwarded to the Director, CED.