REPORT TO THE CONGRESS

Improvements Made In Building Construction Inspections To Determine Compliance With Contract Specifications B-118638

District of Columbia Government

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-118638

To the President of the Senate and the
Speaker of the House of Representatives

This is our report on improvements made by the District of Columbia Government in building construction inspections to determine compliance with contract specifications. Our review was made pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

Copies of this report are being sent to the Director, Bureau of the Budget, and to the Commissioner of the District of Columbia.

Comptroller General
of the United States

Contents

ABBREVIATIONS

ACI	American Concrete Institute
A-E	Architect-engineering firm
ASTM	American Society for Testing and Materials
GAO	General Accounting Office

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

IMPROVEMENTS MADE IN BUILDING CONSTRUCTION INSPECTIONS TO DETERMINE COMPLIANCE WITH CONTRACT SPECIFICATIONS
District of Columbia Government B-118638

D I G E S T

WHY THE REVIEW WAS MADE

The District of Columbia Government's building construction program includes designing and constructing new buildings--primarily schools--and modernizing and altering others. Appropriations for fiscal years 1968 and 1969 were about $54 million and $35 million, respectively.

The General Accounting Office (GAO) reviewed the District's inspection policies and practices to determine compliance with contract specifications--those applicable to concrete especially--because of the large sums being spent and because of indications of weaknesses in management of inspection activities.

FINDINGS AND CONCLUSIONS

The District relied on its site inspectors to determine whether concrete complied with contract specifications and practices recommended by the American Concrete Institute and American Society for Testing and Materials.

The District did not provide its site inspectors with (1) written guidelines clearly defining mandatory and recommended inspection practices and (2) equipment necessary to make required tests. Also, it did not have an adequate system for reporting to management the frequencies and results of concrete tests.

GAO's review showed that site inspectors

--had not made all required and recommended tests and checks on concrete for strength, slump, air content, discharge time, drum revolutions, temperature, or water added. (See pp. 7 to 12.) For example, on seven projects involving about 19,000 cubic yards of concrete--or about 74 percent of the concrete placed in District construction projects during fiscal year 1968--the required compressive-strength tests were not made for about 10,400 cubic yards which represented about 84 percent of the placements.

--had not required that concrete comply with specification limitations for slump, air content, drum revolutions, discharge time, calcium

chloride content, or temperature. (See pp. 8 to 12.) For example, on the seven projects, about 2,000 cubic yards of concrete--representing 22 percent of the concrete tested--were accepted although the slump exceeded the amount allowed by the specifications and the District's building code. Slump tests, which measure the wetness of concrete, are important because the amount of water added largely determines the quality of concrete.

--had not required that the angle of inclination of concrete chutes comply with specifications. The angle is important because, if the chute is too steep, the course aggregate may separate from the concrete. The American Concrete Institute states that, if separation occurs, serious imperfections in the finished product could result. (See pp. 12 to 13.)

The District had not made periodic reviews to determine the receipt of all required evidence from contractors, showing that materials, equipment, and systems incorporated in building construction were in conformity with applicable requirements. GAO's review showed that:

--On one project, about 38 percent of the required material samples and related shop drawings and literature had not been received. These submittals included samples of top soil, polyethylene sheeting, firebrick, sheet metal, hardware, wire and cable, waterproof paper, wood filler, acoustic plaster, and dry-set mortar. The importance of receiving and evaluating submittals is evidenced, GAO believes, by the fact that 50 percent of submittals received and approved on this project covered items which did not initially meet specification requirements. (See pp. 17 and 18.)

--On three projects, 50 percent of the required certifications had not been received. Certifications are required by the District to further evidence that materials and/or systems installed were in accordance with specification requirements. For example, manufacturer's certificates or test reports from a recognized testing laboratory evidencing that certain partitions and enclosures meet required fire-resistance ratings of the District building code were not received. (See pp. 17 and 18.)

Compacted soil (fill and backfill) was accepted even though results of compaction and gradation tests showed that the soil did not comply with specification requirements. Of soil-test results reviewed on six of 12 new building projects under construction in April 1968, about 32 percent of accepted compaction test results and 22 percent of accepted gradation test results did not meet specification requirements. (See p. 19.)

GAO believes that a vigorous and continual inspection program is the District's best means for determining that construction quality is

equal to that planned and paid for. Although no adverse effects were identified from the deviations from specifications and recommended practices, GAO believes that such deviations lowered construction quality and may cause maintenance and repair problems after completion of construction.

RECOMMENDATIONS OR SUGGESTIONS

During the review, GAO suggested to District officials the need for improved management control over building construction inspections. GAO suggested that officials provide needed guidance and test equipment to inspectors and that a better system for reporting and reviewing the results of the inspection activities be implemented.

AGENCY ACTIONS AND UNRESOLVED ISSUES

The District took prompt action to improve its policies and practices. (See pp. 20 to 22.)

MATTERS FOR CONSIDERATION BY THE CONGRESS

Because of congressional interest in the management of the District capital outlay program, GAO is submitting this report to the Congress to inform it of the changes in policies and practices made by the District to improve the inspection of building construction.

CHAPTER 1

INTRODUCTION

The General Accounting Office has made a review of the inspection policies and practices of the District of Columbia Government to determine contractor compliance with certain contract specifications and recommended practices. Our review was directed primarily toward certain aspects of the administration of building construction contracts and did not include an overall evaluation of the District's construction activities. The scope of our review is described in more detail on page 23.

The District's building construction program involves the design and construction of new buildings, primarily schools, and the modernization and alteration of existing buildings. The District received building construction appropriations totaling about $54 million and $35 million for fiscal years 1968 and 1969, respectively.

The District's Department of General Services administers the District's building construction program; this administration includes the supervision and inspection of new construction or major alterations to determine compliance with contract requirements and specifications.

Generally, the District enters into a contract with a private architect-engineering firm (A-E) for the preparation of contract drawings and specifications. According to the standard A-E contract, the drawings and specifications must provide for a complete and finished project when constructed in accordance with such documents. The District supplies the A-E with guide specifications, design manuals, and other related material to aid the A-E in preparing the drawings and specifications which should be prepared in accordance with applicable District requirements.

The District employs about 50 site inspectors whose responsibilities include determining that construction is carried out in accordance with the drawings and specifications and acting as liaisons between the contractors and the Department's Deputy Director who is designated as the

contracting officer. The inspectors have no authority to approve or order changes to contracts without the written approval of the contracting officer.

Inspections of construction, in addition to the site inspections, include (1) periodic construction inspections by Department management personnel, (2) concrete inspections by the District's Department of Highways and Traffic, (3) elevator, boiler work, and mechanical equipment inspections by the District's Bureau of Licenses and Inspections, and (4) acceptance inspections by the agency which is to use the facility being constructed.

The Department of Highways and Traffic's concrete inspection teams, if available, perform concrete tests and checks for the Department of General Services when requested to do so by the site inspectors. These results, except compressive-strength test results, are given to the site inspectors. Even though the Department of Highways and Traffic inspectors perform tests and checks, the responsibility for analyzing the results and accepting or rejecting the concrete remains with the site inspectors.

The requirements for placing and testing concrete are governed by the specifications which, in certain instances, require compliance with regulations of recognized authorities, particularly those of the American Concrete Institute (ACI) and the American Society for Testing and Materials (ASTM).

The principal officials of the District of Columbia Government responsible for the administration of activities discussed in this report are listed in appendix II.

CHAPTER 2

INSPECTION POLICIES AND PRACTICES

Although the District's policy required that construction materials and workmanship conform fully with contract drawings and specifications, our review showed that:

1. Required and recommended tests and checks of concrete to determine compliance with contract specifications had not been made.

2. Concrete had been accepted even though tests and checks showed that it did not comply with contract specifications.

3. Required samples, shop drawings, descriptive literature, and certifications--relating to materials, equipment, and systems--used to determine compliance with contract specifications had not been received.

4. Compacted soil (fill and backfill) had been accepted even though tests showed that it did not meet specification requirements.

Our review showed further that the District had not established adequate controls nor provided sufficient guidance over its construction inspection activities and had not provided certain equipment to enable its site inspectors to perform all necessary tests. Although our review did not reveal any adverse effects from the deviations from specifications and recommended practices, we believe that, if such effects do occur, they may not appear until years after completion of the construction work.

The results of our review have been discussed with District officials, and the District has taken certain corrective actions which should, if properly administered, improve the inspection program.

CONCRETE INSPECTION

Concrete is a mixture in which a paste of cement and water binds aggregates (usually sand, gravel, and crushed stone) into a rocklike mass as the paste hardens through the chemical action of the cement and water. Concrete can be made with wide variations in quality. The water-cement ratio, characteristics of the aggregates, use of admixtures--all materials other than cement, water, and aggregates that are added to concrete--and placing and curing practices are some important factors to be considered in determining the resultant quality of the hardened product. The quality of the concrete has an effect on the structural soundness, durability, maintainability, impermeability, and appearance of a project.

During fiscal year 1968, about 26,000 cubic yards of reinforced concrete, including about 6,200 cubic yards which were air entrained, were placed in District building construction projects. We reviewed all inspection reports made available to us on seven construction projects, which related to about 19,000 cubic yards, or about 74 percent of the concrete placed in District construction projects during fiscal year 1968.

Testing for strength, slump, and air content

The specifications require that, for all reinforced concrete, at least one compressive-strength test be made for each class of concrete (relationship of cement, water, and aggregates) placed each day. The specifications require also that concrete slump and, if applicable, air content, be tested; however, the specifications do not state the required frequency of such tests. The ACI states, and District officials agree, that all three tests--strength; slump; and, if applicable, air content--should be performed at least once for each class of concrete placed each day.

Compressive-strength tests are made to ensure uniform concrete of desired strength and quality. These tests are made by preparing cylinders of freshly mixed concrete which, after cured, are placed under pressure until cracked. For the description and significance of slump and air-content tests see pages 9 and 11, respectively.

By applying the above criteria, we found that a substantial quantity of concrete placed in District building projects during fiscal year 1968 was not tested for strength, slump, and air content. For the projects included in our review, the following schedule compares the total number of placements and yards which should have been tested with the number which were tested.

	Concrete requiring testing		Concrete tested		Percent tested	
	Placements	Yards	Placements	Yards	Placements	Yards
Compressive strength	504	19,188	82	8,750	16.3	45.6
Slump	504	19,188	77	8,748	15.3	45.6
Air content	132	4,375	17	1,970	12.9	45.0

Drum revolutions and discharge time

The specifications state that concrete-mixer trucks shall be equipped with an approved device for recording the number of drum revolutions between the time of adding water to the aggregates and the placing of the concrete. Each batch of concrete is to be mixed not less than 50 nor more than 100 drum revolutions at mixing speed. Overmixing of concrete is objectionable because the grinding action reduces the size of the aggregates and increases the amount of small particles, which require more water to maintain the consistency of the concrete; causes segregation; and drives out entrained air. In addition, since stiffening begins when moisture is added to the cement, the specifications require that concrete be discharged in no more than 90 minutes from the time moist aggregates are added to the cement.

Our review indicated that, except when tests were made by the Department of Highways and Traffic, the number of revolutions and the discharge times had not been checked. On visits to two building construction projects, we observed that the site inspectors did not check the revolutions or the discharge times for the concrete placed. Moreover, for all the concrete records we reviewed, we

found no information to evidence that the other site inspectors had checked the revolutions and discharge times.

Our review of the records of the tests performed by the Department of Highways and Traffic showed that about 5 percent of the concrete tested had been accepted by the site inspectors even though the number of revolutions had exceeded 100. The revolutions which exceeded 100 varied from 116 to 175 revolutions, or averaged 150. On an additional 5 percent of the concrete tested, the revolution counter on the mixer had not been functioning. Our review showed further that about 18 percent of the concrete tested by the Department of Highways and Traffic and accepted by the site inspector had not been discharged within 90 minutes from the time the cement and moist aggregates were batched. The tests which exceeded 90 minutes varied from 94 to 190 minutes, or averaged 129.

Addition of mixing water and results of slump tests

The highest quality cement paste is made with the smallest practicable amount of water. More water is used for the sake of placeability; however, if too much water is used, the paste becomes thin and diluted and, when hardened, will be too weak to bind the aggregates firmly. Such concrete may have tendencies toward shrinkage, cracking, segregation, and excessive dusting. The ACI states that good control over the mixing water added is necessary because of the general tendency of workmen to make the consistency of concrete as wet as possible.

The test for wetness or dryness of concrete mix is referred to as a slump test. These tests are made during the placing of concrete by measuring the number of inches which a mass of concrete settles (slump) after removal of a cone into which the fluid concrete has been poured.

The Building Code of the District of Columbia and the specifications limit the maximum slump to 5 inches with no tolerances. The specifications also require that the amount of mixing water, including moisture in the aggregates, added to each batch of concrete be measured to within plus or minus 1 percent of the amount specified and be recorded.

On District construction projects, water is added to the cement and aggregates at the construction site where the concrete is mixed in concrete-mixer trucks. Our review showed that the site inspectors were not effectively controlling the amount of water added to concrete and that significant amounts of concrete which exceeded both building code and specification slump limitations were incorporated into District building construction projects during fiscal year 1968.

During our review, we were not able to locate any records which showed the amounts of mixing water added to each batch of concrete. We were subsequently informed by District officials that, contrary to specification requirements, such recording was not being done. We visited two construction sites and observed that the truck drivers were allowed to add water on the basis of their judgment. We noted that the inspector, at one of the sites visited, did not know how to compute the moisture in the aggregates to enable him to determine whether the proper amount of mixing water was added.

Our review of slump-test results showed that about 2,000 cubic yards of concrete--representing about 22 percent of the concrete tested--had been accepted even though the slump was in excess of the 5 inches allowed by both the specifications and the building code.

Air-content test results

The most destructive weather hazard for concrete is alternate freezing and thawing cycles. As water freezes it expands and produces pressures that can rupture the concrete and cause spalling. Resistance to freezing action can be increased by adding an agent to the concrete mix which produces minute well-distributed microscopic air bubbles--air entrainment. The entrained air bubbles allow for, and relieve expansion caused by, the freezing water and thereby prevent damage to the concrete. Excessive air entrainment can reduce concrete strength.

Our review showed that air-entrained concrete which did not comply with specification requirements for air content was incorporated into District building construction during fiscal year 1968. The specifications generally require the percent of air content to be between 4 and 6 percent of the volume of the concrete. Our review of the results of air-content tests taken showed that about 41 percent of the tests accepted, representing about 40 percent of the air-entrained concrete tested, or about 800 cubic yards, had not complied with the specifications. These results varied from 3.7 to 7.4 percent.

Addition of calcium chloride and temperature of concrete

Calcium chloride is added to concrete mixes in cold weather to accelerate setting and hardening of the concrete before it dries out. The specifications require that, when the air temperature is below 40° F., the temperature of the concrete being placed must be between 70° and 100° F. and calcium chloride must be added to the concrete mix. The specifications generally limit the amount of calcium chloride added to 2 pounds per sack of cement. The addition of too much calcium chloride can result in placement problems and can be detrimental to the concrete since it may cause rapid stiffening, increase drying shrinkage, and corrode reinforcement materials.

Our review showed that the site inspectors were not enforcing compliance with these specification requirements. Concrete delivery tickets show the amount of calcium

chloride added to the concrete. Our review of these tickets for three school projects under construction during fiscal year 1968 showed that, of about 10,300 cubic yards of concrete which contained calcium chloride, about 2,400 cubic yards, or about 23 percent, contained excessive amounts.

Moreover, our review showed that calcium chloride had been added to about 700 cubic yards of concrete, even though the temperature was above 50° F., and in one instance the temperature was 81° F. Although the specifications do not prohibit the use of calcium chloride when the air temperature exceeds 40° F., the ACI states that calcium chloride should not be added in warm weather.

Although the specifications require that concrete temperature be between 70° and 100° F. when the air temperature is 40° F. or lower, we were informed by 10 site inspectors that, in most cases, they did not check the temperature of concrete being placed. We noted that the Department of Highways and Traffic inspectors checked and recorded the temperature of concrete when they made tests for the Department of General Services. A review of these records showed that the concrete temperature was not at least 70° F. on seven of eight tests made when the air temperature was 40° F. or lower.

Chutes and segregation

The specifications require that the method and manner of placing of concrete must prevent segregation of materials. When chutes are used, the specifications require that their angle of inclination not exceed 30 degrees from horizontal. District officials have informed us that chutes, since they are used only when deep excavations are required, are not always used on District building construction projects.

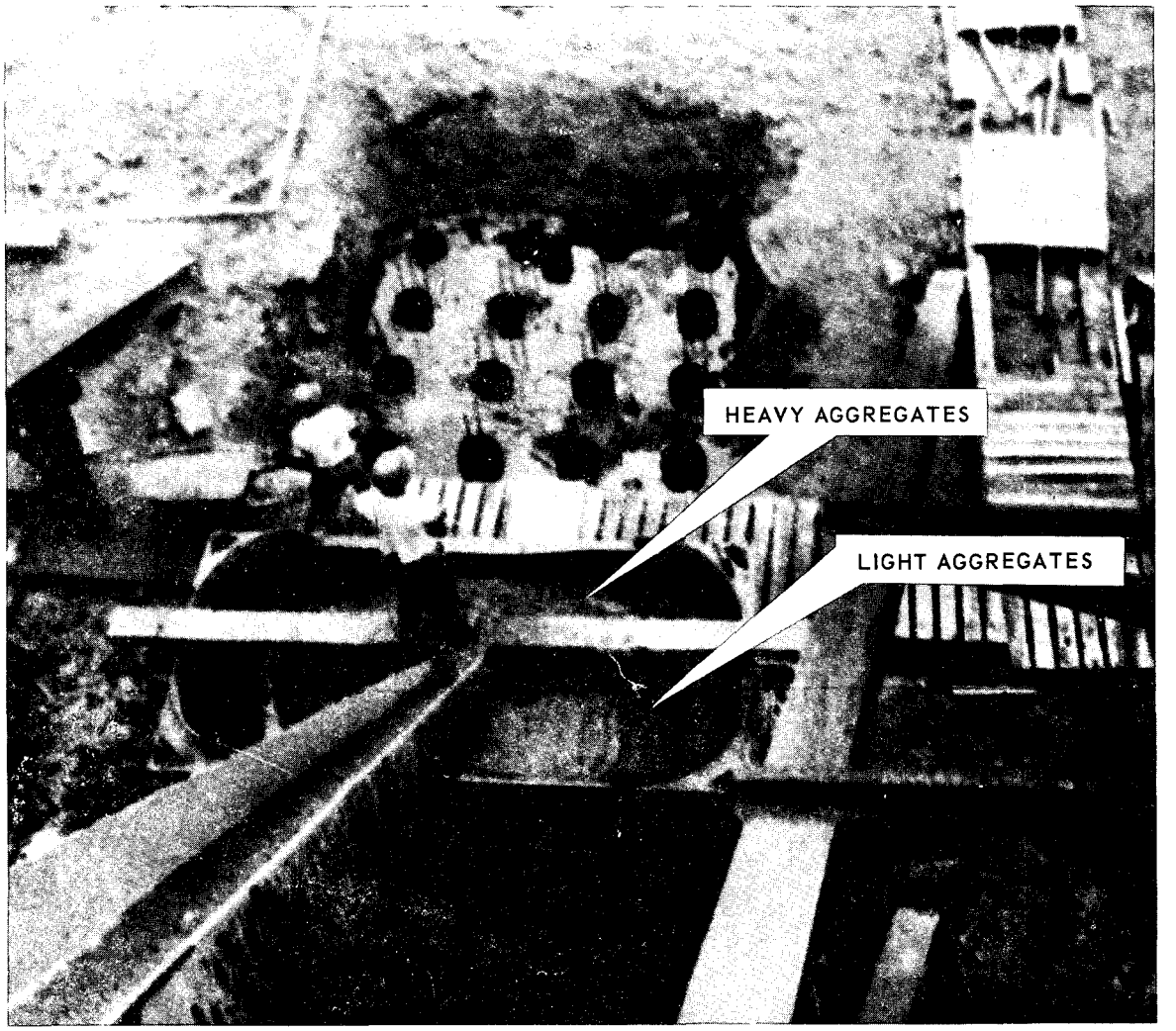
The ACI states that the most important consideration relating to handling and placing concrete is that of avoiding separation of the coarse aggregate from the concrete and that, if such separation occurs, serious imperfections in the finished work could result. The ACI states also that, whenever concrete is dropped into a hopper, the

direction of fall must be vertical, otherwise excessive segregation of coarse aggregate will invariably occur. The ACI recommends that, if chutes are used as conveying devices, a vertical drop can be ensured by the use of a short vertical section of pipe at the end of the chute.

During our review, we visited a District building construction project and observed that four concrete delivery chutes being used were at angles in excess of the 30-degree maximum angle of inclination permissible by the specifications. District officials informed us that the use of chutes which are in excess of 30 degrees from horizontal would unfavorably contribute to the separation of the concrete aggregates. These chutes were used to discharge concrete into hoppers from which the concrete was conveyed to the actual placement site. We noted that one of these chutes, about 30 feet in length, was inclined at an angle of approximately 60 degrees from horizontal. (See picture on p. 14.)

We also observed that the concrete discharged from the chutes was segregating in the hoppers. We noted that the District did not require, nor did the contractor utilize, a device at the end of the delivery chutes to ensure a vertical drop that would reduce the separation of concrete coarse aggregates from the concrete mortar. (See picture on p. 15.)

CONCRETE CHUTE AT ANGLE OF ABOUT 60° FROM HORIZONTAL



CONCRETE SEGREGATION

Management control

We found that the District placed full reliance upon its site inspectors to determine the compliance of concrete with contract specifications and recommended practices without providing the inspectors with written guidelines more clearly defining mandatory and recommended inspection procedures. For example, although the specifications state that concrete should be tested for slump and air content, the site inspectors had not been provided with written instructions as to the frequency of such testing. Moreover, we found that the District had not provided, and many inspectors did not have, concrete thermometers and devices to measure air content and to make slump tests. Such equipment is necessary to perform tests required by the specifications.

We found also that the District had not established an adequate system for reporting to management the frequencies and results of concrete testing. Although the inspectors were required to submit daily inspection reports to the Department's Bureau of Construction Management, the District did not require the reports to contain such information as the number of slump, air content, and strength tests taken and their results; the number of drum revolutions and discharge times; the amount of calcium chloride and water added; the concrete temperature; or any unsatisfactory conditions. Our review showed that generally, the reports did not contain such information.

SUBMISSION OF SAMPLES, SHOP DRAWINGS, DESCRIPTIVE LITERATURE, AND CERTIFICATIONS

To evidence that the materials, including equipment, and systems incorporated in District building construction are in conformity with all applicable requirements, the specifications require that the contractor submit to the District certain material samples, shop drawings, descriptive literature, and certifications.

The specifications state that the submittals must be furnished to, and approved by, the District prior to installation of the items covered by the samples and related drawings and literature. Upon receipt and approval of the samples, site inspectors are to receive a description and/or sample of the materials approved as a means for determining that the materials to be installed are the same as those approved.

The Department's Bureau of Construction Management is responsible for determining that required submittals are furnished and cover items which comply with specifications. We discussed the management procedures relating to submittals with a Bureau official, and he informed us that periodic reviews had not been made to determine that required submittals were received.

We reviewed the specifications for one building construction project to identify the material samples and related shop drawings and literature that were required to be submitted and compared this data with the submittals received. A Bureau official informed us that, in his opinion, this project should be fairly representative of all District building construction.

Our review of District records for this project showed that, of 232 submittals required, 85, or 38 percent, had not been received by the District. The submittals that were not received, which related to many phases of building construction, included samples of top soil, polyethylene sheeting, firebrick, sheet metal, hardware, wire and cable, waterproof paper, wood filler, acoustic plaster, and dry-set mortar. The importance of receiving and evaluating submittals is evidenced, we believe, by the fact that, of the 147

submittals received and approved, 70, or about 50 percent, covered items which initially did not meet specification requirements and which were returned to the contractor for corrections.

In regard to submittals of certifications, the specifications state that the submittals must be furnished prior to acceptance of the work and issuance of final payment. Certifications are required to further evidence that materials and/or systems installed were in accordance with specification requirements.

We reviewed the specifications for three construction projects to identify required certifications and compared this data with the certifications received. For these projects District records showed that, of 70 certifications required, 35 had not been received by the District. Following are examples of certifications not received.

1. Certification that the quality of the structural facing tile units conforms with requirements of the specifications.

2. Manufacturer's certificates or test reports from a recognized testing laboratory to evidence that certain partitions and enclosures meet required fire-resistance ratings of the District Building Code.

3. "Smoke and Boiler and Unfired Pressure Vessel Inspection Certificate" on the heating and ventilating system.

SOIL TESTING

The specifications generally require two types of tests to be performed on compacted fill and backfill--(1) compaction tests which measure soil density and (2) gradation tests which measure the distribution of particle sizes throughout a mass of soil.

Soil-compaction and gradation tests are important since soil density characteristics affect settlement of embankments, bearing strength of the soil, soil permeability, and soil resistance to water absorption and movement. Soil tests are performed by personnel from the Department of Highways and Traffic when requested to do so by the site inspectors.

We reviewed the results of the soil tests performed by the Department of Highways and Traffic on six of 12 new building projects under construction in April 1968. Our review showed that of 19 compaction test results accepted by the site inspectors, six, or about 32 percent, did not meet specification requirements. Also, of 37 gradation test results accepted, eight, or about 22 percent, did not meet specification requirements.

CHAPTER 3

CONCLUSION AND AGENCY ACTIONS

In our opinion, a vigorous and continual inspection program is the District's best means for determining that construction quality is equal to that planned and paid for. We believe that the District had not established adequate controls nor provided sufficient guidance over its building construction inspection activities. Also, it had not provided its site inspectors with the equipment necessary to make required tests and checks. Although we could not identify any adverse effects from the deviations from specifications and recommended practices, we believe that such deviations lowered construction quality and may cause maintenance and repair problems after completion of construction.

During the review, we discussed our findings with District officials and suggested the need for improved management control over building construction inspections by (1) providing needed guidance and test equipment to its inspectors and (2) implementing a better system for reporting and reviewing the results of the inspection activities. District officials concurred in the importance of making sure that building materials are in compliance with specifications and assured us that they would make certain that all aspects of District building construction fully comply with specification requirements in the future. The following actions have been taken to correct the deficiencies in inspection practices that we found during our review.

1. Guidelines for inspecting, testing, and rejecting concrete--including mandatory practices for inspectors, explanations of common deficiencies, and recommended inspection procedures--have been prepared and distributed to site inspectors.

2. A concrete data report on which inspectors are required to record pertinent concrete data has been instituted. District officials stated that these reports would be periodically reviewed to ensure that the inspectors are enforcing contractor

compliance with specifications and would be maintained as a permanent record.

3. Fifty ACI manuals of concrete inspection, 50 concrete thermometers, 25 Chace indicators for measuring air content, and 12 slump cones have been purchased and distributed to site inspectors in accordance with their needs.

4. The angles of inclination of concrete chutes on one project we visited were adjusted so that they complied with specifications and one chute was removed. The concrete which had been placed on this project was given extensive tests to determine whether or not the structural soundness of the building had been jeopardized. We were informed that the test results showed that the concrete exceeded minimum specification requirements for strength and that the concrete was structurally sound. We were informed also that, in the future, recommended ACI procedures would be used to help prevent segregation.

5. Letters have been issued, where appropriate, requesting that missing submittals be furnished by the contractors of the construction projects included in our review. Also, a District official informed us that more care would be taken and that an additional technician had been assigned to determine that required submittals are furnished.

6. The importance of requiring compliance with specified soil requirements had been emphasized to the site inspectors.

In commenting on a draft of this report by letter dated January 20, 1970, the Assistant to the Commissioner agreed with our conclusions that improved controls should result in better construction and that the quality of the finished product is in large measure a reflection of the quality of inspection. He stated that testing of concrete and earthwork placements was being emphasized during inspector training sessions and that special courses in these

subjects were being arranged; specifications were being updated; closer coordination was being maintained between the Department of General Services and the Department of Highways and Traffic; and additional testing equipment was being provided to inspection personnel.

We believe the corrective actions taken by the District should, if properly administered, improve the District's building inspection program.

CHAPTER 4

SCOPE OF REVIEW

Our review of the District's inspection program for building construction was made at various offices in the Departments of General Services and Highways and Traffic. Our review included examinations of pertinent District building codes, policies, and contract specifications. Also, we interviewed various District officials responsible for determining contractor compliance with building specifications. Standards of the American Concrete Institute and the American Society for Testing and Materials were consulted. We visited several construction sites to observe inspection practices.

We reviewed all inspection reports made available to us on seven large projects, which related to about 19,000 cubic yards, or about 74 percent of the concrete placed in District construction projects during fiscal year 1968. We scheduled the results of various concrete tests and checks made and compared this data with contract specifications, and the practices recommended by the American Concrete Institute and the American Society for Testing and Materials. We reviewed District records to ascertain whether required material samples, shop drawings, and descriptive literature had been received for one project and whether required certifications had been received for three projects. Also, we compared contract requirements with results of compaction and gradation soil tests taken on six of 12 new building projects under construction in April 1968.

APPENDIXES

GOVERNMENT OF THE DISTRICT OF COLUMBIA
EXECUTIVE OFFICE
WASHINGTON, D. C. 20004

January 20, 1970

Mr. Willard L. Russ
Assistant Director, Civil Division
United States General Accounting Office
Washington, D. C. 20548

Dear Mr. Russ:

This is in response to your letter dated December 10, 1969, requesting comments on your proposed report to the Congress on need for improved inspection policies and practices in assuring contractor compliance with building specifications.

The draft report has been given careful review and the opportunity to comment on it is appreciated.

We agree with your conclusions, as contained in Chapter 3 of the report, that improved controls should result in better construction and that the quality of the finished product is in large measure a reflection of the quality of inspection.

The six corrective actions indicated in the report were initiated in April, 1969. Testing of concrete and earthwork placements is being emphasized in our inspector training and special courses in these subjects are being arranged. Specifications are being updated. Closer coordination is being maintained between the Department of General Services and the Department of Highways and Traffic. Additional testing equipment such as concrete thermometers is being provided our inspection personnel.

We trust that future evaluations by the General Accounting Office will recognize that improvements in our inspection procedures have been effectively implemented and that quality construction is being achieved economically.

Sincerely yours,

Graham W. Watt
Deputy Mayor-Commissioner

PRINCIPAL OFFICIALS OF THE DISTRICT OF COLUMBIA GOVERNMENT RESPONSIBLE FOR THE ADMINISTRATION OF ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
COMMISSIONER OF THE DISTRICT OF COLUMBIA		
Walter E. Washington	Nov. 1967	Present
ASSISTANT TO THE COMMISSIONER OF THE DISTRICT OF COLUMBIA		
Graham W. Watt	Jan. 1970	Present
Thomas W. Fletcher	Nov. 1967	Dec. 1969
DEPARTMENT OF GENERAL SERVICES (note a)		
DIRECTOR:		
Samuel D. Starobin (acting)	Mar. 1969	Present
DEPARTMENT OF BUILDINGS AND GROUNDS (note a)		
DIRECTOR:		
James A. Blaser	Nov. 1956	Mar. 1969

[a]Under the provisions of Commissioner's Order No. 69-96 effective March 10, 1969, the Department of General Services was established and the former Department of Buildings and Grounds was incorporated into the new Department.

U.S. GAO Wash., D.C.