

CHAPTER 5
CONTROL OF MATERIALS

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5-1 GENERAL

This chapter deals with the general requirements for materials inspection and control, including the inspection and control of the *installation* of those materials, i.e. the work itself.. Some additional information concerning inspection of materials for specific construction items is included in Chapter 9 of this manual. The *FLH Field Materials Manual* is the primary guide for sampling and testing materials.

Specific requirements for all materials are stated in the Standard Specifications, Special Contract Requirements and Plans.

Copies of all preliminary engineering materials and subsurface data; such as soil profiles, boring log data, materials sources, borrow area diagrams, options, use permits, and test reports should be on file at the project office. The Project Engineer should consult with the Construction Operations Engineer to insure that he/she has what is available.

The *FLH Field Materials Manual* explains verification of contractor testing as well as Independent Assurance sampling and testing, including required frequency thereof. The Project Engineer will need to monitor these functions or at least be aware of the requirements, and advise the Construction Operations Engineer and/or Materials Specialist of when construction operations require them to perform required functions.

Materials incorporated into highway work are of three basic types:

- Off-the-shelf commercial items, which are represented by the manufacturer as meeting a standard or industry specification. E.g. guardrail, traffic paint, culvert pipe.
- Commercial items manufactured specifically to meet the requirements of FLH, or which are of sufficient criticality to require inspection and quality assurance by FLH or an organization engaged by FLH. E.g. structural steel, precast structural elements.

- Items manufactured at or near the site of work by the Contractor, subcontractor or supplier, and which are subject to routine inspection, and quality assurance procedures by FLH. E.g. asphaltic concrete, aggregate base course.

Testing and inspection of commercial items, other than off-the-shelf items will generally be conducted at the site of manufacture by specialists engaged by FLH. Often State DOT personnel will be engaged to perform these Quality Assurance functions.

Tests for locally produced materials will be made by Contractor or FLH personnel as per the requirements of the Contract. Often the tests will be performed at commercial laboratories on samples submitted through the Project Engineer.

The Standard Specifications require the Contractor to notify the Engineer of all proposed sources of materials at the earliest date possible. These sources should be reported immediately to the Construction Operations Engineer in order that necessary arrangements may be made for the testing of materials. If, as for Contractor proposed sources of crushed aggregates, the Contractor is to do sampling and testing, the Construction Operations Engineer will make known any requirements relative to the size and numbers of samples, not explicit in the Contract.

Pursuant to FAR Clause 52.246-12, the Contractor will be required to maintain an adequate inspection system and perform such inspections as will ensure the work conforms to contract requirements. The Project Engineer should review all test reports for accuracy and completeness, whether the test was performed on the project, by designated laboratories, or other inspection agency. Commercially produced products that are shipped to the project, whether or not quality assurance documentation is required, should be physically inspected by the Contractor upon delivery. Spot checks by FLH personnel should verify that these inspections are effective.

The FLH Field Materials Manual provides details as to the nature of quality assurance documentation required for various type of materials.

The Contract provides that the Contractor shall, without charge, replace any material or correct any work found by the Government not to conform to the Contract requirements, unless in the public interest the Government consents to accept such material or work with an appropriate adjustment in Contract price.

With respect to acceptance, construction materials will fall into one of the following categories:

- Those found to exceed minimum specification requirements and are accepted at a pay factor exceeding 1.00 as per a statistically based acceptance plan in the contract.
- Those found to be in reasonably close conformity with the specifications; and are therefore accepted at full payment.
- Those not in reasonably close conformance but deemed technically serviceable and therefore accepted at reduced payment as provided by a contract acceptance plan or as mutually agreed if there is no acceptance plan.
- Those not in reasonably close conformance, and not deemed technically serviceable and therefore rejected, and require to be removed, replaced or acceptably corrected.

Care should be taken when evaluating materials after a Contractor's corrective efforts. One common misconception is that an individual sample and test result represents a discrete quantity of material. But often poor quality materials contain both passing and failing quantities. One test which passes may be due solely to chance.

In fact, any quantity of material is collectively represented by all the samples taken from it. If acceptance is based on the statistically based

acceptance plan in the Contract, at least five tests are required for even a minimal assessment of the quality level. Any corrective effort should be applied to the whole of any material represented by a series of samples, unless additional testing convincingly isolates the defective areas. After corrective action, multiple tests must be used to verify that the corrective actions were effective.

Nonconforming material with a quality level within the range of the Contract acceptance plan is accepted in accordance with that plan, provided that the material is uniform in appearance and apparent quality. I.e. as long as there are no isolated areas of grossly defective materials. However, if the Contractor chooses to replace or correct the defective materials, that option should be permitted as long as the Government incurs no added expense or risk, and ultimately receives materials and related work which fully conform to the Contract requirements.

For nonconforming materials for which there is no applicable acceptance plan, the Contractor must either remove and replace, or correct the defects; or negotiate a pay reduction acceptable to the Government.

To accept nonconforming materials at reduced payment when there is no contract acceptance plan two things must happen:

- **The Government must make a determination that the materials will serve the purpose intended, and**
- **The Government must agree on the amount of the reduced payment.**

Generally the Contractor is told that the materials or work in question are rejected, that they must be replaced or corrected, and that any offer of acceptance at reduced payment must be generated by the Contractor, together with acceptable support documentation. If the Contractor indicates such an offer is forthcoming, there must be a determination by the Government that the defective materials will serve the intended purpose. If the

Government cannot make this determination, the default is to go back to remove & replace or correct. If the determination is affirmative, the appropriate amount of the pay reduction should be evaluated by the Government. Advice of the COE and materials specialists will be required. The appropriate amount of the adjustment will be based on engineering and contractual considerations, and the particular circumstances of each situation. In the end, the final amount of the price reduction must be negotiated and mutually agreed or else the default is back to the remove & replace or correct.

Once agreement on price is achieved, a contract modification is then required to effect the acceptance at a reduced price.

Refer to Chapter 3 for procedures to be followed in negotiating a Contract Modification for accepting nonconforming material.

5-2 SOURCES FOR AGGREGATES, SELECT BORROW, ETC.

The Standard Specifications usually provide that the Contractor may furnish materials from sources shown on the plans or described in the special provisions, or from Contractor furnished sources. In any case, the Contractor is to determine the amount of equipment and character of the processing required to produce specification materials.

The Contractor is required to submit certain information relative to any proposed materials source other than a source shown by the Government in the contract as acceptable. The COE will, with consultation with Materials, review the Contractor's test results and quantity data before approval and authorization of Contractor furnished sources.

The Construction Operations Engineer will usually require sufficient exploration and testing to be reasonably confident of the source. But for a Contractor selected source, the Contractor will always assume additional risk in that the Contractor, not the Government is responsible for the adequacy of the source.

If the Contractor attempts, using reasonable and accepted industry processing practices, to produce specification material from a Government source, and is unable to do so, the Contractor may be eligible for a equitable adjustment for increased costs incurred in producing material from a new source. This additional compensation may include the costs of equipment moves and setup, additional haul, and additional costs, if any, of producing the material. Again a Contract Modification is indicated, and the COE and appropriate specialists will have to evaluate the situation and agree that the Government source is not acceptable.

The Contractor is responsible for producing a material which meets gradation and plasticity requirements by appropriate crushing, screening and even reasonable wastage. On the other hand, processing cannot change such characteristics as soundness, abrasion, or stripping resistance of

the aggregate, nor the quantity of material in the deposit. Therefore, the Government assumes these responsibilities when proposing sources.

Care should be taken to insure that all reasonably available material is secured from a source before the Contractor is authorized to move to a new source. Different formations in sources and other factors affecting production should not be used as reason for abandonment, when acceptable material can be reasonably produced.

Extraction methods, land use, and quantities of material located on U.S. Government property should be discussed with a representative of the land managing agency if one is present during the preconstruction meeting, or in any event before any work on the deposit is started by the Contractor.

5-3 SAMPLES AND TESTS

5-3.1 Sampling and Testing

Sampling and testing requirements are contained in the specifications. Detailed instructions are in the *FLH Field Materials Manual*.

5-3.2 Records and Reports of Materials

On assignment to a construction project, the Project Engineer should obtain copies of test results, soil profiles, pit diagrams, materials source options or use permits, and all other applicable preliminary materials data for the project.

It is the responsibility of the Project Engineer to maintain a file at the project office of all tests made, both in the field or elsewhere, to indicate the quality of all materials delivered to the project and used in the construction. All test reports should show the source of the samples, the quantity represented, and where, when and by whom the sampling and testing was done. The record should also show whether the material so represented is accepted or rejected.

Copies of test reports are to be furnished to the Contractor.

Forms for recording of field testing operations are described in the *FLH Field Materials Manual*.

5-3.3 Size of Samples and Schedule for Sampling and Testing

Frequencies at which quality control, verification and independent assurance samples are to be taken should conform to the Contract requirements; otherwise guidance in the *FLH Field Materials Manual* should be used. Sample sizes to be submitted for testing should conform to the requirements of the contract as detailed in the Contract or the *FLH Field Materials Manual*.

5-4 STORAGE AND HANDLING OF MATERIALS

The Contractor is responsible for the handling and storage of materials to insure the preservation of their quality and fitness for the work. If the Project Engineer comes to believe the Contractor's handling and storage operations will be detrimental to quality, and the belief continues after consultation with and/or suggestions to the Contractor, the Project Engineer should consult the Construction Operations Engineer relative to directed operations and/or payment for preliminary work. The Government always has the right to retest materials to verify they have not been degraded by Contract operations or the lack of adequate protection. The Government can decline to make advance payment for materials which are not stored and protected from degradation.