1000 CONTROL OF MATERIAL

Logging of Tests

Project personnel will keep and maintain materials testing logs or reports for all testing results. Either “paper” or “computer” logs may be kept as desired by the project. Copies of materials testing logs are sent to the Regional Lab and/or the Central Lab only upon request.

The service life of a project is dependent not only upon the care used in construction, but also on the quality control and kind of materials incorporated. It is necessary that only materials which comply with the specifications be used. The Materials Policy & Procedures Directives, Materials Testing Manual, AASHTO and ASTM Standard Methods of Sampling and Testing, Construction Manual, and Construction Bulletins provide the procedures necessary for the sampling and testing of material. The project personnel must continually watch to see that no inferior materials are used. They must see that samples are taken in accordance with the Sampling Guide Schedule, by the required procedures, and that these samples are tested and reported promptly.

Prompt testing and prompt reporting to all concerned (including the contractor) are a vital part of our system of quality control. The following guidelines are established in order to provide an acceptable system of reporting project material test results.

Each construction unit will implement one of the two systems as below outlined, with no substitutions or exceptions. The systems will be either Manual Materials Logs or Computer Material Logs.

Project Materials Coordinators (PMC) should provide the inspectors with a list of Proctors, approved concrete mix designs, and approved asphalt mix designs for use in the field. Inspectors should not have to look up the info on their own (sometimes they may not be able to).

Manual Materials Logs

1. Materials test cards or work cards listed below will be used:

    - 44-1000 - One Point Proctor Density (Field Office)
    - 44-1001 - Field Density/Moisture of Soils by the Nuclear Method (Field Office)
    - 44-1002 - Method A or Alternate Method D Proctor Density (Field Office & Lab)
    - 44-1003 - Method C or Method D Proctor Density (Lab)
    - 44-9338 - Asphalt Test Data (Lab)
    - 44-9347 - Sand Cone Density (Field Office)
    - 44-9348 - Volumeter Density (Field Office)
    - 44-9352 - Asphaltic Concrete Tabulation (Lab)
    - 44-9372 - Asphaltic Concrete Tabulation - Furnace (English) (Lab)
    - 44-9374 - PG Binder Test Data (Lab)
    - 44-9379 - RAP Material Tabulation - Ignition Furnace (Lab)
    - 44-9337 - Concrete Test Report - PEN V was developed to automatically assign concrete samples with the next available number in FAST once approved in PEN. This was developed to ensure the Department doesn’t have duplicate numbers or skipped numbers. The inspector makes the sample, enters the info in PEN, then turns in the card and uploads to PEN (the inspector does not need to number the card). The PMC approves the PEN concrete sample and FAST automatically assigns the sample with the next available number based on PSI strength for that project. The PMC goes into FAST to retrieve the sample number and puts it on the test card and concrete cylinder samples. When the cylinders are delivered to the Lab, they are already numbered and in FAST. This process was intended to move away from manually numbering samples.

2. The required information will be transferred from the work cards to the appropriate log form listed below:

- 44-3904 - Materials Certification Log
- 44-3917 - Proctor and Density Log is available in FAST and shows all info entered in PEN for the test once approved. There is no need to manually track the density tests. The PMC should approve density tests in PEN, and FAST tracks all of the information numbering every test based on classification. This report can be printed.
- 44-4404 - Concrete Log was used to track cylinders made on a project and enter the break data after 28 days. FAST now provides this information. FAST has a printable Density Log and Concrete Log for every TRACS number. The Department no longer requires manual Logs for this.

Additions and/or updates can be made intermittently to any of the above listed forms.

3. Materials will be sampled as outlined in the Sampling Guide Schedule of the ADOT Materials Quality Assurance Program (Appendix C) or the project Special Provisions. Project test results will be typed or printed in black. Lines will be left blank immediately below the results of each split sample for the purpose of recording corresponding Regional and Central lab results as soon as they are received at the project.

4. For those who wish to record statistical information such as running averages, averages in data, standard deviation, coefficient variation, of individual screens, or other information, may do so on these forms. Averages may be accumulated down the sheet and recorded by leaving blank the number of lines needed. This type of information may also be recorded in the concrete log in spaces not utilized.

Computer Materials Reports (Logs)

1. The same test or work cards as listed for manual material logs will be used.

2. Information from the test or work cards will be entered into the computer when completed, which will make all testing information performed by the project lab available by computer to the project.

3. An up-to-date computer report may be maintained at the project lab or office. When computer reports, commonly called material logs, are used, the necessary information may be obtained two ways, by either looking at the computer screen directly or by printing out a materials report.

4. Materials will be sampled as outlined in the *Sampling Guide of the Materials Testing Manua*l or the project Special Provisions.

Whichever of the two systems is utilized, it is essential that all calculations of test results be correct. When manual materials logs are used, it is essential that the individual performing each test, sign and date each test or work card. Each card should, in turn, be checked and initialed by a supervisor before the results are recorded in the materials log. If a computer report is used, the name of the person performing the test should be recorded in the computer next to the test results.

Logs or computer reports should show all acceptance and test results performed by the project, regional, and central lab. Tests such as informational, etc., will be left to the individual project or District discretion as to whether the information will be included in the log or report. The approximate total quantity of material required should also be shown in the log heading.

Logging of Concrete Test Results

It has been customary to log all tests on concrete after the laboratory reports covering strength have been received. It is suggested all tests on concrete, except strength, be logged as soon as possible after making the tests, then log the strength tests after receipt of the laboratory report showing the strength results. It is believed that earlier logging of all tests, except strength, will serve to alert the Engineer and others concerned with the project to the need of any corrective action with respect to the slump, air content, temperature, yield, and etc.

Logging of Density Test Results

The location and results of density tests shall be logged in the proctor and density log.

1001 MATERIAL SOURCES

The Standard Specifications provide definitions for two types of materials sources specified in the contracts. Sources may be Department-Furnished, or contractor-Furnished. The contractor-furnished sources include commercial operations.

A Materials Source Environmental Analysis (EA) is required for every and all types of material sources. ADOT Materials Group has a list of commercial materials sources known by the Department to have approved environmental analysis. Department-furnished sources should be on the list. All approved sources are assigned a commercial materials number, or CM#; this number must be used when referencing/identifying any material by its source. The contractor must provide an acceptable environmental analysis for contractor-furnished sources. The contractor can either choose a source from ADOT's approved list, or provide an environmental analysis in accordance with the requirements of Subsection 104.12 of the Standard Specifications.

1001-2 General

Section 1001 covers the requirements and restrictions when working a materials source. The Engineer and the inspectors are expected to be familiar with the section and to properly document that the source is worked in accordance with the requirements and restrictions.

The provisions of the OSHA, State Mining Laws, the Arizona Native Plant Law, and Pollution Control Laws relating to exhaust emissions, burning, stream pollution, and dust control are to be complied with. If the contractor does not appear to be complying with these laws they should be notified and the situation should be documented in the project record. ADOT does not enforce these laws but there is an obligation to promote an awareness on the part of the contractor that they must comply with the law.

If the nature of the material or the method of processing changes, so that an unacceptable product may result, the Engineer is to notify the contractor. Changing conditions are to be documented along with any action or inaction on the part of the contractor towards correcting the condition.

Whenever the material source shows evidence of material varying in the vertical plane, the approval of the source should include a requirement to work a full face in order to get the maximum blending of the different materials. Almost all sources, including quarries, have enough variability that justify a full-face method of working. Sources having variability in the horizontal dimension may require blending of material from various areas before final processing.

Even though a source is the contractor's responsibility, the Engineer will need to monitor the operation so he can alert the contractor to any processing problems that could result in a lowering of the quality of the final product. There have been occasions when contractors have refused access to materials sources to ADOT personnel under the pretext that ADOT had no right to be concerned until the final product was tested. The Engineer should not accept such a position on the part of the contractor. If necessary, the assistance of the District and Central offices should be enlisted in getting access to the contractor's operations.

In crushing and screening operations, wet and dry materials usually require different handling methods to produce the same results. The mixing or selection of wet and dry material has to be watched closely to prevent broad and erratic variations in the final product.

1001-2.01 Material Sources in Floodplains:

Any development of a material source that is determined to be in a flood plain must meet the requirements of the appropriate local, state, and federal agencies, including as applicable, the U.S. Army Corps of Engineers, Section 404 of the Clean Water Act, ADEQ or Tribal 401 Water Quality Certification, and the National or Arizona Pollutant Discharge Elimination System (NPDES/AZPDES).

If the contractor wishes to procure a material source within a floodplain, the contractor or material supplier shall submit a Floodplain Use Permit application to the appropriate floodplain management agency. The contractor shall submit to the Department documentation that the Floodplain Use Permit for the material source was approved and signed by the appropriate agency's Floodplain Administrator. The contractor or material supplier shall comply with all the requirements of the Floodplain Use Permit, including renewal of the Permit as needed or required.

The Department will require an engineering report if the material source is situated in the 100 year floodplain of any stream or watercourse, and located within one mile upstream and two miles downstream of any highway structure or surfaced roadway crossing. The engineering report shall be prepared by a professional engineer with expertise in hydrology, hydraulics, river mechanics, and fluvial geomorphology. The engineering report shall address the effects of the potential for structural damages following a 100 year flood event.

All other permits required to obtain a material source shall be furnished to the Department upon request.

Surplus material from agency administered flood control management projects may be used as borrow material only if the contractor submits written evidence to the Engineer that the flood control agency project was fully designed and funded.

Material sources in floodplains located on Native American Tribal Lands will be considered for use on an individual analysis. The analysis shall include a review of applicable land use plans, floodplain management plans, environmental plans, applicable laws and regulations pertaining to Native American Tribal Lands, and an engineering analysis of the effects on any highway facility or structure. The contractor shall obtain from the Bureau of Indian Affairs (BIA) and the Native American Tribal Council all permits, licenses, and approvals for the Department to review.

Department-Furnished Sources

An information packet may be available with Department furnished sources. The Engineer should be familiar with the information packet which contains information on the type of material, ownership, and other pertinent matters.

One print of each material pit established for the project showing its serial number and location with reference to township and section, shall be received by the Hazardous Materials Team within the Environmental Planning Group and the Resident Engineer at the beginning of the project. The Resident Engineer is required to keep all pit information up-to-date as construction proceeds.

It is important to monitor the contractor's operations in the source to be sure they are using the material as intended and not operating wastefully. When a Department-furnished source is exhausted early, the Department may have to pay moving and development costs. A complete record should be kept of the pit operation so that it can be readily determined and verified that a source has been exhausted after being worked in a reasonable manner.

An accurate and indisputable record shall be kept on the amount and type of material removed from each individual ownership. This will save the Department many legal difficulties relating to overpayment, underpayment, no payment, or exceeding the limits of the area covered by the license.

It is very important that all pits from which any type of material is taken (including borrow pits) be accurately described as to location and serial number, and that the type and quantity of material from each pit be detailed separately with the final estimate. The name of the owner of each parcel of land from which materials are taken shall be shown.

Material from a Department furnished source is to be used only for the purposes stated in the contract. A supplemental agreement is necessary for any change in usage. The owner's approval for a change of use is to be

obtained by the contractor. The Department has the right to deny a change in use of material when the pit is to be preserved for future use or other valid reasons.

Special care shall be taken when there is more than one owner in one pit area. Before removing any material, the Resident Engineer shall make certain that the property lines between owners are mutually satisfactory. Agreement as to property lines should be attested to by the owners, in writing, after inspection at the pit site where feasible. It is not the Resident Engineer's responsibility to reestablish corners or lines for property owners.

Pits on State Land

Some projects require the procurement of material pits on State Land Department properties. This agency has issued specific requirements which must be strictly adhered to for removal of materials from State Land Mineral Material Leases.

The following procedures will apply to materials removed from all State Land Department Pits:

Preliminary Report

Within twenty days of the notice of award of a contract which requires the use of State Land Pits, Field Reports shall report to the State Land Department, through the Hazardous Materials Team within Environmental Planning Group, the following information:

1. Project number and general location
2. Name of contractor
3. State Pit serial number and State Mineral Materials Pit Lease number
4. As nearly as possible, the date the contractor proposes to enter upon the leased
5. Land (verified at time of preconstruction conference)
6. The time allotted to the project or anticipated completion date
7. The approximate release date (this date will normally fall after completion of project)
8. The approximate amount and types of materials anticipated to be removed from each State Land Pit

As soon as possible after the preconstruction conference, the Resident Engineer shall relay to Field Reports the information necessary to report items 4 and 7 above.

Pit Re-cap Documentation

The Resident Engineer will, within 24 hours after the contractor has completed removal of materials from a State Land Department Pit, estimate quantities of each type of material removed from the State Land source. A reasonably accurate estimate will also be made of all stockpiles (aggregate base, mineral aggregate, cover material, etc.) remaining in the pit. The Resident Engineer shall also estimate the quantities in reject piles for which there will be no royalty accounting. A memo confirming information shall be sent to Field Reports. A final verification of quantities and recapitulation of all material pits is required with all final estimates. Field Reports will submit the following recapitulation through the Hazardous Materials Team within Environmental Planning Group to the State Land Department within 60 days after notice of project completion:

- Project number and general location
- Contractor
- State Pit serial number
- State Land Mineral Materials Pit Lease number
- Type of material removed
- Quantity of materials removed
- Royalty rates on materials removed
- Total royalties due, including a 3% administrative charge. (Total royalties due is equal to the material royalties multiplied by 1.03)

State Land Department Inspection

Inspection of State Land Pit sites and quantity documentation records may be made at any time by an authorized agent of the State Land Department. The Resident Engineer shall cooperate and assist in any such inspection.

Pits on Native Nations

Occasionally, projects will require the procurement of material pits on Indian lands. This procurement is accomplished by the Hazardous Materials Team within the Environmental Planning Group through contact with the United States Department of the Interior, Bureau of Indian Affairs and the particular Indian Agency involved.

Upon receipt of the Notice of Procurement of Material Pits on Indian lands, it is recommended that the same basic steps as outlined above be followed by the Resident Engineer, with special emphasis on the fact that care shall be taken when there is more than one owner in one pit area. Because these pits will often have designated allotments covering different entities, it is recommended that the Resident Engineer contact the Superintendent of the Indian Agency and work with him to determine suitable methods of proportioning quantities to the various allotments. This will also serve to inform the Resident Engineer of any other conditions which may be peculiar to the particular Indian Agency.

The office of Environmental Planning will receive and maintain a list of sacred sites designated by the Navajo Nation and may have additional sites from other Native American Nations. These sites will be incorporated into the highway construction contract documents and referenced to their location. Although the FHWA has informed us that we cannot prevent the use of any particular material source, we will stipulate in the contract that the contractor must be aware that the site is sacred. The contractor must be in compliance with all historical and environmental laws and regulations, which may serve to limit or prevent the use of materials from a designated site.

1001-2.04 Royalty Charges

It is the Engineer's responsibility to see that the contractor has paid all royalty charges before final payment is made on the contract.

Material pits furnished by the Department on some projects will require payment of a royalty charge, while on other projects, the pit or pits will be furnished free of royalty charges. The Resident Engineer shall review the Standard Specifications and Special Provisions to ascertain whether the pits for the project involve royalty charges, and shall be guided accordingly. In any event, a Pit Recap Sheet shall be made and submitted with the final estimate (Exhibit 1001-2.04-1).

No payment by the contractor to the State Land Department shall be made until final billing is forwarded by Field Reports to the contractor. The contractor shall make checks payable to the State Land Department and mail as follows:

Attention: Field Reports Section
Arizona Department of Transportation
Project Delivery & Operations
206 South 17th Avenue, Mail Drop 133A
Phoenix, Arizona 85007

Other Situations Involving Royalties

The information below is a general outline on how other pit situations are handled:

State-leased pits may or may not be set up in the Special Provisions.

1. If they are, the royalty rate is specified within the contract.

2. If they are not:
    - The contractor asks to use a pit.
    - The Resident Engineer checks with the Hazardous Materials Team within the Environmental Planning Group and Environmental Planning to get approval and royalty rate.
    - A copy of the pit license is picked up by the contractor from the Hazardous Materials Team within the Environmental Planning Group. The contractor then checks over and clears the license and any other pertinent information with the Hazardous Materials Team within the Environmental Planning Group. When this is done, the contractor will give the letter to the Resident Engineer.
    - The Resident Engineer then distributes a letter to the Hazardous Materials Team within the Environmental Planning Group informing them of the contractor's use of the pit.

In either case, a Pit Recapitulation is sent to Field Reports even if the pit is not used. Field Reports verifies any quantities and sends one copy to the contractor. Field Reports also sends one copy to the FHWA with the project final. The FHWA sends the Pit Recap royalty final to the contractor and requests verification of payment. Upon receipt of the contractor's verification of payment, the FHWA releases funds.

1001-2.05 Performance Bonds

The contractor is required to furnish a performance bond when using sources under the jurisdiction of the State Land Department or the Bureau of Land Management. Note that a fully executed copy of the bond is to be furnished to the Engineer together with evidence that a fully executed copy has been sent to the agency having jurisdiction before any work is started in the source.

ARIZONA DEPARTMENT OF TRANSPORTATION

OFFICE MEMO

July 1, 2001

TO: **DEE BOOKS**

Field Reports, 133A

FROM: **KEN DORIGHT**

Project Supervisor, X999

RE: **MS 1111; REVISED**

As part of ADOT Project TEA-87-C(1)P, H9999-01C; Red Ridge-FS Boundary, the following aggregate quantities have been removed from above-referenced material source.

SECTION 416

Asphaltic concrete produced; to date (Item No. 4160003)	33,213 tons
Less:	
Mineral Admixture (Item No. 4160031)	312 tons
Asphaltic Binder (Item No. 4040282)	1,661 tons
Blend Sand (from pit MS1026)	10,964 tons
Subtotal Deductions	-12,937 tons
Aggregate used for Section 416	20,276 tons

SECTION 414

Asphaltic concrete produced; to date (Item No. 4140040)	4,326 tons
Less:	
Mineral Admixture (Item 4140044)	39 tons
Asphaltic Rubber Material (4140042)	389 tons
Subtotal Deductions	-428 tons
Aggregate used for Section 414	3,898 tons
Total aggregate used to date:	**24,174 tons**

Exhibit 1001-2.04-1. Pit Recap Sheet

1001-3 Proposed Source

A letter approving the source is required for contractor-furnished sources. The Bridge Group must be contacted prior to approval of a material source located within the specified upstream or downstream distances from any drainage structure.

When materials sources are contractor-furnished, the contractor is responsible for sampling and testing to determine whether there is enough material available to complete the work within the specifications, for preparing an environmental analysis, for complying with the Arizona Native Plant Law, and for securing rights and access to the material. Evidence must be furnished to the Engineer that the contractor has fulfilled these requirements.

The same requirements for changes in usage, royalty payments, and meeting environmental stipulations apply to contractor-furnished sources as applied to Department-furnished sources. The contractor is required to furnish evidence to the Engineer that they have fulfilled their commitment to the owner. Acceptable evidence is a letter from the owner stating that all agreements have been fulfilled, including payment, and that the contractor is released from any further obligation.

The contractor's complete environmental analysis should be in accordance with Standard and Specifications 104.12 for all material sources. The Resident Engineer should assure that the contractor has complied with state historical preservation rules.

Contractor Leased Pit

The following procedures are followed if the contractor wishes to lease a materials pit from a private party:

1. The Resident Engineer verifies the landowner's permission and any conditions (such as royalties and clean-up). The contractor should provide a copy of the agreement.

2. The Engineer writes a Pit Approval letter to the contractor (copy to Field Reports).

3. The Engineer completes the Pit Recap and then sends a copy to the Hazardous Materials Team within the Environmental Planning Group and informs the contractor of final quantities.

4. Before finalizing the project, the Engineer requests a copy of the pit-owner's release of the contractor. Upon receipt of the pit-owner's release, the Engineer can finalize the project.

Commercial Operations

A letter approving the source is required for commercial materials sources. The Bridge Group must be contacted prior to approval of a material source located within the specified upstream or downstream distances from any drainage structure.

Commercial operations are to meet the requirements in Subsection 1001-2.01, Definitions, of the Standard Specifications.

Specifically, proof of the following shall be submitted to the Resident Engineer:

- Owner or Producer has been located on site for at least preceding 12 months.
- Owner or Producer has been routinely engaged during regular business hours in processing and selling of materials.
- The Owner or Producer shall have a retail sales tax license.

Specifications require the contractor to furnish documentation verifying the above requirements are being met.

1001-4 Special Access

The contractor may make a request to the Engineer to approve special access to a controlled access highway if special access is not shown on the project plans.

When access is not being utilized, gates shall be closed and locked. Upon completion of all operations, the area within the right-of-way that has been disturbed shall be restored to the condition existing prior to the contractor's operations

1001-5 Operations at Source

The contractor shall notify the Engineer in advance of operations at the source. Notice shall be given before and after clearing and grubbing, and before and after cleaning up. Before beginning stripping, the contractor shall clear and grub the source as necessary to prevent the contamination of materials to be used in the work.

Burning will be permitted only after the contractor has obtained a permit from the ADEQ, and from any other Federal, State, County or City Agency that may be involved. This is generally applicable for counties outside of Maricopa County.

Materials shall be removed from the source in a workmanlike manner and, when required, in accordance with the contractor’s project-specific Plan of Operation and Restoration.

1001-6 Fences and Cattle Guards

The livestock operator or owner shall be contacted prior to the beginning of any operations and effective measures shall be taken and means provided by the contractor to restrict the livestock to the land where it is being kept.

The contractor shall furnish all materials and construct temporary fencing, gates and cattle guards as may be necessary to restrict the livestock as specified.

Existing fences that are to remain in place and which have been damaged by the contractor's operations shall be replaced or restored by the contractor at no additional cost to the Department

1001-7 Cleaning Up

Cleanup of a source should not be taken lightly as it will have a lasting impact on the owner which can drastically affect ADOT's future relations.

The Engineer should always require a final inspection and letter of acceptance by an agent of the public agency involved and have the contractor furnish a clearance letter from private owners.

1002 PAINT

The inspector should be able to recognize the various paint categories since mixing and storage requirements vary. The Standard Specifications group paint into the following categories: Three-Paint Coating System, Zinc Rich Primer, Inorganic Zinc-Rich Primer, Alkyd Primer, Direct-to-Metal (DTM) Combination Primer and Finish Paint, and Acrylic Emulsion Paints. Three-paint coating systems are considered as one unit and include a primer (paint number 1), intermediate coat (paint number 2) and topcoat (paint number 3). Zinc rich primer shall be a solvent based , one-part, epoxy ester, zinc-rich coating used as a primer to repair galvanized metal surfaces. Alkyd primer is solvent based designed for ferrous metal surfaces where rust is an issue and precludes the use of water based primer. Direct-to-Metal is a water-based acrylic paint primer or primer & finish. Acrylic emulsion paint is a waterborne (latex) universal coating system similar to exterior house paint.

Certificates of Compliance are required for each lot or batch of paint. The Certificate of Compliance should be received before paint is applied. Random samples of any lot or batch may be taken at any time. The Engineer should confirm that the contractor and paint supplier have made arrangements for paint testing. Samples of paint may be tested at the Phoenix Central laboratory before any paint is delivered to the project, or may be obtained in the field or from the fabricator and submitted to Materials Group for testing.

Only paints and paint systems approved in accordance with Subsection 1002-3 and shown on the Department's Approved Products List will be allowed for use. The contractor needs to submit to the Engineer a Certificate of Compliance for each lot or batch of paint supplied in accordance with Subsection 106.05.

After testing, the containers of approved paint will have appropriate tags or labels attached identifying them as tested and approved. Additional samples will be taken at the project site as the paint is used.

The Standard Specifications require each label to clearly show the exact title of the paint, the Federal specification number (when applicable), the name and address of the manufacturer, the date of paint manufacture, and the lot or batch number.

Established suppliers of paint within the State are familiar with testing and approval routines; therefore, very few problems arise in dealing with these suppliers. Suppliers from out-of-state or those who have not dealt with ADOT may experience problems initially. The Engineer and the contractor need to cooperate in order to minimize possible problems with paint testing and approval.

1003 REINFORCING STEEL

Certificates of Compliance are required for reinforcing steel. The Certificate of Compliance for reinforcing steel should be received before payment is made. If the project requires epoxy coated bars then the epoxy resin must be on the Department's Approved Products List (APL). The inspector must ensure that any damage to the epoxy coating is repaired in accordance with the Standard Specifications.

Additional information on reinforcing bars and their dimensions can be found in Chapter 5, Section 605-2. Minimum frequency for sampling reinforcing steel - samples are required for No. 7 and above. For No. 6 and below, samples can be taken at the Engineer's discretion.

The same general procedures are followed for wire mesh and smooth bars used as reinforcement except that there are no markings on the metal.

The "W" size designation of wire mesh refers to the area of the individual wire in hundredths of a square inch. W5 wire has an area of 0.050 square inches as shown in the following table (Exhibit 1003-1).

The Standard Specification allows substitution of Grade 60 reinforcing bars for Grade 40 in certain cases. When the substitution is permitted, the authorization is to be in writing.

NOMINAL SIZE NUMBER	NOMINAL DIAMETER (in.)	AREA (square in.)
W 31	0.628	0.310
W 30	0.618	0.300
W 28	0.597	0.280
W 26	0.575	0.260
W 24	0.553	0.240
W 22	0.529	0.220
W 20	0.505	0.200
W 18	0.479	0.180
W 16	0.451	0.160
W 14	0.422	0.140
W 12	0.391	0.120
W 10	0.357	0.100
W 8	0.319	0.080
W 7	0.299	0.070
W 6	0.276	0.060
W 5.5	0.265	0.055
W 5	0.252	0.050
W 4.5	0.239	0.045
W 4	0.226	0.040
W 3.5	0.211	0.035
W 3	0.195	0.030
W 2.5	0.178	0.025
W 2	0.160	0.020
W 1.5	0.138	0.015
W 1.2	0.124	0.012
W 1	0.113	0.010
W 0.5	0.080	0.005

Exhibit 1003-1. Welded Wire Fabric Dimensions

1004 STRUCTURAL METALS

Most structural metals are accepted on the basis of certificates of compliance and certificates of analysis.

The metal fabricator is generally the party responsible for forwarding to the contractor (or supplier) the required mill certifications covering the base metal and any treatment prior to fabrication.

The number of certifications required depends on how many processes/companies the metal passed through before being delivered as the final product.

Each material item is to be considered separately to determine what certifications are needed. Ensure certifications meet the requirements of 106.05 including Build America, Buy America Act (BABAA) requirements.

As a minimum, all structural metals are certified in accordance with the following:

1. The manufacture of the base metal will include a chemical analysis of the metal, a statement that it was manufactured according to a given specification (ASTM, AASHTO, etc.), and a description of the pieces represented by the certificate.
    - A heat number or heat lot is an ID number stamped on a steel product to prove it meets industry quality standards. These numbers are used to identify production runs for quality control purposes. The heat lot serves as a certification of quality. Each heat lot comes with a Mill Certificate, outlining where the raw materials were melted from and what the chemical and physical properties of that particular metal.
    - The manufacturer's certification also assures the individual pieces were made to comply with the specification in regard to allowable variations in dimensions and finish.
2. Any coating or special treatment such as galvanizing or heat treatment must be certified. The coating or treatment may be done by the manufacturer, an intermediate processor, or the final fabricator. Whoever performs the work is the one who must certify it.

3. The fabricator who produces the final product certifies that the materials used are the same as the materials represented by the certifications in #1 and #2 above and that the fabrication process complied with the Standard Specifications. The Standard Specifications cited in the contract are to be referred to individually. A generalized statement such as "meets ADOT requirements" is not acceptable.
    - The certification covers all of the fabrication process including bending, machining, welding, heating, painting, etc.
    - The fabricator is responsible for securing all of the certifications from the manufacturers and processors and relating them to the material he has fabricated.

Structural elements are sometimes inspected at the fabrication plant by the Bridge Group, other agencies, or consultants. A copy of the inspection report must be in the project file before structural elements are accepted. Additional discussion of steel structures is found in Section 604.

1005 BITUMINOUS MATERIALS FOR SURFACING

1005-2 Sampling of Bituminous Material

Sampling and testing of bituminous materials are covered in the Standard Specifications, the Materials Testing Manual, and the Policy and Procedures Directives Manual. Everyone involved in sampling, testing and inspection of bituminous materials is required to be familiar with the written procedures and guidelines.

It is important that everyone understands that the contractor is the one who takes the sample of hot asphalt cement while being witnessed by the Engineer. The Engineer will choose the location, the time and the number of samples to be taken by the contractor. The Engineer will also determine whether the facilities and methods for sampling are satisfactory for obtaining accurate samples and are safe.

For materials using crumb rubber asphalt (CRA) such as ARAC or AR-ACFC, it is now common for the asphalt supplier to blend the granulated crumb rubber and virgin asphalt cement at the terminal in agitated tanker trucks. Therefore, the materials for such, the granulated crumb rubber and virgin asphalt cement, may need to be sampled at the terminal rather than at the hot plant since this process no longer includes a blend plant and these materials are not shipped to the production site separately. This will require coordination and scheduling in advance for projects administered by construction units in outlying districts located far from asphalt supply terminals. Also note that the reaction period time and temperature should be monitored, and the contractor is responsible for performing rotational viscometer tests at the hot plant, also witnessed by the Engineer, prior to using the blended CRA.

1005-3 Bituminous Material Requirements

See Specifications for information on Performance Grade (PG) Asphalt Binder, Terminal Blend Rubberized Binder, Polymer Modified Asphalt Binder, Emulsified Asphalts, Emulsified Recycling Agents, and other bituminous requirements.

1006 PORTLAND CEMENT CONCRETE

1006-1 General Requirements

This specification deals with Portland cement concrete. Included are component materials, design, mixing, transporting, and curing, as covered in the Standard Specifications. Placing and finishing concrete are covered by Specifications 401 and 601. Utility concrete is covered by Specification 922.

Refer to the Standard Specifications and Materials Group Policy & Procedures Directives Manual for additional information on Portland cement concrete inspection guidelines.

Good consistency control of concrete is of primary importance. It should be noted that other factors being equal, an increase in the water cement ratio of 0.4 gallon per sack of cement will result in an increase in slump of approximately 1 inch thereby causing a potential loss in compressive strength of about 100 pounds per square inch. Over-watered concrete also increases segregation and shrinkage. This is not to say that concrete having a very low slump should always be used. Good judgment must be exercised.

The Concrete Inspector should be aware of the factors which affect the slump of a concrete mix.

The following are some of those factors:

- Variations in water content have a very pronounced effect on the slump. A change of 1% in the amount of free moisture in the fine, or 3% in the coarse aggregate can change the slump by about 1/2 inch.
- A change of 1% in the amount of entrained air may alter the slump by approximately 1/2 inch. An increase in air causes an increase in slump.
- A fineness modulus of the sand is important because of its effect on the water demand of the mix. The finer the sand, the lower the fineness modulus, the more water required for a given slump. The fineness modulus of sand is obtained by adding the cumulative percentages retained on the following standard sieves: 4, 8, 16, 30, 50, and 100, the total is then divided by 100.

Under these specifications, duties such as checking the stockpiles for moisture and adjustment of the mix are the contractor's responsibility.

For simplicity, the inspection duties to be performed by ADOT personnel are separated into two categories: plant and site inspection.

Documentation of inspection is necessary and will be made as follows:

- The number of random checks to be made is at the discretion of the individual Resident Engineer or Project Supervisor. The number of random checks needed to document the acceptability of the aggregates will vary. In areas where testing has indicated a uniform product that meets specifications and which has been properly stockpiled to minimize segregation, the sampling guide minimum will probably be sufficient. In cases where testing has shown the material to be borderline or the stockpiles show segregation or excess moisture, extensive sampling may be required.
- Frequent visits should be made to observe plant operations during the time material is being batched for the project. Although ADOT does not control the batching and mixing, it is important that project personnel assure all plant procedures are meeting standards. If problems are found they must be discussed and resolved with all parties involved. The contractor should be advised in writing the first time a discrepancy occurs.

When inspecting the plant some of the things to look for are:

- Inspect/check the aggregates to see that there is no intermingling of aggregates from one stockpile or bin to another of a different gradation. Inspect for foreign material and contamination. If any of these conditions occur, you should stop production until the condition is corrected.
- Inspect the aggregates for moisture content and inform the contractor of your findings Concrete aggregate should be maintained in a saturated condition; this is especially important when chemical admixtures are used. Although we do not control the mix, every expedient shall be used to obtain and preserve uniform moisture content in the aggregates.
- Inspect the aggregate for cleanliness to ensure these have been maintained in the same condition as when sampled for acceptance testing. There should be no adhesions of dust or presence of other deleterious materials.
- Inspect the cement storage. Inspect for caked cement that may be due to long storage time.
- Inspect additive dispensing equipment. Agitation of these materials is not required by the Standard Specifications; however, it is believed to be necessary in all cases to assure that the original quality of the material is maintained. Agitation should be accomplished by the use of an air jet extending to the bottom of the container.
- If concrete is being mixed in truck mixers, determine that mixers are in good condition and display an approved inspection sticker.
- Verify that the mix designs submitted by the contractor and approved by the Department is the correct design for the concrete strength (f'c) being used.
- Check the batch ticket for correct information. The copy of the contractor's or supplier's invoice (delivery ticket) provided for each load of concrete will be acceptable. Documentation of inspections will be made on the applicable invoice. It will not be necessary for ADOT Inspectors to fill out the concrete test report form for each load of concrete supplied. The minimum information to be shown on each invoice shall be the date, time batched, truck identification number, name or identification of the batch plant, name of the contractor, name and location of the project, volume of the concrete, the number of revolutions the concrete has been mixed, the batch weights, mix design code number, the percent free moisture in the coarse and fine aggregates, the water withheld during batching, and any water added to the mix at the site. When samples for strength tests are taken, the concrete test report form will be completed by the ADOT Inspector and will accompany the cylinders to be tested.
- Check the time cement is added to the batch to assure that the proper time has been recorded on the ticket. (90 minutes is the maximum time allowed for agitated discharge). Time begins when cement first comes into contact with water or aggregate. If additional time is necessary, this should be approved by the Regional Materials Engineer, likely with the inclusion of hydration stabilizing admixture.
- Make sure the revolution counter has been zeroed before mixing. Check mixing time and revolutions at the plant. Document these on the delivery ticket, initial it, and return it to the driver.
- All plant inspections and verifications must be well documented. All information, referring to a particular batch should be recorded and initialed on that batch ticket.
- Any water added to a batch after the batching procedure will be measured and documented (See placement site inspection requirements). Measurement using a clean, calibrated sight glass is acceptable.

Non-Agitated Concrete

Non-agitated concrete is often used for PCCP. In the instance that non-agitated concrete is used, it's important to note that 45 minutes, as opposed to the standard 90 minutes, is the maximum time allowed for non-agitated concrete to be discharged. An example of this would be when a dedicated batch plant is built on-site or near a project requiring large amounts of concrete. The contractor may choose to do this for economy of scale and to shorten the haul route. If standard concrete trucks with agitation aren't available or not chosen to be used by the contractor, either end dumps or articulated dump trucks (rock trucks) can be used to transport the concrete. It is critical that the trucks are kept clean, same as would be done for a standard concrete truck. When concrete is poured out of the end dumps, the concrete should have dimples in it and not flow out onto the grade, i.e. very low slump usually 1"-1.5".

It is important that the complete plant operation be observed for addition of water other than in the batching operation. This is important to assure the maximum water/cement ratio is not exceeded.

The previously cited guidelines do not require full time inspection at the batch plant but it is advisable to have an inspector watch the operation during the first day's production and on all-important major placements.

No concrete should be placed except in the presence of the Concrete Inspector.

Some of the duties of this inspector are as follows:

- Check the batch ticket to see if the correct concrete has been delivered. (See Standard Specifications)
- Observe the discharge of all concrete for acceptability (slump, air, segregation, etc.). If concrete slump is too low, it may have additional water incorporated, followed by additional mixing. Care should be exercised to be sure the problem of low slump is caused by low water. There may be other reasons for a low slump that water will only make worse. For example: sand too fine, or inadequate mixing.
- Document any additional water added, mixing revolutions, temperature of concrete, and discharge times on the delivery ticket. The contractor should not be permitted to move concrete down the chute with a vibrator since this segregates the concrete as it flows.
- Document time each load is completed discharging.
- Document where each load of concrete is placed, and how much of the load is placed there.
- Take slump, air, and cylinder tests as specifications require, or as required to assure compliance of the concrete.

1006-2 Materials

1006-2.01 Hydraulic Cement

The contractor is required to state the type and sources of cement when he submits his mix design.

Refer to the Materials Policy and Procedures Directive Manual (PPD No. 13) for certification and acceptance of hydraulic cements and fly ash.

1006-2.02 Water

The contractor should identify the source when he or she submits his or her mix design. If the water is from a potable supply obtained from a public utility, no testing is required, however a memo stating this should be submitted to Materials Group. Water obtained from any other source shall be sampled and tested.

1006-2.03 Aggregate

(A) General Requirements

The production of aggregates meeting the specification requirements is the contractor's responsibility but this does not mean that the Engineer may divorce himself from all involvement in this phase of the work. There are numerous aggregate quality requirements that are not part of the acceptance testing performed during construction, but are performed annually by the supplier (see Table 1006-1). These tests were previously performed by the Department during bi-annual “pit checks.” Pit checks are no longer performed by the Department, but the requirement for documentation confirming conformance to the specifications remains. These documents should be on file (maintained by Materials Group), but if not on file, the contractor will need to provide these documents for the source materials prior to use in concrete incorporated into the project.

During aggregate production, the Engineer will periodically observe the production methods, the sampling and testing, and stockpiling and handling to determine whether the methods used will result in acceptable products. If the Engineer finds any shortcomings or problems he should discuss these with the contractor and document the

details. The Engineer will not do production control testing; quality control is entirely the contractor's responsibility.

Aggregates must be inspected during production to make certain that they do not become segregated through improper handling or stockpiling practices, and that they do not become contaminated. Allowing equipment with steel tracks to operate on stockpiles will tend to break edges of coarse aggregate. This material filters down through the voids and may cause the lower portions of the coarse aggregate stockpile to be out of grading specifications due to the self-contamination.

Uniformity of moisture contents is essential in the production of a concrete mix of uniform consistency. It is necessary to have saturated aggregate and uniform consistency, particularly in bridge decks, to avoid shrinkage and finishing problems. In slip form concrete pavement, it avoids edge slumping, shrinkage of the concrete, and finishing problems. Aggregate which comes directly from washing plants should remain in the stockpile long enough so that no free drainage is visible when the aggregate is transported to the mixer. Aggregate proposed for use in concrete pavement should not vary in moisture content more than 3% in any one work shift if good slump control is to be maintained.

An excess of moisture may collect in the bottom of a sand stockpile. The bottom 1 foot of a stockpile cannot be used, unless the aggregates are stockpiled on a paved surface. If the contractor elects to reclaim the bottom of a stockpile, he will be required to do sufficient testing to be sure that the material conforms to the Standard Specifications; this may require much more testing than is needed when producing the aggregate originally.

Batch plants are typically equipped with moisture probes for estimating the moisture content in the aggregate and the control system may automatically adjust the batch water quantity (relative to saturated aggregate conditions). However, such moisture probes should not be solely relied upon for adjusting the amount of batch water. The contractor or supplier must sample the aggregate to confirm moisture content at appropriate intervals governed by existing conditions. If the moisture is known to be variable or if some event or production change affects the moisture, more frequent sampling may be called for. A reasonable frequency is one or two per day, if visual observation indicates little or no change.

1006-2.04 Admixtures

(A) General Requirements

The contractor has the option of using admixtures for adjusting time of set, adding air, or for reducing water in the mix. If the admixtures have not been used with the aggregates or in the quantities proposed, the contractor will have to test the admixtures using the proposed aggregates to determine the proper amounts to be used. Combining admixtures can result in undesirable effects that cannot be known without testing. Admixtures which may be included in the mix must be on the approved mix design.

The mechanical dispensing devices used for admixtures must be accurate to within narrow limits so they need to be carefully checked to see that they operate properly. Some admixtures are used at rates as low as 2 or 3 fluid ounces per 100 pounds of cement, therefore, it can be seen that the dispensing equipment needs to be accurate. Accuracy checks are made by actual measurement of the material as it is dispensed.

Admixtures may be used prior to testing provided an acceptable Certificate of Compliance has been received and is on file with the Materials Group. Refer to the sampling guide and the Standard Specifications. Most commonly used chemical admixtures are on the Department’s Approved Products List (APL).

(B) Air Entraining Admixtures

The contractor must add air entrainment when it is called for, but the air content shall not exceed 7% and temperature must be documented. If above the 3,000 foot elevation, concrete must have a minimum of 4% entrained air to protect against freeze-thaw induced damage.

1006-3 Design of Mixtures

1006-3.01 Design Criteria

Even though the following discussion is based on ADOT design procedures, the principles apply equally to designs by a contractor or a private laboratory. ADOT design procedures are covered in greater detail in the Material Testing Manual.

1006-3.02 Design Procedures

Approval of Portland cement concrete mix designs is described in the Standard Specifications.

Checking the mix design is essentially the responsibility of the Regional Laboratory; however, it is important that the project personnel are able to check mix designs and evaluate mix adjustments based on the design procedures. The Concrete Inspector should be able to perform the design calculations and to understand the relationships between the various design criteria.

Upon receipt of a concrete mix design submittal, the materials coordinator should confirm that all required information was included in the submittal prior to forwarding to the Regional Materials Engineer for review and approval (see section 1006-3.02 (A),(B) &(C)).

After the Regional Laboratory has checked the mix design, if sufficient compressive strength mix history is not available, a trial mix or test batch will be required to confirm slump and compressive strength, and entrained air if necessary. A test batch may also be produced to check the mix design against actual field conditions.

If it is found that the "test batch" does not give the correct slump and checking has shown that the water in the aggregates has been accurately accounted for and corrected in the field mix, then it may be necessary to change the amount of water or water reducing admixture dosage being used to obtain the specified slump.

Changes must remain within the specifications, mix design limits, and admixture manufacturer recommended ranges. If greater changes are needed, a new mix design will be required.

Water may not be increased beyond the water/cement ratio shown on the approved design. Once at the design water/cement ratio, only water reducing admixtures may be used to further adjust mix consistency (slump). Limited decreases in water are generally beneficial for mixes with typical water/cement ratios (should not be done for those with low water/cement ratios), but if the decrease is substantial, the mix design should be checked.

1006-4 Concrete Production

1006-4.01 General Requirements

Portland cement concrete is strength specified and there are penalties against the contractor if his product does not meet the strength requirements. Proper sampling, molding and curing of test cylinders is of the utmost importance. The specified procedures are to be followed without variation.

The anticipated strength is used by the designer to determine the strength characteristics of the structure. If the 28-day strength is below that specified or if the contractor's 7-day strength indicates that the 28-day strength may be lower than the anticipated strength, then an immediate study should be made to see if there is any deficiency in the materials, proportioning, or procedure. Low strength is usually an indication that something is not being done as it should be done and is an immediate signal for investigation. The District Office should be notified whenever low strength is detected. No adjustments for low strength should be made without District Office and Regional Lab approval.

The yield, as determined by form measurement, will normally be short from 3% to 5%. The reasons for this normal loss may be attributed to such things as spillage, loss of moisture and the fact that a mixer truck cannot be completely discharged. Also, when concrete is placed in the forms, expansion of the forms accounts for part of the loss. The mix will not be adjusted to correct for actual yield variations based on form volumes.

Remember that the discussion in this section is only a guide for the Resident Engineer to enable him to judge whether the contractor is controlling the mix using acceptable practices. The Resident Engineer is not to order any of the adjustments discussed in this section; control of the mix is wholly the contractor's responsibility. If acceptable procedures are not followed, the contractor should be notified and the conditions documented.

1006-4.02 Proportioning

There will probably be minor adjustments needed due to one or more of the following causes:

- Moisture content of aggregate being used.
- Variation in air content.
- Variation in slump.

All the variations can be corrected by field adjustments. However, judgment is needed to determine when to consult with the Regional Materials Engineer before allowing the contractor to make adjustments. Major adjustments may require the contractor to submit a new mix design (see 1006-3.03(A)(1))

The mix design is designed on the basis of an absolute volume of 27.00 +/- 0.05 cubic feet and aggregates in the saturated surface dry (SSD) condition.

All equipment should be inspected to assure that all scales, dials, metering devices, etc. are graduated within allowable tolerances and accurate as outlined in the specifications.

(B) Water

It is extremely important that the amount of water being used in the mix be known at all times; therefore, the water tank or water meter should be the first piece of equipment to be calibrated. This can be done by drawing off water and measuring or weighing the amount for different settings of the gauge or meter. Water valves should be inspected to make certain there are no leaks into the mix.

(C) Aggregates

The amount of mixing water will probably have to be adjusted to allow for the moisture content variations as the stockpiles are used. It is preferable that stockpiles are kept in a saturated surface dry (SSD) condition to minimize adjusting mixing water. The contractor should make moisture determinations at least daily or as often as conditions require.

Scales for weighing cement and aggregate should be inspected for condition of working parts and knife edges. Hoppers should be inspected to make certain that there is no possibility of leakage and that each hopper empties completely. Make certain that the cement hopper is equipped with one or more suitable vibrators as required by the Standard Specifications.

Batching scales must be checked and certified by the Weights and Measures Services Division (WMSD) before any production begins. Certified 50 pound weights furnished by the contractor or supplier should be available at all times for checking these scales. To check scales using these weights, use the WMSD approved procedure. If the scales are not accurate within the limits of the specifications, they should not be used until repaired or adjusted. The scales should be balanced several times each shift and should be retested when deemed necessary by the Engineer

(D) Admixtures

It should be noted that the Standard Specifications require that any admixture added shall be added by means of mechanical dispensing equipment. The inspector should examine and test the dispensing equipment to see that it functions properly and that the amount of admixture can be accurately measured and also that the amount of admixture used can be readily adjusted.

The mix design will show the amount of air entraining agent estimated to be required to give the specified air content. It must be realized, however, that the effectiveness of air entraining agents may be changed by the effectiveness of the mixing of the concrete. The mixing action of the particular mixer employed may have an effect on the amount of air entrained. The amount of air entrained by a large batch mixer or a transit mixer might be much greater or less than the amount obtained by a somewhat smaller mixer.

The amount of air entrained is also variable with the temperature of the mix. The effectiveness of the air-entraining agent is ordinarily decreased with higher temperatures or increased with lower temperatures. It can be seen that the amount of air entraining agent required in the field might be entirely different from the originally recommended amount.

After one or two tests have been made to determine the amount of air entrained, it will often be found necessary to increase or decrease the amount of air entraining agent used on future batches. After the correct amount is once determined, the same amount will usually continue to be satisfactory unless there is considerable temperature change or some other variation which might affect the results.

If it is noted during construction that a high or a low air content has been obtained, one or two check tests should be made immediately. If these check tests confirm the original result then adjustments should be made in the amount of air entraining agent used. Air meters sometimes get out of adjustment; to assure that results are correct, the air meter should be calibrated prior to each day's use.

There is one other factor which sometimes affects the quantity of air entraining agents required. Some of these agents have a tendency to settle or separate in the drum. Agitation of these materials is not required by the Standard Specifications, however, it is believed to be necessary in all cases to assure that the original quality of the material is maintained. The Engineer should therefore require such agitation at least once daily when the material is being used.

1006-4.03 Mixing

(A) General Requirements

Because the contractor is responsible for the concrete does not mean that the Resident Engineer is unable to reject material that is obviously improperly batched. Likewise, if batching equipment is malfunctioning, the Engineer has the authority to refuse the product. All information regarding improper batching or malfunctions of equipment must be carefully documented by the Engineer.

In order to assure that the contractor will be able to control concrete production, the Resident Engineer will have to inspect the batching and mixing equipment for proper operation including checking the weighing devices in actual operation.

Checking will begin with the stockpiled aggregates to see that the stockpiles do not become segregated and that intermingling of stockpiles does not occur. Adequate bulkheads or pile separation will prevent mixing as the piles are built and when material is removed. Spillover in batching bins is fairly common when the bins are loaded with an end loader. It is not unusual to find good stockpile control but poor control in the bins. While the Engineer cannot direct changes in the contractor's operation, they do have the authority to refuse to accept material that is produced when the equipment is not functioning properly. Whenever material is rejected because of faulty processing, it is important to be sure of what the mechanical problem is, what the effect on the final product is,

and to carefully document all the details. It goes without saying that every effort should be made to induce the contractor to operate efficiently without getting into the position of having to reject the material being produced.

Alternatively, the supplier may participate in either or both the National Ready Mix Concrete Association (NRMCA) or Arizona Rock Products Association (ARPA) concrete production facility certification programs. Evidence of such certification in lieu of ADOT's inspection must be submitted by the contractor prior to the concrete being incorporated into the project.

(B) Mixing in a Stationary Mixer

After the field mix has been determined by the contractor, the weights of each size of aggregate, cement, water, air entraining agent, and admixtures, if any, are usually given to the operator for posting on the scales. Any subsequent change in the weights due to a change in the proportions or a change in the free moisture content, should be posted, by the contractor, on the scale and copies provided to the operator. Each change should be noted in the inspector's records, with each one being dated including the time.

It is often useful to prepare a chart showing batch weight adjustments for changes in aggregate moisture content. The inspector can make a quick check of the changes needed to be made by the contractor to allow for variations in the moisture content.

Batching plants can be classified into three categories: manual, semi-automatic, and automatic. All three types are permitted under the Standard Specifications. The operator controls all the functions necessary to complete the weighing and dumping on the manual plant. This type of plant is subject to human error in every operation so it should be inspected carefully by the inspector. A semiautomatic plant is governed by controls that are actuated in a certain sequence to complete the batching cycle. An automatic plant has the complete batching cycle set in motion by a control button, which may be located remotely from the plant. Automatic plants are seldom encountered except at commercial concrete plants and large paving plants.

Dial scales or a load cell providing a digital printed readout is required for weighing all hydraulic cement.

(C) Mixing in Truck Mixers

A large percentage of the concrete placed in structures is mixed by truck mixers. This equipment is not usually permitted for mixing concrete for pavement principally because it cannot quickly discharge the low slump concrete which is required for pavement (Tilt-up type mixers are an exception). Truck mixers usually are satisfactory for structural concrete but require constant inspection of the operation. Instead of having one mixer and one operator to control, as in central mixed concrete, there may be a dozen or more truck mixers and operators, on a large job, where concrete is being mixed by truck mixers. Each truck mixer should be inspected occasionally for hardened concrete, worn blades, and water leaks. The inspector must see that no mixer is loaded beyond its mixing capacity as indicated on the manufacturer's plate attached to the mixer. Weighing trucks before and after charging is an excellent check on the accuracy of the plant.

Where feasible, and when the equipment is adaptable, the sequence of weighing and discharging the aggregates, cement, and water from the batch plant should be such that a small amount of water enters the mixer in advance of the other ingredients then followed by a blended "ribbon" of all the other ingredients, together with the remainder of the required water. Extensive research has proven conclusively that the "ribbon" method of charging a mixer contributes greatly to the uniformity of the concrete within any given batch. The transit mixers should be periodically inspected to confirm that the drums are free of water before being charged

The Standard Specifications require that each batch shall be mixed for not less than 70 and no more than 100 revolutions, at mixing speed, except that the maximum may be increased upon approval of the Engineer. Any revolutions made beyond the 100 specified as maximum are required to be at agitation speed.

Specification 1006-4.03(A) permits mixing at the plant site or at the delivery site. This specification has been interpreted to mean that mixing may also be performed while the truck mixer is enroute between the plant and the delivery site. Remember the maximum time limit for mixing to begin.

If it is necessary to add water to the mix at the site, it is required that the mixer shall be turned a minimum of 30 revolutions at mixing speed before the concrete may be discharged. The amount of water added, and the additional mixing time (or revolutions) shall be recorded on the concrete delivery ticket and, where appropriate, on the test report. This additional mixing may be in excess of the maximum revolutions previously specified. Remember that if samples are taken, they should be taken after all the water has been added.

Regardless of the type of mixer, the mixer drum should be inspected for worn blades or hardened concrete, rate of rotation, and mixing time. Each mixer is required to have a nameplate attached showing capacity and recommended speed of operation.

If truck mixers are used they are to be inspected at least annually, and the inspection will be documented per the Standard Specifications. Similar to concrete production facilities, suppliers may participate in the NRMCA or ARPA concrete truck mixer certification programs annually and provide evidence of such certification to the Department. However, at any time a truck mixer is observed to be deficient, it should be removed from the project until deficiencies are corrected and reinspected.

1006-6 Curing Concrete

Curing practices can significantly detract from, or enhance the long-term durability of concrete. inspectors and Concrete Finishers usually don't pay close attention to curing practices and to concrete while it cures, but they should. Research has shown that the service life of concrete slabs, decks, pavements and walls is increased when proper curing procedures are followed. Given the high cost of replacing existing highway pavements and structures, the extra amount of time and effort spent on properly curing concrete can result in substantial cost savings over time.

Wet curing for 7 days is the most preferred method of curing (10 days for bridge decks and 14 days for high performance or silica fume concrete). Most contractors prefer to use liquid membrane curing since it is much less labor intensive. However, if given a choice, wet curing is preferred over curing membrane since the added water will promote hydration.

Both water curing and the liquid membrane forming method must be used for bridge decks. Historically, wet burlap was the typical practice for water curing, however more modern products are available and have been developed specifically for water curing that are easily applied and ensure ample water remains available during the entire duration of the wet curing process. These water curing products, without question, facilitate more complete curing and result in a much more durable concrete, and are the preferred medium for water curing.

It is vital that the wet curing process occur uninterrupted and curing membranes be applied thoroughly and remain undamaged for the required curing duration (number of curing days). A curing day is one during which the concrete temperature remains above 40 degrees F for the entire 24-hr period, or the ambient temperature in the shade remains above 50 degrees F for a minimum of 19 hrs. Refer to section 1006-5.03 for Cold Weather Concreting requirements and section 1006-5.02 for Hot Weather Concreting requirements. It may be necessary to embed temperature sensors throughout the structure, especially for bridge decks, to ensure adequate curing temperature is maintained.

1006-7 Acceptance Sampling and Testing

1006-7.02 Sampling and Testing of Concrete

In all cases, a diligent effort should be made to keep the consistency of the concrete within the range of slump and/or air as specified. However, when an occasional batch of concrete is found to have a slump or air content in excess of the maximum specified, corrective action must be taken.

Field tests will be made in accordance with the requirements of ASTM C143 on the concrete as it is discharged to determine the consistency in slump. One additional slump test will be made on a concrete batch that has failed to fall within the required slump range on the first test, unless the contractor elects to make adjustments in the slump. If adjustments are made, the concrete batch will be tested twice after such adjustments. In either case, the average of the two tests for that batch shall be within the required slump range and no single test shall be less or greater than the required range by more than one inch. Concrete that does not conform to the above consistency requirements should be rejected.

High slump concrete which has been placed prior to obtaining slump test results is subject to adjustment in price or removal based on the 28-day compressive strength obtained. An additional set of cylinders should be made to represent the load or portion of a load of high slump concrete placed. The location of the concrete in the structure and the quantity represented by the extra cylinders must be recorded.

Proper fabrication, handling, and curing of the cylinders are extremely important. All personnel responsible for any of the tasks relating to cylinders should be thoroughly familiar with the field procedures associated with the tests listed in Table 1006-9.

The relationship between the contractor's and ADOT's testing programs should be discussed at the preconstruction conference and just prior to the beginning of concrete work. The Engineer should request that if the contractor finds any fault with the ADOT sampling and testing procedures, he will be notified immediately. The contractor should also be clearly informed that he will be promptly notified in writing of any shortcomings in their procedures.

It should be apparent that ADOT project personnel doing testing must perform the tests in exact conformity with the prescribed test method. All inspectors performing concrete testing must be observed annually by the Independent Assurance Sampling technician or Regional Laboratory. The testing technique should be observed frequently and referee tests should be made often enough to assure that proper procedures are being followed.

Compressive strength is not the only measure of the quality of concrete. The compressive strength test does not measure actual field strength of concrete. Field curing procedures (Subsection 1006-6) are different from the test cylinder curing procedure. Field conditions, such as ambient temperature and relative humidity can vary, but test cylinders should be cured in a controlled environment.

Failure to meet the specified mix design criteria such as slump, air, mixing time, segregation, incorrect batching, unloading time, etc., may be sufficient reason for rejection regardless of any claim by the contractor that the concrete is acceptable because it will meet the strength requirement.

Sampling of fresh concrete mix for testing purposes, fabricating cylinders, or beams shall be in accordance with the Materials Testing Manual (Series 300 ASTM C172).

Some contractors and suppliers are doing independent concrete testing and are being observed by ADOT personnel. If the contractor performs the test they should be observed and documented noting whether test procedures conform to ADOT procedures. For example, early age compressive strength testing is the responsibility of the contractor unless ADOT requests for the contractor to accelerate their schedule for reasons beneficial to the Department.

1006-7.03 Acceptance Criteria

Concrete acceptance test results and verifications shall be evaluated for acceptance using the criteria established in this section.

The batch time is defined as the time at which cementitious material is combined with water or aggregate. Discharge from the truck mixer or truck agitator shall be completed within 90 minutes from batching. The Engineer may allow concrete placement to continue in excess of the 90 minutes if the concrete is of such slump, workability, and/or temperature that it can be placed without the addition of water to the batch. Additional discharge time shall also be allowed provided a hydration stabilizing admixture is shown on the approved mix design and has been included in the batch, subject to the following:

- The concrete remains of sufficient slump and workability to facilitate adequate consolidation during placement.
- The hydration stabilizing admixture conforms to the requirements of subsection 1006-2.04 of the specifications and retards hydration by a hydration stabilizing mechanism.
- The dosage rate is identified in the approved mix design, and the additional amount of batch to discharge time exceeding the 90 minute limit has been requested by the contractor for approval by the Engineer and acknowledged on the mix design by the Engineer.
- If during placement, the dosage range is identified in the approved mix design and the application-specific dosage and additional time has been requested by the contractor and approved by the Engineer.

The temperature of the concrete mixture immediately before placement shall not be less than 50 degrees F nor greater than 90 degrees F. The Engineer may allow concrete placement to continue in excess of the maximum temperature if the concrete is of such slump or workability that it can be placed without the addition of water to the batch. The Engineer may also approve concrete mixtures with a temperature less than 50 degrees F or greater than 90 degrees F if otherwise specified or pre-approved by a mix design that accounts for the temperature deviation. Otherwise, concrete that fails to conform to this temperature requirement will be rejected prior to placement.

For Air Entrainment Requirements refer to Table 1006-10 of the Specifications. Concrete placed above 3,000 ft. elevation must have sufficient air content to protect against freeze-thaw induced damage. For batches determined to have low air content, the supplier may add additional air entraining admixture at the project site, and thoroughly mix the concrete at mixing speed, to correct deficiencies in air content. This may be performed only once and acceptable air content must be confirmed by subsequent acceptance testing. If air content is initially high, the contractor may continue placement at their own risk and the concrete may be accepted only upon acceptance cylinders having attained adequate 28-day compressive strength.

Concrete that appears stiff or is of insufficient slump (workability) for the items being placed should be rejected. If the slump fails to meet the minimum stated on the mix design, the inspector may allow placement and the Engineer may accept the material upon adequate 28-day compressive strength test results, provided placement and adequate consolidation is observed and documented by the inspector, and upon removal of forms, no voids, honeycombing, or other evidence of insufficient consolidation is apparent. If slump exceeds the range stated on the mix design, in order to accept the concrete, cylinders must meet 28-day strength requirements, and the inspector must observe and document that no segregation (separation of the coarse aggregate from the paste) occurred during placement or consolidation of the concrete.

Insufficient or excessive air content, or issues with temperature or mix consistency (slump), should be reported to the contractor immediately to allow them to discuss with their supplier and make adjustments for subsequent batches as appropriate.

Excessive variability in slump and or air content is an indication of dry aggregate stockpiles. Provided batching is occurring as expected and quantities on the delivery ticket match the approved mix design, inspect the aggregate stockpiles for both adequate and consistent moisture content (saturated conditions are ideal). If concrete

aggregate is dry or only slightly moist, it will absorb both mixed water and chemical admixtures which will adversely affect the properties of the freshly mixed concrete. Some specialty concrete produced with lightweight and highly absorptive aggregate require the aggregate to be presoaked (completely submerged in water) for 24 hrs or more prior to batching.

For Class S and Class B Concrete compressive strength acceptance, use the Table from section 1006-4.03(B)(2) of the Specifications - Adjustment in Contract Unit Price for Compressive Strength of Class S and Class B Concrete.

If concrete fails to meet compressive strength, depending on the class, application, and required strength, the concrete may be in reject and subject to removal. If subject to removal, the contractor has the option to core the concrete to confirm if adequate strength has been attained within the structure. This should be done in consultation with both Bridge Group and Materials Group, and typically must be performed within 45 days of placement.

Special considerations are required for handling, transporting, conditioning, and testing of core specimens. Be sure to confirm that the proposed methods for obtaining the cores are consistent with the requirements. Notify the lab that will be receiving and testing the core specimens so that they may provide guidance and make necessary preparations to receive the cores. Due to a required minimum conditioning period, the day of the week during which the cores are obtained matters; consult with the lab.

In some instances, the concrete may be subject to a reduction in unit price, but not be in reject, or may be in reject but of adequate strength to remain in the structure (as determined by Bridge Group). In such an instance, the contractor may not elect to core the concrete in question. The contractor may only request to core the structure when the compressive strength of the acceptance cylinders is found to be inadequate by Bridge Group and would otherwise result in removal of the concrete/structure in question.

It is preferred to avoid coring the structure when possible. If cores are obtained, core test results replace the 28-day compressive strength for determination of payment. If hold cylinders are available, these may be broken at 56 days to confirm adequate strength, however, the 28-day compressive strength is used for determination of any reduction in bid item price unless the hold cylinders were broken in lieu of obtaining cores. Note that there is a maximum reduction in price of $150 per cubic yard of concrete that may be applied. Also note that cores of properly placed and adequately consolidated concrete typically break at a higher strength than do properly fabricated cylinders.

1006-7.04 Sampling Frequency for Cast-In-Place Concrete

The inspector should refer to Section 1006-7.04 of the Standard Specifications and the Acceptance Sampling Guide for Portland Cement Concrete prior to testing and sampling concrete. Field tests vary for the class of concrete and the amount of concrete being placed. In any case, the inspector and contractor’s personnel should coordinate and agree to a consistent sampling location and procedure in order to avoid as many discrepancies and arguments as possible.

1007 RETROREFLECTIVE SHEETING

The material specified in this section is used on signs and markers and is intended to provide good visibility during day and night. The sheeting must be on the Department's Approved Products List (APL). The current APL is available on the Internet from the Research Center, through its Product Evaluation Program (PEP) program. Certifications and test reports furnished by the contractor should be submitted to Traffic Design for review and acceptance (refer to Section 608 of the Standard Specification).

The Engineer must conduct inspections of the sheeting in the field to verify that:

- The correct type of sheeting is used
- It adheres properly to the support
- Colors, reflectivity are uniform, and meet reflectivity requirements
- It is free of dirt, scratches, and other unacceptable conditions

When sheets from different production runs are used on the same panel, there may be an obvious difference in color or reflectivity that is not acceptable. All surfaces of panels to be covered with retroreflective sheeting shall be prepared in accordance with the recommendations of the sheeting manufacturer (refer to Section 608 of the Standard Specification).

Bubbles and loose corners or edges are not acceptable.

All sheeting shall be applied on flexible delineators in the factory by the manufacturer. Field application of reflective sheeting on flexible delineator assemblies should not be allowed unless approved by the Engineer. If the sheeting has been damaged in any way, the damaged flexible delineator post shall not be installed, and the contractor will need to provide and install a new undamaged device at no additional cost to the Department.

1008 PRISMATIC REFLECTORS

This section covers the material requirements for reflectors used on delineators, reference markers, object markers, snow markers, and milepost markers, letters, symbols, etc. on signs.

When used in arrays, such as for letters or numbers on a sign, all the reflectors are to be from the same manufacturer. Reflectors from different sources that vary in brightness or color and do not present a uniform appearance are not acceptable. The use of reflectors in delineators and markers is discussed in Standard Specification Section 703.

The devices should exhibit good workmanship and shall be free of burns, discoloration, cracks, or other objectionable marks which would affect appearance or serviceability.

The prismatic reflectors in button-copy signs should be attached to the frame of the letter.

Certificates of Compliance conforming to the requirements of Subsection 106.05 of the specifications shall be submitted for approval. Additionally, the contractor shall provide detailed manufacturer's information, specifications and application guidelines.

Samples of each device shall be supplied for testing if requested by the Engineer. The Engineer and contractor shall field verify the locations, necessary lengths and quantities prior to materials being ordered. Item lengths and quantities shall be adjusted as necessary.

1009 ASPHALT RUBBER MATERIAL

1009-2 Materials

Certificates of Compliance are required. The inspector should verify that the certificate confirms the rubber is a crumb rubber derived from materials listed in the Standard Specifications and no waste products were generated during processing.

1009-2.02 Asphalt-Rubber Proportions

Asphalt rubber shall contain a minimum of 20% ground rubber by weight of the asphalt cement. The inspector should check the proportions to ensure the required amount of rubber material is being incorporated into the asphalt-rubber mixture and is documented by the contractor.

1009-3 Construction Requirements

1009-3.01 Mixing of Asphalt-Rubber

The temperature of the asphalt cement shall be between 350 °F and 400 °F at the addition of rubber. The inspector should review Section 1009-3 of the Standard Specifications for other requirements regarding mixing of asphalt-rubber. The inspector should also check the contractor's operation for compliance and that all information can be determined by temperature measuring devices on the storage and mixing tanks.

Prior to production, the inspector should review the contractor's proposed form for recording all the information that is required in Section 1009-3 of the Standard Specifications to ensure that all the information is included. Each batch of asphalt-rubber material should be produced so that all the requirements may be determined by the contractor's documentation. The contractor's documentation should show all the requirements needed for each batch of asphalt-rubber.

1009-3.02 Handling of Asphalt-Rubber

Once the asphalt-rubber has been mixed, the contractor's documentation should contain information that each batch of asphalt-rubber material is handled in accordance with Section 1009-3 of the Standard Specifications. Temperatures should be spot checked during the shift by the inspector.

1010 DRAINAGE PIPE

Certificates of Compliance (COC) for culvert pipe materials need to be carefully compared with the requirements of the Standard Specifications. Each type of culvert material may be covered by several Standard Specifications each of which must be cited in the certificates. Chapter 5 contains additional information on pipe culvert and storm drains.

An exhibit of the different gauges may be seen in Section 1325 of this Manual.

General types of pipe include: Metal Corrugated Pipe, Spiral Rib Metal Pipe, Concrete-Lined Corrugated Metal Pipe, Thermoplastic Pipe, Slotted, etc.

Thermoplastic Pipe includes CHDPPP, HDPE, PVC, etc. Thermoplastics often include polyvinyl chloride (PVC), polyethylene (PE), and polystyrene (PS). An inspection will be done for the thermoplastic pipe 30 days after installation before placing pavement. Pipes can be checked for deflection using a mandrel or laser to verify the pipe size. Pipe inspection shall be performed in the safest manner possible, i.e. no manual inspection for pipes 24” or less in diameter. Pipes 30” or greater inches may be entered following OSHA requirements, and deflection levels may be measured directly.

Reinforced Concrete Pipe (RCP) should be ADOT stamped on the side of the pipe prior to delivery. If it is not, then follow the steps below prior to rejecting the pipe off site.

- ADOT Materials Group, Structural Materials Section, must receive a call from the pipe manufacturer to inspect the RCP ahead of time. It's common practice to have ADOT inspect/stamp prior to shipment.
- ADOT Structural Materials Section must observe load testing (D-Load) in order to verify pipes met AASHTO M 242 for load strength/cracking - 1 test per 100 joints per size and per class needed. Also dimension tolerances are verified at the time of casting.
    - Per 1010-6, Reinforced concrete pipe (circular) shall conform to the requirements of AASHTO M 242 for the D-load specified.
    - Reinforced concrete pipe (circular) shall conform to the requirements of AASHTO M 170 for the class of pipe specified.
- For each pipe installed, the pipe must correlate to the approval date range listed for the tested pipe’s representative lot.
- Certificate of Compliance (COC) needs to show class, type, quantity of which the cert is good for. "Per contract plans" for quantity is not specific enough.

Tracer wire, will be required for non-metallic pipe such as corrugated high density polyethylene plastic pipe (HDPE), steel reinforced high density thermoplastic ribbed pipe, corrugated polypropylene plastic pipe (PP), vitrified clay pipe (VCP), and for polyvinyl chloride pipe (PVC) 2 inches in diameter and larger. Tracer wire will be required where the metallic component is encased within the pipe, such as reinforced concrete pipe (RCP), rubber gasket reinforced concrete pipe (RGRCP), and steel cylinder concrete pipe which is to be placed in the trench with the corrugated high density polyethylene plastic pipe, steel reinforced high density thermoplastic ribbed pipe, or corrugated polypropylene plastic pipe as an aid in location after burial, shall conform to the following requirements;

Tracer wire shall be solid copper wire, American Wire Gauge (AWG) No. 12 or larger. Tracer wire shall be coated with a minimum 30 mil polyethylene jacket designed specifically for buried use. Tracer wire shall conform to the specifications of the NEC, UL, and other applicable industry standards. Splices as required to promote continuity shall utilize sealed water tight connections.

1011 JOINT MATERIALS

The items included under this section are rubber waterstops, PVC waterstops, joint sealant (hot poured), joint sealant (cold application), bridge deck joint seals (neoprene), preformed expansion joint filler, bituminous joint filler, non-bituminous joint filler, cellular plastic joint filler, and silicone joint sealant.

Certificates of Compliance are required for all joint materials. Each type of joint material will have installation procedures recommended by the manufacturer which are to be carefully followed. A copy of the recommended procedures furnished by the contractor are to be included in the project records along with a statement that the material was installed as recommended by the manufacturer. Compare the certification with the specification requirements to be sure that the certification is complete. Also refer to the Sampling Guide Schedule in the *Materials Testing Manual (Series 100 ARIZ 110)* for instructions.

The specification for Bridge Deck Joint Seals (compression & strip seals) requires that one piece of the material shall be furnished 18 inches longer than needed. The extra material is cut off for a test sample.

1012 GUARDRAIL MATERIALS

The AASHTO - AGC - ARTBA “Guide to Standardized Highway Barrier Rail Hardware” is available on the ADOT website under Barrier Design Information. Additionally refer to MASH barrier design.

Reflector tabs made by stamping from galvanized metal sheets is acceptable. The ungalvanized edge is not considered detrimental to the nonstructural tabs.

Post and block inspection for appearance and physical characteristics is a project responsibility.

Rail elements including bolts, nuts, and washers, shall be galvanized after fabrication, with fabrication to include forming, cutting, shearing, punching, drilling, bending, welding, and riveting.

1013 BEARING PADS

The Standard Specifications, Section 1013, describe several different types of bearing pads including but not limited to elastomeric, preformed fabric, etc. It is important to note the type called for in the plans and to read the appropriate Special Provisions and Standard Specifications. All types must be sampled on varying schedules, and all require manufacturer's certification. ADOT will select the pads to be tested at random - the sample shall consist of at least one bearing from each size and material batch lot. The Contractor is responsible for assuring that the pads are tested by a lab approved by ADOT, and provide the results to the Engineer

Bearing pads should be visually inspected for workmanship and conformance to design tolerances. They should be free of damage from weather, handling or other hazards. At the time of installation, they should be clean and free of contaminants.

Installation at the proper position and orientation are critical. A copy of the bearing layout is to be provided to the Engineer. Bearing surface must be clean and free of all loose materials before placing the bearing pad. Pads must be set only on concrete surfaces which have been properly prepared in accordance with the Standard Specifications

Section 601 discusses the construction requirements. Very little is said about bearing pads in Section 600 of the Standard Specifications. The Project Plans and Special Provisions specify the installation requirements. The Special Provisions may talk about material requirements for bearing pads not covered by Section 1013.

1014 GEOSYNTHETICS

Section 1014 of the Standard Specifications describes several different types of geosynthetics and their uses. It is important that each be used for the specific purpose specified.

Certificates of Compliance are required before the material is incorporated into the work. Materials should be sampled and submitted for testing to the regional laboratory. All materials should be visually inspected to see that they were shipped and handled in accordance with manufacturers' instructions and that care has been exercised to prevent damage. Materials should be free from tears and other obvious defects.

Materials should be installed in accordance with specifications and with the manufacturers' recommendations. Care should be taken to ensure proper overlaps, when appropriate, and anchors or staples should be installed properly. Wrinkles should normally be avoided. Geosynthetics must be installed over properly prepared surfaces. Most materials can be damaged by heavy equipment running directly on the fabric, and should be backfilled with care.

If material has not been pre-approved, a Certificate of Analysis is required and one sample (if requested by the Engineer) for every 10 rolls per lot. (Minimum of one sample per lot.) Samples shall not be taken within 5 feet from either end of the roll, and shall be at least 6 feet long by the full width of the roll.

1015 EPOXY RESIN ADHESIVES

1015-1 General Requirements

While most epoxy resin adhesives utilized by contractors on projects can be found on the ADOT Approved Products List (APL), there are instances in which non-APL materials can be substituted. These materials need to be approved by the Resident Engineer prior to use on the project, and need to be accompanied by all the required documentation listed in the specifications. This review should be done with input from the applicable ADOT design section or the consultant design engineer.

All adhesives shall be made up of two components that, when mixed per the manufacturer's requirements, react with each other to produce the adhesive's properties. The Inspector should make sure that the product's packaging is not damaged, that it is stored properly, and that the material has not expired prior to its use, all things which will compromise the adhesive's efficacy. Any material compromised in any of these fashions cannot be utilized.

1015-2 Anchoring Adhesives - Steel to Concrete

Structural Application

When used in a structural application, epoxy resin adhesives not only need to meet the chemical properties of the project's specifications, but they also need to be rated to meet the strength requirements of the project's design. These strength requirements should be outlined in either the project's plans or specifications.

It is important that the contractor submit the product's testing data produced by the International Code Council Evaluation Service (ICC-ES) for the Resident Engineer's approval and not just the product's marketing brochure. These reports are easily accessible online and provide independently-verified testing data for the products in question.

APPROVED PRODUCTS LIST

The Approved Products List (APL) is a list of products that are used in the construction and maintenance of the State's highway system. The APL process begins by manufacturers submitting products for testing. Once the products are tested, the Product Evaluation Committee decides whether they are suitable for highway use. When a product has been approved it is added to the APL.

The APL does not eliminate field testing requirements that are specified in the Standard Specifications, the Materials Group Policy and Procedures Manual, or the Special Provisions for each project. If a Contractor submits a product that is not on the APL, then it is left to the discretion of the Engineer to show that the product is of equivalent value before use.

REFERENCES AND ADDITIONAL INFORMATION

APPROVED PRODUCTS LIST (APL) - *(Found on the ADOTNet and on the public webpage)*

ASSOCIATED FORMS

There are no blank forms associated with this chapter at the present time..