

GENERAL SPECIAL PROVISIONS FOR ALL PROJECTS  
2001 STANDARD SPECIFICATIONS

SECTION 101 - DEFINITIONS AND TERMS

1. 101.01 ABBREVIATIONS, is hereby modified by adding the following (in alphabetical order) to the existing list of abbreviations:

T Metric Ton

2. 101.02 DEFINITIONS, is hereby modified by replacing the present definition for METRIC TON with the following definition:

METRIC TON - A unit of measure equivalent to 1000 kg, denoted in Contract Documents as "Metric Ton" or "T." See also TON.

SECTION 103 - AWARD AND EXECUTION OF CONTRACT

3. 103.11 INSURANCE, is hereby modified by replacing the third and fourth paragraphs of Part (e) with the following paragraphs:

The contractual liability insurance requirements detailed in the Contract Documents, including Subsection 107.16, are to indemnify, defend, and hold harmless the Municipality(ies), the State, the Agency, and railroad(s), as applicable, and their officers, agents, representatives, and employees, with respect to any and all claims, causes of actions, losses, expenses, or damages that arise out of, relate to, or are in any manner connected with the Contractor's work or the supervision of the Contractor's work on this project.

Each policy shall name the Municipality(ies), the State, the Agency, and railroad(s), as applicable, as additional insureds for actions, losses, expenses, or damages that arise out of, relate to, or are in any manner connected with the Contractor's work or the supervision of the Contractor's work on this project.

SECTION 105- CONTROL OF THE WORK

4. 105.01 AUTHORITY OF THE ENGINEER, is hereby modified by adding the following paragraph:

As they appear in these specifications, phrases like "approval of the Engineer," "as ordered by the Engineer," "with the consent of the Engineer," and any similar phrase indicating acceptance or direction by the Engineer shall not supercede any requirement of the Contract that the Contractor meet all contractual obligations, including but not limited to, compliance with permit conditions and applicable laws, rules, regulations, ordinances and bylaws.

5. 105.05 COORDINATION OF PLANS, STANDARD SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, SPECIAL PROVISIONS, AND GENERAL SPECIAL PROVISIONS, is hereby deleted in its entirety and replaced with the following:

105.05 COORDINATION OF PERMITS, SPECIAL PROVISIONS, DETAIL PLANS, GENERAL SPECIAL PROVISIONS, STANDARD PLANS, SUPPLEMENTAL SPECIFICATIONS AND STANDARD SPECIFICATIONS. These Project Permits, Special Provisions, Detail Plans, General Special Provisions, Standard Plans, Supplemental Specifications, Standard Specifications, and all supplemental documents are essential parts of the Contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, precedence of the Contract Documents will be determined in the following order:

Contract Document Precedence

- (a) Project Permits
- (b) Special Provisions
- (c) Detail Plans
  - (1) Calculated Dimensions
  - (2) Scaled Dimensions
- (d) General Special Provisions
- (e) Standard Plans
  - (1) Calculated Dimensions
  - (2) Scaled Dimensions
- (f) Supplemental Specifications
- (g) Standard Specifications

The Contractor shall take no advantage of any apparent error or omission in the Contract Documents. In the event that the Contractor discovers an error or omission, the Contractor shall immediately notify the Engineer.

The Engineer will make such corrections and interpretations as deemed necessary for fulfilling the intent of the Contract Documents. When there is an apparent absence or mention of any detail or an apparent omission of a detailed description relative to any point or feature in the Contract Documents, the detail or description shall be interpreted/understood in accordance with the best general engineering and construction practice.

Other specifications (e.g. ASTM, NDS, CRSI, ACI) cited by reference shall become effective only if the work or material covered by them is not included in the Contract Documents. Specifications so referenced shall be the latest revision in effect on the date of advertisement for bids.

SECTION 107 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

6. 107.01 LAWS TO BE OBSERVED, is hereby modified by adding the following paragraphs:

The Contractor, by signing this Contract, agrees to comply with the Americans with Disabilities Act of 1990 and to assure that individuals with disabilities have equal access to the services, programs and employment activities/opportunities offered by the Contractor under this Contract.

The Contractor, by accepting and signing the Contract, agrees to fully comply with the provisions of 9 V.S.A. Chapter 102, also referred to as Act No. 74 of 1991 or the Prompt Payment Act, as amended.

On all federal-aid and state funded contracts, the Contractor, during the life of the Contract and on a monthly basis, shall submit electronically, a listing of payments to subcontractors on the form specified by the State and made available at:

<http://www.aot.state.vt.us/dbe/>. Electronic reports shall be filed with the VAOT Office of Civil Rights by an authorized representative and received in the VAOT Office of Civil Rights on or before the tenth working day after month end. Contractors without access to the internet shall obtain and submit manual reports to the VAOT Office of Civil Rights. Manual reports shall be signed by an authorized representative, sent to the VAOT Office of Civil Rights, and postmarked on or before the tenth working day after month end. There shall be no direct compensation allowed the Contractor for this work, but the cost thereof shall be included in the general cost of the work.

In accordance with 9 V.S.A. Section 4003, notwithstanding any contrary agreement, payments made to subcontractors after seven days from receipt of a corresponding progress payment by the State to the Contractor, or seven days after receipt of a subcontractor's invoice, whichever is later, violate this agreement.

Violations shall be reported to the VAOT Office of Civil Rights for review. Failure to resolve disputes in a timely manner may result in a complaint made to the VAOT Pre-qualification Committee. In the Committee's judgment, appropriate penalties may be invoked for failure to comply with this specification. Penalties may include suspension, reduction or revocation of the Contractor's pre-qualification rating.

This clause shall be included in the prime Contractor's Contract made with all of its subcontractors.

7. 107.16 RESPONSIBILITY FOR DAMAGE CLAIMS, text is hereby deleted in its entirety and replaced with the following:

The Contractor shall defend, indemnify and save harmless the Municipality(ies), the State, the Agency, and railroad(s) and all their officers, agents, and employees from all suits, actions, or claims of any character, name, and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property that arise out of, relate to, or are in any manner connected with the Contractor's work or the supervision of the Contractor's work on the project; or by or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or by or on account of any act of omission, neglect, or misconduct of the Contractor; or by or on account of any claims or amounts recovered for any infringement of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the Workers Compensation Act, or any other law, bylaw, ordinance, order or decree. So much of the money due the Contractor under and by virtue of the Contract, as shall be considered necessary by the Agency for such purpose, may be retained for the use of the State.

If no money is due, the Contractor's surety shall be held until such suit or suits, action or actions, or claim or claims for injuries or damages, as aforesaid, shall have been settled and suitable evidence to that effect furnished to the Agency.

8. 107.24 INTEREST, is hereby made a new subsection of SECTION 107 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC as follows:

107.24 INTEREST. Notwithstanding any statutory or other provisions to the contrary, interest on monies owed pursuant to the Contract shall be paid as follows:

- (a) Escrowed monies. When the Contractor or State is deemed entitled to some or all of the monies deposited in an escrow account pursuant to an escrow agreement, the Contractor or State shall be entitled to a pro rata share of the interest earned in the account.
- (b) Claim for adjustment or dispute - pre-decision or judgment. Interest shall be allowed the Contractor on a decision or judgment for money in a claim for adjustment or dispute. Pre-decision or judgment interest shall be calculated from twenty-one (21) days after the date the money would have been paid in a biweekly or final estimate, or the date of the claim, whichever is later, but for the failure of the Agency to make the payment to the date of decision or judgment, at a simple rate equal to the weekly average 1-year constant maturity Treasury yield, as published by the Board of Governors of the Federal Reserve System, for the calendar week preceding the date of the decision or judgment.
- (c) Claim for adjustment or dispute - post-decision or judgment. Interest shall be allowed the Contractor on a decision or judgment for money in a claim for adjustment or dispute. Post-decision or judgment interest shall be calculated from the date of decision or judgment to the date of payment at a simple rate equal to the weekly average 1-year constant maturity Treasury yield, as published by the Board of Governors of the Federal Reserve System, for the calendar week preceding the date of the decision or judgment.

SECTION 108 - PROSECUTION AND PROGRESS

9. 108.11 DETERMINATION OF EXTENSION OF CONTRACT TIME FOR COMPLETION,  
is hereby modified by deleting the first paragraph of the  
subsection and inserting the following:

When a definite date for completion or a fixed number of days is specified in the proposal and Contract, and when the Contractor finds it impossible to substantially complete the work within the Contract time specified due to unforeseen conditions beyond the control and without fault or negligence of the Contractor, the Contractor may submit the appropriate extension of time forms. The Contractor will be supplied these forms within 90 calendar days of the acceptance date. The forms can be completed and returned to the Finals Engineer within 60 calendar days of the date of the letter accompanying the forms. Failure to respond within 60 calendar days shall constitute a waiver to apply for an extension of time, and the Contractor will be assessed liquidated damages as prescribed in the Contract documents. Upon written order by the Engineer establishing a substantial completion date prior to the anticipated completion date, no request for an extension of time by the Contractor will be necessary.

10. 108.11 DETERMINATION OF EXTENSION OF CONTRACT TIME FOR COMPLETION,  
is hereby further modified by deleting Part (f) of the second  
paragraph and inserting the following Part (f):

(f) If satisfactory completion of the Contract with any authorized extension and increases requires the performance of work in greater quantities than those set forth in the proposal, the Contract time allowed for performance of the work will be increased in the same ratio that the total cost of the work actually performed bears to the total cost in the proposal. However, when additional time is added to the Contract by change order/supplemental agreement, the number of days added will be deducted from the number of days calculated in the method above. Also, if more days are added by change order/supplemental agreement than would have been by the previously mentioned method, the Contractor will not have the excess days deducted. In the event that a change order is done adding work to the Contract, but does not contain any additional time, the Contractor will be granted additional time as described above. Additional time may be allowed for unusual circumstances when cost alone is not a determining factor in time required to perform the additional work. Any change in the final Contract time shall be computed to the nearest full day.

11. 108.14 EMERGENCY TERMINATION OF CONTRACT, is hereby deleted in its entirety and replaced with the following subsection:

108.14 TERMINATION OF CONTRACT FOR CONVENIENCE. The Agency may, by written order to the Contractor, terminate the Contract or any portion thereof when such termination would be in the best interest of the Agency. In the event such termination occurs, without fault and for reasons beyond the control of the Contractor, all completed items of work as of the date of termination will be paid for at the Contract bid price. Payment for partially completed work will be made either at agreed prices or by force account methods provided elsewhere in the Contract. Items which are eliminated in their entirety by such termination shall be paid for as provided in Subsection 109.07 - Eliminated Items. The Contractor shall make all work records available to the Agency upon request regarding payment under this Subsection.

Acceptable materials, obtained by the Contractor for the work but which have not been incorporated in the work, may, at the option of the Agency, be purchased from the Contractor at actual cost delivered to a location prescribed by the Engineer, or otherwise disposed of as mutually agreed.

After receipt of Notice of Termination from the Agency, the Contractor may submit a claim for additional damages or costs not covered above or elsewhere in the Contract within 60 days of the effective termination date. Such claim may include such cost items as bidding and project investigative costs, overhead expenses attributable to the project terminated, legal and accounting charges involved in claim preparation, subcontractor costs not otherwise compensated, idle labor cost and idle equipment time for work —stopped in advance of the termination date using properly adjusted "Blue Book" rates, guaranteed payments for private land usage as part of original Contract, and any other cost or damage for which the Contractor believes reimbursement should be made.

The intent of negotiating this claim is to reach a settlement equitable to both the Contractor and the Agency. In no event, however, will loss of anticipated profits be considered as part of any settlement.

The Contractor agrees to make all cost records available to the Agency to the extent necessary to determine the validity and amount of each item claimed.

Termination of the Contract, or portion thereof, shall not relieve the Contractor of its contractual responsibilities for the completed work, and it shall not relieve the Contractor's Surety of its obligation for and concerning any just claim arising out of the work performed.

SECTION 203 - EXCAVATION AND EMBANKMENTS

12. 203.09 DISPOSAL OF SURPLUS MATERIAL, is hereby deleted in its entirety and replaced with the following:

203.09 DISPOSAL OF SURPLUS EXCAVATION AND WASTE MATERIAL. All surplus excavation and waste material shall be deposited as shown on the Plans or as authorized in writing by the Engineer. Excavated material shall not be wasted unless directed by the Engineer. Compaction requirements for surplus or waste material used to flatten slopes outside the embankment limits shown on the Plans may be waived; however, placement procedures shall ensure a stable fill slope.

Disposal of all surplus or waste material shall be in accordance with Subsections 105.23 through 105.29.

Disposal of surplus or waste material will not be paid for directly but shall be considered as incidental work pertaining to the grading or excavation Contract item from which the material was obtained.

When sufficient on-site disposal areas are not shown on the Plans or directed by the Engineer, it shall be the responsibility of the Contractor to locate disposal areas in accordance with Subsections 105.23 through 105.29.

SECTION 204 - EXCAVATION FOR STRUCTURES

13. 204.13 METHOD OF MEASUREMENT, is hereby modified by deleting Subparts (1) and (2) of Part (a) in their entirety and replacing these subparts with the following:

- (1) The horizontal dimensions for excavation for culverts and pipes (excluding underdrain and carrier pipe) shall be the distance between vertical planes 500 mm (18 inches) outside of the interior lines of the culvert or pipe.
- (2) The horizontal dimensions for drop inlets, manholes, end sections, and other minor structures shall be 500 mm (18 inches) outside the exterior lines of the structure.

SECTION 406 - BITUMINOUS CONCRETE PAVEMENT

14. SECTION 406 - BITUMINOUS CONCRETE PAVEMENT, is hereby deleted in its entirety.

SECTION 406 - BITUMINOUS CONCRETE PAVEMENT -MARSHALL

15. SECTION 406 - BITUMINOUS CONCRETE PAVEMENT - MARSHALL, is hereby made a new section of these Specifications as follows:

406.01 DESCRIPTION. This work shall consist of constructing one or more courses of bituminous mixture on a prepared foundation in accordance with these specifications and the specific requirements of the type of surface being placed, and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer.

406.02 MATERIALS. Materials shall meet the requirements of the following subsections of Division 700 - Materials:

Asphalt Cement	702.02
Emulsified Asphalt, RS-1	702.04
Aggregate for Bituminous Concrete Pavement	704.10

The grade of asphalt cement used to produce Bituminous Concrete Pavement shall be a PG asphalt as shown on the plans.

406.03 COMPOSITION OF MIXTURE.

(a) Gradation. The materials shall be combined and graded to meet limits for each of the pavement types in the following table:

Percentage by Mass Passing Square Mesh Sieve

Sieve Size	Type I	Type II	Type III	Type IV	Type V
31.5 mm (1 ¼ inch)	100				
25.0 mm (1 inch)	95 - 100	100			
19.0 mm (¾ inch)	74 - 86	95 - 100	100		
12.5 mm (½ inch)	60 - 80	64 - 88	95 - 100	100	
9.5 mm (⅜ inch)	---	50 - 82	70 - 90	95 - 100	100
4.75 mm (No. 4)	35 - 60	32 - 62	42 - 75	48 - 78	85 - 100
2.36 mm (No. 8)	25 - 45	22 - 45	28 - 56	28 - 56	66 - 88
1.18 mm (No. 16)	---	13 - 35	14 - 41	14 - 41	45 - 67
600 µm (No. 30)	10 - 25	8 - 27	7 - 31	7 - 31	27 - 53
300 µm (No. 50)	---	3 - 20	3 - 22	3 - 22	13 - 40
75 µm (No. 200)	2 - 6	2 - 6	2 - 6	2 - 6	2 - 7
Total Aggr.	94 - 97	93 - 97	92 - 97	92 - 95	91 - 93
Bitumen (% of Total Mix)	3 - 6	3 - 7	3 - 8	5 - 8	7 - 9



(b) Design Criteria. The materials shall be combined and graded to meet the following criteria:

DESIGN CRITERIA

Marshall Test Properties	406.27 - Medium Duty Bituminous Concrete Pavement - 50 blows/side	406.25 - Bituminous Concrete Pavement - 75 blows/side
Air Voids	3.0 - 5.0	3.0 - 5.0
VMA % Type I	13.0 min.	13.0 min.
VMA % Type II	14.0 min.	14.0 min.
VMA % Type III	15.0 min.	15.0 min.
VMA % Type IV	16.0 min.	16.0 min.
Stability, Newtons	5340 min.	8010 min.
Flow, millimeters	2.0 - 4.5	2.0 - 4.0
% Stone Screenings (Fine Aggregate Portion) Passing 2.36 mm (No. 8) sieve	60.0 min.	75.0 min.

Air Voids. The percent of air voids of the mixture shall be calculated by the following formula:

$$F = 100 \frac{(R-P)}{R}$$

Where: F = % voids in compacted mixture  
 R = Maximum specific gravity of uncompact mixture (AASHTO T 209)  
 P = Bulk specific gravity of compacted mixture (AASHTO T 166, Method A)

Unless specifically designated on the plans, all bituminous concrete pavement shall be designed in conformance with the design criteria for Bituminous Concrete Pavement.

Unless otherwise specified for highways, Type I shall be used for base course, Types I or II shall be used for binder course and Types II, III, or IV shall be used for wearing course. Unless otherwise specified for bridges, Type IV shall be used for binder course.

Type V mix will be designed to meet the gradation criteria of Subsection 406.03(a) only.

The mix design shall have a filler/asphalt ratio ranging between 0.50 and 0.90.

- (c) Mix Design. The Marshall Method of Mix Design will be used to develop a mix that will meet the Design Criteria. A copy of all test data, including graphs, used in developing the mix, may be required with the submittal of the mix design.

The job-mix formula for each mixture shall establish a single percentage of aggregate passing each sieve and a single percentage of bituminous material to be added to the aggregate. No change in the job-mix formula may be made without approval of the Engineer. The job-mix formula must fall within the master range of the specification as shown in Subsection 406.03(a).

No work shall be started until the Contractor has submitted and the Engineer has approved a mix design including cold feed and hot bin gradings, mixing times, the percentage of each ingredient including bitumen, the job-mix formula from such a combination, and the optimum mixing and compaction temperatures as required in the Marshall Method of Mix Design.

The Engineer may approve changes in the job-mix formula if placement, finishing, or compaction characteristics are determined by the Engineer to be unsatisfactory.

At the time the above mix design is submitted, the Contractor shall indicate, and make available for sampling and testing, stockpiles of all aggregates and asphalt proposed for use.

A maximum of 10 working days shall be allowed for testing and evaluation of the submitted mix design. Once a mix design is approved, the job-mix formula is valid until the producer makes a change in aggregate source, asphalt grade, or asphalt source.

- (d) Control of Mixtures. The plant shall be operated so that no intentional deviations are made from the job-mix formula. The gradation of the actual mixture shall not vary from the job-mix formula by more than the following tolerances:

Testing Tolerances

Aggregate larger than 2.36 mm (No. 8) sieve	±6.0%
Aggregate passing 2.36 mm (No. 8) sieve and larger than 75 µm (No. 200)	±4.0%
Aggregate passing 75 µm (No. 200) sieve	±1.0%
Temperature of Mixture	±11°C (±20°F)

The quantity of asphalt cement introduced into the mixer shall be that quantity specified in the accepted job-mix formula and will be accepted on the basis of the mass (weight) on the printed weigh slip.

If an analyzed sample is outside of the testing tolerances and/or other design criteria, immediate adjustment shall be made by the Contractor. After the adjustment, the resulting mix will be sampled and tested for compliance with these Specifications. With the permission of the Engineer, the plant may continue production pending results of these tests, but if the Engineer deems it is in the best interest of the project, the Engineer may at any time order plant production stopped. In this event, additional adjustments shall be made and tested on a trial basis until the deficiency is corrected.

Acceptance sampling and testing will be conducted by the Agency in accordance with the latest version of the Agency's Quality Assurance Program.

If VAOT plant inspectors are not available for daily testing and inspection functions, box samples will be made at the project site and materials requirements of Subsection 406.03 COMPOSITION OF MIXTURE are waived regarding testing and calculations required to establish bulk specific gravity, air voids, VMA, stability, flow, and dust proportion. Box samples shall be processed and results reported to the resident engineer within ten working days of being received at the VAOT Central Laboratory in Berlin Vermont.

406.04 WEATHER AND SEASONAL LIMITATIONS. Bituminous material shall not be applied between November 1 and May 1. The bituminous material shall not be placed when the ambient air and pavement temperature at the paving site in the shade and away from artificial heat is below 5°C (40°F) for courses 35 mm (1 ¼ inches) or greater in compacted thickness or below 10°C (50°F) for courses less than 35 mm (1 ¼ inches) in compacted thickness.

Bituminous material shall not be placed on a wet or frozen surface or when weather or other conditions would prevent the proper handling, finishing, or compacting of the material, unless otherwise approved by the Engineer.

Bituminous wearing course materials shall not be applied before May 15 or after October 15.

When it is in the public interest, the Construction Engineer may adjust the ambient air temperature requirements, pavement temperature requirements, or extend the dates of the paving season.

406.05 BITUMINOUS MIXING PLANT AND TESTING. Sufficient storage space shall be provided for each size of aggregate. The different aggregate sizes shall be kept separated until they have been delivered to the cold storage bins. The storage yard shall be maintained neat and orderly and the separate stockpiles shall be readily accessible for sampling.

All existing plants shall be inspected and obtain approval each construction season by an authorized representative of the Agency. Written notification shall be given for any plant which has not been inspected so that an authorized representative of the Agency may inspect said plant prior to any mixing operation for Agency of Transportation projects. A minimum of ten business days shall be allowed for the scheduling of the inspections. The plant shall be in operation at the time of inspection.

Plants used for the preparation of bituminous mixtures shall conform to all requirements under (a) below, except that scale requirements shall apply only where mass (weight) proportioning is used. In addition, batch mixing plants shall conform to the requirements under (b) below, continuous mixing plants shall conform to the requirements under (c) below, and drum mixing plants shall conform to the requirements under (d) below.

Scales for the weighing of materials shall conform to the restrictions herein set forth and shall meet all specifications, tolerances, and regulations which have been or may be adopted from time to time by the DIRECTOR OF STANDARDS OF THE VERMONT DEPARTMENT OF AGRICULTURE, and shall be subject to approval by the Engineer. The scales shall be checked and sealed as deemed necessary to assure accuracy.

Producers located outside Vermont shall observe all annual hopper scale mass, measurement, and seal requirements of their respective State or location.

(a) Requirements for all Plants.

The Contractor shall give the Engineer two working days notice of intent to produce bituminous mixture so that arrangements can be made for plant inspection and control.

The plants shall be so designed, coordinated, and operated as to produce a uniform mixture within the mix design approved for the project.

All plants shall have automatic controls which coordinate the proportioning, timing, and discharge of mixture by the operation of a single switch or button. In addition to these controls, the plant will have an approved recording system.

The recording system shall be capable of printing the total net mass (weight) of the load. Each weigh slip will be automatically printed with the date and the time of batching and will show project and truck identification, and will indicate the approved mix design number being produced.

All originals of recorded data pertaining to the weighing or proportioning of bituminous concrete, after recording, shall become the property of the Agency.

1. Truck Scales. Approved truck scales shall be provided at each plant. The scale platform shall be of such length and width that it will conveniently accommodate all trucks or other approved hauling equipment. The entire vehicle load must rest on the scale platform and be weighed as one draft.

These scales may be used for spot checking the accuracy of the recording equipment. Any variance exceeding 0.5% of the net mass (weight) shall result in immediate corrective action by the Contractor.

A weatherproof building of sufficient size to house the scale operator and the inspector shall be provided. It shall have adequate lighting, both natural and artificial, and it shall be adequately and safely heated.

If the Contractor's printer breaks down, the Contractor may continue to operate for the remainder of that day, provided the following conditions are met:

- a. The Resident Engineer grants permission to operate.
- b. The Resident Engineer assigns an Inspector to record the total aggregate and asphalt mass (weight) for each batch on the appropriate ticket.

2. Equipment for Preparation of Bituminous Material. Tanks for storage of bituminous material shall be insulated and capable of heating the material, under effective and positive control at all times, to the temperature requirements set forth in the specifications. The heating system shall provide uniform heating of the entire contents of the tanks.

Heating shall be accomplished by steam or oil coils, electricity, or other means so that no flame shall come in contact with the heating tank.

A circulating system for bituminous material shall be of adequate capacity to provide proper and continuous circulation between storage tank and the proportioning units during the entire operating period.

The discharge end of the circulating pipe shall be maintained below the surface of the bituminous material in the storage tank to prevent discharging hot bituminous material into the open air.

All pipe lines and fittings shall be steam or oil jacketed or otherwise properly insulated to prevent heat loss.

3. Feeder for Dryer. The plant shall be provided with an accurate mechanical means for uniformly feeding the mineral aggregate into the dryer so that uniform production and uniform temperatures will be obtained.
4. Dryer. The dryer shall be capable of heating and drying the mineral aggregates to specification requirements without leaving any visible unburned oil or carbon residue on the aggregate when it is discharged from the dryer. Black smoke from the exhaust stack shall not be permitted. Drying shall continue until all moisture is removed. If unusually wet aggregate is being used, the input to the dryer shall be reduced to an amount which the dryer is capable of drying.

5. Screens. Plant screens shall have the capacity and size range to separate the aggregates into sizes for proportioning so that they may be recombined within the limits of the specifications. The screen over the "fines bin" shall have a maximum square opening of 5.0 mm (3/16 inch). Slotted screens may be used when approved by the Engineer. Screens are not applicable to drum-mix plants.
6. Cold Storage Bins. The plant shall have cold bin storage of sufficient capacity to ensure a uniform and continuous operation.

The bins shall be so constructed as to prevent any intermingling of aggregates from one bin to another. The use of loaders or trucks which are larger in width than the bins being charged shall not be allowed. The blending of two or more aggregates in the same bin shall not be permitted.

For all bituminous concrete supplied for use on Agency projects, uniform feeding of all fine aggregates shall be accomplished by the use of a variable speed, continuous belt feeder on each cold storage bin of fine aggregate.

7. Hot Bins. The plant shall include hot storage bins of sufficient capacity to supply the mixer when it is operating at full capacity. The hot storage shall consist of at least four bins arranged to ensure separate and adequate storage of appropriate fractions of the aggregate.

When more than 15% of the material is undersized for that bin, based on the sieve analysis of hot bins used in determining the job-mix formula, all bins shall be emptied and the cause for such condition shall be corrected.

Each bin shall be provided with a free-flowing overflow pipe of such size and at such a location as to prevent backing up of material into other bins or into contact with the screen. This overflow material shall not be fed back into the system or into any accepted stockpiles.

All bins shall be equipped with a sensor device indicating when the bin is one quarter full. An automatic plant shutoff device shall operate to interrupt the batching process when any aggregate bin becomes empty.

Adequate additional dry storage shall be provided when mineral filler is required. The system shall have a device to feed the mineral filler accurately and uniformly at adjustable rates consistent with the percent required. The feeder shall be interlocked so that production is interrupted if the bin becomes empty or the flow is obstructed.

Adequate and convenient facilities shall be provided to obtain representative aggregate samples from each bin.

Hot bins are not applicable to drum-mix plants.

8. Bitumen Control Unit. Satisfactory means, either by weighing or metering, shall be provided to obtain the proper amount of bitumen. Metering devices for bitumen shall be accurate to within plus or minus two percent the amount of bitumen delivered when tested for accuracy.

The section of the bitumen flow line between the charging valve and the spray bar shall be provided with a three-way valve and outlet so that the metering device can be checked for accuracy.

Suitable means shall be provided, either by steam, oil-jacketing, or other insulation, for maintaining the specified temperatures of the bitumen in the pipe lines, meters, weigh buckets, spray bars, and other containers or flow lines.

9. Thermometric Equipment. An accurate and armored thermometer shall be fixed in the bituminous feed line at a suitable location near the discharge valve at the mixer unit to indicating the temperature of the bitumen.

The plant shall also be equipped with an approved recording thermometer, pyrometers, or other approved recording thermometric instruments placed at the discharge chute of the dryer.

The Engineer may reject questionable thermometric instruments, may direct replacement of any instrument with an approved temperature recording apparatus, and may further require that daily temperature charts be filed with the Engineer.

10. Control of Mixing Time. The plant shall be equipped with positive means to govern the time of mixing and to maintain a constant mixing time, unless otherwise approved by order of the Engineer.

11. Dust Collectors. The plant shall be equipped with adequate dust collectors so that exhaust will not be dispersed into the atmosphere. Provisions shall be made to waste or uniformly reintroduce all or any part of the heavier dust particles from primary collectors into the flow of aggregate.

The introduction of baghouse fines into bituminous concrete mixes will be allowed when the fines are introduced by an approved metering or weighing system which uniformly introduces the fines.

The Engineer has the authority to withdraw the approval for use of baghouse fines at any time that the bituminous concrete pavement mix provided by the Contractor is unsatisfactory as determined by the Engineer.

12. Testing Facilities. The Contractor shall provide a weatherproof building, with at least 22 square meters (240 square feet) of floor space, in which to house and use the testing equipment. This building shall be maintained for the use of the Agency Engineers or Inspectors, and shall be located so that details of the Contractor's plant are plainly visibly from at least one window of the building. Adequate lighting, heating, and electrical connections shall be provided 24 hours per day. Proper means for ventilation shall be provided.

The method of heating shall be such that a minimum temperature of 21°C (70°F) will be maintained at all times. Sanitary toilet facilities with lavatory, with proper sewage disposal, shall be furnished for the use of Agency personnel. Cleaning supplies shall be furnished by the Contractor. Private telephone service shall be provided in the laboratory.

The Contractor must have its office space separate from the office space used by Agency personnel. The office spaces shall be located to afford privacy to Agency personnel.

A trailer type mobile laboratory may be used only in conjunction with a temporary plant. Any plant that occupies or has occupied the same location for more than one year will be classified as a permanent plant and will require a permanent building for a laboratory.

The facility shall be equipped with the following standard commercial quality equipment. Substitutes may be provided when approved by the Engineer.

- One - Air conditioner for the capacity of the building capable of maintaining a maximum temperature below 25°C (77°F).
- Two - Two kilogram (5 pound) minimum capacity fire extinguishers, either ABC Dry Chemical or Carbon Dioxide, of standard commercial quality.
- One - Standard office desk with drawers, locks and keys, 1200 mm x 750 mm (4 feet x 2 ½ feet) (minimum dimensions).
- One - Adjustable office chair.
- Two - Adjustable drafting stools.
- One - Electric calculator, four function, ten column, with memory.
- Two - Bench sections and storage compartments. The benches shall be approximately 900 mm (36 inches) high, 600 mm (24 inches) wide and three meters (10 feet) long.
- One/Two - Approved exhaust fans and hoods shall be provided over the stoves and extractors. The exhaust fans shall be high volume axial flow, at least 300 mm (12 inches) in diameter.
- One - Water cooler with supply of potable water.
- One - Sink with faucet within the office, with a continuous supply of pressurized clean water for the duration of the project. The sink shall drain to the outside of the office.



The facility shall be equipped with the following test equipment and supplies. Substitutes may be provided when approved by the Engineer.

One - Marshall Test Set Reference AASHTO T 245 including:

- One - Automatic Bituminous Compactor.
- Two - Compaction molds with base plates.
- One - Stability mold.
- One - Flow meter.
- One - Motorized compression and testing machine.
- One - Water bath capable of maintaining a temperature of  $60^{\circ}\pm 1^{\circ}\text{C}$  ( $140^{\circ}\pm 2^{\circ}\text{F}$ ).

One - Motorized 3000 g (6.6 pound) centrifuge extractor with two small bowls with covers and two large bowls with covers, and/or an ignition oven that conforms to the apparatus requirements of "Standard Test Method for Determining the Asphalt Content of Hot Mix Asphalt (HMA) by the Ignition Oven Method, AASHTO T 308" with the following related equipment: two full sets of sample basket(s), two catch pans, and one set of safety equipment as defined in T 308.

One - Full set of 203.2 mm (8 inch) diameter sieves full height, pans and covers necessary for testing all bituminous items required on the project.

One - Electronic balance, 6000 g (13.2 pound) minimum capacity.

One - Motorized sieve shaker with either rocking and tapping action or circular and tapping action capable of holding at least six sieves and one pan.

One - Mechanical aggregate shaker with a 0.028 m<sup>3</sup> (one cubic foot) capacity plus necessary screens. This may be placed in a separate enclosure outside of trailer.

One - Platform Beam Scale sensitive to 5.0 g (0.01 pound) with a minimum capacity of 45 kg (100 pounds).

One - Sample splitter, 63.5 mm (2½ inch) chute.

Two - Square pointed shovels; one long handled, one short handled

Two - Double burner hot plates, variable temperature.

Twelve - Tin pans, 267 mm x 267 mm x 25 mm (10½ x 10½ x 1 inches).

One - 0.028 m<sup>3</sup> (one cubic foot) minimum capacity electric oven.

One - Flat triangular trowel.

One - Brass wire bristle brush.

One - Standard floor brush.

One - Standard table brush.

Filter papers for duration of project.

Two - 40 mm (1½ inch) soft bristle paint brushes.

One - Automatic Timer (interval 0-30 minutes).

One - Sample Splitter (riffles) chute width 25 mm (1 inch).

Two - Flexible spatulas with 150 mm (6 inch) long blade.

One - 10 L (10 quart) pail.

Two - Pair lined, heat resistant gloves.

Two - hand scoops (size #1).

- Two - Metal thermometers, 10°C to 260°C (50 to 500°F), approximately 200 mm (8 inches) long with a 45 mm (1¾ inch) head.
- Two - Laboratory thermometers, capable of reading at least 60°C in 1°C (140°F in 2°F) increments.
- One - Cold chisel, approximately 40 mm (1½ inches) wide.
- Two - Volumetric Flasks, having a capacity of at least 2,000 mL (68 ounces); for use with the flask, a rubber stopper, and a connection, either molded in the flask, or attached to the rubber stopper.
- Two - Volumetric Flask having a capacity of at least 4,000 mL (135 ounces); for use with the flask, a rubber stopper and a connection either molded in the flask, or attached to the rubber stopper.
- One - Vacuum Pump or Water Aspirator, for evacuating air from the container. Vacuum system must be capable of removing entrapped air by subjecting the contents to a partial vacuum and maintaining a residual pressure of  $3.7 \pm 0.3$  kPa ( $1.1 \pm 0.1$  inches Hg) for  $15 \pm 2$  minutes. The vacuum system shall be equipped with a residual pressure manometer which reads in kilopascals (inches Hg) and a pressure release valve.
- One - Plastic funnel, to introduce mix into volumetric flask.
- One - Syringe to adjust water level in flask.  
Xylol for use as an asphalt solvent shall be furnished by the Contractor for the duration of the project.

For drum-mix plants, the facility shall be equipped with the following additional test equipment and supplies. Substitutes may be provided when approved by the Engineer.

- One - Microwave oven with a minimum interior volume of 0.028 m<sup>3</sup> (one cubic foot) with defrost as well as normal mode of operation.
- Six - Ovenproof glass dishes; approximately 300 mm x 300 mm x 40 mm (12 x 12 x 1½ inches).

All of the foregoing testing equipment shall be in good condition and shall be replaced or repaired by the Contractor if, during the duration of the project, it becomes unsuitable for testing purposes.

The above mentioned equipment is for a one plant operation only. In the event the Contractor chooses to use more than one plant, the Contractor shall provide adequate laboratory facilities as deemed necessary by the Engineer for making tests.

13. Safety Requirements. Adequate and safe stairways to the mixer platform shall be provided, and guarded ladders to other plant units shall be located where required for accessibility to plant operations.

All heated pipe lines adjacent to work areas, gears, pulleys, chains, sprockets, and other dangerous moving parts shall be thoroughly guarded and protected.

Ample and unobstructed space shall be provided on the mixing platform. A clear and unobstructed passage shall be maintained at all times in and around the truck-loading space. This space shall be kept free of drippings from the mixing platform. A platform shall be located at the truck-loading space to permit easy and safe inspection of the mixture as it is delivered into the trucks. Adequate overhead protection shall be provided where necessary.

14. Surge or Storage Bins. Surge or storage bins will be permitted for use in the production of bituminous items, provided they are approved and inspected by the Engineer. A surge or storage bin shall be capable of storing the mix without any degradation of its properties. The surge or storage bins shall be covered during inclement weather to protect the stored mix from the elements. Should circumstances preclude paving operations, the Agency will not be obligated to purchase mix remaining in a surge or storage bin.

For continuous mixing and drum-mix plants, an approved recording, weighing system shall be used on all surge bins.

When a surge bin is used in conjunction with a batch plant, the determination of pay quantities for this item shall be in accordance with the following procedure:

- a. The plant will produce mix with the printer operating according to the standard requirements for this device. The mix will be deposited in the surge bin. A sequentially numbered ticket will be prepared for every normal load produced.
- b. As each truck is loaded from the surge bin, the driver will be given the ticket previously prepared when the mix was produced for that bin. The truck driver will then deliver the ticket to the paving Inspector upon reaching the paving site.
- c. The mass (weight) shown on the ticket will not be the actual mass (weight) of the mix contained in the truck since the truck was loaded from the surge bin. The bin will be completely emptied at the end of every day, circumstances permitting, and all tickets delivered to the paving Inspector.
- d. Any rejected or held over material shall be weighed on the platform truck scales and this quantity shall be deducted from the daily totals.

- e. When paving ramps or other areas where a definite quantity is desired, the material required will be weighed on the platform scales and appropriate adjustments made in the daily totals obtained from the printer. These masses (weights) will be entered on the ticket or a separate ticket provided.
- f. Plant Inspectors will sign the first ticket of each day. If the Inspector changes during the day, this procedure will be followed for each change. At the end of each day, Plant Inspectors will inspect the storage bin to determine that it is empty and so note on the last ticket. Paving Inspectors will acknowledge receipt of the material at paving sites by initialing the lower right-hand corner of each ticket.
- g. All standard checks of the weighing apparatus on all plants will be made at the prescribed intervals.
- h. All mix produced for commercial customers and/or other projects must be discharged from bins other than those used for this project or directly from the pugmill into the haul vehicle; such mix shall not be loaded from the bin used for this project.
- i. All surge bins shall be emptied each day unless written permission is obtained from the Engineer.

(b) Requirements for Batching Plants.

1. Weigh Box or Hopper. The equipment shall include a means for accurately weighing each bin size of aggregate in a weigh box or hopper suspended on scales of ample size to hold a full batch without hand raking or running over.

The weigh box or hopper shall be supported on fulcrums and knife edges constructed so that they will not be easily thrown out of alignment or adjustment.

All edges, ends and sides of weighing hoppers shall be free from contact with any supporting rods or columns or other equipment that will in any way affect proper functioning of the hopper. Also, there shall be sufficient clearance between the hopper and supporting devices to prevent accumulation of foreign materials.

The discharge gate of the weigh box shall be hung so that the aggregate will not be segregated when dumped into the mixer. The gate shall close tightly when the hopper is empty so that no material will be allowed to leak into a batch in the mixer during the process of weighing for the next batch.

2. Aggregate Scales. Scales for any weigh box or hopper shall be springless dial or load cell with digital readout, and shall be of standard make and design sensitive to 0.1% of the maximum load that may be required. Dials will be free of vibration and shall be located to be plainly visible and readable to the operator at all times.

Accuracy of the scales shall be either by the use of ten 20 kg (50 pound) test masses (weights) provided by the Contractor or by other methods provided by the Contractor and approved by the Engineer. All test masses (weights) shall be certified annually by the Division of Weights and Measures.

3. Bitumen Bucket. The bucket for weighing bitumen shall be able to hold and weigh the amount required for a batch in a single weighing.

The filling system and bucket shall be designed, sized, and shaped so that bitumen will not overflow, splash or spill outside the bucket during filling and weighing.

The bucket shall be steam or oil-jacketed or equipped with properly insulated electric heating units. It shall be able to deliver the bitumen in a thin uniform sheet or in multiple sprays over the full length of the mixer within 15 consecutive seconds.

4. Bitumen Scales. Bituminous material shall be weighed on scales that conform to the specifications for the weighing of aggregate. The value of the minimum graduation shall not exceed 1.0 kg (2 pounds).

5. Mixer Unit for Batch Method. The plant shall include an approved, twin pugmill type batch mixer, jacketed or insulated and capable of producing a uniform mixture within the applicable job-mix tolerance. The mixer shall be so constructed as to prevent leakage and designed to provide a means of adjusting clearance between the mixer blades and liner plates.

6. Recording. The recording system of the batch plant shall print the mass (weight) of the bitumen, mass (weight) of the aggregate, and the total combined mass (weight) of both in addition to printing the combined net mass (weight) of each load.

(c) Requirements for Continuous Mixing Plants.

1. Aggregate Proportioning. The plant shall be able to accurately proportion aggregate from each bin, by mass (weight). The unit shall include interlocked feeders mounted under the compartment bins. Each bin shall have an accurately controlled, individual gate to control the rate of flow of aggregate from each bin compartment.

The opening shall be rectangular, with one dimension adjustable by positive mechanical means. Locks shall be provided on each gate. Calibrated gauges with minimum graduations not exceeding 2.5 mm (0.1 inch) shall be provided for each gate to establish gate openings.

2. Calibration of Aggregate Feed. The plant shall include a method to calibrate gate openings by means of test samples. The materials fed out of the bins through separate openings shall be bypassed to a suitable test box with each compartments material being confined in a separate box section. The plant shall be able to conveniently handle test samples with a mass (weight) of up to 365 kg (800 pounds) and to weigh them on accurate scales.
3. Synchronization of Aggregate Feed and Bituminous Feed. Satisfactory interlocking control of the flow of aggregate from the bins and the flow of bitumen from the meter or other proportioning source shall be provided. This control shall be accomplished by interlocking mechanical means or by other method under the Engineer's control and approved by the Engineer.
4. Mixer. The plant shall include an approved twin, pugmill type continuous mixer, insulated or jacketed, and capable of producing a

uniform mixture within the applicable job-mix tolerance. The paddles shall be adjustable for angular position on the shafts and reversible.

The mixer shall carry a manufacturer's plate indicating the net volumetric contents at several heights on a permanent gauge. The plate shall also indicate the rate of feed of aggregate per minute, at plant operating speed.

Unless otherwise required, determination of mixing time shall be by the following formula:

$$\text{Mixing time in seconds} = \frac{\text{Pugmill dead capacity in kilograms (pounds)}}{\text{Pugmill output in kilograms (pounds) per second}}$$

The masses (weights) shall be determined by tests made under the direction of the Engineer.

(d) Requirements for Drum-Mix Plants.

1. Aggregate Cold Bin Feeders. The plant shall have a device at each cold bin to feed the aggregate accurately and uniformly. The feeding orifice shall be adjustable. Gravity type feeders will not be permitted. Indicators graduated to not more than 2.5 mm (0.1 inch) shall be provided on each orifice. Each aggregate feeder shall be interlocked so that production is interrupted if one or more cold bins become empty or the flow is obstructed.

2. Mineral Filler System. When mineral filler is to be added, it shall be fed from a bin and feeder separate from the aggregate cold bins. The system shall be able to feed the mineral filler at adjustable rates accurately and uniformly.

The feeder shall be interlocked so that production is interrupted if the bin becomes empty or the flow is obstructed. The filler shall be fed so that no filler is lost as fugitive dust.

3. Aggregate Weighing Equipment. All aggregates including mineral filler shall be weighed by a continuous weighing device, either as it is proportioned by the individual feeders or after all materials have been deposited on a common belt. Belt scales shall meet the requirements of National Bureau of Standards Handbook 44 and shall be installed according to the scale manufacturer's recommendations by a technician licensed by the Division of Weights and Measures. Any other type of weighing device must be approved by the Engineer prior to use.

4. Bitumen Control Unit. The bitumen shall be proportioned by a meter. A flow switch that will interrupt production if the bitumen flow is discontinued shall be installed in the delivery line between the meter and the mixer. A temperature compensating device shall be installed in conjunction with the meter to correct the quantity of asphalt to 16°C (60°F).

5. Proportioning Controls. All proportioning controls for aggregates, mineral filler, and bitumen shall be located at the panel which controls the mixer and temperature. The panel shall have a master control capable of increasing or decreasing the production rate without having to reset the individual controls.

- a. Aggregate Feed-Rate Control. The plant shall have an adjustable feed-rate control for each aggregate cold bin feeder and mineral filler feeder. The control shall maintain an aggregate flow accuracy such that the variation of material per interval of time shall not exceed an amount equal to 1.5% of the total mass (weight) of bituminous mixture per interval of time. When separate addition of mineral filler is required, it shall be added with an accuracy of 0.5% on the basis stated above. The rate of aggregate flow shall be displayed on a meter and it shall be based on mass (weight) or percentage of dry aggregates.

- b. Aggregate Mass (Weight) Indicator. The plant shall have an aggregate mass (weight) indicator that displays, in the control room, the mass of combined aggregates and mineral filler; it shall continuously accumulate the dry aggregate mass (weight) of material during the production period, generally one day. The indicator shall be resettable to zero and lockable.

- c. Aggregate Moisture Compensator. The plant shall have a moisture compensation device capable of electronically changing the wet mass (weight) of aggregate to dry aggregate mass (weight). The compensator may be set manually based on moisture tests performed on composite aggregate samples. The maximum graduations on the compensator shall be 0.1%.
  - d. Bitumen Control. The plant shall have a bitumen control capable of presetting the actual bitumen content directly as a percentage based on total mass (weight) of mixture. The maximum gradation on the bitumen control shall be 0.1%. The asphalt delivery system shall be coupled with the aggregate delivery system to automatically maintain the required proportions as the aggregate flow varies.
  - e. Bitumen Quantity Indicator. The plant shall have a bitumen quantity indicator in the control room indicating the accumulated quantity of bitumen during the production period, generally one day. The quantity indicated may be either mass (weight) or volume at 16°C (60°F). The indicator shall be resettable to zero and lockable.
6. Recording Proportions. The plant shall have an automatic digital recording device approved by the Engineer that simultaneously records the accumulated mass (weight) of both dry aggregate and bitumen during production time and on demand. All recordings shall show the date, including day, month, and year, and time to the nearest minute for each print. The original recordings shall become the property of the Agency.
  7. Calibration of Feed Rates. The feed rates of aggregates from the cold bins, mineral filler when used, and bitumen shall be established for each mix type initially by passing the individual aggregates and mineral filler over the continuous weighing device and the bitumen through the meter respectively. The feed rates shall be checked periodically or at the direction of the Engineer.
  8. Automatic Aggregate Sampling Device. The plant shall have an automatic aggregate sampling device which will divert a representative combined aggregate sample, including mineral filler, into a hopper or container for gradation testing.  
  
The sampling tray shall cut the full width and depth of the aggregate flow. The sampling point shall be after the aggregate is proportioned and prior to it mixing with bitumen.
  9. Mixer Unit. The plant shall have a drum mixer, approved by the Engineer, having an automatic burner control and capable of producing a uniform mixture within the job-mix tolerances. The mixture shall be discharged into a hot bituminous mixture holding bin meeting the requirements of Subsection 406.05 (a), part 14, Surge Bins.



406.06 PREPARATION OF BITUMINOUS MATERIAL. The bituminous material shall be uniformly heated to the specified temperature. A continuous supply of the bituminous material shall be provided to the mixer at a uniform temperature at all times.

406.07 PREPARATION OF AGGREGATES. The aggregate for the mixture shall be dried and heated at the mixing plant before being placed in the mixer. Flames used for drying and heating shall be properly adjusted to avoid damage to the aggregate and to avoid soot or unburned fuel on the aggregate.

Immediately after heating, the aggregates shall be screened and conveyed into separate bins ready for batching and mixing with bituminous material.

If required to meet the grading requirements, mineral filler shall be added after the aggregates have passed through the dryer in a manner approved by the Engineer.

The above preparation of aggregates does not apply for drum-mix plants.

406.08 MIXING. The dried aggregates shall be combined with the bituminous material in a manner that will produce a mixture which, when discharged from the mixing unit, shall be at the temperature specified on the approved mix design unless otherwise directed by the Engineer.

The dried aggregates shall be combined in the mixer in the appropriate proportions required to meet the job-mix formula and be thoroughly mixed prior to adding the bituminous material.

The bituminous material shall be measured and introduced into the mixer in the amount determined by the Engineer for the material being used and at a temperature corresponding to Subsection 702.06, unless otherwise directed by the Engineer.

After the aggregate and bituminous material have been introduced into the mixer, the materials shall be mixed until a complete and uniform coating of the particles and a thorough distribution of the bituminous material throughout the aggregate is obtained. In any event, the mixing time shall be regulated by the Engineer, and a suitable locking mechanism shall be provided for such regulation.

All plants shall have a means of eliminating oversize and foreign material from being incorporated into the mixer.

406.09 HAULING EQUIPMENT. To prevent the mixture from adhering to the beds, trucks used for hauling bituminous mixture shall have tight, clean, smooth metal beds which have been thinly coated with a bond release agent. Petroleum based products will not be permitted.

The trucks used for hauling bituminous mixture shall be compatible with the equipment used for placing the bituminous mixture.

Each truck shall have a cover of canvas or other suitable material large enough to protect the mixture from the weather. When necessary to assure placement of material at the specified temperature, truck beds shall be insulated and covers shall be securely fastened.

406.10 PLACING EQUIPMENT. The bituminous concrete paver shall be a self-propelled unit with an activated screed or strike-off assembly capable of being heated if necessary and capable of spreading the mixture without segregation for the widths and thicknesses required. The screed shall be adjustable to provide the desired cross section shape.

The finished surface shall be of uniform texture and evenness, and shall not show tearing, shoving, or pulling of the mixture. The paver shall be in good mechanical condition and operated by competent personnel at all times.

Pavers shall be equipped with all necessary attachments, designed to operate electronically, to control the grade for the finished surface.

The adjustments and attachments of the paver shall be checked and approved by the Engineer before placement of bituminous material.

Bituminous concrete pavers shall be equipped with a sloped plate to produce a tapered edge at longitudinal joints.

The sloped plate shall produce a tapered edge having a face slope of 1 vertical: 3 horizontal minimum. The plate shall be able to accommodate compacted mat thicknesses from 35mm to 100mm (1 $\frac{1}{4}$  to 4 inches). The bottom of the sloped plate shall be mounted 10mm to 15mm ( $\frac{3}{8}$  to  $\frac{1}{2}$  inch) above the existing pavement.

Bituminous pavers shall be equipped with a joint heater of at least 110,000 W total capacity to heat the longitudinal edge of the previously placed mat to a surface temperature of 95°C (200°F), or higher if necessary, to achieve bonding of the newly placed mat with the previously placed mat without undue breaking or fracturing of aggregate at the interface. The surface temperature shall be measured immediately ahead of the screed. The joint heater shall be equipped with automated controls which shut off the burners when the paving machine stops and reignite them with the forward movement of the paver. The joint heater shall heat the entire area of the previously placed wedge to the required temperature. Heating to the point of 95°C (200°F) or higher shall immediately precede placement of the bituminous material.

406.11 ROLLERS. Rollers shall be in good mechanical condition, operated by competent personnel, capable of reversing without backlash, and operated at speeds slow enough to avoid displacement of the bituminous mixture. The mass (weight) of the rollers shall be sufficient to compact the mixture to the required density without crushing the aggregate. They shall be equipped with tanks and sprinkling bars for wetting the rolls or tires.

Pneumatic-tired rollers shall be equipped with appropriate skirts at all times and be preheated prior to use in order to avoid picking. The Contractor shall remove all picked material from the surface.

Vibratory rollers shall have separate controls for energy and propulsion. They shall be equipped with automatic cutoffs that stop the vibration when the roller is stopped or reversing its direction of travel.

406.12 CONDITIONING OF EXISTING SURFACE. All surfaces shall be cleaned and sprayed with Emulsified Asphalt, RS-1, before placing of the bituminous mixture. The emulsion shall be applied under pressure at the rate of 0.05 to 0.14 L/m<sup>2</sup> (0.01 to 0.03 gallons per square yard). The application shall be made just prior to the placement of the bituminous concrete mixture, and shall progress sufficiently ahead of the paving so that the surface to be paved will be "tacky". Equipment used to apply the emulsion shall meet the requirements for distributors under Subsection 404.04, Equipment.

Prior to paving, bridge decks shall be treated as detailed on the project plans.

Prior to paving, all large cracks in a bituminous surface shall be thoroughly cleaned and filled with a bituminous material or mixture approved by the Engineer. Large cracks are defined as at least 40 mm (1½ inches) in width.

Contact surfaces such as curbing, gutters, and manholes shall be painted with a thin, uniform coat of Emulsified Asphalt, RS-1, immediately before the bituminous concrete mixture is placed against them.

If there are deficiencies that require corrective action in the base course constructed as part of the contract, a bituminous concrete mix approved by the Engineer shall be used to bring the base course to the designed grade and contour.

Where Bituminous Concrete Pavement is used to resurface existing pavements and the existing pavement contains irregularities, depressions or waves, such deficiencies shall be eliminated by the use of extra bituminous material for spot leveling to bring existing base to uniform section and grade before placing of the required courses of bituminous concrete.

406.13 PLACING AND FINISHING. At the time of discharge from the haul vehicle, the bituminous mixture shall be within 6°C (10°F) of the compaction temperature for the approved mix design.

The Contractor shall protect all exposed surfaces that are not to be treated from damage during all phases of the paving operation.

The bituminous mixture shall be placed and finished with the specified equipment, shall be struck off in a uniform layer to the full width required and of such depth that each course, when compacted, shall have the required thickness, and shall conform to the grade and elevation specified. Bituminous pavers shall distribute the mixture over the entire width or over such partial width as may be practical. Bituminous pavers will be equipped with auger extensions at longitudinal joints.

When operating in tandem on multi-lane paving, the pavers shall be of the same type and have the same characteristics. Material for leveling may be spread by the use of a grader, if approved by the Engineer.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked and luted by hand tools.

All material shall be produced early enough in the day so the completion of spreading and compaction of the mixture will occur during daylight hours, unless night paving has been approved for the project.

No traffic shall be permitted on placed material until the material has been thoroughly compacted and cooled to 60°C (140°F).

The use of water to cool the pavement shall not be permitted.

The Agency may require that all work adjacent to the pavement, such as guardrail, cleanup, and turf establishment, be completed prior to placing the wearing course when such work could cause damage to the pavement.

When bituminous concrete is to be placed on a waterproofed bridge deck, a rubber-tired paver shall be used to place the binder course of pavement.

On projects where traffic will be maintained, the Contractor may be required to schedule daily paving operations to have all travel lanes of the roadway paved to the same limits at the end of each work day, as directed by the Resident Engineer.

Suitable permanent aprons or temporary fillets shall be constructed at side road intersections and driveways as directed by the Engineer within 24 hours of adjacent mainline paving. Permanent aprons will be constructed within 5 working days of adjacent mainline paving. Reasonable access to and from the mainline mat shall be maintained at all times.

406.14 COMPACTION. Immediately after the bituminous mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling.

The surface shall be rolled when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking, tearing or shoving. Should the mix exhibit these tender characteristics, and the Contractor can not remedy these conditions to the satisfaction of the Engineer, the placement will be terminated and the approval of the mix design will be terminated.

The number, mass (weight), and type of rollers furnished shall be sufficient to obtain the required compaction when the mixture is in a workable condition. Generally, one breakdown roller will be needed for each paver used in the spreading operation.

Leveling courses shall be compacted using a self-propelled pneumatic-tired roller unless otherwise directed in writing by the Engineer. On base, binder, and wearing courses, the initial or breakdown rolling shall be done by using a two-axle tandem roller; intermediate rolling shall be done by using a two-axle tandem roller or self-propelled pneumatic-tired roller; and final rolling shall be done by using an additional two or three-axle tandem roller. An intermediate roller will not be required for shoulders constructed with one course of bituminous concrete, but the equipment used shall be sufficient to obtain the required compaction while the mixture is in a workable condition.

To prevent adhesion of the mixture to the rollers, they shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid and petroleum products shall not be permitted.

Along forms, curbs, headers, walls, and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hand tampers, smoothing irons, or mechanical tampers coated with a non-petroleum based bond release agent. On depressed areas, a trench roller may be used, or cleated compression strips may be used under the roller, to transmit compression to the depressed area.

Other combinations of rollers and/or methods of compacting may be used if approved in writing by the Engineer, provided the compaction requirements are met.

Unless otherwise directed, the longitudinal joint shall be rolled first and then rolling shall begin at the low side of the pavement and proceed towards the center or high side with lapped rollings parallel to the centerline. The speed of the roller shall be slow and uniform to avoid displacement of the mixture, and the roller shall be kept in as continuous operation as practicable. Rolling shall continue until all roller marks and ridges have been eliminated.

Rollers will not be stopped or parked on the new, freshly placed material.

Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective shall be removed and replaced with fresh hot mixture, which shall be compacted to conform with the surrounding area. Any area showing an excess or deficiency of bitumen shall be removed and replaced. These replacements shall be at the Contractor's expense.

Should the Contractor choose to use vibratory rollers, the following additional criteria shall govern their operation. Vibratory rollers may be used when operated at an amplitude, frequency and speed that produces a mat conforming to specifications and which prevent the creation of transverse ridges in the mat. Vibratory rollers may be used as a breakdown roller, an intermediate roller, or a finish roller. They shall not be used as a substitute for a pneumatic-tired roller on leveling courses, nor shall they be used for compacting lifts of pavement under 25 mm (1 inch) in depth. A single vibratory roller shall not be used alone as the breakdown, intermediate, and finish roller, but may be used as any one of the rollers in the roller train.

If the Engineer determines that unsatisfactory compaction is being obtained, unacceptable surface distortion is occurring, or damage to highway components and/or adjacent property is occurring using vibratory compaction equipment, the Contractor shall immediately cease using this equipment and proceed in accordance with the fourth paragraph of this subsection. All requirements of Subsection 406.14 shall apply regardless of compaction equipment used.

The Contractor assumes full responsibility for, and shall repair at its cost, all damages which may occur to highway components and adjacent property if vibratory compaction equipment is used.

Bituminous Concrete Pavement and Medium Duty Bituminous Concrete Pavement will be analyzed for density according to the procedure outlined below. Leveling courses will not be analyzed for density.

The density of the compacted pavement shall be at least 92%, but not more than 96%, of the corresponding daily average maximum specific gravity for each mix type (each mix design) of bituminous mix placed during each day. For material that falls outside of this range, payment will be made by adjusting the daily production totals according to the following:

DAILY

AVERAGE DENSITY	DENSITY PAY FACTOR, PF(d)
90.0% - 90.5%	0.900
90.6% - 90.9%	0.925
91.0% - 91.5%	0.950
91.6% - 91.9%	0.975
92.0% - 92.9%	1.000
93.0% - 95.0%	1.010
95.1% - 96.0%	1.000
96.1% - 96.5%	0.975
96.6% - 97.0%	0.950
97.1% - 97.5%	0.925
97.6% - 98.0%	0.900

For material that exceeds 98% and is less than 90%, the Construction Engineer will evaluate whether the pavement will be removed and replaced by the Contractor at no expense to the Agency or a greater penalty imposed.

It shall be the responsibility of the Contractor to conduct whatever process control the Contractor deems necessary. Acceptance testing will be conducted by Agency personnel using cores provided by the Contractor.

Acceptance testing to verify density of the compacted pavement will be done by averaging the densities of a minimum of 4 cores for each day's production for each type of bituminous mix placed, excepting shim/leveling courses, or at a minimum rate of one (1) core per lane kilometer (0.6 mile) paved excluding shoulders.

The cores taken for acceptance testing will be the final cores taken for determination of densities. If the Agency elects to not take cores of any lift, no bonus will be paid or reduction taken, PF(d)=1.000.

(c) CORING PROTOCOL.

Original core sampling locations will be restricted to travel lanes only and will not include those areas within 150 mm (6 inches) of a longitudinal joint or within 15 m (50 feet) of a transverse joint. That area encompassing a longitudinal tapered joint will not be selected as a sampling location.

Original core sampling locations will be selected by the Resident Engineer or designee in accordance with ASTM D 3665, Practice for Random Sampling of Construction Materials, within two working days of the bituminous mixture being placed. The Contractor will be advised in writing of the selected sampling locations.

The Contractor may challenge the representativeness of any particular original sample location(s) by notifying the Resident Engineer in writing. This notification shall be made within one working day of the subplot location(s) being selected and shall state reasons for recommending a reselection of original sample location(s).

Upon receipt of representativeness challenge, the Resident Engineer will evaluate it, within one working day, and notify the Contractor in writing of either acceptance or rejection of the Contractor's challenge. Rejection of a challenge will result in the Resident Engineer using the original core sampling locations for the determination of density data in any compaction pay factor calculations. Acceptance of a challenge will result in the Resident Engineer selecting alternate core sampling location(s) for those challenged samples. Alternate core sampling location(s) will be selected by the Resident Engineer by use of a new random number(s) to determine a new longitudinal coordinate(s) within the subplot in question. The transverse coordinate(s) of the original core sampling location(s) will be used in conjunction with the new longitudinal coordinate(s) to determine the alternate sampling location(s). The alternate core sampling location(s) shall not be subject to further challenge and will be used for the determination of density data in any compaction pay factor calculations. The contractor will be notified in writing of the final core sampling location(s).

Within one working day of final selection of the core sampling locations, the Contractor shall core in the presence of the Resident Engineer or designee and shall deliver samples to the Resident, in a suitable container provided by the Contractor, on the same day the samples are taken. The Resident Engineer will identify and record the core samples. Any cores not delivered in a suitable container will be rejected and new cores taken at the Contractor's expense. The Contractor shall fill the core holes with hot bituminous concrete pavement on the same day that cores are taken and at its expense.

Cores will be taken in accordance with AASHTO T-230, Method B. Agency personnel will process core samples within ten working days and will relay test results to the Resident Engineer and Contractor personnel. Testing will be performed in accordance with AASHTO T 166 Method A for bulk specific gravity (B) and AASHTO T 209 for maximum specific gravity (M) from tests performed at the plant lab for that day. All cores will be sawcut. The Contractor will mark the cores for sawcutting in the presence of the Resident Engineer or designee for verification of cut locations. The degree of compaction (DC) will be determined by using the following equation:

$$DC = (B/M) \times 100$$

To satisfy the provisions of (d) below, physical core samples will be retained for a period of two working days from the time that DC test results are relayed to the Resident Engineer and Contractor personnel. Additionally, any subsequently "retested" or "recored" samples, as defined below, will be retained to the point of fully satisfying section (d) below.

(d) CORE RESULT VERIFICATION.

Upon the above test results being relayed to the Resident Engineer and Contractor Personnel, any individual core sample result considered to be an outlier as determined by ASTM E-178 will enter a core result verification process as defined below. This process will consider only those core samples processed by the Agency as acceptance tested samples.

The core result verification process consists of four levels as follows:

Level 1: The Agency will perform a statistical analysis on all lots of core sample compaction values to investigate any presence of statistical outlier(s) as determined by using ASTM E-178, Table 1, at a 5% significance level. In cases where a statistical outlier is not detected, all core sample results as reported under (c) above will be used in any compaction pay factor calculations.

When an outlier is determined to exist, the core sample representing that outlying result will be retested to insure procedural integrity (support information accuracy, testing methodology, mathematical accuracy). The core sample "retested" results will replace the original "outlier" core sample results for any future calculations within this level. Should it be verified at this point that an outlier does in fact exist or the core sample retested results vary from those originally obtained, options to either party are:

1. Compute any compaction pay factors using all core sample test results derived through this level or
2. Proceed to Level 2.

Level 2: The above Level 1 outlier core sample results will be replaced by virtue of "recored" sample results to be obtained under this level. The recoring location shall be at the same transverse offset as the original location and shall be offset longitudinally a forward 450 mm (18 inches) from the original location. The recored sample will be tested per those applicable paragraphs of (c) CORING PROTOCOL above, and may reenter Level 1 analysis of this section up to and including the point of insuring procedural integrity. The recored sample will not reenter Level 2 analysis. Upon receiving recored sample test results of this level, options to either party are: 1. Compute any compaction pay factors using those recored sample test results or

2. State reasons for belief that said recored sample test results are in error. Receipt of reasons shall be cause for this verification process to proceed to level 3.



Level 3: A final attempt at field resolution of core sample test results will be addressed under this level by introduction of a third party testing facility. Selection of such a facility will be discussed and mutually agreed upon by both parties prior to commencement of construction activities and will not be involved in project QC or acceptance testing processes. Any findings of a third party facility will become final and will not be subject to further review. Payment to a third party for services rendered will be borne by the party having provided the Level 2 reasons leading to Level 3.

The recored samples from Level 2 shall be provided to the third party testing facility. The facility will process the recored samples and provide results to Agency and Contractor personnel. Upon receipt of the third party recored sample test results, the options to either party are: 1. Compute any compaction pay factors using these results or 2. Proceed to Level 4.

Level 4: At this level, the Agency and Contractor will defer to Subsection 105.02 of the Standard Specifications for Construction. Both parties shall submit to the Director of Program Development a written report describing the disparity, all subsequent actions taken to date, all documentation related to these actions, and a proposed course of action for settlement. The Director

will review the submittals and all relevant project records and fulfill the requirements of Subsection 105.02.

If the Contractor does not concur with any final decision by the Director, the Contractor may seek other remedies available under Subsection 105.02 and the contract.

406.15 JOINTS. Joints between old and new pavements, or between successive day's work, shall have a thorough and continuous bond between the old and new mixtures. Whenever the spreading process is interrupted long enough for the mixture to attain its initial stability, the paver shall be removed from the mat and a joint constructed.

Transverse butt joints shall be formed by cutting the pavement in a vertical plane at right angles to the centerline, at a location approved by the Engineer, where the pavement has a true surface as determined by the use of a straightedge at least 4.9 m (16 feet) long. The butt joint shall be thoroughly coated with Emulsified Asphalt, Type RS-1, just prior to depositing the paving mixture.

Transverse tapered joints shall be formed by ramping down the last 450 to 600 mm (18 to 24 inches) of the course being laid to match the lower surface. Care shall be taken in raking out and discarding the coarser aggregate at the low end of the taper, and in rolling the taper. The taper area shall be thoroughly coated with Emulsified Asphalt, Type RS-1, just prior to resuming paving. As the paver places new mixture on the taper area, an evenly graduated deposit of mixture will complement the previously made taper. Shovels may be used to add additional mixture if necessary. The joint shall be smoothed with a rake and properly rolled, with coarse material discarded.

Longitudinal joints that have become cold shall be coated with Emulsified Asphalt, Type RS-1, before the adjacent mat is placed. If directed by the Engineer, they shall be cut back to a clean vertical edge prior to coating with the emulsion.

Unless otherwise directed by the Engineer, longitudinal joints shall be offset at least 150 mm (6 inches) from any joint in the lower courses of pavement. Transverse joints shall not be constructed nearer than 300 mm (12 inches) from the transverse joints constructed in lower courses.

406.16 SURFACE TOLERANCE. The surface will be tested by the Engineer using a straightedge at least 4.9 m (16 ft) in length at selected locations parallel with the centerline. Any variations exceeding 3 mm ( $\frac{1}{8}$  inch) between any two contact points shall be satisfactorily eliminated. A straightedge at least 3 m (10 feet) in length may be used on a vertical curve. The straightedges shall be provided by the Contractor under the provisions of Subsection 631.06.

406.17 TRAFFIC CONTROL. Whenever traffic must be maintained during a paving operation, uniformed traffic officers and/or flaggers shall be stationed at each end of the section being paved and at such other locations as may be required by the Engineer. The traffic officers or flaggers shall conform to the requirements of Section 630, Uniformed Traffic Officers and Flaggers.

Whenever one-way traffic is maintained by the Contractor, the traveling public shall not be stopped or delayed more than 10 minutes unless otherwise directed by the Engineer. Two-way traffic shall be maintained during non-working hours.

406.18 METHOD OF MEASUREMENT. The measured quantity for payment of Bituminous Concrete Pavement and Medium Duty Bituminous Concrete Pavement will be the number of metric tons (tons) for a lot of mixture (each type) complete in place in the accepted work as determined from the weigh tickets.

When the density pay factor, PF(d), for a lot (a days run of each type) of Bituminous Concrete Pavement or Medium Duty Bituminous Concrete Pavement is less than or more than 1.000, the measured quantity of Bituminous Concrete Pavement or Medium Duty Bituminous Concrete Pavement placed that day will be multiplied by such pay factor to determine an adjusted tonnage for that day. In this case the adjusted tonnage will become the measured quantity for payment. However, this determination shall not apply if "Quality Acceptance" provisions of Subsections 406.03 and 406.14 are incorporated into the specifications.

When items are to be measured under Quality Acceptance provisions of Subsections 406.03 and 406.14, pay factors (based on plant air voids and density properties) will be used as specified below to arrive at a Composite Pay Factor (CPF). When boxed samples are taken to determine mix properties the pay factor for air voids, PF(av), shall be assumed as equal to 1.000 for a "single day" lot.

$$CPF = PF(av) \times PF(d)$$

For each lot of Bituminous Concrete and Medium Duty Bituminous Concrete produced, a CPF will be determined by applying pay factors as based on the smallest common lot size of air voids and density. That is, a (density) PF(d) for a "single day" lot may be combined with an (air voids) PF(av) for a "two day" lot to arrive at an overall daily CPF.

When the Composite Pay Factor for a lot (a day's run of each type) of Bituminous Concrete Pavement or Medium Duty Bituminous Concrete Pavement is less than, or more than, 1.000, the measured quantity of Bituminous Concrete Pavement or Medium Duty Bituminous Concrete Pavement placed that day will be multiplied by such Composite Pay Factor to determine an adjusted tonnage for the day. In this case the adjusted tonnage will become the measured quantity for payment.

When a roughness pay factor, PF(r), is determined per Subsection 406.16, the tonnage or adjusted tonnage determined above shall be further multiplied by this factor to determine the measured quantity for payment.

406.19 BASIS OF PAYMENT. The measured quantity of Bituminous Concrete Pavement or Medium Duty Bituminous Concrete Pavement will be paid for at the Contract unit price per metric ton (ton), which price shall be full compensation for furnishing, mixing, hauling, and placing of the material specified and the furnishing of signs, labor, tools, equipment, and incidentals necessary to complete the work.

The costs of furnishing testing facilities and supplies at the plant will be considered included in the contract unit price of Bituminous Concrete Pavement or Medium Duty Bituminous Concrete Pavement, as appropriate.

The costs of obtaining, furnishing, transporting, and providing the straightedges required by Subsection 406.16 will be paid for under the appropriate Section 631 pay item included in the Contract.

The cost of taking cores for acceptance testing and filling the core holes will be incidental to the item being cored. Other costs associated with obtaining samples for acceptance testing shall be incidental to the cost of the Section 406 pay item. The cost of traffic control for taking cores for acceptance testing and filling the core holes will be paid under the appropriate item in Section 630.

When not an item in the Contract, the cost of Uniformed Traffic Officers or Flaggers will not be paid for directly, but will be incidental to the item of Bituminous Concrete Pavement or Medium Duty Bituminous Concrete Pavement, as appropriate.

When not specified as items in the Contract, the costs of cleaning and filling joints and cracks, sweeping and cleaning existing paved surfaces, the emulsified asphalt applied to tack these surfaces, and tacking of manholes, curbing, gutters, and other contact surfaces will not be paid for directly, but will be incidental to the item of Bituminous Concrete Pavement or Medium Duty Bituminous Concrete Pavement, as appropriate.

Bituminous concrete mixture approved by the Engineer for use in correcting deficiencies in the base course constructed as part of the Contract will not be paid for as Bituminous Concrete Pavement or Medium Duty Bituminous Concrete Pavement, but will be incidental to the pay item for the specified type of base course.

The bituminous concrete mixture used to correct deficiencies in an existing pavement or to adjust the grade of a bituminous concrete surface completed under the Contract will be paid for at the contract unit price for Bituminous Concrete Pavement or Medium Duty Bituminous Concrete Pavement, as appropriate.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
406.25 Bituminous Concrete Pavement	Metric Ton (Ton)
406.27 Medium Duty Bituminous Concrete Pavement	Metric Ton (Ton)

SECTION 625 - SLEEVES FOR UTILITIES

16. 625.02 MATERIALS, text is hereby deleted in its entirety and replaced with the following:

Materials shall meet the requirements of the following Subsections:

Bituminous Concrete Pavement.....	406.02
Portland Cement Concrete Pavement.....	408.02
Brick.....	705.01
Mortar Type II.....	707.02
Preformed Joint Filler, Cork and Asphalt-Treated Felt.....	707.08
Reinforced Concrete Pipe.....	710.01
ABS Plastic Pipe.....	710.05
PVC Plastic Pipe.....	710.06
Corrugated Steel Pipe, Pipe Arches and Underdrains.....	711.01
Corrugated Aluminum Alloy Pipe, Pipe Arches, and Underdrains.....	711.02

All wood blocks (skids) shall be oak or maple structural lumber #2 Grade or better. Stainless steel strapping shall meet the requirements of ASTM A 666.

For utilities greater than 50 mm (2 inches) diameter, the inside diameter of sleeves shall be at least 300 mm (12 inches) larger than the largest diameter of the carrier pipe, conduit or conductor being installed, except the minimum inside diameter of sleeves for utilities 50 mm (2 inches) and smaller shall be as follows:

Power Lines:	150 mm (6 inches)
Telephone Lines:	150 mm (6 inches)
Cable TV Lines:	150 mm (6 inches)
Water Pipe:	150 mm (6 inches)
Water service Lines, DN20 - DN25 (3/4" - 1"):	50 mm (2 inches)
Sewer Pipe:	150 mm (6 inches)
Gas Pipe:	150 mm (6 inches)

Sleeves for power, telephone, cable TV, and metal pipes shall be nonmetallic.

17. 625.05 BASIS OF PAYMENT, text is hereby deleted in its entirety and replaced with the following:

The accepted quantities of Sleeves for Utilities will be paid for at the Contract unit price per meter (linear foot). Payment will be full compensation for fabricating, furnishing, transporting, handling saw cutting, and placing all materials, including pull wire and end caps, and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Blocking (skids), stainless steel straps, bituminous concrete pavement, portland cement concrete pavement, reinforcing steel, emulsion, subbase materials, brick end walls, and other materials required in conjunction with sleeves will be considered incidental to the Contract item Sleeves for Utilities.

Excavation and backfill of trenches and boring or jacking pits for the placement of sleeves for utilities will be considered incidental to the Contract item Sleeves for Utilities.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
625.10 Sleeves for Utilities	Meter (Linear Foot)

SECTION 631 - FIELD OFFICE

18. 631.02 FIELD OFFICE, ENGINEERS, text is hereby deleted in its entirety and replaced with the following:

631.02 FIELD OFFICE, ENGINEERS.

(a) Design.

- (1) General. The field office shall be available to the representatives of the State and the Federal Government throughout the duration of the work on the project, shall be independent of other buildings or office space used by the Contractor, and shall be removed when released by the Engineer. The field office, equipment, and supplies shall be maintained in good condition and adequate quantities at all times.

The field office shall be provided with adequate light, heat, potable water, ventilation, and electrical or gas connections as required. The method of heating shall be such that a minimum temperature of 20 °C (68 °F) can be maintained at all times.

The Contractor shall furnish all labor and materials for winterizing field offices.

Sanitary facilities consisting of a flush toilet, chemical, or other approved type shall be furnished by the Contractor with proper sewage disposal as is necessary to comply with the requirements and regulations of the State and local Boards of Health and VOSHA. Sanitary facilities shall have adequate facilities for washing hands and shall have adequate lighting.

Entrances shall be provided with a 1.2 by 1.2 m (4 × 4 foot) minimum size deck with appropriate steps and railings meeting the requirements of VOSHA Safety and Health Standards for Construction.

Each field office shall be equipped with an exterior security light of 400 W minimum.

- (2) Field Office. The field office shall be a commercial type field office trailer of standard commercial quality, or a building, in good condition as determined by the Engineer with a minimum of 33 m<sup>2</sup> (360 square feet) of floor space, with a minimum width of 3 m (10 feet). The fully equipped field office shall be available for use from the day that work is commenced by the Contractor until 30 days after acceptance of the project, unless otherwise directed by the Engineer.
- (3) Foundation. The field office shall be constructed on a firm foundation, vibration free and shall not be adversely affected by frost action or water runoff.
- (4) Outside Doors. The field office shall have a minimum of two outside doors equipped with dead bolt locks. All keys shall be in the possession of the Engineer or the Engineer's representatives.
- (5) Windows. The field office shall have a minimum of four side windows, one front window, and one rear window, all glassed and screened with provisions for opening and locking. All windows shall be equipped with adjustable louvered blinds.
- (6) Electrical System. The field office shall be equipped with a 110 V AC, 60 Hz, single-phase electrical system with service entrance equipment suitable for power company attachment and with at least twelve properly positioned interior electrical duplex outlets. The materials and installation methods of all electrical wiring, connections, switches, and grounds shall conform to the provisions of the National Electrical Safety Code and shall be in accordance with all State and local electrical ordinances.
- (7) Interior Lights. The field office shall be provided with a minimum of five 1200 mm (48 inch) long fluorescent lighting fixtures, or equivalent, on the ceiling.
- (8) Air Conditioner. The field office shall be equipped with an air conditioner of adequate capacity, unless otherwise specified in the Contract.

- (9) Fire Extinguishers. The field office shall be equipped with at least two fire extinguishers. Each shall be a Halon fire extinguisher, equal in fire fighting capacity to a 2.27 kg (5 pound) carbon dioxide fire extinguisher.
- (b) Office Equipment. Office equipment shall be standard commercial quality office equipment. Substitutes may be provided when approved by the Engineer. This office shall be provided with at least the following office equipment:
- 1 Standard office desk with drawers, locks, and keys, 1500 by 750 mm (60 x 30 inches) (minimum dimensions).
  - 2 Adjustable, ergonomic office chairs that provide extra support and comfort to the lower back, have height adjustment to fit chair user, and have rolling casters.
  - 1 Standard drafting table, 1 by 2 m (37 1/2 x 72 inches) (minimum dimensions).
  - 2 Adjustable drafting stools.
  - 1 Fire resistant, four-drawer, legal-size file cabinet, rated to withstand a one-hour fire, with lock and two keys.
  - 1 Storage cabinet, 600 by 600 by 900 mm (2 x 2 x 3 feet) (minimum dimensions).
  - 1 Metal, five-drawer, Plan file, 500 h by 710 d by 1010 w mm (20 h x 28 d x 40 w inches) (minimum dimensions).
  - 1 Plan rack, 600 by 600 by 600 mm (2 x 2 x 2 feet) (minimum dimensions).
  - 1 Locker or closet of sufficient size for storage of surveying equipment.
  - 1 Electronic printing calculator, four-function, ten-column with memory.
  - 1 Telephone, touch tone dial, compatible with the local telephone service available.

The Contractor shall arrange for the connection to the system and pay the installation charge as part of the Contract item Field Office. The Contractor shall also pay the monthly service bill. Upon presentation of the paid monthly service bill to the Engineer, the Engineer will pay the Contractor the cost of the service bill under the Contract item 631.25 - Field Office Telephone. Connected to the telephone shall be a good quality telephone answering device capable of receiving and storing messages.

- 1 Electric clock having a dial face of at least 200 mm (8 inches) in diameter.
- 1 Outdoor thermometer with an easy to read weatherproof thermometer having a minimum scale range of -40 to 40 °C (-40 to 100°F) in graduations of 1 or 2 degrees.
- 2 110 L (30 gallon) trash cans.

- 1 Potable water system consisting of a sink with faucet within the office, with a continuous supply of pressurized clean potable water for the duration of the project; or (when clean potable water is not available) a commercial bottled drinking water system installed in the office trailer complete with necessary disposable drinking cups (215 ml (8 oz.) size or larger), cup dispenser, and continuous water supply furnished for the duration of the project. The system shall be capable of supplying both hot and cold water. The system and the bottled water shall be furnished by a commercial water service on a regular basis agreeable to the Engineer.
- 1 First Aid Kit Conforming to ANSI Z308.1-1978
- 1 Dry copying machine with the capability of copying at least legal size paper full size and a rated capacity of at least 1,000 copies per month. It shall have an automated paper feed system. The Contractor shall supply all the paper and shall provide all other necessary supplies and maintenance to keep the copier working during the life of the Contract.
- 1 Color Inkjet Printer, furnished, complete and working for use in the Engineer's Field Office for the duration of the contract. Equipment and supplies shall be provided as follows:
  - a. A color Inkjet Printer, compatible with Microsoft Windows XP and Microsoft Windows 2000, having 2 MB RAM minimum, 600 by 600 dpi black and white resolution, a tray capacity of at least 50 sheets, a print speed of at least 10 pages per minute, and parallel/USB interface capability.
  - b. A Bi-directional PC - type parallel printer cable or USB printer cable - 4.5 meters (15 feet) long.
  - c. A printer stand providing a minimum horizontal space for the printer of 900mm by 600mm (3 feet by 2 feet).
  - d. An anti-static vinyl dust cover.
  - e. A good quality commercial surge suppresser to protect against:
    - A. chronic high and low voltage, and
    - B. dangerous voltage spikes and radio frequency interference traveling on the AC power circuits.
  - f. Spare ink cartridges, both color and black.
  - g. Appropriate software drivers and documentation for the printer.
- 1 Digital Camera with the following requirements:
  - a. At least 2 Megapixel resolution
  - b. Both a LCD and Optical viewfinders
  - c. At least 32 Megabyte storage capacity
  - d. USB Interface capability
  - e. Storage case
  - f. Windows XP/2000 Compatible
- 1 Plain paper facsimile machine meeting the following requirements:
  - a. CCITT Group Compatibility - Groups III, II, I
  - b. Transmission Time - 20 seconds per page, maximum Automatic Feed
  - c. Minimum 10 Page Stock Capacity
  - d. Pulse/Tone Dialing



- e. Speed Dialing - 50 locations, minimum
- f. Single Touch Dialing - 10 locations, minimum
- g. Automatic redial - up to 5 times
- h. Capacity to distinguish between a fax phone call and a telephone call

A combination Copier/Printer/Fax Machine meeting the requirements of the Copier, Printer and Fax Machine described above may be substituted with the permission of the Resident Engineer.

Paper for the fax machine, copier and printer shall be furnished by the Contractor, to the Resident Engineer as required during the term of the project.

Two telephone lines shall be provided. Telephone jacks will be located at each end of the field office for both telephone lines. The jacks shall be located above the surface of the desks.

The cost of furnishing these separate telephone lines, including installation and removal, will not be paid for directly, but will be considered incidental to the item of Field Office - Engineers. The monthly service charges will be paid as part of the item of Field Office Telephone.

All furnished equipment shall be maintained in good working order and replacement equipment shall be provided within 48 hours for all equipment that is damaged, stolen or becomes inoperative in any way.

The Contractor shall provide training to the Resident Engineer in the use of the furnished equipment.

#### SECTION 641 - TRAFFIC CONTROL

19. SECTION 641 - TRAFFIC CONTROL, text is hereby deleted in its entirety and replaced with the following:

641.01 DESCRIPTION. This work shall consist of establishing and maintaining traffic control measures to protect the traveling public and construction operations.

The requirements for uniformed traffic officers and flaggers used in conjunction with traffic control are specified in Section 630.

641.02 GENERAL CONSTRUCTION REQUIREMENTS. The Contractor shall establish traffic controls to divert traffic from the area of construction operations during working hours in accordance with the Contract or as authorized by the Engineer. The Contractor shall refer to Subsection 104.04 for the limits of working hours. Should the Contractor desire to divert traffic after sunset or before sunrise, a written request shall be submitted to the Engineer. In the request, the Contractor shall justify the request and detail the enhanced safety procedures the Contractor proposes to provide and pay for to protect the safety of the traveling public and project personnel. The request shall be submitted at least three weeks prior to the date the Contractor plans to divert traffic outside the normal working hours.

When work is in progress within an interchange area, no more than one ramp at a time may be closed to traffic. Traffic service that would be eliminated by the closing of a ramp shall be maintained elsewhere as specified in the Contract or authorized by the Engineer.

During other than working hours, all highway facilities shall be open to the unrestricted flow of traffic, unless otherwise specified. Traffic control devices, equipment and materials shall be removed from the traveled way, auxiliary lanes, ramps, and shoulders. Traffic signs relative to traffic control for construction operations shall be removed, covered, or turned so they are not readable from the highway. All equipment and materials shall be stored a minimum of 10 m (30 feet) from the edge of pavement.

When the Plans contain an Agency-designed traffic control plan that includes, but is not limited to, references to standard sheets, the Contractor may submit an alternate traffic control plan for this project. This alternate plan may be for the entire traffic control plan of this project or for revisions to various phases of the Agency's design in the Plans, including the specific location of the lanes where the traffic will be maintained.

The submitted alternative must include complete construction details, including all facets of traffic control, to the same extent as provided in the Agency design.

The Contractor shall allow the Agency 30 calendar days to review the proposed alternative before it is to be implemented.

641.03 TRAFFIC CONTROL DEVICES. All traffic control devices shall conform to the requirements of the Contract and the latest edition of the MUTCD. Traffic control devices required in the performance of this work may include lane markings, barricades, signs with yielding posts or portable supports, reflectorized drums, traffic cones, delineators, portable flashing arrow boards, Portable Changeable Message Board, traffic signal lights, and street lighting. In addition, flashing warning lights may be required by the Engineer for use on signs and barricades to improve visibility.

The location of traffic control devices shall be adjusted in the field as directed by the Engineer to provide for maximum visibility and usefulness. Traffic control devices shall be kept clean so they are clearly visible at all times. All signs shall be composed of the same retroreflective material.

Unless protected by guardrail or other positive barrier, mounted traffic control devices shall be erected on yielding or breakaway supports.

When protected by guardrail, these devices shall be placed outside the deflection distance of the particular guardrail in use.

Traffic cones shall be orange, at least 700 mm (28 inches) high, and shall be spaced as shown on the Plans. They shall be weighted or nailed for stabilization. Tires may be used to stabilize the cones only if they have been circumferentially sliced to a minimum of 50 percent of their original thickness.

Portable Changeable Message Boards (PCMBs) shall have three (3) lines of eight (8) characters per line and conform to Section 6F.52 of the MUTCD. The MUTCD reference to Portable Changeable Message Sign shall be clarified to mean Portable Changeable Message Board.

Portable Arrow Boards (PABs) shall conform to the requirements of a Type C in Section 6F.53 of the MUTCD.

The Contractor shall operate and maintain the PCMBs or PAB as recommended by the manufacturer. The locations of the units and the messages to be used shall be as specified in the Traffic Control Plan shown in the Plans or as directed by the Engineer. The Contractor shall supply the Engineer with the name and telephone number of the Contractor's responsible person in charge of the placement, maintenance and repair of the PCMB or PAB and all of its components during the construction period. The Contractor shall conduct daily inspections of both daytime and nighttime operations in order to ensure proper placement and operation of the PCMB or PAB.

The Contractor shall maintain one spare PCMB unit, or a PAB unit if no PCMB unit is being utilized, on site to replace a non-operational unit if necessary. If any unit becomes non-operational during use, and a replacement unit is not available, the Contractor shall provide flaggers or other approved traffic control methods, at no additional cost to the state, until the unit is repaired or replaced. Non-operational units shall be repaired or replaced as soon as possible, but no later than twenty-four (24) hours after discovery of the problem.

A PCMB may be used as a PAB.

The Engineer may order the Contractor to cease operations if traffic control devices found to be deficient in any respect are not immediately replaced or repaired. Time lost due to failure to correct deficient traffic control devices will not be considered justifiable cause for granting an extension of time.

641.04 PERSONNEL. Personnel involved with the placement and use of traffic control devices shall receive orientation and explanation of the requirements of the MUTCD and the special project requirements prior to working on the project. The orientation and explanation are the Contractor's responsibility.

641.05 SPEED ZONE ENACTMENT. If the traffic control plan shown on the Plans is based on a recommended speed limit reduction, or if a speed limit reduction is requested by the Contractor, the Agency will obtain the necessary permit for this speed reduction. In either case, the Contractor shall provide the Agency with a written plan of work and a detailed sketch of the work zones that will be the basis for the permit application. The Contractor shall allow three weeks for the permit to be processed. The traffic control plan shall not be implemented until the permit is approved.

641.06 METHOD OF MEASUREMENT. The quantity of Traffic Control to be measured for payment will be on a lump sum basis for providing traffic control in the complete and accepted work.

The quantity of Portable Changeable Message Board or a Portable Arrow Board to be measured for payment will be on a unit basis for the type of sign specified. A unit shall consist of the designated sign panel complete with controller, power supply, fuel, backup power supply and trailer installed, maintained and removed as indicated on the plans or directed by the Engineer.

641.07 BASIS OF PAYMENT. The accepted quantity of Traffic Control will be paid for at the Contract lump sum price. Partial Payment for the Traffic Control Item shall be as follows:

- (a) The first 50% of the lump sum will be paid upon the complete installation of the traffic control devices and any lane markings associated with the traffic control plan.
- (b) The remaining 50% will be paid on a prorated basis for the estimated duration of the work remaining.

Payment will be full compensation for performing the work specified and for furnishing all labor including traffic patrol vehicle operators, if used by the Contractor, tools, materials, equipment, and incidentals necessary to complete the work. However, if there are items in the Contract for temporary barrier or line striping payment for these will be made under the Contract items.

The accepted quantity for the Portable Changeable Message Board and Portable Arrow Board will be paid for at the Contract unit price for each board being utilized. There will be no payment for any spare units, as they shall be considered incidental to the unit(s) being utilized and paid for through the Contract. Partial Payment for these Items shall be as follows:

- (a) The first 50% of the lump sum will be paid upon the erection of a complete Portable Changeable Message Board or Portable Arrow Board, as described in Subsection 641.06.
- (b) The remaining 50% will be paid on a prorated basis for the estimated duration of the work remaining.

The accepted quantity for the Portable Changeable Message Board and Portable Arrow Board will be paid for at the Contract unit price for each board. However, when the pay unit is Day, the minimum quantity for payment shall be 5 days, if the unit is used for less than five consecutive days.

The accepted quantity of Portable Changeable Message Board or Portable Arrow Board will be paid for at the Contract unit price, which price shall be full compensation for furnishing, operating, maintaining, transporting and installing the designated unit, for removing the sign unit when it is no longer needed, and for furnishing of all labor, tools, equipment and incidentals necessary to complete the work.

When both pay items are in the Contract, a Portable Changeable Message Board used as a Portable Arrow Board will be paid for at the Contract price for a Portable Arrow Board.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
641.10 Traffic Control	Lump Sum
641.15 Portable Changeable Message Board	Each
641.16 Portable Arrow Board	Each
641.17 Portable Changeable Message Board	Day
641.18 Portable Arrow Board	Day

SECTION 651 - TURF ESTABLISHMENT

20. 651.02 MATERIALS, is hereby modified by adding the following references:

Liquid Lime.....755.05A  
Fiber Mulch.....755.06(e)

21. 651.08 SEEDING, is hereby modified by adding the following paragraph after the second paragraph:

When seeding is done by the hydraulic method, liquid lime may be substituted for agricultural limestone at a rate of 4.2 liters (1.1 gallons) of liquid lime to 227 kilograms (500 pounds) of agricultural limestone or at such other rate as recommended by the manufacturer and approved by the Resident Engineer.

22. 651.08 SEEDING, is further modified by adding the following paragraph after the fifth paragraph:

When seeding is done by the hydraulic method, fiber mulch may be substituted for hay mulch at a rate of 1 unit of fiber mulch to 3.1 units of hay mulch or at such other rate as recommended by the manufacturer and approved by the Resident Engineer.

23. 651.12 METHOD OF MEASUREMENT, is hereby modified by adding the following paragraph after the third paragraph:

When seeding is done by the hydraulic method, liquid lime and fiber mulch will be measured for payment in equivalent units of Agricultural Limestone and Hay Mulch.

SECTION 675 - TRAFFIC SIGNS

24. 675.02 MATERIALS, text is hereby deleted in its entirety and replaced with the following:

Materials shall meet the requirements of the following subsections:

Paint for Traffic Signs.....	708.06
Bar Reinforcement.....	713.01
Sign Posts.....	750.01
Extruded Aluminum Panels.....	750.02
Flat Sheet Aluminum.....	750.03
High Density Overlaid Plywood.....	750.06
Acrylic Plastic Reflectors.....	750.07
Reflective Sheeting.....	750.08
Demountable Characters.....	750.09
Plastic Lettering Film.....	750.10
Extruded Aluminum Molding.....	750.11
Assembly Hardware.....	750.12

If the Contract does not specify a particular type of sign material, the Contractor may furnish any one of the following materials:

- (a) Type A sign with an area 2 square meters (20 square feet) or less:
  - (1) Flat sheet aluminum.
  - (2) Extruded aluminum panels (if attached to a Type B sign).
- (b) Type B sign with an area greater than 2 square meters (20 square feet):
  - (1) Extruded aluminum panels.
  - (2) High density overlaid plywood.

Concrete shall conform to the requirements of Section 501 for Concrete, Class B.

All new signs installed shall be marked on the back with the following information:

	Examples	
(State) or (Town)	VAOT	Swanton
Month and Year of Sign Fabrication	01/00	09/85
Route Where Sign Installed	US 5	TH 13

The letters and numbers of the text shall be 25 mm (1 inch) high.

Either stick-on letters and numbers or silk-screened letters and numbers will be allowed as long as they are applied in such a way that they remain intact during the life of the sign. If stick-on letters and numbers are used, all the letters and numbers to be placed on a sign shall come from the same stick-on sheet. Individual stick-on letters or numbers will not be allowed.

Type III, Type IV, Type V, Type VIII or Type IX reflective sheeting shall be used wherever Type III sheeting is shown on the Plans. Type VI reflective sheeting shall be used on traffic cones or barrels.

25. 675.03 EXTRUDED ALUMINUM PANELS, is hereby modified by adding the following paragraph at the end of the subsection:

If a Type A sign is attached to or part of a Type B sign, it shall be fabricated from extruded aluminum panels.

26. 675.06 GALVANIZED FLAT SHEET STEEL and 675.07 FORMED GALVANIZED STEEL PANELS, are hereby deleted in their entirety.

27. 675.09 APPLICATION OF REFLECTIVE SHEETING, is hereby modified by replacing the third paragraph of the subsection with the following paragraph:

Reflective sheeting shall be applied to the face of an extruded aluminum by a squeeze roller applicator. Reflective sheeting shall be applied to flat sheet aluminum, embossed letter frames, and high density overlaid plywood by vacuum heat applicator at 95 °C (200 °F), or by squeeze roller applicator. After aging 48 hours at 20 °C (68 °F), adhesion of the reflective sheeting to the sign surface shall be strong enough to resist stripping when tested with a stiff putty knife.

28. 675.17 METHOD OF MEASUREMENT, is hereby modified by replacing the second paragraph of the subsection with the following paragraphs:

The quantity of flanged channel traffic sign posts to be measured for payment will be the actual measured meters (linear feet) from the tops of the posts to the bottom of the posts, installed in the complete and accepted work. No added allowances will be made for anchors and overlaps.

The quantity of square tube sign posts and anchors to be measured for payment will be the actual measured meters (linear feet) from the tops of the posts to the bottom of the anchors, installed in the complete and accepted work. No added allowances will be made for overlaps.

The quantity of other traffic sign posts to be measured for payment will be the number of kilograms (pounds) of each type of post installed in the complete and accepted work, as determined by the lengths and the standard mass per meter (weight per linear foot) of the specified material.

29. 675.18 BASIS OF PAYMENT, is hereby modified by deleting the following pay item from the pay item list:

<u>Pay Item</u>	<u>Pay Unit</u>
675.30 Flanged Channel Sign Posts	Kilogram (Pounds)

30. 675.18 BASIS OF PAYMENT, is further modified by adding the following pay items to the pay item list:

<u>Pay Item</u>	<u>Pay Unit</u>
675.301 Flanged Channel Sign Post	Meter (Linear Foot)
675.341 Square tube Sign Posts and Anchor	Meter (Linear Foot)

SECTION 700 - GENERAL

31. 700.03 DEFINITION OF TERMS, is hereby modified by adding the following:

THIN AND ELONGATED PIECES - One in which the ratio of the length to the thickness of its circumscribed rectangular prism is greater than five to one.

SECTION 704 - AGGREGATES

32. 704.10 AGGREGATE FOR BITUMINOUS CONCRETE PAVEMENT, is hereby deleted in its entirety and replaced with the following:

704.10 AGGREGATE FOR MARSHALL BITUMINOUS CONCRETE PAVEMENT. Coarse aggregate for Marshall bituminous concrete pavement shall consist of clean, hard, crushed stone or crushed gravel, and be uniformly graded. The blending of crushed stone and crushed gravel may be permitted only in the binder course if, in the opinion of the Engineer, the materials to be blended are equal in quality and are compatible. All aggregate shall be free from dirt, deleterious material, and pieces that are structurally weak. "Coarse Aggregate" shall mean that portion of material coarser than the 2.36 mm (No. 8) sieve.

Fine aggregate for bituminous concrete pavement shall consist of stone screenings or a combination of stone screenings, screened natural and/or manufactured sands, and other fine aggregates, such that at least 95 percent of any individual stockpile of the fine aggregate shall pass a 9.5 mm (3/8 inch) sieve. The minimum percentage, by mass (weight), of the blended material passing the 2.36 mm (No. 8) sieve that must be stone screenings shall be as shown in the "Design Criteria" table of Subsection 406.03(b), unless otherwise authorized in writing by the Engineer.

Manufactured Sand may be substituted for stone screenings when 100 percent of the material passing the 2.36 mm (No. 8) sieve has two or more fractured faces as determined in accordance with ASTM C 295 Modified.

(a) Grading.

1. Coarse aggregate. Coarse aggregate shall be furnished in at least three nominal sizes for Mix Type I and in at least two nominal sizes for Mix Types II and III.

The gradation of the coarse aggregate shall be such that when combined with the fine aggregate, the composite gradation shall meet the specified gradation requirements for bituminous concrete in Subsection 406.03(a). The process of blending coarse and fine aggregates shall be accomplished through the use of separate bins. Blending in the stockpile shall not be permitted.



2. Fine Aggregate. The gradation of the fine aggregate shall be such that, when combined with a coarse aggregate, the composite aggregate shall meet the specified gradation requirements for bituminous concrete as specified in Subsection 406.03(a). The process of blending the fine and coarse aggregates shall be accomplished through the use of separate bins. Blending in the stockpile shall not be permitted.

The percentage of fine aggregate passing the 2.36 mm (No. 8) sieve shall remain uniform within a tolerance of  $\pm 15$  percent for any one mix design. Material produced that does not meet this tolerance may be stockpiled separately and used after an appropriate change is made in the mix design.

3. Recycled Asphalt Pavement. When recycled asphalt pavement (RAP), is used to produce bituminous concrete pavement, the resulting mixture will meet all specification requirements for the type(s) of mix specified.

The bitumen component of the RAP shall be free of significant contents of solvents, tars, or other contaminating substances that will make the RAP unacceptable for recycling as determined by the Engineer.

Should the characteristics of any proposed material for recycling be such that an acceptable mixture cannot be produced and/or maintained, the recycled mix will not be allowed for use on the project.

The Contractor may blend, crush, or prepare the proposed RAP(s) into one or more homogenous stockpiles.

When a bituminous concrete pavement is proposed using RAP, the Contractor shall submit, with the mix design information, an analysis of the RAP material. The analysis of the RAP material shall include an extracted aggregate gradation, coarse aggregate specific gravity, fine aggregate specific gravity, asphalt content, and recovered binder values. The recovered binder values will be obtained by AASHTO M 320 testing for the designated project PG grade. The M 320 testing will consist of Dynamic Shear Rheometer (DSR) values tested under Original, Rolling Thin Film Oven (RTFO) residue and Pressure Aging Vessel (PAV) residue parameters, and Bending Beam Rheometer (BBR) values. The recovered asphalt will be aged with the RTFO and the PAV for this testing. A minimum of four samples shall be analyzed (or tested) to produce design data. The analysis shall be valid for a twelve-month period.

The gradation of the RAP shall be such that, when combined with a coarse and fine aggregate, the composite aggregate shall meet the specified gradation of bituminous concrete in Subsection 406.03(a). The process of blending the RAP, fine aggregate, and coarse aggregate shall be accomplished through the use of separate bins. Blending of these materials in the stockpiles shall not be permitted.

- (b) Percent of Wear. When the coarse aggregate is composed of crushed stone or crushed gravel, the percent of wear of the aggregate shall be not more than 35 percent when tested in accordance with AASHTO T 96. When the aggregate is composed of crushed igneous rock, the percent of wear of the aggregate shall be not more than 50 percent when tested in accordance with AASHTO T 96.
- (c) Fractured Faces. When crushed gravel is used as coarse aggregate, at least 75 percent, by mass (weight), of the material coarser than the 4.75 mm (No. 4) sieve shall have at least two fractured faces.
- (d) Thin and/or Elongated Pieces. Not more than 10 percent, by mass (weight), of the material coarser than the 4.75 mm (No. 4) sieve from each stockpile shall consist of thin and/or elongated pieces.
- (e) Mineral Filler. The mineral filler shall consist of approved limestone dust, talc dust, or other approved materials and shall be added to the aggregate if required.
- (f) Soundness. The soundness shall conform to the requirements of Subsection 704.01(d), except the percentage of loss shall be not more than 12 percent, by mass (weight), and shall apply to wearing course aggregates only.
- (g) Control of Aggregate Stockpiles. Before the start of bituminous concrete paving operations and throughout the duration of the paving operation, the cold feed aggregate stockpiles shall each contain at least 1000 metric tons (1000 tons) of accepted aggregate, or the amount required for the job when less than 1000 metric tons (1000 tons).

The addition of unacceptable material to an accepted stockpile shall result in the rejection of the entire stockpile.

The stockpiles shall be separated by partitions or otherwise separated to the satisfaction of the Engineer to prevent intermixing of the stockpiles.

All stockpiles shall be maintained at the mixing plant site, unless otherwise authorized in writing by the Engineer.

The respective sources of all aggregates to be used in the wearing course shall remain the same for the entire project, unless otherwise authorized in writing by the Engineer.

33. 704.10 AGGREGATE FOR SUPERPAVE BITUMINOUS CONCRETE PAVEMENT, is hereby made a new subsection of SECTION 704 - AGGREGATES as follows:

704.10A AGGREGATE FOR SUPERPAVE BITUMINOUS CONCRETE PAVEMENT. Coarse aggregate for Superpave bituminous concrete pavement shall consist of clean, hard, crushed stone, crushed gravel, or crushed igneous rock, and be uniformly graded. The blending of crushed stone, crushed gravel, and/or crushed igneous rock may be permitted only in the binder course if, in the opinion of the Engineer the materials to be blended are equal in quality and are compatible. All aggregate shall be free from dirt, deleterious material and pieces which are structurally weak. "Coarse Aggregate" shall mean that portion of material coarser than the 2.36 mm (No.8) sieve.

Fine aggregate for Superpave bituminous concrete pavement shall consist of stone screenings or a combination of stone screenings, screened natural sand and/or manufactured sands, and other fine aggregates, such that at least 95 percent of any individual stockpile of the fine aggregate shall pass a 9.50 mm (3/8 inch) sieve. "Fine Aggregate" shall mean that portion of material finer than the 2.36 mm (No.8) sieve.

(a) Grading.

1. Coarse Aggregate. Coarse aggregate shall be furnished in at least three nominal sizes for Mix Type IS and in at least two nominal sizes for Mix Types IIS and IIIS.

The gradation of the coarse aggregate shall be such that when combined with the fine aggregate, the composite gradation shall meet the specified gradation requirements for superpave bituminous concrete pavements in Subsection 490.03(a). The process of blending coarse and fine aggregates shall be accomplished through the use of separate bins. Blending in the stockpile shall not be permitted.

2. Fine Aggregate. The gradation of the fine aggregate shall be such that, when combined with a coarse aggregate, the composite aggregate shall meet the specified gradation of bituminous concrete in Subsection 490.03(a). The process of blending fine and coarse aggregates shall be accomplished through the use of separate bins. Blending in the stockpile shall not be permitted.

The percentage of fine aggregate passing the 2.36mm (No.8) sieve shall remain uniform within a tolerance of plus or minus 15 percent for any one mix design. Material produced which does not meet this tolerance may be stockpiled separately and used after an appropriate change is made in the mix design.

3. Recycled Asphalt Pavement (RAP). RAP shall be permitted to be used in Superpave bituminous concrete pavements. The percentage of RAP, when stated as a percentage of the total mix, shall be limited to a maximum of 15.0 percent, for both design and production purposes.

When RAP is used to produce Superpave bituminous concrete pavement, the resulting mixture will meet all specification requirements for the type of mix specified.

The bitumen component of the RAP shall be free of significant contents of solvents, tars, or other contaminating substances that will make the RAP unacceptable for recycling as determined by the Engineer.

Should the characteristics of any proposed material for recycling be such that an acceptable Superpave bituminous concrete pavement cannot be produced and/or maintained, the recycled mix will not be allowed for use on the project.

The Contractor may blend, crush, or prepare the proposed RAP(s) into one or more homogenous stockpiles.

When a Superpave bituminous concrete pavement is proposed using RAP, the contractor shall submit, with the mix design information, an analysis of the RAP material. The analysis of the RAP material shall include an extracted aggregate gradation, coarse aggregate specific gravity, fine aggregate specific gravity, asphalt content, and recovered binder values. The recovered binder values will be obtained by AASHTO M 320 testing for the designated project PG grade. The M 320 testing will consist of Dynamic Shear Rheometer (DSR) values tested under Original, Rolling Thin Film Oven (RTFO) residue and Pressure Aging Vessel (PAV) residue parameters, and Bending Beam Rheometer (BBR) values. The recovered asphalt will be aged with the RTFO and the PAV for this testing. A minimum of four samples shall be analyzed (or tested) to produce design data. This analysis shall be valid for a twelve-month period.

The gradation of the RAP shall be such that, when combined with a coarse and fine aggregate, the composite aggregate shall meet the specified gradation of Superpave bituminous concrete in Subsection 490.03(a). The process of blending the RAP, fine, and coarse aggregates shall be accomplished through the use of separate bins. Blending in the stockpile shall not be permitted.

- (b) Percent of Wear. When the coarse aggregate is composed of crushed stone or crushed gravel, the percent of wear of the aggregate shall be not more than 35 when tested in accordance with AASHTO T 96. When the coarse aggregate is composed of crushed igneous rock, the percent of wear of the aggregate shall not be more than 50 when tested in accordance with AASHTO T 96.
- (c) Fractured Faces. For Superpave bituminous concrete pavements the following design criteria must be met:

Angularity.

1. Coarse Aggregate. Coarse aggregate angularity criterion relates to one or two fractured face count, as a percentage, by mass (weight), of material coarser than the 4.75 mm (No. 4) sieve based on traffic (ESALs) and usage (depth) in the pavement structure. A fractured face for this purpose is defined as an angular, rough or broken surface of an aggregate created by any means. A face is considered a "fractured face" only if it has a projected area at least as large as 25 percent of the maximum projected area when viewed directly on and the face has sharp and well defined edges. Measurement is made using test method ASTM D 5821 "Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate." Measurement is based on the blended aggregate and is used for design and field control to monitor aggregate production.

Coarse Aggregate Angularity Criteria (Minimum) - Fractured Face Count

Traffic (ESALs)	Depth From Surface	
	<= 100 mm (4 inches)	> 100 mm (4 inches)
< 300,000	55/--	--/--
300,000 to < 3,000,000	75/--	50/--
3,000,000 to < 10,000,000	85/80 <sup>(1)</sup>	60/--
10,000,000 to < 30,000,000	95/90	80/75
>= 30,000,000	100/100	100/100

<sup>(1)</sup> 85/80 denotes that 85 percent of the coarse aggregate has one (1) fractured face and 80% has two (2) or more fractured faces.

Note 1: If less than 25 percent of a layer is within 100 mm (4 inches) of the surface, the layer may be considered to be below 100 mm (4 inches) for mixture design purposes.

2. Fine Aggregate. Fine aggregate angularity criteria is defined as the percent of air voids in loosely compacted aggregate that passes the 2.36 mm (No.8) sieve based on traffic (ESALs) and usage (depth) in the pavement structure. Measurement is made using AASHTO Standard: "Standard Test Method for Uncompacted Void Content of Fine Aggregate; T 304, Method A", and is based on the blended aggregate. Results are used for design purposes, not as a field control tool.

Fine Aggregate Angularity Criteria (Minimum) - Uncompacted Void Content

Traffic (ESALs)	Depth From Surface	
	<= 100 mm (4 inches)	> 100 mm (4 inches)
< 300,000	--	--
300,000 to < 3,000,000	40	40
3,000,000 to < 10,000,000	45	40
10,000,000 to < 30,000,000	45	40
>= 30,000,000	45	45

Note 1: If less than 25 percent of a layer is within 100 mm (4 inches) of the surface, the layer may be considered to be below 100 mm (4 inches) for mixture design purposes.

- (d) Thin and Elongated Pieces. For Superpave bituminous concrete pavements not more than 10 percent, by mass (weight), of the blended material coarser than the 4.75 mm (No.4) sieve shall consist of aggregates which have a ratio of maximum to minimum dimensions greater than five (5). Measurement is made using test method ASTM D 4791 "Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregates, Section 8.4." This criterion is used for design and field control to monitor aggregate production.
- (e) Mineral Filler. The mineral filler shall consist of approved limestone dust, talc dust, or other approved materials, and shall be added to the aggregate if required.
- (f) Soundness. The soundness shall conform to the requirements of Subsection 704.01(d), except the percentage of loss should be not more than 12 percent by mass (weight) and shall apply to wearing course aggregate only.
- (g) Control of Aggregate Stockpiles. Before the start of bituminous concrete paving operations and throughout the duration of the paving operation, the cold feed aggregate stockpiles shall each contain at least 1000 metric tons (1000 tons) of accepted aggregate, or the amount required for the job when less than 1000 metric tons (1000 tons).

The addition of unacceptable material to an accepted stockpile shall result in the rejection of the entire stockpile.

The stockpile shall be separated by partitions or otherwise separated to the satisfaction of the Engineer to prevent intermixing of the stockpiles.

All Stockpiles shall be maintained at the mixing plant site unless otherwise specified in writing by to Engineer.

The respective sources of all aggregate to be used in the wearing course shall remain the same for the entire project unless otherwise specified in writing by the Engineer.

- (h) Clay Content. Clay content criterion is a measure of the amount of clay material in the portion of blended aggregate finer than the 4.75 mm (No. 4) sieve based on traffic (ESALs). Measurement is made using the test method AASHTO Standard "Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test; T-176." Results are used for design purposes and field control to monitor aggregate production.

Clay Content Criteria (Minimum) - Sand Equivalent

Traffic (ESALs)	Sand Equivalent
< 300,000	40
300,000 to < 3,000,000	40
3,000,000 to <10,000,000	45
10,000,000 to < 30,000,000	45
> 30,000,000	50

34. 704.15 QUARTZITE OR GRANITE AGGREGATE USED IN PAVEMENTS, is hereby made a new subsection of SECTION 704 - AGGREGATES as follows:

704.15 QUARTZITE OR GRANITE AGGREGATE USED IN PAVEMENTS. The Agency has identified a potential stripping problem with some granite and quartzite aggregates used in the production of bituminous concrete pavement. Until additional research can determine a more finite evaluation of the problem or identify optional corrective alternatives, any material supplied under items 303, 406, 409, or 490 that contains aggregates from monomineralic (a rock consisting essentially of one mineral) quartzite sources or granite sources will require the addition of a minimum of 0.5% (by percentage of asphalt weight) of an anti-strip additive. Anti-strip additives shall comply with the requirements of Subsection 702.07. The Agency reserves the option to require the use of an anti-strip additive at any time that a potential stripping problem is observed.

SECTION 750 - TRAFFIC SIGNS

35. 750.01 SIGN POSTS, is hereby modified by deleting Part (a) of the subsection and replacing it with the following:

(a) Steel Post and Anchors. Steel posts and anchors shall conform to the following requirements:

- (1) Structural steel tubing shall conform to Subsection 714.11 of the Standard Specifications for Construction. Steel posts consisting of standard rolled steel structural shapes shall conform to the requirements of AASHTO M 270M/M 270, Grade 250 (Grade 36). After fabrication, these posts shall be galvanized in accordance with the requirements of AASHTO M 111M/M 111.
- (2) Steel posts consisting of flanged channels shall conform to the mechanical requirements of ASTM A 499, Grade 60 and the chemical requirements of the 42.2 to 56.6 kg/m (85 to 114 lbs/yard) rail class in ASTM A 1. They shall conform to the details indicated on the plans as to size, shape, weight, hole punching, hole drilling, and other details. After fabrication, these posts shall be galvanized in accordance with the requirements of AASHTO M 111M/M 111.

- (3) Steel posts and anchors consisting of welded mechanical square tubes formed from hot rolled carbon steel sheet shall conform to the mechanical and chemical requirements of ASTM A 1011/A 1011M, Grade 380 (Grade 55). They shall conform to the details indicated on the Plans as to size, shape, weight, hole punching, hole drilling, and other details. The posts shall be fabricated in accordance with ASTM A 787, Type 2, and shall be galvanized with a G165 coating in accordance with ASTM A 653/A 653M or the posts shall be fabricated in accordance with ASTM A 787, Type 3, and shall be galvanized in accordance with AASHTO M 111M/M 111.

- 36. 750.08 REFLECTIVE SHEETING, Part (b) is hereby modified by adding the following ASTM D 4956 specification classification references for reflective sheeting:

- (7) TYPE VII. A super-high-intensity retroreflective sheeting having highest retroreflectivity characteristics at long and medium road distances. This sheeting is typically an unmetallized microprismatic retroreflective element material.
- (8) TYPE VIII. A super-high-intensity retroreflective sheeting having highest retroreflectivity characteristics at long and medium road distances.
- (9) TYPE IX. A very-high-intensity retroreflective sheeting having highest retroreflectivity characteristics at short road distances.

SECTION 755 - LANDSCAPING MATERIALS

- 37. SECTION 755 - LANDSCAPING MATERIALS, is hereby modified by adding the following new subsection:

755.05A LIQUID LIME. Liquid lime shall be a commercially formulated calcium carbonate lime mixture.

- (a) Packaging. Labels shall be clearly marked with the following:

- Manufacturer's name.
- Type
- Mass (Weight)
- Guaranteed analysis

- (b) Certification. A Type A Certification shall be furnished in accordance with Subsection 700.02.

- 38. 755.06 MULCH MATERIALS, is hereby modified by adding the following part:

- (e) Fiber Mulch. Fiber mulch shall be a commercially fabricated product as approved by the Resident Engineer.