ARTICLE XII – PAVEMENT REPAIRS

12.1 DESCRIPTION – The work to be done under this Article consists of furnishing all labor, materials and equipment necessary to repair damaged asphalt pavements at Nawiliwili Harbor.

The Construction Engineer, Contractor, and Tenant will locate and mark the repair areas at the job site, determine the type of repairs to be done, and period of completion of each work phase. Negotiated adjustments by the Construction Engineer may be made if field conditions show that changes or additions are necessary.

12.2 MATERIALS

A. HMAB Course shall conform to Section 301 of the Standard Specifications.

B. Bituminous Tack Coat shall be a slow-setting emulsified asphalt conforming to section 407 of the Standard Specifications.

C. HMA Pavement shall be State Mix III or Superpave 19mm for Types "A" and "B" Repairs; and State Mix IV for Types "C" and "D" Repairs. State Mix III and IV HMA pavement shall conform to Section 401 of the Standard Specifications.

The Superpave 19mm pavement shall conform to the following modifications:

1. Performance Graded (PG) Binder:

Performance graded binder shall conform to Performance Graded Asphalt Binder Specifications, AASHTO M 332. Submit, before usage, a Certificate of Compliance, accompanied by substantiating test data, showing conformance with Performance Graded Asphalt Binder Specification. The Engineer will not accept the PG binder without adequate documentation.

PERFORMANCE GRADED BINDERS FOR SPECIFIC MIXES	
MIX	**BINDER**
Superpave Hot Mix Asphalt for Surface Course (SHMA)	PG 64E-22
* When necessary, neat asphalt with polymer modification shall be used to achieve the specified performance grading.	

2. Aggregates:

Make mineral aggregate by crushing and screening hard, tough, durable stone of uniform quality. Crushed aggregate shall be free from soft or disintegrated pieces, clay, dirt, or other deleterious substances.

Course aggregate shall be that portion of the mineral aggregate retained on the No. 4 sieve. Fine aggregate shall be that portion of the mineral aggregate passing the No. 4 sieve.

When tested according to the designated methods, the combined mineral aggregate shall meet the following requirements:

Test	Test Method	Requirements
Soundness	AASHTO T 104 (5 cycles using sodium sulfate)	9% Maximum
Clay lumps & Friable Particles	AASHTO T 112	0.25% Maximum course aggregate 1.0% Maximum fine aggregate
Flat and Elongated Particles (Length to thickness ratio of 3:1)	ASTM D 4791 (by Weight)	20% Maximum
Los Angeles Abrasion	AASHTO T 96	40% Maximum
Sand Equivalent	AASHTO T 176	45% Maximum
Fine Aggregate Angularity	AASHTO T 304, Method A	45% Maximum
Stripping	AASHTO T 182	Above 95%
Gradation	AASHTO T 27 AASHTO T 11	See Table 402-1
Absorption	AASHTO T 84 & T 85	5% Maximum

At least 90% by weight of the material retained on the No. 4 sieve shall consist of crushed particles. At Least 70% of the material passing the No. 4 sieve and retained on the No. 8 sieve shall consist of crushed particles. A crushed particle is one having at least one mechanically fractured face. A face is considered fractured if it has a projected area that is at least 0.25 of the Maximum projected area of the particle.

3. Aggregate Blend:

Size, uniformly grade, and combine coarse and fine aggregate fractions to produce a job-mix formula that meets the gradation requirements of Table

12-1. Blended aggregate gradation curves shall not pass outside of the maximum control points.

Table 12-1 – Aggregate Gradation Control Points 3/4 Inch Nominal Maximum Size Mix		
SIEVE SIZE	**Control Points Percent Passing**	
	LOWER	**UPPER**
1 inch	100.0	100.0
3/4 inch	90.0	100.0
1/2 inch	-	90.0
No. 8	23.0	49.0
No. 200	2.0	8.0

4. Job-Mix Formula:

Design the job-mix formula according to AASHTO PP28 modified by deletion of Section 11 – Evaluation Moisture Susceptibility.

Table 12-2 – Design Criteria	
$N_{initial}$, N_{design}, N_{max}	8, 100, 160
Air Voids at N_{design}	4%
Voids in Mineral Aggregate (VMA) at N_{design} (for 3/4 inch Nominal Maximum Particle Size)	13.0% Minimum
Voids Filled with Asphalt (VMA)	65 – 75%
Density at $N_{initial}$ (% of Theoretical Maximum Specific Gravity)	Not more than 89.0%
Density at N_{design} (% of Theoretical Maximum Specific Gravity)	96.0%
Density at N_{max} (% of Theoretical Maximum Specific Gravity)	Not more than 98.0%
Dust to Binder Ratio	0.8 to 1.6

Submit the job-mix formula at least fifteen (15) working days before production. The job-mix formula shall include:

a. Design percent of aggregate passing each required sieve size,

b. Design percent of PG binder material added to the aggregate (expressed as % by weight for total mix), and

c. Temperature at which the mixture is delivered to the point of discharge,

d. Source of aggregate,

e. Grade of PG binder,

f. Test data used to develop job-mix formula.

Mixtures shall meet the requirements of Table 12-1 and Table 12-2 without exceeding allowable tolerances in Table 12-3.

Table 12-3 – Range of Tolerances for Job-Mix Formula	
Passing No. 4 and larger sieves	± 6%
Passing No. 8 to No. 100 sieves (inclusive)	± 4%
Passing No. 200 sieve	± 2%
Binder Content (expressed as % by weight of total mix)	± 0.4%
Temperature of Mixture	20° F
Voids, total mix	± 1.0%

5. Compaction Requirements:

92 - 97% Relative compaction based on AASHTO T 209 modified by deletion of Supplemental Procedure for Mixtures Containing Porous Aggregate.

Tensile Strength	70,000 psi	400,000 psi
Length, inch (mm)	0.75” (19.05 mm)	1.5” (38.1 mm)
Color	Yellow, Black, Tan	Yellow, Black, Tan
Acid/Alkali Resistance	Inert	Good
Melt Temperature	212° F (100° C)	800° F (427° C)

D. Asphalt Binder shall be 64E-22 for Types “A” and “B” Repairs and shall conform to Section 702 of the Standard Specifications.

E. Use of RAP is not allowed in State Mix III or Superpave pavements.

12.3 CONSTRUCTION CRITERIA

A. The finished pavement shall be constructed to maintain the existing drainage patterns.

B. Where more than one course of new asphalt pavement is placed, a tack coat shall be provided between each course.

C. The new pavement shall be placed to provide a smooth riding transition between the new pavement and the existing areas.

D. The new pavement shall be feathered into existing utility, hatches, drain inlets, valve covers and manholes.

E. The completed thickness of the pavement repairs varies. Uniform slopes shall be maintained on the finished pavement surfaces. Thinner and thicker pavement surfaces shall be provided to maintain uniform slopes, fill low spots and minimize ponding.

12.4 CONSTRUCTION

A. TYPE "A" REPAIRS – Type "A" Repairs shall be done in areas where the asphalt pavement is unraveled, torn, uplifted, subsided or otherwise damaged. Damage extends into the base course.

Type "A" Repairs shall include the following work:

1. The existing asphalt pavement and base course shall be removed to a depth of 10 inches below the existing grade by cold planing. Cold planing shall be done in accordance with Section 415 of the Standard Specifications. If the subbase is disturbed, the disturbed subbase material shall be compacted to at least 95 per cent relative compaction. The removed asphalt pavement and base course shall not be reused as base material, and shall be hauled away daily from the job site and disposed of by the Contractor.

2. A bituminous tack coat shall be applied on the prepared subbase surface in accordance with Section 407.03 of the Standard Specifications.

3. New 5-inch thick HMAB course shall be placed on a properly prepared subbase and shall conform to Section 301.03 of the Standard Specifications. The subbase shall be prepared conforming to the requirements of subsection 203.03(D) – Subgrade Preparation of the Standard Specifications.

4. A bituminous tack coat shall be applied on HMAB course in accordance with Section 407.03 of the Standard Specifications.

5. New 5-inch thick HMA pavement State Mix III or Superpave 19mm shall be placed in accordance with Section 401.03 of the Standard Specifications. The finished pavement shall be smooth, dense, uniformly graded, well drained while maintaining existing drainage, and compacted to a density of not less than 92 percent nor greater than 97 percent of maximum theoretical specific gravity in accordance with AASHTO T 209 modified by deletion of Supplemental Procedure for Mixtures Containing Porous Aggregate.

B. TYPE "B" REPAIRS – Type "B" Repairs shall be done at areas where the existing asphalt pavement is worn, uneven, slightly cracked and the base course is not damaged or contaminated.

Type "B" Repairs shall include the following work:

1. The existing asphalt pavement shall be removed to a depth of 3 inches below the existing grade by cold planing. Cold planing shall be done in accordance with Section 415 of the Standard Specifications. The removed asphalt pavement materials shall be hauled away daily from the job site and disposed of by the Contractor.

2. The pavement area shall be swept clean of all loose material, water, dirt, excess dust or other objectionable matter.

3. A bituminous tack coat shall be applied on the asphalt concrete base course in accordance with Section 407.03 of the Standard Specifications.

4. New 3-inch thick HMA pavement State Mix III or Superpave 19mm shall be placed in accordance with Section 401.03 of the Standard Specifications. The finished pavement shall be smooth, dense, uniformly graded, well drained while maintaining existing drainage, and compacted to not less than 92 percent nor greater than 97 percent of the maximum specific gravity determined in accordance with AASHTO T 209, modified by deletion of Supplemental Procedure for Mixtures Containing Porous Aggregate.

C. TYPE "C" REPAIRS – Type "C" Repairs shall be done in areas where the asphalt pavement is unraveled, torn, uplifted, subsided or otherwise damaged. Damage extends into the base course.

Type "C" Repairs shall include the following work:

1. The existing asphalt pavement and base course shall be removed to a depth of 9 inches below the existing grade by cold planing. Cold planing shall be done in accordance with Section 415 of the Standard Specifications. If the subbase is disturbed, the disturbed subbase material shall be compacted to at least 95 per cent relative compaction. The removed asphalt pavement and base course shall not be reused as base material, and shall be hauled away daily from the job site and disposed of by the Contractor.

2. A bituminous tack coat shall be applied on the prepared subbase surface in accordance with Section 407.03 of the Standard Specifications.

3. New 6-inch thick HMAB course shall be placed on a properly prepared subbase and shall conform to Section 301.03 of the Standard Specifications. The subbase shall be prepared conforming to the requirements of subsection 203.03(D) – Subgrade Preparation of the Standard Specifications.

4. A bituminous tack coat shall be applied on HMAB course in accordance with Section 407.03 of the Standard Specifications.

5. New 3-inch thick HMA pavement State Mix IV shall be placed in accordance with Section 401.03 of the Standard Specifications. The finished pavement shall be smooth, dense, uniformly graded, well drained while maintaining existing drainage, and compacted to a density of not less than 92 percent nor greater than 97 percent of maximum theoretical specific gravity in accordance with AASHTO T 209 modified by deletion of Supplemental Procedure for Mixtures Containing Porous Aggregate.

D. TYPE "D" REPAIRS – Type "D" Repairs shall be done at areas where the existing asphalt pavement is worn, uneven, slightly cracked and the base course is not damaged or contaminated.

Type "D" Repairs shall include the following work:

1. The existing asphalt pavement shall be removed to a depth of 2 inches below the existing grade by cold planing. Cold planing shall be done in accordance with Section 415 of the Standard Specifications. The removed asphalt pavement materials shall be hauled away daily from the job site and disposed of by the Contractor.

2. The pavement area shall be swept clean of all loose material, water, dirt, excess dust or other objectionable matter.

3. A bituminous tack coat shall be applied on the asphalt concrete base course in accordance with Section 407.03 of the Standard Specifications.

4. New 2-inch thick HMA pavement State Mix IV shall be placed in accordance with Section 401.03 of the Standard Specifications. The finished pavement shall be smooth, dense, uniformly graded, well drained while maintaining existing drainage, and compacted to not less than 92 percent nor greater than 97 percent of the maximum specific gravity determined in accordance with AASHTO T 209, modified by deletion of Supplemental Procedure for Mixtures Containing Porous Aggregate.

E. The Contractor shall hire an independent qualified testing lab to verify asphalt pavement compaction requirements using field compaction testing in accordance with ASTM D2950, density test method by nuclear methods. Tests shall be performed at the minimum rate of three tests per 1,000 square yards.

12.5 PAYMENT – Payment for pavement repairs shall be made as described in Article X of these Specifications.