

Engineers Design Report
**Runway Lighting and Other Airfield
Improvements Project**

Seaside Municipal Airport

AIP# 3-41-0057-005



June 2015

ENGINEER'S DESIGN REPORT

**SEASIDE MUNICIPAL AIRPORT
2015 AIRPORT IMPROVEMENT PROJECT
AIP NO 3-41-0057-005**

June, 2015

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Project Engineer:

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Prepared for:

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GENERAL

Seaside Municipal Airport (56S) is primarily a personal and recreational aviation facility and a general aviation access point to local communities. The Airport is located 1 mile northeast of downtown Seaside. The airport features one runway and one parallel taxiway.

The City of Seaside (The City), Oregon, with the Federal Aviation Administration (FAA), has programmed an Airport Improvement Program (AIP) project for The Airport during the 2015-2016 calendar years. The City has contracted with WHPacific, Inc. (WHP) to provide design services and construction support. The City is providing administrative services.

DESCRIPTION OF WORK

The current Seaside AIP project involves the following work items:

1. Installation of a new Medium Intensity Runway Lighting system including new electrical equipment and control building, radio control system and lights in cans and conduits.
2. Installation of 4' tall security fencing along west property line.
3. Paving an entrance Taxiway to realign the centerline to avoid the Object Free Area.
4. Construction of a small run-up apron on the Runway 16 end.
5. Installation of Edge Reflectors along the parallel and connector Taxiways.
6. Installation of three lighted hold line signs.
7. Removal of small trees and brush at both ends of the runway.
8. Installation of a water quality swale.

DESIGN REPORT OBJECTIVES

This design report describes the technical aspects of the project. Existing conditions will be reviewed, design criteria and assumptions will be stated, construction scheduling will be discussed, and preliminary quantity and cost estimates will be presented. Preliminary plans, specifications and the drainage report are being submitted separately.

EXISTING CONDITIONS

Soils and topography

No soils investigation was conducted at the project site.

Based on a web soil survey performed for the airport, the topography is generally flat and the soil is a loamy fine sand. According to table 2-2 in AC 150/5320-6E, this type of soil has a CBR value ranging from 5-15.

Drainage

Several areas are prone to flooding; the entire airport is located in a flood zone and a majority of the airport property has been designated as a wetland. There are 2 outfalls for the airport. One of the outfalls empties to the drainage ditch to the north which drains the apron and hangar area. The other outfall empties into the river at the southwest corner of the airport which drains the southern area between the runway and taxiway.

The overall drainage scheme of the airfield has water flow coming off the runway and taxiway crowns to wetland infields and dispersed to scattered catch basins.

Pavements

Seaside Airport has one runway, Runway 16-34, which is served by one taxiway, Taxiway A.

The existing pavement condition and depths were taken from the Oregon Department of Aviation (ODA) Pavement Evaluation Program (PEP), which as part of the program develops a maintenance and construction history for all pavements at the airport. Based on the most recent evaluation performed in 2012, the existing applicable pavement depths are shown:

Pavement Location	PCI Rating	Pavement Depth	Base Depth	Subbase Depth
Taxiway A	84	2" AC	6" Crushed Aggregate	6" Aggregate
Existing Taxiway at Midfield (To be Realigned)	59	2" AC	6" Crushed Aggregate	6" Aggregate

Lighting, Signing, and NAVAIDS

Lighting:

Lighting at the airport includes runway edge lights, runway threshold lights, minimal runway end lights, and minimal taxiway connector lights. Taxiway A is currently unlit. The runway lighting is a stake mounted, direct bury cable system and has exceeded its useful life.

Signs:

There are no existing navigational signs on the airfield.

Pictures



Figure 1: Existing Outdated Threshold Lights



**Figure 2: Property Encroachment onto Airport.
The Proposed Fence Would Prevent Further Encroachments.**



Figure 3: Existing Electrical Panel to be Replaced by Electrical Building

GENERAL

All improvements are designed in accordance with FAA Airport Design Advisory Circular 150/5300-13A with the latest changes incorporated.

PAVEMENTS

Pavement Section Design

As stated above within existing conditions, a CBR value of the existing soil ranges from 5-15. This CBR value is a key factor in determining the weight capacity of a given pavement section. For the pavement design, a CBR value of 7 was used.

The fleet mix was determined by analyzing the aircraft that are currently based at the airport. The total number of operations for 12 months ending in April of 2014 was 2,600 and the design aircraft selected is a generic 12,500 pound single wheel aircraft.

The pavement design analysis was completed using the selected fleet mix, the CBR value of the subgrade, and the properties of existing pavement materials. FAARFIELD software was used to design the pavement section and software outputs are provided in the Appendix. The FAARFIELD pavement structure calculated 3 inches of HMAC on top of 5.74 inches of crushed aggregate. For design simplicity, the crushed aggregate will be increased to 6 inches in depth. In the new pavement areas, a geotextile fabric will be placed on the compacted subgrade.

Taxiway Pavement Geometry

There are two pavement areas where the geometries are being updated: the midfield entrance Taxiway onto Taxiway A and the north end of Taxiway A.

The taxiway pavement geometry is designed based on Taxiway Design Group (TDG) 1A. This aligns with the existing taxiway system at the airport.

Midfield Taxiway Realignment:

There are two reasons for realigning the midfield entrance Taxiway leading from the west apron onto Taxiway A:

1. There are objects penetrating the existing taxiway Object Free Area to the south.
2. In accordance with AC 5300-13A, taxiways should not be designed to lead directly from an apron to a runway without requiring a turn.

The new design features the centerline relocated to the north approximately 45' off the edge of the existing fence line, perpendicular to Taxiway A. Moving the centerline north will provide a fix for both of the issues listed above. See Figure 4 for an aerial depiction of the proposed realignment.

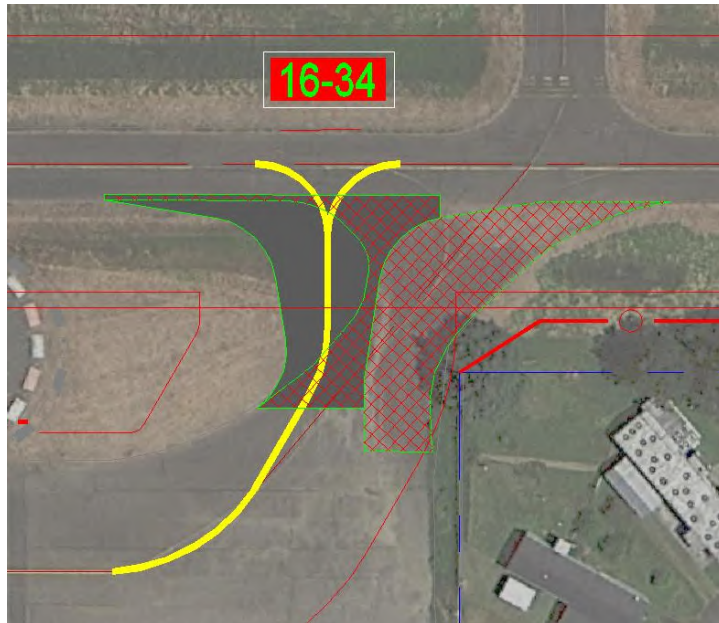


Figure 4: Midfield Taxiway Realignment

North Taxiway Run-up:

A small run-up apron at the north end of Taxiway A (Runway 16 end) will be constructed to allow aircraft a perpendicular approach to the hold line. This improves safety by providing the pilot better visibility of the Runway.

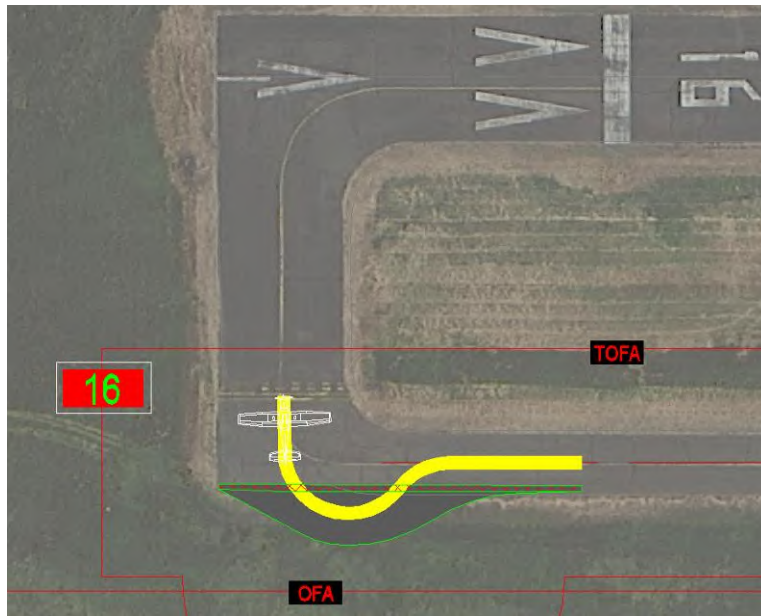


Figure 5: Taxiway Run-up Addition

Pavement Markings

After the entrance Taxiway is relocated and the run-up is built, striping will be completed. Both areas will need centerline striping. FAA Advisory Circular 150/5340-1L outlines the standard dimensions and locations for these markings. The taxiway markings will be yellow with reflective media.

GRADING AND DRAINAGE

It is the general guidance from both the State and Federal agencies to minimize impacts to wetlands. However, the paving proposed for this project that impacts wetlands is a required improvement for the airport to improve safety of the airfield to life and property. The design will minimize impacts to wetlands to the extent possible while still achieving the required safety improvements.

Midfield Taxiway Realignment

The new layout of the entrance Taxiway will be moved slightly to the north, placing the taxiway within the existing wetland. Areas of impact will require stripping of all vegetation and backfilled to the appropriate subgrade elevation for the taxiway and shoulder, while trying to minimize wetland impact. The addition of a catch basin at the low point along the north side of pavement will provide excess storm flow collection. The overall drainage pattern will remain the same.

North Taxiway Run-up

The new run-up design will add an additional 1692 SF of pavement off the northwest end of Taxiway A. In order to maintain the existing drainage pattern and for design simplicity, the run-up will continue the downward slope from the crown of Taxiway A. Additional material will be required to meet grading requirements. Due to the run-up being located within a wetland, the shoulder and grading out to the taxiway safety area will be designed for minimal wetland impact.

Drainage Swale

In general, new impervious runoff should be treated before it discharges to wetlands. However, the agencies have agreed to allow treatment of an existing parking lot outside the airport fence in lieu of treating the runoff from the proposed pavement. A water quality treatment vegetated swale has been designed as a stormwater treatment facility for the existing parking lot which currently has no treatment. The water quality swale has been designed per the City of Portland Stormwater Management Manual per agency requirements. A drainage report is included in Appendix 3 showing the swale design.

AIRFIELD RUNWAY LIGHTING SYSTEM AND SIGNAGE

The existing lighting system will be replaced with a new Medium Intensity Runway Lighting system (MIRL) that meets the requirements of a visual runway with a displaced threshold. New MIRL fixtures and base cans will be installed along the runway per AC 150/5340-30H. The MIRL fixtures and conduit will be located at a ten-foot offset from the runway edge.

The existing lighting system is outdated and inadequate for the proposed electrical needs. In order to supply the upgraded lighting, the electrical supply/control systems will be updated and a new electrical building will be constructed with a constant current regulator. Pilot radio control will be included.

Lighted Runway holding position signs will be installed at hold line locations at Taxiway connectors A1, A2 and A3.

Installation of taxiway edge reflectors along the parallel and connector taxiways will be designed per AC 150/5340-30H.

FENCING AND MARKING

A 4' tall chain link fence will be constructed along the west property line of the airport. Due to the property line being adjacent to a 55 years and older living community and the location being within city limits, the chain link fence will have no barbed wire at the top.

OBSTRUCTION ANALYSIS AND MITIGATION

The Oregon Department of Aviation identified obstructions during an airport inspection and notified the city. During the survey work for this project, the approach areas off each end of the runway were surveyed for obstacles. The Part 77 approach and AC 150/5300-13A displaced threshold approach surfaces were analyzed. The proposed obstruction removal plan clears all trees surveyed that penetrate or come within 10 feet of the displaced threshold approach surface.

BID ALTERNATIVES

Taxiway Edge Reflectors, lighted airfield signs and fencing will be included in this project as bid alternatives to allow the city flexibility with the award to assure costs do not exceed funding.

FAA TECHNICAL SPECIFICATIONS

Since there is a very small quantity of paving, less than 100 tons, the aggregate base and the asphalt will be specified per Oregon Department of Transportation Standards. A modification to standard is included in the appendix, as allowed per P-403. This will prevent unnecessary cost increase for an asphalt plant to generate P-403 HMAC. The proposed specification is the 2740 specification which references Oregon DOT Specifications which will also be included in the contract documents.

PRELIMINARY COST ESTIMATE

The preliminary engineer's cost estimate is based on our understanding of the proposed work, and historical information for similar work.

**Table 5-1
COST SUMMARY**

**Seaside Airport - 2015 Improvement Project
Engineering Quantity/Cost Opinion**

By:	L. Elbert
Date:	6/2/2015
Proj. No.:	5537W

<u>Item No.</u>	<u>Item Description</u>	<u>Est. Total Qty.</u>	<u>Units</u>	<u>Price</u>	<u>Estimated Cost</u>
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Bid Schedule A: Base Bid

0001	Mobilization (Section 01505)	1	LS	\$31,400.00	\$31,400
0002	Temporary Flagging, Signing, and Marking (01115)	1	LS	\$5,000.00	\$5,000
0003	Construction Staking (Section 01406)	1	LS	\$8,000.00	\$8,000
0004	Pavement Removal (Item P-101)	181	SY	\$8.00	\$1,449
0005	Unclassified Excavation (Item P-152)	111	CY	\$20.00	\$2,220
0006	Geotextile Fabric (P-152)	547	SY	\$1.00	\$547
0007	Temporary Erosion Control (P-156)	1	LS	\$2,000.00	\$2,000
0008	Crushed Aggregate Base Course (Item P-209)	180	TON	\$55.00	\$9,916
0009	Bituminous Surface Course (Item P-401)	96	TON	\$125.00	\$12,009
00010	Permanent Pavement Marking - Yellow (Item P-620)	221	SF	\$4.00	\$882
00011	Pavement Marking Removal (Item P-620)	220	SF	\$4.00	\$878
00012	6-Inch HDPE Pipe (Item D-701)	23	LF	\$50.00	\$1,150
00013	Catch Basin (Item D-751)	1	EA	\$2,500.00	\$2,500
00014	Seeding and Fertilizing (Item T-901)	1	LS	\$2,000.00	\$2,000
00015	Tree Removal	25	EA	\$500.00	\$12,500
00016	Small Tree and Brush Removal to 12" off Ground	0.86	ACRE	\$15,000.00	\$12,900
00016	Water Quality Swale	1	LS	\$5,000.00	\$5,000
Subtotal					\$106,351

Section 5
PRELIMINARY COST ESTIMATE

E-1	Electrical Building (Item 16000)	1	LS	\$25,000.00	\$25,000
E-2	Constant Current Regulator (Item 16511)	1	EA	\$10,000.00	\$10,000
E-3	Medium Intensity Elevated Edge Light - LED (Item 16560)	44	EA	\$1,100.00	\$48,400
E-4	Remove Existing Edge Light (Item 16560)	39	EA	\$50.00	\$1,950
E-5	Electrical Junction Box	1	EA	\$400.00	\$400
E-6	H2O Hand Hole	2	EA	\$3,300.00	\$6,600
E-7	#8 AWG, 5 KV Cable (Item L-108)	5469	LF	\$1.50	\$8,204
E-8	Bare Copper Counterpoise (Item L-108)	5308	LF	\$2.00	\$10,616
E-9	1" Sch 40 PVC Conduit (Item L-110)	6	LF	\$15.00	\$90
E-10	4" Sch 40 PVC Conduit (Item L-110)	62	LF	\$30.00	\$1,845
E-11	(3) 3" Sch. 40 PVC Concrete Encased Duct Bank (Item L-110)	174	LF	\$60.00	\$10,410
E-12	2" Sch. 40 PVC Conduit (Item L-110)	4953	LF	\$12.00	\$59,436
Subtotal - Electrical					\$182,951

Bid Schedule A Total	\$289,302
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Bid Schedule B: Add. Alternative - Retro-Reflective Markers

0001	Construction Staking	1	LS	\$2,000.00	\$2,000
0002	Retro-Reflective Taxiway Markers	93	EA	\$70.00	\$6,510
Subtotal - Bid Schedule B					\$8,510

Bid Schedule C: Add. Alternative - Signage

0001	Install Guidance Sign	3	EA	\$4,000.00	\$12,000
0002	#8 AWG, 5 KV Cable (Item L-108)	548	LF	\$1.50	\$822
0003	L-867 Base Can (Item 16560)	2	EA	\$650.00	\$1,300
0004	2" Sch. 40 PVC Conduit (Item L-110)	274	LF	\$12.00	\$3,288
0005	Bare Copper Counterpoise (Item L-108)	274	LF	\$2.00	\$548
Subtotal - Bid Schedule C					\$17,958

Bid Schedule D: Add. Alternative - Fencing

0001	4' Chain-Link Fence (Item F-162)	1150	LF	\$20.00	\$23,000
Subtotal - Bid Schedule D					\$23,000

Subtotal - Add Alternatives	\$49,468
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ALL BID SCHEDULES	\$338,770
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GENERAL

The project schedule has been developed and the recommended contract time for this work is 45 calendar days based upon estimates of quantities and production rates. The following is a breakdown of the preliminary scheduled dates:

Item	Date
Advertisement Date	6/26/15 – 7/22/15
Final Estimates/Bid Opening	7/22/15
Contract Evaluation/Approval by Commission	7/27/15
Notice to Proceed	8/24/15
Construction	8/24/15 – 10/21/15

GENERAL

Seaside Municipal Airport will monitor construction and set the safety standards for the project. Safety considerations will be covered in the contract documents. The project schedule and specifications will detail all coordination and safety items necessary for safe operations during construction, including issuance of NOTAM's and closures. The pre-construction conference will cover construction safety issues and coordination during the project.

PLANNED CLOSURES

The runway will be closed for up to 30 days.

Refer to the construction site plan for work area.

SAFETY GUIDELINES

Advisory Circular 150/5370-2F, "Operational Safety on Airports During Construction" and the project Construction Safety and Phasing Plan (CSPP). All work will be performed under OSHA guidelines, including lock-out procedures for construction and electrical equipment.

VEHICLE MARKING

All construction vehicles are required to have flashing lights or orange and white flags while operating on the airport. All vehicles higher than 15 feet are required to have flags. Advisory Circular 150/5210-5D, latest edition, "Painting, Marking and Lighting of Vehicles Used on an Airport" will be discussed at the pre-construction conference.

APPENDIX 1

FAARFIELD CALCULATION OUTPUTS

FAARFIELD - Airport Pavement Design (V 1.305, 9/28/10 64-bit)

Section SeasideTW in Job Seaside.

Working directory is C:\Program Files (x86)\FAA\FAARFIELD\

The aircraft list contains only one aircraft. Please see the introduction to the Help File for a discussion on using FAARfield to make single aircraft comparisons.

The structure is New Flexible. Asphalt CDF was not computed.

Design Life = 20 years.

A design for this section was completed on 03/12/15 at 07:24:22.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	P-401/ P-403 HMA Surface	3.00	200,000	0.35	0
2	P-209 Cr Ag	5.74	27,037	0.35	0
3	Subgrade	0.00	10,500	0.35	0

Total thickness to the top of the subgrade = 8.74 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	Sngl Whl-12.5	12,500	1,300	0.00

Additional Airplane Information

Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	Sngl Whl-12.5	1.00	1.00	4.83

APPENDIX 2

MODIFICATION TO STANDARDS – STATE SPECIFIES PAVING AND BASE MATERIAL

Modification of Airport Standards Request Form

Airport information

1. AIRPORT NAME: Seaside Municipal	2. AIRPORT LOCATION (CITY,STATE): Seaside, Oregon	3. LOCID: 56S
4. AFFECTED RUNWAY/TAXIWAY: Taxiway A	5. APPROACH (EACH RUNWAY): <input type="checkbox"/> PIR <input type="checkbox"/> NPI <input checked="" type="checkbox"/> VISUAL	6. AIRPORT REF. CODE (ARC):
7. DESIGN AIRCRAFT (EACH RUNWAY/TAXIWAY): Cessna 172 (typical user). Design aircraft for pavement design is generic 12,500 SW.		

Modification of Standards

8. TITLE OF STANDARD BEING MODIFIED (CITE REFERENCE DOCUMENT): P-403/P-209
9. STANDARD/REQUIREMENT: The FAA standards allow for state DOT specs to be used for Paving and Bases, but requires approval
10. PROPOSED: It is proposed to use Oregon DOT Level 2 asphalt mix and base aggregate. Level 2 is for moderate truck traffic. The OR DOT specifications used are 641, 744, and 2630 (attached).
11. EXPLAIN WHY STANDARD CANNOT BE MET (FAA ORDER 5300.1): There is only approximately 92 tons of asphalt to be placed. It would not be cost effective to require an FAA spec asphalt and base for this small of a quantity. The design aircraft weight for the proposed pavement is less than highway loadings, so the state specification
12. DISCUSS VIABLE ALTERNATIVES (FAA ORDER 5300.1): The alternate would be to require FAA specified base rock and asphalt mix. This alternative would require a quarry to crush a special mix to meet P-209 aggregate base and for the P-403 mixture. The proposed smaller quantity would not make it financially feasible for the supplier to make the FAA standard asphalt mix or provide P-209 base rock. Also, the schedule could be significantly delayed as the supplier would most likely delay making the mix until all other projects are complete that include higher quantities.
13. STATE WHY MODIFICATION WOULD PROVIDE ACCEPTABLE LEVEL OF SAFETY, ECONOMY, DURABILITY, AND WORKMANSHIP (FAA ORDER 5300.1): The proposed aircraft loading at the Seaside Airport is relatively minimal, <12,500 lbs. The state specification is used for pavements exposed to moderate truck traffic (32,000 lb axle load). Also, the state specified pavement and base rock has been used on the airport for pavement maintenance and trench patching over the last 8 years and have performed well, without any failures. See attached for a site plan of the proposed work as well as the proposed specifications for asphalt and base rock.

Attach more sheets as needed.

Include sketch or plan.

14. AIRPORT NAME: Seaside Municipal Airport	15. AIRPORT LOCATION (CITY, STATE): Seaside, Oregon	
16. NAME OF ORIGINATOR: Derek Mayo, PE	17. ORIGINATOR'S ORGANIZATION: WHPacific	18. TELEPHONE: (503) 720-8777
SIGNATURE OF ORIGINATOR		19. DATE SIGNED:

For FAA Use Only			
20. DATE OF LATEST FAA SIGNED ALP:			
21. ADO RECOMMENDATION:		SIGNATURE:	22. DATE:
23. FAA DIVISIONAL REVIEW (AT, AF, FS)			
ROUTING SYMBOL	SIGNATURE	DATE	CONCUR OR NON-CONCUR
			<input type="checkbox"/> Concur; <input type="checkbox"/> Nonconcur
			<input type="checkbox"/> Concur; <input type="checkbox"/> Nonconcur
			<input type="checkbox"/> Concur; <input type="checkbox"/> Nonconcur
24. COMMENTS:			
25. AIRPORTS DIVISION FINAL ACTION:			
<input type="checkbox"/> Unconditional Approval <input type="checkbox"/> Conditional Approval <input type="checkbox"/> Disapproval			
26. DATE:	SIGNATURE:	27. TITLE:	
28. CONDITIONS OF APPROVAL:			

Section 02740 Asphalt Concrete Paving and Bases

PART 1: GENERAL

1.1 DESCRIPTION

This section describes construction of aggregate base course, asphalt concrete surface course, and tack coat.

1.2 REFERENCED STANDARDS

AI: Asphalt Institute, Manual Series No. 2 (MS-2).

ASTM: American Society for Testing and Materials.

ODOT: Oregon Department of Transportation - "Oregon Standard Specifications for Construction - 2015."

1.3 SUBMITTALS

Submit aggregate qualification tests in accordance with ODOT Sections 02630 and 00744 for aggregate used in aggregate base and asphalt concrete, respectively.

Submit a mix design and job mix formula for asphalt concrete to the Engineer 15 days prior to start of production of the paving mixture per ODOT Section 00744. Formula shall indicate:

Definite percentage for:

Each sieve fraction for new aggregate

New asphalt cement

Temperature of completed mix when discharged from mixer.

Character and quantity of anti-strip and recycling agents.

PART 2: PRODUCTS

2.1 AGGREGATE BASE

¾" – 0" Dense graded, in accordance with ODOT Section 00641 and Section 2630.10.

2.3 ASPHALT CONCRETE

In accordance with OSHD Section 00744 Asphalt Concrete Pavement (ACP), Level 2, 1/2" ACP Mix, except as modified below.

Asphalt cement, PG 64-28 or PG 64-22, at contractor's discretion.

Mix Design:

The job mixture formula (JMF) shall be per ODOT section 00744

The established job mix formula shall remain in effect until modified in writing by the Engineer.

The Engineer may require that a new job mix formula be established if unsatisfactory results or other conditions make it necessary.

Should a change in sources of materials be made, a new job mix formula must be approved before material is used.

1.4 TACK COAT

In accordance with ODOT section 00730.11, CSS-1 or CSS-1h.

PART 3: EXECUTION

3.1 AGGREGATE BASE COURSE

Construct in accordance with ODOT Section 00641.

Obtain the Engineer's acceptance of the foundation layer for aggregate base course before beginning construction of the aggregate base course.

Compact each lift per ODOT section 00641.44

The finished top of base course when tested with a Contractor-furnished 12-foot straightedge shall not vary from the testing edge by more than 0.04 foot at any point, and shall be within 0.04 foot of specified grade. Contractor to provide surveyed confidence points to engineer at maximum 25 foot intervals, 3 at each interval (centerline and near edges) along alignment centerlines.

3.2 TACK COAT

Apply to existing pavement surfaces and structures that will be in contact with new asphalt concrete surface course.

3.3 ASPHALT CONCRETE SURFACE COURSE

Construct in accordance with ODOT Section 00744.

Obtain the Engineer's acceptance of the foundation layer for asphalt concrete surface course before beginning construction of the asphalt concrete surface course.

Compact the bituminous mixture per OSHD section 00744.49.

The finished top of the surface course when tested with a Contractor-furnished 16-foot straightedge shall not vary from the testing edge by more than 1/4 inch at any point, and shall be within 1/2 inch of specified finished grade.

3.4 TRAFFIC

Vehicular traffic, including heavy equipment, shall not be permitted on newly paved areas until surface temperatures have cooled to at least 120 °F.

PART 4: ACCEPTANCE SAMPLING AND TESTING

4.1 AGGREGATE BASE COURSE.

For base aggregate, compact to 100% per ODOT MFTP using nuclear gauge tests per AASHTO T310. Provide minimum 1 random test within 10 feet of centerline for each pavement area (2). In addition.

4.2 HMAC

Acceptance testing of material shall be in accordance with ODOT section 00744

For compaction, provide once nuclear gauge compaction tests per paving area verifying minimum 91% of MAMD "

PART 5: MEASUREMENT

5.1 Aggregate Base:

The cubic yardage of base course to be paid for shall be the number of cubic yards of base course material placed, compacted, and accepted in the completed course. The quantity of base course material shall be measured in final position based upon average end areas on the complete work computed from elevations to the nearest 0.01 foot.

5.2 Level 2, 1/2 inch ACP Mixture

Asphalt pavement shall be measured by the number of tons of bituminous mixture used in the accepted work. Recorded batch weights or truck scale weights will be used to determine the basis for the tonnage. There will be no price adjustments resulting in price escalation.

PART 6: BASIS OF PAYMENT

Payment for accepted base aggregate shall be made at the contract unit price per cubic yards (CY). The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment for accepted Level 2, ½ Inch Dense HMAC shall be made at the contract unit price per ton. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

- Item 02740 – 5.1 Base Course, ¾" - 0" - per CY
- Item 02740 – 5.2 Level 2, ½ inch ACP Mixture – per ton.

END OF SECTION 274

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Section 00641 - Aggregate Subbase, Base, and Shoulders

Description

00641.00 Scope - This work consists of furnishing and placing one or more layers of aggregates, mixed with water, on a prepared surface to the lines, grades, thicknesses and cross sections shown or established.

Materials

00641.10 Materials:

(a) Base and Shoulder Aggregate - Aggregate for bases and shoulders shall be sized as specified. Base aggregate shall be dense-graded unless otherwise specified. Shoulder aggregates shall be either 1" - 0 or 3/4" - 0 size as the Contractor elects.

Furnish base and shoulder aggregates meeting the following requirements:

Dense-Graded Base Aggregate	02630.10
Open-Graded Aggregate	02630.11
Shoulder Aggregate	02640

(b) Subbase Aggregate - Aggregate for subbases shall be crushed or uncrushed, including sands, reasonably well graded from coarse to fine.

Maximum size aggregate shall not exceed 75 percent of the compacted thickness of the layer in which it is incorporated. Aggregates passing the 1/4 inch sieve shall not be less than 10 percent nor more than 50 percent of the whole, by weight. No more than 10 percent of the aggregate shall pass the No. 100 sieve. Within these limits, the subbase aggregate gradation shall be adequate to produce a dense, firm base when placed and compacted.

(1) Grading - All of the grading requirements are given as percentages by weight. The gradation will be determined by sieve analysis according to AASHTO T 27.

(2) Abrasion - The source materials for aggregate subbase shall not exceed 45 percent wear when tested according to AASHTO T 96 unless otherwise approved.

(3) Sand Equivalent - Aggregate subbase will be tested according to AASHTO T 176 and shall have a sand equivalent of not less than 25.

00641.11 Stockpiling - If the produced aggregates are to be stockpiled, prepare the stockpile site and pile the materials according to 00680.40 and 00680.41.

00641.12 Limits of Mixture - Provide a mixture of aggregate and water having a uniform moisture content sufficient to obtain the required compaction. Proportions will be in percentages by weight and will be known as the Mix Design. Determine the proportion of aggregate and water according to the MFTP. The amount of water for the Mix Design will be based on the dry weight of the aggregate.

When introducing water at the mixing plant, furnish the mixture with a tolerance of ± 2 percent of the optimum water content at the time of mixing. If approved, excess percentage of water may be allowed. The Agency will treat excess percentage of water according to 00641.80(d).

00641.15 Quality Control:

(a) Aggregate Production Quality Control - Have a CAgT perform sampling and testing of aggregates according to Section 00165 and the MFTP. Statistically evaluate the aggregates according to Section 00165.

(b) Preproduced Aggregate - Compliance of aggregates produced and stockpiled before issuance of Notice to Proceed will be determined according to (1) or (2) below.

(1) Continuing production records meeting the requirements of Section 00165 and the MFTP.

(2) Sampling and testing the entire stockpile according to Section 00165 and the MFTP.

In addition, the material shall meet the requirements of 00641.10.

00641.16 Acceptance of Aggregates - Acceptance will be according to Section 00165.

(a) Stockpiled Aggregate for Aggregate Base and Shoulders - Acceptance will be based on the Contractor's quality control testing, if verified, as required in Section 00165.

(1) **Aggregate Gradation** - A stockpile contains specification aggregate gradation when the Quality Level (QL) for each sieve size, calculated according to 00165.40, is equal to or greater than the QL indicated in Table 00165-2 for a PF of 1.00. Each required sample represents a subplot. When the QL indicated in Table 00165-2 yields a PF of less than 1.00 for any sieve size, the material is non-specification.

(2) **Non-specification Aggregate Gradation** - Stockpiled aggregates having non-specification aggregate gradation will be rejected unless the non-specification material is removed from the stockpile. Do not add additional material to the stockpile until enough non-specification material has been removed so that the QL for each sieve size is equal to or greater than the QL in Table 00165-2 for a 1.00 PF.

No payment will be made for non-specification materials.

(b) Aggregate Base and Shoulder Mixture - Acceptance testing will be performed on random samples obtained immediately following mixing with water according to the MFTP. For non-specification mixture the Engineer will determine the appropriate price reduction or order its removal from the work according to 00150.25.

(c) Aggregate Subbase - Aggregate subbase will be accepted based on the Engineer's visual inspection. Samples will be obtained and tested for compliance with 00641.10 by the Engineer if it is suspected that the material does not meet Specifications.

Equipment**00641.20 Mixing Plant** - Mix aggregate and water by one of the following methods:

(a) Mixing Plant - Mix with a pug mill, rotary mixer, or other equipment at a mixing plant that:

- Has adjustable weighing or calibrated feeders, and other equipment that produces uniform, non-segregated, specified mixtures.
- Discharges water into the mixer by weighing or metering. The device shall be adjustable and shall assure uniform water content in the mixture.

- Has mixing blades or paddles of proper size, adjustment and clearance to provide uniform mixture.

(b) Road Mix - Motor grader or other suitable equipment.

00641.21 Hauling Equipment - Provide mixture hauling vehicles capable of hauling and depositing the mixture with a minimum of mix segregation.

00641.22 Spreading Equipment - Provide equipment capable of spreading the material and striking it off to designated line, grade, and transverse slope without segregation, dragging, or fracture of aggregate.

00641.24 Compacting Equipment - Provide self-propelled rollers and compactors capable of reversing without backlash. Rollers and compactors shall have a gross static weight of at least 8 tons, and shall be capable of compacting to specified density while the mix is still moist.

Labor

00641.30 Quality Control Personnel - Provide technicians having CEET, CAET, and CDT technical certifications.

Construction

00641.40 Preparation of Foundation - Provide a firm surface or material, on which aggregates are to be placed, according to Sections 00320, 00330, or 00610 as applicable.

00641.41 Mixing, Hauling, and Placing - Add water to the aggregate while mixing to provide a moisture content according to 00641.12.

Thoroughly mix the combined aggregate and water for as long as necessary to produce a homogenous mixture with all aggregate particles uniformly coated with water. Mix, haul and place the material by one of the following methods:

(a) Stationary Mixing Plant - Combine materials in a pug mill or rotary mixer.

Deliver and deposit the mixture without delay. Deliver the mixture to the spreading equipment by direct deposit into its receiving device, or by placing in uniform windrows in front of the equipment.

(b) Road Mix - Place materials for each layer, add water and mix with motor grader until homogeneous mixture is achieved.

Do not place aggregate shoulder material on the top lift of newly constructed EAC or open-graded pavement.

00641.42 Placing Aggregate Base or Subbase on Geotextile - When subgrade or drainage geotextile is required between the subgrade and base, place the first lift of material directly on the fabric, without road mixing.

00641.43 Thickness and Number of Layers:

(a) Aggregate Base Courses - If the required compacted depth of the base course exceeds 6 inches, construct it in two or more layers of nearly equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches unless approved.

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Place each layer in spreads as wide as practical and to the full width of the course before a succeeding layer is placed.

(b) Aggregate Subbase Courses - The maximum compacted thickness of any one layer shall not exceed 9 inches unless approved.

(c) Shoulder Courses - Place aggregates in shoulder areas, other than as part of the base course, in one layer, or in two or more layers of nearly equal thickness. The maximum compacted thickness of any one layer shall not exceed 9 inches.

00641.44 Shaping and Compacting:

(a) Aggregate Base Courses:

(1) Dense-graded Aggregates - Begin compaction of each layer of dense-graded aggregates immediately after the material is spread and continue until a density of not less than 95 percent of the maximum density has been achieved when tested according to the MFTP.

(2) Open-graded Aggregates - Compact the surface of each layer of open-graded aggregates using rollers conforming to 00641.24. Roll until there is no appreciable reaction or yielding under the compactor.

Shape and maintain the surface of each aggregate layer during the compaction operations to produce a finished surface meeting the requirements of 00641.45.

Apply additional water over the materials for proper compaction, according to Section 00340 and as directed.

(b) Aggregate Subbase and Shoulder Courses - Compact each layer of aggregate subbase and shoulder material until no reaction or yielding is observed under the compactor.

00641.45 Surface Tolerance - The finished surface of the aggregate and the surface of each underlying layer shall parallel the established grade and cross section for the finished surface within 1/2 inch.

The finished surface of the compacted aggregate, when tested with a 12 foot straightedge, shall not vary from the testing edge by more than 1/2 inch at any point. Furnish and operate the straightedge as directed.

Maintenance

00641.60 Care of the Work - After construction of each layer and completion of base, maintain the layer to specified conditions and prevent or repair segregation, raveling, or rutting until it is covered with a following layer or until all work is completed.

Measurement

00641.80 Measurement - The quantities of aggregate mixture will be measured on the weight basis, on the volume basis, or on the area basis according to the following:

(a) Weight Basis - When measurement is by weight, quantities will be measured in the hauling vehicle, after mixing.

(b) Volume Basis - When measurement is by volume, quantities will be measured in the hauling vehicle.

(c) Area Basis - When measurement is by area, the quantity will be the number of square yards of aggregate base constructed to the full thickness. The surface area will be determined by horizontal measurements. Each area constructed with varying thicknesses, as directed or shown, will be adjusted by converting it to an equivalent area at the pay item thickness on a proportionate volume basis.

(d) Adjustment of Water in Mixture - If the water in the aggregate mixture placed according to 00641.41(a) exceeds the percentage established in the mix design by more than 2 percent, the excess percentage of water will be deducted from the measurement of the mixture. Determination of excess water will be made by the same procedure used in setting the water content of the Mix Design under 00641.12 or converted to the equivalent volume.

If aggregates are stationary plant mixed, no separate measurement will be made for water added at the plant to bring the material to optimum moisture content.

If aggregates are road mixed, water used to bring the mixture to optimum moisture content will be measured according to 00340.80.

Payment

00641.90 Payment - The accepted quantities of aggregates will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Aggregate Subbase	Ton or Cubic Yard
(b) Aggregate Base	Ton or Cubic Yard
(c) _____ Aggregate Base	Ton or Cubic Yard
(d) Plant Mix Aggregate Base.....	Ton or Cubic Yard
(e) Plant Mix _____ Aggregate Base.....	Ton or Cubic Yard
(f) Aggregate Shoulders	Ton or Cubic Yard
(g) Aggregate Base, _____ Inches Thick	Square Yard

Items (b) and (d) will apply when the Contractor has the option of furnishing one or another of two or more designated sizes of aggregates.

In items (c) and (e), the designated size of aggregate to be used will be inserted in the blank.

In item (g), the depth of aggregate base will be inserted in the blank.

Payment will be payment in full for furnishing and placing all materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

No separate or additional payment will be made for water used in the mixture, mixed and placed according to 00641.41(a), subject to the limitations of 00641.80(d).

No separate or additional payment will be made for water used in the care of the work according to 00641.60.

00641.91 Material on Hand - Payment for stockpiled materials on hand may be allowed according to 00195.60, subject to the requirements of 00641.10, 00641.15, 00641.16(a), and subject to QA verification.

Section 00744 - Asphalt Concrete Pavement

Description

00744.00 Scope - This work consists of constructing asphalt concrete pavement (ACP) to the lines, grades, thicknesses, and cross sections shown or established.

00744.01 Abbreviations:

HMAC - Hot Mix Asphalt Concrete
MAMD - Moving Average Maximum Density
RAM - Recycled Asphalt Material
TSR - Tensile Strength Ratio
VFA - Voids Filled with Asphalt
VMA - Voids in Mineral Aggregate
WMA - Warm Mix Asphalt Concrete

00744.02 Definitions:

Asphalt Concrete Pavement - Uniformly coated mixture of asphalt cement, graded aggregate, and additives as required. The use of ACP in this section refers to either hot mix or warm mix asphalt concrete.

Hot Mix Asphalt Concrete - A hot plant mixed ACP.

Level 1 ACP - ACP for use in applications with very low traffic and only limited exposure to trucks.

Level 2 ACP - ACP for use in applications with low traffic volumes and low volume truck traffic.

Level 3 ACP - ACP for use in applications exposed to moderate truck traffic.

Recycled Asphalt Material - The combination of reclaimed asphalt pavement (RAP) and recycled asphalt shingles (RAS).

Warm Mix Asphalt Concrete - An asphalt concrete mix following all requirements of HMAC, except that through use of approved additives or processes, it is mixed, placed, and compacted at lower temperatures.

Materials

00744.10 Aggregate - Furnish new aggregate, RAP aggregate, and RAS aggregate meeting the following requirements:

(a) New Coarse and Fine Aggregates - Produce coarse and fine aggregate from crushed rock or other inert material of similar characteristics.

Blend sand is allowed for Levels 1, 2, and 3 mixes. Do not use more than 6 percent natural or uncrushed blend sand, by weight, in the total aggregate. Provide a means of verifying and documenting the amount of blend sand added to the aggregate.

Testing of aggregates for soundness, durability, and harmful substances will be at the discretion and expense of the Agency.

(1) Soundness - Provide coarse and fine aggregate with a weighted loss not exceeding 12 percent when subjected to five cycles of the soundness test using sodium sulfate solution according to AASHTO T 104.

(2) Durability - Provide aggregate not exceeding the following maximum values:

Test	Test Method		Aggregates Coarse
	ODOT	AASHTO	
Abrasion		T 96	30.0%
Degradation			
Passing No. 20 sieve	TM 208		30.0%
Sediment Height	TM 208		3.0"

(3) Fractured Faces - Provide crushed aggregate with not less than the minimum number of fractured faces as determined by AASHTO T 335 as follows:

Type of Mix	Percent of Fracture (by Weight)	
	Material Retained on 1", 3/4", 1/2" and No. 4 Sieve (two fractured faces)	Material Retained on No. 8 sieve (one fractured face)
All ACP	75	75

(4) Harmful Substances - Do not exceed the following maximum values:

Test	Test Method		Aggregates	
	ODOT	AASHTO	Coarse	Fine
Lightweight pieces		T 113	1.0%	
Wood Particles	TM 225		0.10%	
Elongated Pieces (at a ratio of 5:1)	TM 229		10.0%	
Plasticity Index		T 90		0 or NP
Sand Equivalent		T 176		45 min.

(b) Reclaimed Asphalt Pavement - RAP material used in the production of new ACP is optional. No more than 30 percent RAP material will be allowed in the new ACP pavement. Use RAP aggregates in the ACP that are no larger than the specified maximum allowable aggregate size before entering the cold feed. Blend the RAP material with new aggregate to provide a mixture conforming to the JMF within the tolerances specified.

(c) Recycled Asphalt Shingles - RAS used in the production of new ACP is optional. Either manufacturer waste (post-manufacturer) RAS or tear-off (post-consumer) RAS may be used. Manufacturer waste RAS is processed asphalt shingle material derived from manufacturer's shingle scrap. Tear-off RAS is processed asphalt shingle material derived from shingle scrap removed from structures. All percentages are based upon dry weights for calculations.

(1) Processing Shingles - Process the RAS by grinding at ambient temperature so that 100 percent of the shredded pieces are less than 1/2 inch in any dimension and that 90 percent are less than 3/8 inch in any dimension when sampled according to AASHTO T 2 and tested according to AASHTO T 27. Sample and test the processed RAS for gradation at a frequency of one test for every 50 tons of RAS processed.

(2) Harmful Substances - Certify that the RAS does not contain asbestos fibers according to the policies and procedures established by the Department of Environmental Quality. Test deleterious materials according to ODOT TM 335 at a frequency of one test for every 50 tons of RAS material. Limit the percentage of deleterious materials to 1.0 percent. If fine aggregate is added as an anti-clumping agent, sample and test processed RAS for harmful substances before adding the fine aggregates.

(3) Anti-Clumping Additive - Fine aggregate meeting the requirements of 00744.10(a) may be added to the RAS in a quantity not to exceed 4 percent by weight of RAS to keep the material workable and to prevent conglomeration of the shingle particles in the stockpile. Include these added fine aggregates in the mix design. RAS may also be blended with RAP in controlled percentages to preclude clumping. Do not contaminate stockpiled RAS with dirt or other foreign materials.

(4) Allowable Percentages - No more than 5.0 percent RAS by total weight of aggregate is allowed in ACP mixtures. Restrict the maximum allowable percentage of asphalt binder replacement to 20.0 percent for base courses and 15.0 percent for wearing courses in ACP containing only RAS.

When RAS is used in conjunction with RAP, restrict the maximum allowable percentage of binder replacement to 30.0 percent for base courses and 25.0 percent for wearing courses.

(5) Establishing Mix Design Inputs - For ACP mixtures containing RAS or RAM, following any addition of fine aggregate as an anti-clumping agent, test the material according to ODOT TM 319 to establish the asphalt content, material specific gravities, and gradation. Develop mixture designs according to the ODOT Contractor Mix Design Guidelines for Asphalt Concrete.

Blend the RAS or RAM with new aggregate to provide a mixture conforming to the JMF within the tolerances specified.

00744.11 Asphalt Cement and Additives - Furnish the following asphalt cement and additives:

(a) Asphalt Cement - Provide asphalt cement conforming to the requirement of ODOT's publication "Standard Specifications for Asphalt Materials". Copies of the publication are available from ODOT's website. The applicable specifications are those contained in the current publication on the date the Project is advertised. Use the grade of asphalt that is specified in the Special Provisions.

(b) Asphalt Cement Additives - Use standard recognized asphalt cement additive products that are of known value for the intended purpose and approved for use on the basis of laboratory tests and capable of being thoroughly mixed. Do not use asphalt cement additives that have detrimental effects on the asphalt material. Do not use silicones as an additive. Add the following asphalt cement additives when required by the JMF:

- Anti-stripping asphalt cement additives to prevent stripping or separation of asphalt coatings from aggregates to satisfy the TSR specified in 00744.13.
- Asphalt cement admixtures used to aid in the mixing or use of asphalt mixes or for experimental purposes.

When WMAC is used, select one of the WMAC technologies and process and additive types identified on ODOT's publication "Approved WMAC Technologies".

Submit the proposed WMAC technology to be used and a plan for its implementation at the pre-construction conference.

Comply with the manufacturer's recommendations for incorporating additives and WMAC technologies into the mix. Comply with manufacturer's recommendations regarding receiving, storing, and delivering the additives.

00744.12 Mix Type and Broadband Limits - Furnish the mix type specified in the Contract Documents within the broadband limits according to following:

(a) Mix Type - Furnish the types of ACP shown or as directed. When the plans allow an option of two types for a course of pavement, use only one type throughout the course.

(b) Broadband Limits - Provide a JMF for the specified mix type within the control points listed below:

Sieve Size	3/4" ACP		1/2" ACP		3/8" ACP	
	Control Points (% passing by Weight)		Control Points (% passing by Weight)		Control Points (% passing by Weight)	
	Min.	Max.	Min.	Max.	Min.	Max.
1"	100					
3/4"	90	100	100			
1/2"	–	90	90	100	100	
3/8"	–	–	–	90	90	100
No. 4	–	–	–	–	–	90
No. 8	23	49	28	58	32	67
No. 200	2.0	8.0	2.0	10.0	2.0	10.0

00744.13 Job Mix Formula Requirements - Provide a JMF for the Project meeting the following criteria and that was either developed or verified within 3 years of the date the Contract was advertised:

	Level 1	Level 2	Level 3
Design Method	Superpave	Superpave	Superpave
Compaction Level	65 Gyration	65 Gyration	80 Gyration
Air Voids, %	3.5	4.0	4.0
VMA, % minimum	1/2 inch - 14.0 3/8 inch - 15.0	3/4 inch - 13.0 1/2 inch - 14.0 3/8 inch - 15.0	3/4 inch - 13.0 1/2 inch - 14.0 3/8 inch - 15.0
VMA, % maximum	min + 2.0%	min + 2.0%	min + 2.0%
P No. 200 / Eff. AC ratio	0.8 to 1.6	0.8 to 1.6	0.8 to 1.6
TSR, % minimum	80	80	80
VFA, %	70 - 80 3/8 inch: 70 - 80	65 - 78 3/8 inch: 70 - 80	65 - 75 3/8 inch: 70 - 80

Develop the JMF according to the ODOT Contractor Mix Design Guidelines for Asphalt Concrete; or verify according to the ODOT Mix Design Verification process. Submit the proposed JMF and supporting data to the Engineer for review at least 10 calendar days before anticipated use. If acceptable, written acceptance will be provided. Perform a new TSR if the source of the asphalt cement changes.

For Level 3 wearing course mixes, include the results of the performance testing as outlined in the latest ODOT Contractor Mix Design Guidelines for Asphalt Concrete in the mix design submittal.

Issue a separate JMF for WMAC. Do not use RAS in WMAC mixes with minimum compaction temperatures less than 260 °F.

When WMAC is used, provide the following information in addition to the requirements listed for ACP:

- WMAC technology and WMAC additives information.
- WMAC technology manufacturer's established recommendations of usage.
- WMAC technology manufacturer's established target rate for water and additives, the acceptable variation for production, and documentation showing the impact of excessive production variation.
- WMAC technology material safety data sheets if applicable.
- Temperature range for mixing.
- Temperature range for compacting.
- Except for foaming technology, asphalt binder performance grade test data of the asphalt binder and chemical additive at the manufacturer's recommended dosage rate.
- Except for foaming technology, WMAC mixture performance test results. Perform testing for foaming technology on the production mix on specimens compacted at WMAC compaction temperatures.

00744.14 Tolerances and Limits - Produce and place ACP within the following JMF tolerances and limits:

Gradation Constituent	ACP Type		
	3/4"	1/2"	3/8"
1"	JMF ± 5% *		
3/4"	90 - 100%	JMF ± 5% *	
1/2"	JMF ± 5%	90 - 100%	JMF ± 5% *
3/8"	—	—	90 - 100%
No. 4	JMF ± 5%	JMF ± 5%	JMF ± 5%
No. 8	JMF ± 4%	JMF ± 4%	JMF ± 4%
No. 30	JMF ± 4%	JMF ± 4%	JMF ± 4%
No. 200	JMF ± 2.0%	JMF ± 2.0%	JMF ± 2.0%

* Maximum not to exceed 100%

Constituent of Mixture	ACP All Types
Asphalt Cement - AASHTO T 308 (Ignition) and ODOT TM 323	JMF ± 0.50%
RAP Content - ODOT TM 321	JMF ± 2.0%
RAS Content - ODOT TM 321	JMF ± 1.0%
RAM Content - ODOT TM 321	JMF ± 2.0%
Moisture content at time of discharge from the mixing plant - AASHTO T 329	0.80% max.

When a JMF tolerance applies to a constituent, full tolerance will be given even if it exceeds the control points established in 00744.12(b). Full tolerance will be given for RAP, RAS, or RAM content even if it exceeds the limits established in 00744.10.

00744.16 Sampling and Testing - For each 1,000 tons of placement, have a CAT-I perform a minimum of one of each of the following test methods as modified in the MFTP:

- Asphalt Content - AASHTO T 308 with ODOT TM 323 determined Calibration Factor
- Gradation - AASHTO T 30
- Mix Moisture - AASHTO T 329
- Maximum Specific Gravity - AASHTO T 209

When less than 1,000 tons of mix is placed in a day, perform a minimum of one series of tests per day. Provide test results to the Engineer by the middle of the following work shift.

If less than three samples are obtained on a project, the Contractor may supplement test results with the Engineer's approval by:

- Accelerating testing.
- Providing test results from other projects with the same JMF within the past 120 days of first date of JMF production.
- Testing back up samples.

Provide a minimum of three test results. Provide samples or split samples to the Engineer when requested.

00744.17 Acceptance - If the average for each mix gradation constituent and asphalt content is within the specification limits, the material will be accepted. If the average asphalt content or one or more gradation constituents is not within the specification limits, the material will be accepted according to 00150.25.

Equipment

00744.23 Pavers - Provide pavers that are:

- Self-contained, self-propelled, supported on tracks or wheels, none of which contact the mixture being placed.
- Equipped with augers and a screed or strike-off assembly, heated if necessary, which:
 - Can spread and finish the ACP to a uniform texture, in the specified widths, thicknesses, lines, grades and cross sections.
 - Will not segregate, tear, shove or gouge the ACP.
- Equipped with a paver control system which:
 - Controls the ACP placement to specified slope and grade.
 - Maintains the paver screed in proper position.
 - Provides the specified results through mechanical sensors and sensor-directed devices actuated from independent line and grade control references.

00744.24 Compactors - Provide self-propelled steel-wheeled or vibratory rollers specifically designed to compact ACP and capable of reversing without backlash. Provide a sufficient number of appropriately weighted rollers to compact the mixture. Equip vibratory rollers with amplitude and frequency controls. Do not operate in vibratory mode for lifts thinner than two times the maximum aggregate size for the type of ACP being compacted.

Labor

00744.30 Quality Control Personnel - Provide technicians having CAgT, CAT-I, CDT, and CMDT technical certifications.

Construction

00744.40 Season and Temperature Limitations - Place ACP when the temperature of the surface that is to be paved is not less than the temperature indicated:

Nominal Compacted Thickness of Individual Lifts and Courses as shown on the typical section of the plans	All Levels	Level 1 and Level 2	Level 3	
		All Courses	Travel Lane Wearing Course	All Other Courses
	Surface Temperature*	From To Inclusive	From To Inclusive	From To Inclusive
Less than 2 inches	60 °F	All Year**	3/15 9/30	All Year**
2 inches - 2 1/2 inches	50 °F	All Year**	3/15 9/30	All Year**
Greater than 2 1/2 inches	40° F	All Year**	3/15 9/30	All Year**
Temporary	40 °F	All Year**	All Year**	All Year**

* Do not use field burners or other devices to heat the pavement surface to the specified minimum temperature.

** If placing ACP between March 15 and September 30, temperature requirement may be lowered 5 °F.

00744.41 Mixing Temperatures - Produce ACP within the temperature ranges recommended by the asphalt cement supplier for the grade of asphalt being used on the Project.

Establish the allowable mixing and placement temperature ranges by the JMF. Measure the mixture temperature at the discharge of the mixer. Measure the placement temperature behind the paver. The allowable production temperatures may be adjusted based on the asphalt cement supplier's recommendation if approved by the Engineer. The maximum mixture temperature and the minimum placement temperature shall be as follows:

Type	Temperature, °F	
	Maximum at Mixer	Minimum Behind Paver
HMAC	350	240
WMAC	275	215

Within the above limits, the Contractor with approval of the Engineer, or the Engineer may adjust this temperature in 10 °F increments from the JMF as follows:

- **Up** - If the aggregate coating, moisture content, workability or compaction requirements are not attained.
- **Down** - If the aggregate coating, moisture content, workability and compaction requirements are attained.

00744.42 Tack Coat - Construct a tack coat before placing each lift of ACP according to Section 00730. A tack coat is not required before placing ACP on aggregate base.

Treat all paved surfaces on and against which ACP is to be placed with an asphalt tack coat according to Section 00730. Before applying the tack coat, clean and dry the surface to be tacked.

Remove all loose material that will reduce adhesion of the tack by brooming, flushing with water, or other approved methods.

00744.43 Hauling, Depositing, and Placing - Haul, deposit, and place ACP according to the following:

(a) Hauling - Cover ACP if rain is encountered any time between loading and placement.

ACP will be rejected before placing if one or more of the following occurs:

- Below temperature limit specified in 00744.41.
- Slumping or separating.
- Solidifying.

Dispose of rejected loads at no additional cost to the Agency.

Deliver the mixture to the paving machine at a rate that provides continuous operation of the paving machine, except for unavoidable delay or breakdown. If excessive stopping of the paving machine occurs during paving operations, the Engineer may suspend paving operations until the mixture delivery rate matches the paving machine operation.

(b) Depositing - Deposit ACP from the hauling vehicles so segregation is prevented.

(c) Placing - Alternative equipment and means may be allowed by the Engineer if the use of a paver is impractical.

Do not place ACP during rain or other adverse weather conditions, unless allowed by the Engineer. ACP in transit at the time adverse conditions occur may be placed if:

- It has been covered during transit.
- The ACP temperature is satisfactory.
- It is placed on a foundation free from pools or flow of water.

Place the mixture in the number of lifts and courses, and to the compacted thickness for each lift and course, as shown. Place each course in one lift unless otherwise specified. Do not exceed a compacted thickness of 4 inches for any lift. Limit the minimum lift thickness to twice the maximum aggregate size in the mix.

00744.44 Longitudinal Joints - At longitudinal joints, bond, compact and finish the new ACP equal to the ACP against which it is placed.

(a) Location - Place the ACP in panel widths which hold the number of longitudinal joints to a minimum. Offset the longitudinal joints in one panel by at least 6 inches from the longitudinal joints in the panel immediately below.

(1) Base Course - Place base course longitudinal joints within 12 inches of the edge of a lane, or within 12 inches of the center of a lane, except in irregular areas, unless otherwise shown.

(2) Wearing Course - Construct longitudinal joints at either lane lines or fog lines, or as shown or directed.

(b) Drop-offs:

- Provide warning signs and markings according to Section 00225 where abrupt or sloped edge drop-offs 1 inch or more in height occur.
- Protect edges from being broken down.

If unable to complete the pavement without drop-offs according to 00744.44(c) do the following:

- Construct and maintain a wedge of ACP at a slope of 1V:10H or flatter along the exposed longitudinal joint.
- Remove and dispose of the wedge before continuing paving operations.
- Construct, maintain, remove, and dispose of the temporary wedge at no additional cost to the Agency. ACP for the temporary wedge will be paid for at the pay item price.

(c) Placing Under Traffic - When placing ACP pavement under traffic, schedule work for the nominal thickness being laid as follows:

(1) More Than 2 Inches - Schedule work so at the end of each working shift the full width of the area being paved, including shoulders, is completed to the same elevation with no longitudinal drop-offs, unless approved.

(2) Less Than or Equal to 2 Inches - Schedule work so that at the end of each working shift one panel of new travel lane pavement does not extend beyond the adjoining panel of new travel lane pavement more than the distance normally covered by each shift. At the end of each week complete the full width of the area to be paved, including shoulders, to the same elevation with no longitudinal drop-offs.

00744.45 Transverse Joints:

(a) Travel Lanes - Construct transverse joints on the travel lane portion of all specified pavement courses, except leveling courses, as follows:

(1) Temporary End Panel - Maintain pavement depth, line and grade at least 4 feet beyond the selected transverse joint location, and from that point, wedge down on the appropriate slope until the top of the course being laid meets the underlying surface (assuming a pavement course thickness of 2 inches) as follows:

- For wedges that will be under traffic for less than 24 hours, construct an 8 foot long wedge (1V:50H taper rate).
- For wedges that will be under traffic for 24 hours or longer, construct a 25 foot long wedge (1V:160H taper rate).
- Construct, maintain, remove, and dispose of the temporary wedge at no additional cost to the Agency. ACP for the temporary wedge will be paid for at the pay item price.

When the pavement course thickness is different than the above 2 inch example, use the appropriate taper rate to compute the length of the wedge. The wedge length plus the 4 feet or longer panel form the temporary end panel.

(2) Vertical Face - After the mixture has reached the required density:

- Provide a smooth, vertical face the full depth of the course being laid at the location selected for the joint by sawing, cutting or other approved method.

- Remove the ACP material from the joint to the end of the panel. If removed before resuming paving beyond the joint, reconstruct the temporary end panel immediately by placing a bond-breaker of paper, dust, or other suitable material against the vertical face and on the surface to be occupied by the temporary end panel. Construct a full-depth panel at least 4 feet long, beginning at the sawed or cut joint, and taper it on a 1V:50H slope to zero thickness.

(3) Excess Asphalt Concrete Pavement - After completing a temporary end panel as specified, dispose of unused, remaining ACP as directed. Payment will be made for the entire load of ACP, but will be limited to only one load for each joint of each panel.

(4) Resume Paving - When permanent paving resumes, remove the temporary end panel and any bond-breakers. Clean the surface of all debris and apply a tack coat to the vertical edge and the surface to be paved.

(5) Joint Requirements - Compact both sides of the joint to the specified density. When tested with a straightedge placed across the joint, the joint surface shall conform to 00744.70.

(b) Abutting Bridge Ends - Compact the ACP abutting bridge ends and other rigid type structures in the longitudinal direction and either transverse or diagonal direction, as directed.

(c) Bridge Deck Overlays - Saw cut the wearing course of pavement directly over the joints in bridge decks, bridge end joints and end panel end joints as soon as practical but within 48 hours of paving each stage of the wearing course, unless otherwise directed. Saw cut a 3/8 inch wide, $\pm 1/8$ inch, by 1/2 inch less than the thickness of the panel of pavement depth or 1 1/2 inches deep, whichever is less.

Flush the saw cut thoroughly with a high-pressure water stream after the cut has been made. Before the cut dries out, blow it free of water and debris with compressed air. Fill the joint with a poured filler from the QPL.

00744.49 Compaction - After the ACP has been spread, struck off, and surface irregularities and other defects remedied, roll it uniformly until compacted to a minimum of 91 percent of MAMD. Perform finish rolling and continue until all roller marks are eliminated.

Determine compliance with density specifications by random testing of the compacted surface with calibrated nuclear gauges. Determine the density by averaging QC tests performed by a CDT with the nuclear gauge operated in the backscatter mode according to WAQTC T 8 at one random location for each 100 tons of asphalt concrete placed, but take no less than 10 tests each shift. Do not locate the center of a density test less than 1 foot from the panel edge. Calculate MAMD according to ODOT TM 305. The Engineer may waive compaction testing upon written notice.

Compaction to a specified density will not be required for the following:

- **Thin Pavements** - Leveling, patches, or where the nominal compacted thickness of a course of ACP will be less than 2 inches.
- **Other Areas** - Temporary surfacing, guardrail flares, mailbox turnouts, road approaches, and areas of restricted width of less than 8 feet wide or limited length, regardless of thickness.

Compact thin pavements and other areas according to 00749.45.

Maintenance

00744.60 Correction of Defects - Correct all defects in materials and work, as directed, at no additional cost to the Agency, according to the following:

(a) Fouled Surfaces - Repair, clean, and retack fouled surfaces that would prevent full bond between successive lifts of mixture.

(b) Boils, Slicks, and Oversized Material - Replace boils, slicks, and oversized materials with fresh mixture.

(c) Segregation - Take corrective measures when segregation or non-uniform surface texture is occurring in the finished mat. If segregation continues to occur, stop production until a plan for providing uniform surface texture is approved.

(d) Roller Damage to Surface - Correct surface damage from rollers with additional fresh mixture or by other approved means.

(e) Longitudinal Joints - Take corrective measures when open longitudinal joints are being constructed or when the elevation of the two sides of a longitudinal joint does not match. If problems with the longitudinal joint continue to occur, stop production until a plan for providing tight, equal elevation longitudinal joints is approved.

(f) Other Defects - Remove and replace any ACP that:

- Is loose, broken, or mixed with dirt.
- Shows visually too much or too little asphalt.

Finishing and Cleaning Up

00744.70 Pavement Smoothness - Furnish a 12 foot straightedge. Test with a 12 foot straightedge parallel to and perpendicular to the centerline, as directed. The pavement surface shall not vary by more than 1/4 inch. Mark areas not meeting the surface tolerance.

00744.75 Correction of Pavement Roughness - Correct equipment or paving operation procedures when tests show the pavement smoothness does not comply with 00744.70. In addition, do the following:

(a) Methods - Correct surface roughness to the required tolerances, using one of the following methods as approved by the Engineer:

- Remove and replace the wearing surface lift.
- Profile to a maximum depth of 0.3 inch with abrasive grinders equipped with a cutting head comprised of multiple diamond blades, and apply an emulsion fog seal as directed.

(b) Time Limit - Complete correction of all surface roughness within 14 calendar days following notification, unless otherwise directed.

Measurement

00744.80 Measurement - The quantities of ACP will be measured on the weight basis.

No deductions will be made for asphalt cement, mineral filler, lime, anti-strip, or any other additive used in the mixture.

Payment

00744.90 Payment - The accepted quantities of ACP incorporated into the project, whether or not recycled materials are used, will be paid for at the Contract unit price, per ton, for the item "Level ____, _____ ACP Mixture _____".

The following will be inserted in the blanks:

- The level of ACP (1, 2, 3) will be inserted in the first blank.
- The type of ACP (3/4 inch, 1/2 inch, 3/8 inch), will be inserted in the second blank.
- The words "in Leveling", "in Temporary", or "in Leveling and Temporary" will be inserted in the third blank when applicable.

Payment will be payment in full for furnishing and placing all materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

No separate or additional payment will be made for:

- asphalt cement, mineral filler, lime, and anti-stripping or other additives
- sawing, cleaning, and filling joints on bridge deck overlays

Section 02630 - Base Aggregate

Description

02630.00 Scope - This Section includes the requirements for aggregates in base.

Materials

02630.10 Dense-Graded Aggregate:

(a) Grading - Dense-graded base aggregate shall be crushed rock, including sand. Uniformly grade the aggregates from coarse to fine. Sieve analysis shall be determined according to AASHTO T 27. The aggregates shall conform to one of the grading requirements of Table 02630-1 as identified in the Special Provisions or indicated by the pay items in the Contract Schedule of Items.

Table 02630-1
Grading Requirements for Dense-Graded Aggregate
Separated Sizes

Sieve Size	2 1/2" - 0	2" - 0	1 1/2" - 0	1" - 0	3/4" - 0
Percent Passing (by Weight)					
3"	100				
2 1/2"	95 - 100	100			
2"	-	95 - 100	100		
1 1/2"	-	-	95 - 100	100	
1 1/4"	55 - 75	-	-	-	
1"	-	55 - 75	-	90 - 100	100
3/4"	-	-	55 - 75	-	90 - 100
1/2"	-	-	-	55 - 75	-
3/8"	-	-	-	-	55 - 75
1/4"	30 - 45	30 - 45	35 - 50	40 - 55	40 - 60
No. 4 ¹	-	-	-	-	-
No. 10	2	2	2	2	2

¹ Report percent passing sieve when no grading requirements are listed

² Of the fraction passing the 1/4 inch sieve, 40 percent to 60 percent shall pass the No. 10 sieve

(b) Fracture Of Rounded Rock - Fracture of rounded rock shall be determined according to AASHTO T 335. Provide at least one fractured face based on the following percentage of particles retained on the 1/4 inch sieve for the designated size:

Minimum Percent of Fractured Particles (by Weight of Material)

Designated Size	Retained on 1/4 inch Sieve
1 1/2" - 0 and larger	50
Smaller than 1 1/2" - 0	70

(c) **Durability** - Dense-graded aggregate shall meet the following durability requirements:

Test	Test Method	Requirements
Abrasion	AASHTO T 96	35.0% maximum
Degradation (coarse aggregate) Passing No. 20 sieve	ODOT TM 208	30.0% maximum
Sediment Height	ODOT TM 208	3.0" maximum

(d) **Sand Equivalent** - Dense-graded aggregate shall be tested according to AASHTO T 176, and shall have a sand equivalent of not less than 30.

02630.11 Open-Graded Aggregate:

(a) **Grading** - Open-graded aggregate shall conform to the following grading requirements:

**Table 02630-2
Aggregate Gradation for Open-Graded Aggregate**

Sieve Size	Percent Passing (by Weight)
1"	100
3/4"	80 - 98
1/2"	60 - 85
3/8"	30 - 65
No. 10	5 - 20
No. 40	0 - 6
No. 100	0 - 3 (Dry Sieve)

(b) **Fracture of Rounded Rock** - Fracture of rounded rock shall be determined according to AASHTO T 335. Open-graded aggregate fracture requirements shall conform to the following:

Percentage of Fracture (by Weight)	
Material Retained on 3/4", 1/2", and 1/4" Sieves (two fractured faces)	90
Material Retained on No. 10 Sieve (one fractured face)	75

(c) **Durability** - Open-graded aggregate shall meet the durability requirements of 02630.10(c).

APPENDIX 3

DRAINAGE REPORT

PROJECT DRAINAGE REPORT

Project Sponsor: City of Seaside, OR
 Project Location: Seaside Municipal Airport
 Project Name: 2015 Runway Lighting and Other Improvements

Project Introduction

This drainage design report is to document the drainage design for the 2015 Runway Lighting, Taxiway Paving, Fencing, and Obstruction Removal Project. Specifically, this report will address the stormwater runoff impacts to wetlands, which includes the Taxiway Paving only. The proposed project is an FAA Airport Improvement Project sponsored by the City of Seaside for the Seaside Municipal Airport. A wetland delineation has been conducted for the project area of potential impact and the delineation has received concurrence from the State of Oregon Department of State Lands. All other proposed construction either has no or temporary wetland impact and does not increase impervious area contributing to the wetland. See Figures 1 and 2 for an aerial images indicating the proposed impact for the 2 areas of proposed taxiway pavement in wetlands.

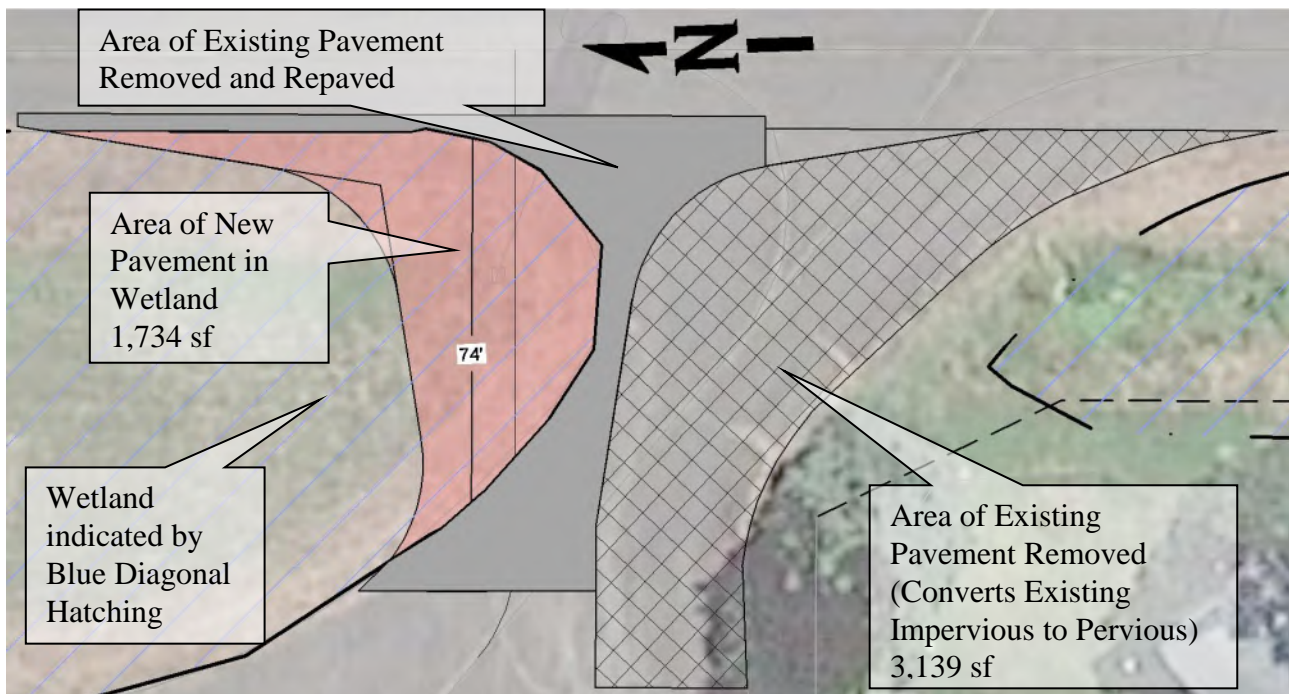


Figure 1 - Midfield Taxiway Realignment

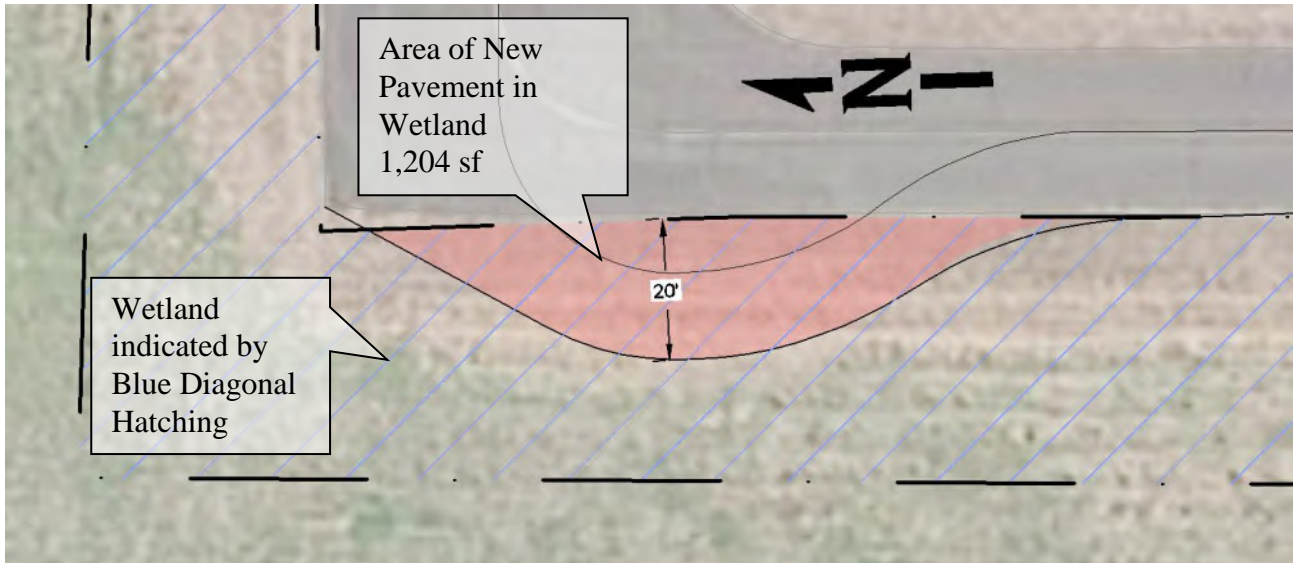


Figure 2 - North Taxiway Widened Pavement

As indicated by Figure 1, there is a portion of the existing pavement that will be removed, decreasing the impervious area contributing storm runoff to wetlands. The total area of impervious removed permanently is 3,139 square feet (sf). The proposed new impervious pavement area is 1,734 sf from Figure 1 (Midfield Taxiway) and 1,204 sf from Figure 2 (North Taxiway). The Net change is a *decrease* in impervious area of 201 sf.

Wetland Consideration and Requirements

It is the general guidance from both the State and Federal agencies to minimize impacts to wetlands. However, the paving proposed for this project that impacts wetlands is a required improvement for the airport to improve safety of the airfield to life and property. The design will minimize impacts to wetlands to the extent possible while still achieving the required safety improvements.

Also, in general, new impervious storm runoff should be treated before it discharges to wetlands. However, the agencies have agreed to allow treatment of an existing parking lot outside the airport fence in lieu of treating the runoff from the proposed pavement. The stormwater runoff from the parking lot is currently not being treated before it discharges to a drainage system which eventually discharges to a wetland within 1000 feet. With the net reduction in impervious area, the amount of runoff discharging to wetlands will decrease as a result of this project. The FAA will not allow construction projects to create new wildlife attractants, such as a treatment swale or detention pond, within the Aircraft Operations Area and any treatment would further impact wetlands, so the treatment of the parking lot runoff was an accepted approach. See Figure 3 for the existing parking lot and the proposed treatment swale.

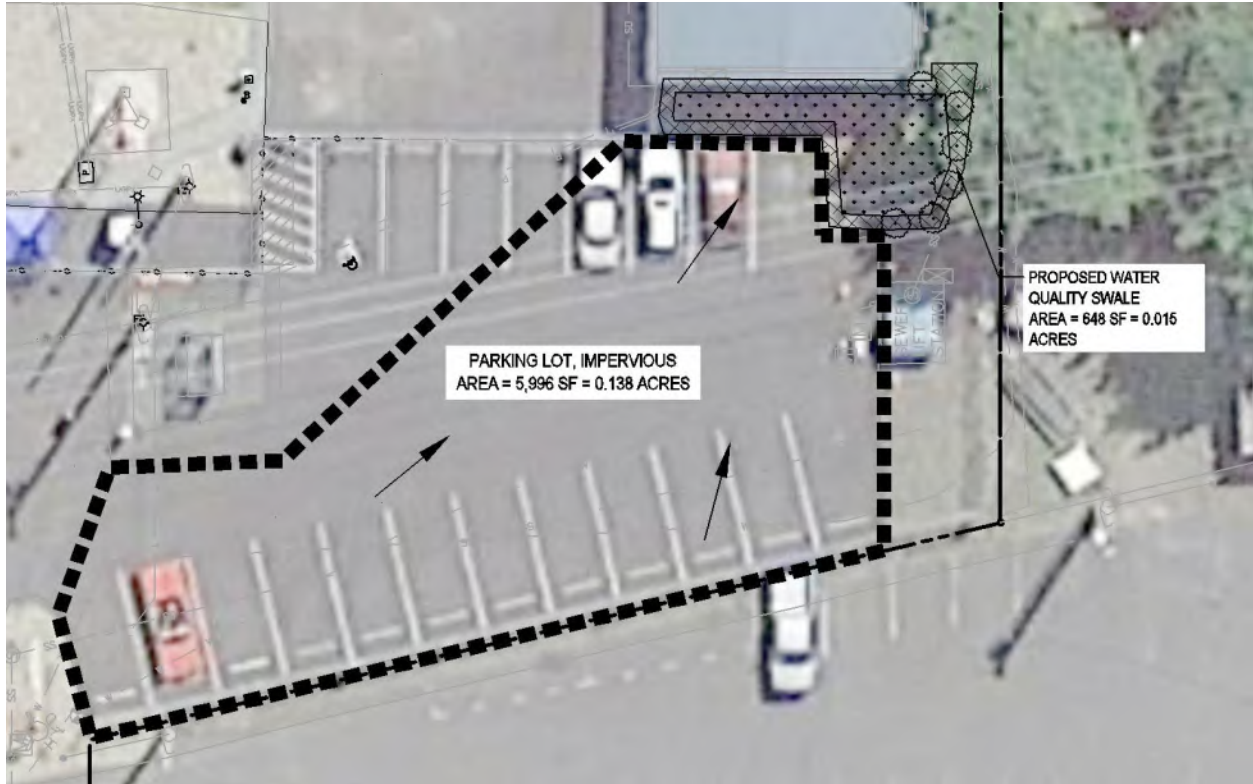


Figure 3 - Existing parking lot and proposed swale

Storm water Treatment Design Criteria

The following criteria has been used in the design of the stormwater treatment facility for the existing parking lot:

- Stormwater treatment design conforms to City of Portland (C.O.P) Stormwater Management Manual, dated January 2014. The “Simplified Method” shall be utilized as allowed by section 2.2. A vegetated swale is the proposed treatment facility
 - For proposed pavement areas less than 10,000 sf, the swale area must be 9% of the proposed pavement area.
- Detention capacity will be sized to accommodate 50% of the 2 year storm.

Existing Soil

According to the NRCS Web Soil Survey the existing soil at the proposed swale is sandy soil with a permeability of 1.98 inches per hour. This information coincides with engineering assumptions made from site inspections during previous projects and its proximity to the ocean.

Storm Information

The 2 Year, 24 hour storm was the design storm used in the swale analysis and design. Per the Oregon DOT Hydraulic Manual, the 2 Year, 24 hours storm for seaside is approximately 3.5 inches of rainfall.

Swale Design

The proposed swale has been designed to treat and infiltrate all runoff from the existing parking lot for a 2 Year, 24 hour storm event, but also infiltrates all runoff from a 10 year event. The swale area meets the 9 percent requirement from the City of Portland Standards. See Table 1 below for the summary calculations. The infiltration and storage capacity is approximately twice the amount of runoff generated from a 2 year and 10 year event.

Impervious Parking Lot Area Contributing Runoff to Proposed Water Quality Swale	5996	sf
Required Swale Surface Area (0.09 sf)	540	sf
Proposed Swale Surface Area	648	sf
Total Runoff Generated from Impervious Area during 2 year design storm (3.5 inches)	1749	Cubic Feet
Total Runoff Generated from Impervious Area during 10 year design storm (4.5 inches)	2249	Cubic Feet
24 hr Infiltration capacity of swale (assume 1.98 in/hr)	2566	Cubic Feet
Detention Storage Available in Swale (Volume)	908	Cubic Feet
Total Swale Storage Available (Detention Volume + 24 hr Infiltration Capacity)	3474	Cubic Feet
Percent of Runoff Stored and Infiltrated from 2 year Storm	100%	
Percent of Runoff Stored and Infiltrated from 10 year Storm	100%	

Table 1

Conclusion

The proposed project at the Seaside Municipal Airport includes constructing a small area of pavement in an existing wetland. To minimize impact to the wetland, some existing pavement is being removed permanently to create a net loss in impervious surfaces discharging runoff to the existing wetlands. In addition, this project will create a water quality treatment vegetated swale to treat runoff from an existing parking lot which currently has no treatment. The area being treated is close to twice the area of the proposed pavement and the storage capacity of the swale is sufficient to prevent runoff from the existing parking lot during a 2 year and 10 year storm event from entering existing wetlands. The water quality swale has been designed per the City of Portland Stormwater Management Manual.