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Federal Aviation Agency

ADVISORY CIRCULAR

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AIRPORTS	
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SUBJECT: MATERIALS AND TEST REQUIRED BY AC 150/5370-1, STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS

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1. PURPOSE. This circular transmits seven attachments listing the specifications for various materials and methods of testing established as standards by the American Association of State Highway Officials (AASHO), American Society for Testing and Materials (ASTM), or the Federal Government. These specifications and test methods are required by AC 150/5370-1, Standard Specifications for Construction of Airports.

2. GENERAL. These lists will be useful in establishing the kind and amount of testing that will be required to determine the suitability of construction materials prior to actual construction. Also, the kind and amount of testing needed during construction to determine that the materials and finished products do fulfill the requirements of the project plans and specifications can be established through the use of these lists.

3. HOW TO GET THIS CIRCULAR. Obtain additional copies of this circular, AC 150/5370-3 , Materials and Tests Required by AC 150/5370-1, Standard Specifications for Construction of Airports, from the Federal Aviation Agency, Printing Branch, HQ-438, Washington, D.C. 20553.

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ATTACHMENT 1. AASHO AND/OR ASTM SPECIFICATIONS FOR MATERIALS REFERENCED IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS

AASHO	ASTM	Title
M-6	C-33	Fine Aggregate for Portland Cement Concrete
M-17	D-242	Mineral Filler for Sheet Asphalt and Bituminous Concrete Pavements
M-18	D-241	Oil Asphalt Filler
M-20	D-946	Asphalt Cement (Prepared from Petroleum)
M-31	A-15	Billet Steel Reinforced Bars
M-33	D-994	Preformed Bituminous Expansion Joint Filler
M-36		Corrugated Metal Culvert Pipe
M-42	A-16	Rail Steel Reinforcement Bars
M-45	C-144	Mortar Sand
M-52	D-490	Tar for Use in Road Construction
M-53	A-160	Axle Steel Reinforcement Bars
M-54	A-184	Steel Bar or Rod Mats for Reinforcement
M-55	A-185	Welded Wire Fabric for Reinforcement
M-65		Clay Pipe
M-73	C-440	Cotton Mats for Curing Concrete
M-75	D-694	Crushed Stone and Slag for Base Course
M-80	C-33	Coarse Aggregate for Portland Cement Concrete
M-81	D-597	Cutback Asphalt, Rapid Curing

ATTACHMENT 1. AASHO AND/OR ASTM SPECIFICATIONS FOR MATERIALS REFERENCED IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

AASHO	ASTM	Title
M-82	D-598	Cutback Asphalt, Medium Curing
M-83		Liquifier
M-85	C-150	Portland Cement
M-86	C-14	Concrete Sewer Pipe
M-90		Redwood Board Expansion Joint Filler
M-91	C-32	Sewer Brick
M-103	A-27	Carbon Steel Castings
M-105	A-48	Gray Iron Castings
M-106	A-47	Malleable Iron Castings
M-111	A-123	Zinc Coating on Fabricated Products
M-134	C-175	Air-Entraining Portland Cement
M-135	C-10	Natural Cement
M-136		Corrugated Metal Pipe Underdrain
M-137	A-305	Deformation of Steel Bars
M-139	C-171	Waterproof Paper for Curing Concrete
M-140		Emulsified Asphalt
M-141		Slow Curing Liquid Asphalt Road Material
M-144	D-98	Calcium Chloride
M-148		Membrane-Forming Curing Compounds
M-151	C-205	Portland Blast-Furnace Slag Cement
M-153	D-1751 D-1752	Resilient Preformed Expansion Joint Fillers

ATTACHMENT 1. AASHO AND/OR ASTM SPECIFICATIONS FOR MATERIALS REFERENCED IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

AASHO	ASTM	Title
M-154	C-260	Air-Entraining Admixtures for Concrete
M-157	C-94	Ready-Mixed Concrete
M-158		Bituminized-Fiber Drain Pipe
M-170	C-76	Reinforced Concrete Culvert Pipe
M-171		Polyethylene Sheeting for Curing Concrete
M-175	C-444	Perforated Concrete Drain Pipe
M-176		Porous Concrete Pipe
M-177		Perforated Bituminized-Fiber Drain Pipe
M-181		Chain Link Fence
M-189		Perforated Asbestos Cement Drain Pipe
M-190		Bituminous Coated Metal Culvert Pipe and Arches
M-196		Corrugated Aluminum Alloy Pipe
M-197		Perforated Corrugated Aluminum Pipe
	C-6	Hydrated Lime
	C-13	Standard Strength Clay Pipe
	C-200	Extra Strength Clay Pipe
	C-261	Standard Strength, Unglazed Clay Pipe
	C-278	Extra Strength Unglazed Clay Pipe
	C-350	Fly Ash Admixture for Concrete
	C-402	Raw or Calcined Pozzolans for Admixture in Concrete
	C-425	Vitrified Clay Pipe Joints

ATTACHMENT 1. AASHO AND/OR ASTM SPECIFICATIONS FOR MATERIALS REFERENCED IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

AASHO	ASTM	Title
	C-443	Joints for Circular Concrete Pipe
	C-462	Standard Strength Ceramic Clay Glazed Pipe
	C-463	Extra Strength Ceramic Clay Glazed Pipe
	C-494	Chemical Admixtures for Concrete

ATTACHMENT 2. FEDERAL SPECIFICATIONS REFERENCED IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS

Number	Included in Item	Title
J-C-103	L-101-102-107 109-112-119	Cable, power, electrical and wire, electrical, general purpose
J-C-129	L-101-102-107 108-109-112 119	Cable and wire; thermoplastic-insulated, general purpose
J-C-145	L-119	Cable, power electrical and wire electrical, weather resistant
L-C-00740	L-110	Conduit and fittings, plastic
R-P-00355	P-625	Pitch; coal tar for coating bituminous pavements
R-T-143	P-625	Tars; for use in road construction
W-C-571	L-109-110	Conduit and fittings (asbestos cement)
W-C-581	L-109-110-119	Conduit and fittings (bituminized fiber)
HH-P-117	D-701	Packing; jute, twisted
HH-G-156	D-701	Gaskets, general purpose
RR-F-183	F-162	Fence-posts, gates and accessories
RR-F-191	F-162	Fencing, chain-link fabric
RR-F-221	F-160-161-162	Fencing, wire
SS-A-674	P-626	Asphalt; paving emulsion
SS-P-331	D-701	Pipe; asbestos-cement, sewer, nonpressure
SS-R-451	L-109	Roof-coating; asphalt
SS-S-156	P-605	Sealer; cold-application emulsion type, for joints in concrete
SS-S-158	P-605	Sealing compound; cold-application ready-mixed liquifier type, for joints in concrete
SS-S-159	P-605	Sealing compound; cold-application mastic multiple component type, for joints in concrete

ATTACHMENT 2. FEDERAL SPECIFICATIONS REFERENCED IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

Number	Included in Item	Title
SS-S-164	P-605	Sealer, hot-poured type, for joints in concrete
SS-S-167	P-605	Sealing compound, jet-fuel resistant, hot applied, concrete paving
SS-S-169	D-701	Sealer, sewer pipe, joint
SS-S-170	P-605	Sealing compound, two-components, jet fuel resistant, cold applied, concrete paving
SS-S-00200	P-605	Sealing compound, two-components, elastomeric, polymer type, jet-fuel resistant, cold-applied, concrete paving
TT-C-00800	P-501	Curing compound, concrete, for new and existing surfaces
TT-D-651	L-101-102-103 107-109-112	Drier, paint, liquid
TT-E-487	L-109	Enamel; floor and deck
TT-O-369	L-101-102-103 107-109-112	Linseed oil, raw (use TT-L-215)
TT-P-53	L-112	Paint, ready mixed, outside
TT-P-59	L-101-102-103 107	Paint, ready mixed, international orange
TT-P-102	L-101-102-103 107-109	Paint, oil; titanium-lead-zinc and oil, exterior
TT-P-641	L-101-102-103 107-112	Primer, paint; zinc dust-zinc oxide
TT-R-191	L-101-102-103 107-109-112	Red lead, dry and paste-in-oil

ATTACHMENT 2. FEDERAL SPECIFICATIONS REFERENCED IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

Number	Included in Item	Title
TT-T-801	L-101-102-103 107-109-112	Turpentine
WW-C-581	L-101-102-107 109-110-112 114-119-121	Conduit, metal, rigid and coupling
MIL-T-8637	L-103	Tower and Extension, Aerial Navigation Beacon
MIL-I-7854	L-107	Army-Navy Aeronautical Specification - Indicator Assemblies; Wind Cone

ATTACHMENT 3. TEST METHODS REFERENCED IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS

AASHO	ASTM	Title
T-11	C-117	Amount of Material Finer than No. 200 Sieve in Aggregate
T-26		Quality of Water to be Used in Concrete
T-27	C-136	Sieve Analysis of Fine and Coarse Aggregate
T-84	C-128	Specific Gravity and Absorption of Fine Aggregate
T-85	C-127	Specific Gravity and Absorption of Coarse Aggregate
T-87	D-421	Dry Preparation of Disturbed Soil Sample For Test
T-89	D-423	Determining Liquid Limit of Soils
T-90	D-424	Determining the Plastic Limit of Soils
T-91	D-424	Calculating the Plasticity Index of Soils
T-96	C-131	Abrasion of Coarse Aggregate by use of the Los Angeles Machine
T-99	D-698	Moisture-Density Relations of Soils Using a 5.5 lb. Rammer and a 12" Drop
T-101		Determining Swell Characteristics of Aggregate When Mixed With Bituminous Materials
T-104	C-88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
T-119	C-143	Slump of Portland Cement Concrete
T-121	C-138	Weight per Cubic Foot, Yield and Air Content (Gravimetric)
T-134	D-558	Moisture-Density Relations of Soil Cement Mixture
T-135	D-559	Wetting and Drying Test of Compacted Soil-Cement Mixtures

ATTACHMENT 3. TEST METHODS REFERENCED IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

AASHO	ASTM	Title
T-136	D-560	Freezing and Thawing Tests of Compacted Soil-Cement Mixtures
T-152	C-231	Air Content of Freshly Mixed Concrete by the Pressure Method
T-155	C-156	Water Retention Efficiency of Concrete Curing Materials
T-180	D-1557	Moisture-Density Relations of Soils using a 10 lb. Rammer and an 18" Drop
T-182	D-1664	Stripping Test for Bitumen-Aggregate Mixtures

ATTACHMENT 4. MATERIALS REQUIRED IN SEPARATE ITEMS OF STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS

AASHO Specification (Short Title)	Number	P-301	-302	-304	-501	-610
Fine Aggregate	M-6				x	x
Oil Asphalt Filler	M-18					x
Billet Steel	M-31				x	x
Joint Filler	M-33					x
Rail Steel	M-42				x	x
Axle Steel	M-53				x	
Steel Mats	M-54				x	
Wire Fabric	M-55				x	x
Cotton Mats	M-73				x	
Coarse Aggregate	M-80				x	x
Asphalt - RC	M-81		x	x		
Portland Cement	M-85	x	x	x	x	x
Joint Filler	M-90				x	x
Air-entraining P. C.	M-134	x		x	x	x
Natural Cement	M-135				x	x
Steel Deformations	M-137				x	x
Waterproof Paper	M-139			x	x	
Calcium Chloride	M-144				x	x
Curing Compound	M-148				x	
Slag Cement	M-151				x	x
Joint Filler	M-153				x	x
Admixture	M-154				x	x
Ready-mixed Concrete	M-157				x	

ATTACHMENT 4. MATERIALS REQUIRED IN SEPARATE ITEMS OF STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

AASHO Specification (Short Title) cont'd.	Number	P-301	-302	-304	-501	-610
Polyethylene Sheeting	M-171				x	
Fly Ash	C-350 (ASTM)				x	
Pozzolan	C-402 (ASTM)				x	
Chemical Admixture	C-494 (ASTM)				x	

ATTACHMENT 4. MATERIALS REQUIRED IN SEPARATE ITEMS OF STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

AASHO Specification (Short Title)	Number	D-701	-705	-706	-751	-753	-755
Corrugated Metal Pipe	M-36	x			x		
Mortar Sand	M-45	x	x		x	x	x
Clay Pipe	M-65	x	x				
Portland Cement	M-85	x			x	x	x
Concrete Pipe	M-86	x					
Sewer Brick	M-91				x		
Carbon Steel Castings	M-103				x		
Gray Iron Castings	M-105				x		
Malleable Iron Castings	M-106				x		
Zinc Coatings	M-111				x		
Corrugated Metal Pipe	M-136		x				
Bituminized Pipe	M-158	x					
Reinforced Concrete Pipe	M-170	x			x		
Perforated Concrete Pipe	M-175		x				
Porous Concrete Pipe	M-176		x				
Perforated Bituminous Pipe	M-177		x				
Perforated Asbestos Pipe	M-189		x				
Bituminous Coated Pipe	M-190			x			
Corrugated Aluminum Pipe	M-196	x					
Perforated Aluminum Pipe	M-197		x				

ATTACHMENT 4. MATERIALS REQUIRED IN SEPARATE ITEMS OF STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

ASTM Specifications	Number	D-701	-705	-706	-751	-753	-755
Hydrated Lime	C-6	x	x				
Clay Pipe	C-13	x					
Clay Pipe	C-200	x					
Clay Pipe	C-261	x					
Clay Pipe	C-278	x					
Clay Pipe	C-425	x					
Joints for Pipe	C-443	x					
Clay Pipe	C-462	x					
Clay Pipe	C-463	x					

ATTACHMENT 4. MATERIALS REQUIRED IN SEPARATE ITEMS IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

AASHO Specification (Short Title)	Number	P-201	-204	-205	-206	-215	-216	-401	-405
Mineral Filler	M-17	x	x			x		x	
Asphalt Cement	M-20	x						x	x
Tar	M-52	x	x				x	x	x
Crushed Stone	M-75			x	x				
Asphalt - RC	M-81		x				x		
Asphalt - MC	M-82						x		
Portland Cement	M-85		x				x		
Asphalt - SC	M-141						x		

AASHO Specification (Short Title)	Number	P-408	-410	-411	-602	-603	-604	-609	-626
Mineral Filler	M-17								x
Asphalt Cement	M-20	x	x	x		x		x	
Tar	M-52	x			x	x	x	x	
Asphalt - RC	M-81					x	x	x	
Asphalt - MC	M-82				x				
Liquifier	M-83		x	x					

ATTACHMENT 5. TESTS REQUIRED IN SEPARATE ITEMS OF STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS

AASHO Test (Short Title)	Number	P-152	-154	-201	-204	-205	-206	-208	-209	-210	-211	-212	-213	-214	-215	-216	-217
Gradation	T-11			x	x	x	x	x	x	x		x	x	x	x	x	
	T-27																
Specific Gravity	T-84																
	T-85			x										x			
Sample Preparation	T-87									x							
Liquid Limit	T-89		x	x	x			x	x	x		x	x		x	x	x
Plasticity Index	T-90																
	T-91		x	x	x			x	x	x		x	x		x	x	x
Abrasion	T-96			x	x	x	x	x	x					x	x	x	x
Density	T-99				x										x	x	x
Swell	T-101			x	x										x		
Soundness	T-104			x		x	x		x					x	x		
Stripping	T-182			x	x									x	x	x	
Sand Stability	T-607 (FAA)															x	
Density	T-611 (FAA)	x	x					x	x	x	x		x				

ATTACHMENT 5. TESTS REQUIRED IN SEPARATE ITEMS OF STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

AASHO Test (Short Title)	Number	P-301	-302	-304	-401	-405	-408	-410	-501	-604	-609	-610	-625	-626
Gradation	T-11, T-27	x		x	x	x	x		x	x	x	x	x	x
Water	T-26	x	x	x					x		x			
Specific Gravity	T-84, T-85				x	x		x	x		x	x		
Liquid Limit	T-89			x	x		x							x
Plasticity Index	T-90, T-91			x	x		x							x
Abrasion	T-96		x	x	x	x		x	x	x	x	x		
Swell	T-101				x	x	x							
Soundness	T-104		x	x	x			x	x		x	x		
Slump	T-119								x			x		
Yield	T-121								x			x		
Density	T-134	x		x										
Wet-Dry	T-135	x		x										
Freeze Thaw	T-136	x		x										
Air Content	T-152								x					
Water Retention	T-155								x					
Stripping	T-182									x				x
Density	T-611 (FAA)		x	x			x							

ATTACHMENT 6. CONSTRUCTION REQUIREMENTS CONTAINED IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS

Item	Title	Thickness of Layers	Density	Thickness Measurements
P-152	Excavation and Embankment	Max. 8" loose depth	Cut areas under pavement- Top 6" - 95% of T-611 Fill areas under pavement Top 9" - 95% of T-611 Other fill areas - 90% of T-611	
P-154	Subbase Course	3" to 8" compacted	95% of T-611	Each 500 s.y.
P-201	Bituminous Base Course	3" Maximum	92% of theoretical	Twice Daily
P-204	Mixed In-place Base Course	4" Maximum	95% of AASHO T-99	Each 300 s.y.
P-205 P-206	Dry and Wet Bound Macadam	3" to 4" Rolled 4" to 10" Vibrated		Each 300 s.y.
P-208 P-209 P-210 P-211 P-212 P-213	Base Courses	Variable 2½" to 6"	100% of T-611	Each 300 s.y.
P-214	Penetration Macadam Base Course	2" to 4"		Each 300 s.y.
P-215	Emulsified Asphalt Base Course	5"	94% of AASHO T-99	Twice Daily

ATTACHMENT 6. CONSTRUCTION REQUIREMENTS CONTAINED IN STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS (cont'd.)

Item	Title	Thickness of Layers	Density	Thickness Measurements
P-216	Mixed In-place Base Course		95% of AASHO T-99	Each 300 s.y.
P-301 P-302 P-304	Cement-Aggregate Base Courses			Each day
P-401	Bituminous Surface Course	1" to 2"	92% of Theoretical	Twice Daily
P-408	Bituminous Limestone and Sand Surface Course	1" to 2"	90% of Theoretical	Twice Daily
P-410	Asphalt (Liquifier Type) Surface Course	1" to 2"		
P-411	Limestone and Asphalt Sand Surface Treatment		90% of Theoretical	Twice Daily

Surface Smoothness	Grade Tolerance	Thickness Tolerance
Subgrade 1/2" in 16'	0.05 feet from true grade	
Subbase 1/2" in 16'	0.05 feet from true grade	Not more than 1/2"
Base Course 3/8" in 16'		Not more than 1/2"
Surface Course 1/4" in 16' (P-401, 408, 410, 411, 501)		See P-501

ATTACHMENT 7. FREQUENCY OF TESTING

The following tabulation of frequency of testing for job control is recommended for guidance only. Rigid conformity with a frequency pattern established as a guide is not expected. The frequency may vary for individual projects or phases of projects in accordance with job conditions such as uniformity of materials at the source, the methods and equipment used, and weather conditions. The number of samples and the distribution of the locations from which they are taken should be such as to adequately assure or verify that the materials incorporated and construction produced are acceptable in accordance with the plans and specifications. The sampling and testing should be supplemented by sufficient visual inspection of the materials as a whole to ascertain whether the samples and tests are reasonably representative of the entire mass of materials. In addition, there should be sufficient observation of the actual construction operations and processes to ascertain whether they can be expected to consistently produce uniformly satisfactory results.

MATERIALS	TYPE OF TESTS	FREQUENCY
Subgrade (unclassified excavation, borrow, embankments)	Density and Moisture Content	One per layer for each 2000 s.y.
Aggregate for Subbase and Base Courses		
(Quality-preliminary)	Gradation, LL & PI Soundness	Six samples from each source
(Quality-construction)	Gradation, LL & PI Soundness	One for each 1000 c.y.
(In Place)	Density and Moisture Content	One per layer for each 1000 s.y.
Aggregates for Asphaltic Mixture		
(Quality-preliminary)	Gradation, LL & PI Soundness, Stripping, Job Mix	Six samples from each source
(Quality-construction)	Gradation, LL & PI	One for each 500 tons
(Pavement In Place)	Density	Two per day
Aggregates for Portland Cement Concrete		
(Quality-preliminary)	Gradation, Soundness	Six from each source
(Quality-construction)	Gradation	One for each 1000 c.y.
Portland Cement Concrete		
(During Construction)	Slump, yield, air content	Four per day
Manufactured Materials: Steel, cement, pipe, etc.	Applicable AASHO, ASTM, or Federal Specification requirements	Vendors certification or Engineers discretion