

POLYCAST[®]

Trench Drain Systems

Specifications for Airports



LENOIR CITY, INC.

POLYCAST® 600 Series Drainage System Specification for Airports

Specification Number 010888

Rev. 031902

1.0 General Requirements

- 1.1 This specification outlines the requirements for a precast, presloped polymer concrete drain system. No substitute product shall be accepted unless previously approved.
- 1.2 This document describes the design of the channels, the associated hardware, the materials to be used, the technical characteristics of the channels, and the requirements for packaging and shipping.
- 1.3 This document does not cover the manufacture of the product in detail and is intended only to define specific requirements. In all respects not covered by this document, the product shall be in accordance with the standard practice of the supplier.
- 1.4 The method of manufacturing, handling and shipping, and the quality of materials used shall be such as to ensure for the finished product the properties specified in this specification.
- 1.5 Where dimensions are given in this document without specific tolerances, or where no dimensions are given, the tolerances and the dimensions permitted by good shop practices shall be considered acceptable.
- 1.6 No merchandise shall be furnished for field use until written approval is received or unless the supplier is specifically authorized to the contrary. This approval shall not be construed as waiving the requirements of this document.
- 1.7 The design architect and/or engineer must be notified in advance, and a written approval obtained, for any changes in material or design of the product.
- 1.8 The design architect and/or engineer reserves the right to remove this item from the Approved Products List if the item falls below standards, as presented.
- 1.9 All components of the system shall be from one manufacturer and shall be POLYCAST® or an approved substitute.

2.0 Specific Requirements

- 2.1 The precast, presloped polymer concrete channels are designed to remove rain, melting snow and ice and the specific chemicals outlined in this document.
- 2.2 The precast, presloped polymer concrete drain system has been designed to be installed flush to grade. The minimum design live load is 250 psi as outlined in Advisory Circular (Airport Pavement Design and Evaluation) AC 150/5320-6D. Appendix "A".
- 2.3 The precast, presloped polymer concrete drain system shall be designed for installation in taxiways and hangars. In areas that are accessible to snowplows, a HARDNOSE™ frame must be used with a cast iron grate. The standard channel with a cast iron grate may be used in other areas.

- 2.4 The precast, presloped polymer concrete drain components must have a minimum average slope of 0.65%.
- 2.5 The HARDNOSE™ channel and the standard channel shall each have a minimum safety factor of five (5), for the minimum design live load specified.

3.0 Design and Dimensions

- 3.1 Each channel shall be four (4) feet in length or two (2) feet in length for half channels.
- 3.2 Provide two (2) lockdown mechanisms per four (4) foot section and one (1) per two (2) foot section. Lockdown bolts shall be provided with each channel and grate assembly. The lockdown bolts shall be 3/8" - 16 UNC stainless steel. A round washer shall be placed between the bolt head and the grate. The lockdown mechanism shall be designed for an installation torque of ten (10) ft./lbs.
- 3.3 Male and female end caps shall be provided where required. Each type of end cap shall be available with a removable diaphragm for flow through applications. (See Figures 1-2)
- 3.4 Transition pieces for female to female connections and male to male connections shall be available and provided where specified. (See Figures 4 & 5)
- 3.5 Each precast, presloped polymer concrete channel shall be designed with a means of mechanical engagement into the adjacent concrete. This locking key shall be along the bottom on both sides. This key must be centered and run along at least sixty (60) percent of the length of each channel. The transition from the locking key to the channel shall be developed in a manner which minimizes any stress concentrations on the channel or the adjacent concrete.
- 3.6 Alignment chairs shall be available which support the channel at the joint and aid in holding two corresponding channels together. These chairs shall be easy to install and adjust.
- 3.7 Catch basins shall also be available which have nominal outlet drain pipe provisions of 4", 6" and 8" or 10" and 12".

4.0 Materials Technical Requirements

- 4.1 Materials used in the manufacture of the precast, presloped polymer concrete drain system shall have the properties specified in this section.
- 4.2 Compressive strength shall be 14,000 psi and flexural strength shall be 3,000 psi when tested in accordance with ASTM C579 and C78 respectively.
- 4.3 Three specimens shall be tested for accelerated service in accordance with ASTM D756, Procedure E, with the exception that the specimen conditioning may be deleted.
- 4.4 Three specimens shall be exposed to each of the following chemical reagents in accordance with ASTM D543, Section 7, Procedure 1, using standard laboratory atmosphere and seven days for all tests.

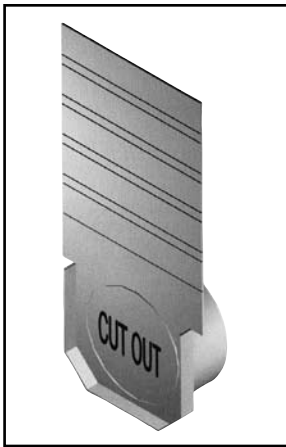


Figure 1.
DA0670 Female
End Cap

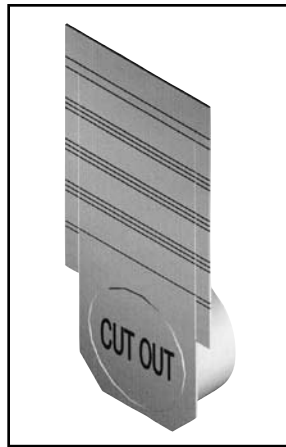


Figure 2.
DA0670M Male
End Cap

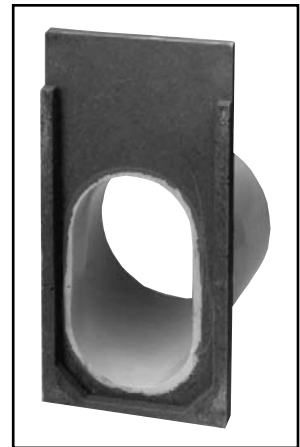


Figure 3.
DP0625D6 - 6" Outlet
End Cap

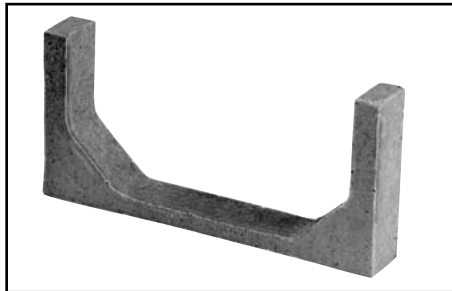


Figure 4.
DP0699M Male Joint Channel
Adaptor

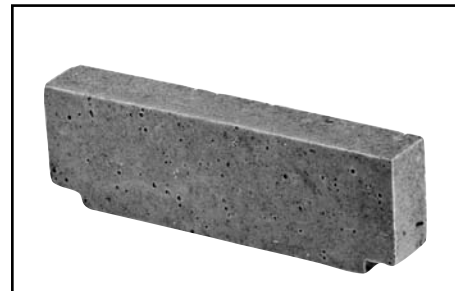


Figure 5.
DP0699F Female Joint Channel
Adaptor

Polyester Resin

<u>Chemical</u>	<u>Concentration</u>
Sodium Chloride	5%
Sulfuric Acid	0.1 N
Sodium Carbonate	0.1 N
Ethylene Glycol	100%
Naptha	100%
Sodium Sulfate	0.1 N
Hydrochloric Acid	0.2 N
Sodium Hydroxide	0.1 N
Acetic Acid	5%
Kerosene	Per ASTM D543
Diesel Fuel	100%
Fuel Oil	100%
Motor Oil	100%
Glycol	100%
Hydraulic Fluid (Standard)	100%
Jet Fuel JP-4	100%

- 4.5 After testing for accelerated service and chemical resistance, the material shall retain at least 75% of the strength of the control specimens and there shall be no more than 2% change in weight or any dimension.
- 4.6 Three specimens shall be tested for water absorption in accordance with ASTM D570, Sections 5 and 6.1. The specimens shall weigh approximately 9 ounces and have a thickness of 1/2". There shall be no more than a 2% change in weight or any dimension.
- 4.7 The test specimens, with the exception of the flammability test specimens, shall show no visual cracking, crazing, checking, blistering or surface pitting. Changes in color will be permitted only if the change does not indicate degradation of the material and, in the opinion of the user, the change will not be detrimental to the overall appearance of the product.

5.0 Packaging and Shipping

- 5.1 The precast, presloped polymer concrete drain system shall be shipped with all of the necessary hardware securely fastened to the channels or the shipping pallet.

6.0 Supplementary Specifications

- 6.1 Federal Aviation Administration (FAA) Advisory Circular Airport Pavement Design and Evaluation (AC 150/5320-6D Appendix 3 Design of Structures for Heavy Aircraft)

The most recent issue of the following unattached specifications shall be supplementary to this specification:

ASTM Standard D229, Method of Testing Rigid Sheet and Plate Materials Used for Electrical Insulation

ASTM Standard D543, Test Method for Resistance of Plastics to Chemical Reagents

ASTM Standard D570, Test Method for Water Absorption of Plastics

ASTM Standard D576, Practice for Determination of Weight and Shape Changes of Plastics Under Accelerated Service Conditions

ASTM Standard G53, Recommended Practice for Operating Light and Water Exposure Apparatus for Exposure of Non-Metallic Materials

ASTM Standard C78, Test Method for Flexural Strength of Concrete

ASTM Standard C579, Test Method for Compressive Strength of Chemical Resistant Mortars and Monolithic Surfacing

END OF SPECIFICATION 010888

POLYCAST® 3000 Series Large Capacity Drainage System Specification for Airports

Specification Number 051501

Rev. 021102

1.0 General Requirements

- 1.1 This specification outlines the requirements for a preformed, presloped surface drain system. No substitute product shall be accepted unless previously approved.
- 1.2 This document describes the design of the channels, the associated hardware, the materials to be used, the technical characteristics of the channels, and the requirements for packaging and shipping.
- 1.3 This document does not cover the manufacture of the product in detail and is intended only to define specific requirements. In all respects not covered by this document, the product shall be in accordance with the standard practice of the supplier.
- 1.4 The method of manufacturing, handling and shipping, and the quality of materials used shall be such as to ensure for the finished product the properties specified in this specification.
- 1.5 Where dimensions are given in this document without specific tolerances, or where no dimensions are given, the tolerances and the dimensions permitted by good shop practices shall be considered acceptable.
- 1.6 No merchandise shall be furnished for field use until written approval is received or unless the supplier is specifically authorized to the contrary. This approval shall not be construed as waiving the requirements of this document.
- 1.7 The design architect and/or engineer must be notified in advance, and a written approval obtained, for any changes in material or design of the product.
- 1.8 The design architect and/or engineer reserves the right to remove this item from the Approved Products List if the item falls below standards, as presented.
- 1.9 All components of the system shall be from one manufacturer and shall be POLYCAST® or an approved substitute.

2.0 Specific Requirements

- 2.1 The preformed, presloped channels are designed to remove rain, melting snow and ice and the specific chemicals outlined in this document.
- 2.2 The preformed, presloped drain system has been designed to be installed flush to grade. The minimum design live load is 250 psi as outlined in Advisory Circular (Airport Pavement Design and Evaluation) AC 150/5320-6D. Appendix "A".
- 2.3 The preformed, presloped drain system shall be designed for installation in taxiways, parking aprons, de-icing pads and hangars.
- 2.4 The preformed, presloped drain components must have a minimum average slope of 1%. The minimum length of continuously sloped channels shall be 120 feet.

- 2.5 At full channel conditions, the system flow rate shall not be less than 6.73 cfs and the flow velocity not less than 5.8 fps for continuously sloped runs.
- 2.6 Glass fiber reinforced polymer components shall have a minimum of 65% glass reinforcement and UV surfacing veil on inner and outer surfaces.

3.0 Design and Dimensions

- 3.1 Each channel shall be eight (8) feet in length.
- 3.2 Provide four (4) lockdown mechanisms per eight (8) foot section. Lockdown bolts shall be provided with each channel and grate assembly. The lockdown bolts shall be 3/8" - 16 UNC stainless steel. A round washer shall be placed between the bolt head and the grate. The lockdown mechanism shall be designed for an installation torque of ten (10) ft./lbs.
- 3.3 End caps shall be provided where required. Each end cap shall be available in closed style with a scored line to allow adaptation to an 8" pipe opening. (See Figure 1)
- 3.4 Transition pieces for inlet to inlet connections shall be available and provided where specified.
- 3.5 The shape of the channel shall lock into the concrete for the entire length of the channel. Channels deeper than 20" shall have an integral longitudinal stiffening rib reinforcement that locks into the concrete. Channel sidewall deflection shall not impede fluid flow or exceed 0.20 inches during concrete placement. The bottom shall be 8-5/8" inside to match 8" pipe diameter and be fully rounded. Radiused longitudinal transitions between vertical wall sections having a nominal inside width of 5-5/8" and the channel bottom are acceptable.
- 3.6 Integral chairs shall be incorporated into the frame to support the channel and aid in holding two corresponding channels aligned. These chairs shall be easy to adjust. The design of the chair shall be such that it can be used to support the channels from the bottom of the trench or hang the channels from the top of the trench.
- 3.7 The frame shall provide a concrete interlock. It shall also capture and support the channel sidewall. Frames shall not restrict the longitudinal movement of the drain body due to thermal expansion.
- 3.8 No composite material shall be between the frame grate bearing member and the encasing concrete.
- 3.9 The coefficient of thermal expansion for the channel bodies shall not exceed 4.5×10^{-6} in/in/ F.
- 3.10 The frame shall incorporate an integral air vent of a design and frequency to release air from under the bearing structure.
- 3.11 The frame material shall be _____ (galvanized steel) (stainless steel) as required.

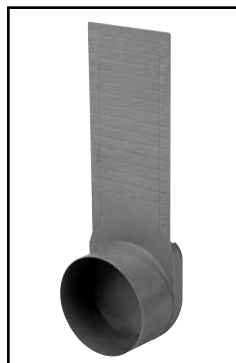


Figure 1.
DA3000A End
Cap/Adapter

4.0 Materials Technical Requirements

- 4.1** Materials used in the manufacture of the preformed, presloped drain system shall have the properties specified in this section.
- 4.2** Compressive strength shall be 10,000 psi and flexural strength shall be 8,000 psi when tested in accordance with ASTM D695 and D790 respectively.
- 4.3** Three specimens shall be tested for accelerated service in accordance with ASTM D756, Procedure E, with the exception that the specimen conditioning may be deleted.
- 4.4** Three specimens shall be exposed to each of the following chemical reagents in accordance with ASTM D543, Section 7, Procedure 1, using standard laboratory atmosphere and seven days for all tests.
- 4.5** After testing for accelerated service and chemical resistance, the material shall retain at least 75% of the strength of the control specimens and there shall be no more than 2% change in weight or any dimension.

Polyester Resin

Chemical	Concentration
Sodium Chloride	5%
Sulfuric Acid	0.1 N
Sodium Carbonate	0.1 N
Ethylene Glycol	100%
Naptha	100%
Sodium Sulfate	0.1 N
Hydrochloric Acid	0.2 N
Sodium Hydroxide	0.1 N
Acetic Acid	5%
Kerosene	Per ASTM D543
Diesel Fuel	100%
Fuel Oil	100%
Motor Oil	100%
Glycol	100%
Hydraulic Fluid (Standard)	100%
Jet Fuel	100%

- 4.6** Three specimens shall be tested for water absorption in accordance with ASTM D570. There shall be no more than a 2% change in weight or any dimension.
- 4.7** The test specimens, with the exception of the flammability test specimens, shall show no visual cracking, crazing, checking, blistering or surface pitting. Changes in color will be permitted only if the change does not indicate degradation of the material and, in the opinion of the user, the change will not be detrimental to the overall appearance of the product.
- 4.8** All metallic components of the frame and lock down mechanism shall be subjected to the salt spray test in accordance with ASTM B-117 for 1000 hours. After salt removal there shall be no more than a 2% reduction in weight. All parts must remain functional with no detrimental effect on welds.

5.0 Packaging and Shipping

- 5.1 The preformed, presloped drain system shall be shipped with all of the necessary hardware securely fastened to the channels or the shipping pallet.
- 5.2 All packaging, dunnage, and construction debris must be removed by the installer prior to completion.

6.0 Supplementary Specifications

- 6.1 Federal Aviation Administration (FAA) Advisory Circular Airport Pavement Design and Evaluation (AC 150/5320-6D Appendix 3 Design of Structures for Heavy Aircraft)

The most recent issue of the following unattached specifications shall be supplementary to this specification:

ASTM Standard D229, Method of Testing Rigid Sheet and Plate Materials Used for Electrical Insulation

ASTM Standard D543, Test Method for Resistance of Plastics to Chemical Reagents

ASTM Standard D570, Test Method for Water Absorption of Plastics

ASTM Standard D576, Practice for Determination of Weight and Shape Changes of Plastics Under Accelerated Service Conditions

ASTM Standard G53, Recommended Practice for Operating Light and Water Exposure Apparatus for Exposure of Non-Metallic Materials

ASTM Standard D695, Test Method for Compressive Properties of Rigid Plastics

ASTM Standard D790, Test Methods for Flexural Properties of Unreinforced and Reinforced

END OF SPECIFICATION 051501

APPENDIX "A"

APPENDIX 3. DESIGN OF STRUCTURES FOR HEAVY AIRCRAFT¹

1. BACKGROUND

Airport structures such as culverts and bridges are usually designed to last for the foreseeable future of the airport. Information concerning the landing gear arrangement of future heavy aircraft is speculative. It may be assumed with sufficient confidence that strengthening of pavements to accommodate future aircraft can be performed without undue problems. Strengthening of structures, however, may prove to be extremely difficult, costly and time-consuming. Point loadings on some structures may be increased; while on overpasses, the entire aircraft weight may be imposed on a deck span, pier or footing.

2. RECOMMENDED DESIGN PARAMETERS

A. For structures with spans in excess of 10 feet (3m), the slab or deck design, and to some degree the design of piers and foundations, becomes greatly dependent upon the aircraft gear configuration. Our assessment indicates that three basic configurations, shown in Figure 1, will, if all are considered in the design of the bridge components, provide sufficient support for any aircraft which may be forthcoming. These consist of two areas enclosing eight wheels each, or 16 wheels per aircraft comprising the main gear. Nose gears, as such, are not considered, except as they occur in the static load. The "area" dimensions are 6 to 8 feet by 20 feet (2-3m by 6m) each supporting half of the aircraft gross weight. Wheel prints are uniformly spaced within their respective areas.

B. Foundation design will vary with depth and soil type. No departure from accepted methodology is anticipated; except that for shallow structures, such as inlets and culverts, the concentrated loads may require heavier and wider spread footings than those presently provided by the structural standards in current use.

C. It should be noted that all loads discussed herein are to be considered as live loads, and that braking loads as high as 0.7G (for no-slip brakes) must be anticipated on bridge decks and considered for other structures subject to direct wheel loads.

D. Decks and covers subject to direct heavy aircraft loadings such as manhole covers, inlet grates, utility tunnel roofs, bridges, etc., should be designed for the following loadings:

- (1) Manhole covers for 100,000 lb. (45,000 kg) wheel loads with 250 psi (1.7 MN/m²) tire pressure.
- (2) For spans of 2 feet (0.6m) or less in the least direction, a uniform live load of 250 psi (1.7 MN/m²).
- (3) For spans between 2 feet (0.6m) and 10 feet (3m) in the least direction, a uniform live load varying between 250 psi (1.7 MN/m²) and 50 psi, in inverse proportion to the span length.

(4) For spans of 10 feet (3m) or greater in the least direction, the design shall be based on the number of wheels which will fit the span. Wheel loads of 50,000 to 75,000 lbs. (22,700 to 34,000 kg) should be considered.

(5) Special consideration shall be given to structures that will be required to support both in-line and diagonal traffic lanes, such as diagonal taxiways or apron taxi routes. If

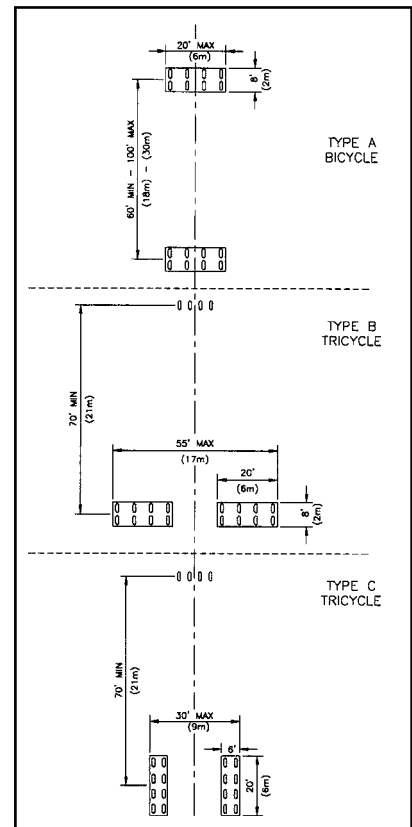


Figure 1.

¹ Federal Aviation Administration. *Advisory Circular Airport Pavement Design and Evaluation AC 150/5320-6D Appendix 3. Design of Structures for Heavy Aircraft (7/7/95)*. Washington DC: U.S. Government Printing Office.



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NOTE: Because Hubbell has a policy of continuous product improvement, we reserve the right to change design and specifications without notice.

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