
AASHTO-AGC-ARTBA Joint Committee

Task Force 13 Report

Guide to Standardized Highway Drainage Products

November 1999



**AASHTO-AGC-ARTBA
Joint Committee**

Task Force 13 Report

**Guide to Standardized
Highway Drainage Products**

November 1999

PREFACE

This document is disseminated upon sponsorship of the Joint Committee of the American Association of State Highway and Transportation Officials, the Associated General Contractors of America and the American Road and Transportation Builders Association (The Joint AASHTO-AGC-ARTBA Committee) in the interest of information exchange, based on the combined technical expertise of the authors. As such, the opinions and conclusions implied or expressed herein do not necessarily reflect the official views or policies of the Joint Committee or its member organizations.

This report was approved for publication by the three member organizations comprising the Joint Committee and was published on behalf of the Joint Committee by AASHTO.

All rights to this report are reserved to the Joint Committee. However, permission to make copies of this report can be obtained with the understanding that credit will be given to the Joint Committee. For permission to make copies, write to AASHTO at the following address:

American Association of State Highway
and Transportation Officials
444 North Capitol St., N.W., Suite 249
Washington, DC 20001

November 1999

AASHTO-AGC-ARTBA Joint Cooperation Committee
Subcommittee on New Highway Materials
Task Force No. 13
(Standardization of Details for Bridge and Road Hardware)

Members

(Chairman Emeritus)

Kenneth J. Boedecker, Jr.
President
Coastal Marketing Associates
1339 S. Edgewater Dr.
Charleston, SC 29407
803/556-3573 (Office) 803/763-6420 (Home)
FAX: 803/556-2329

Andrew V. Bailey, II

State Maintenance Engineer
Virginia Dept. of Transportation
1221 East Broad Street
Richmond, VA 23219
804/786-2847; FAX: 804/225-4979

Jack F. Caraway

Assistant Chief Engineer (Ret.)
Alabama Dept. of Transportation
1409 Coliseum Boulevard
Montgomery, AL 36130
334/242-6324; FAX: 334/262-8041

(Vice Chairman)

B. Patrick Collins, Bridge Engineer
Wyoming Dept. of Transportation
State Highway Office Building
P.O. Box 1708
Cheyenne, WY 82002-9019
Office Location: 5300 Bishop Boulevard
307/777-4427; FAX: 307/777-4279

(Chairman)

Arthur Dinitz, President
Transpo Industries, Inc.
20 Jones Street
New Rochelle, NY 10801
914/636-1000; FAX: 914/636-1282

John P. Dusel, Jr.

Senior Materials & Research Engineer
Office of Materials Engineering & Testing Services
of the Engineering Service Center
California Dept. of Transportation
5900 Folsom Boulevard
P.O. Box 19128
Sacramento, CA 95819
916/227-7264; FAX: 916/227-7117

James G. Gehler

Chief Bureau of Materials & Physical Res.
Illinois Dept. of Transportation
126 East Ash Street
Springfield, IL 62706
217/782-7200; FAX: 217/782-2572

(Secretary)

James H. Hatton, Jr.
Federal Highway Administration/HNG-14
400 Seventh Street, SW
Room 3134
Washington, DC 20590
202/366-1329; FAX: 202/366-3988

Norval P. Knapp, Director of Engineering & Program & Project Development

Louisiana Dept. of Transportation & Development
P.O. Box 94245/Capitol Station
Baton Rouge, LA 70804-9245
Office Location: Room 322
1201 Capitol Access Road
504/379-1248; FAX 504/379-1962

David R. Lewis

The David R. Lewis Group, Inc.
263 Bradford Drive
Canfield, OH 44406
216/533-6490; FAX: 216/533-0523

Paul J. Mack, Deputy Chief Engineer

Director, Technical Services Division
New York Dept. of Transportation
1220 Washington Avenue
Albany, NY 12232
518/457-4445; FAX: 518/457-8171

Richard L. Wilkinson, Engineer of Bridge Design

Dewitt C. Greer State Highway Building
Texas Dept. of Transportation
125 East 11th Street
Austin, TX 78701-2483
512/416-2276; FAX: 512/416-2557

AASHTO-AGC-ARTBA Joint Cooperation Committee
Subcommittee on New Highway Materials
Task Force No. 13
(Standardization of Details for Bridge and Road Hardware)
Committee 1—Drainage Hardware

Members

Jack F. Caraway (Chairman)
Assistant Chief Engineer (Ret.)
Department of Transportation
1409 Coliseum Boulevard
Montgomery, AL 36130
334/242-6324; FAX: 334/262-8041

Josh W. Beakley
Director of Technical Services
American Concrete Pipe Association
222 West Las Colinas Blvd., Suite 641
Irvin, TX 75039
972/506-7216; FAX: 972/506-7682

Robert B. Austin, Technical Services Director
National Precast Concrete Association
10333 N. Meridian Street, Ste. 272
Indianapolis, IN 46290-1081
317/571-9500; FAX: 317/571-0041

James B. Goddard, Marketing Engineer
Advanced Drainage Systems, Inc.
3300 Riverside Drive
Columbus, OH 43221
614/457-3051; FAX: 614/459-0169

John A. Green, V. President, Technology
The Aluminum Association
900 - 19th Street, NW
Washington, DC 20006
202/862-5121; FAX: 202/862-1962

Norval P. Knapp, Director
Engineering & Program & Project Development
Dept. of Transportation & Development
P.O. Box 94245, Capitol Station
Baton Rouge, LA 70804-9245
Office Location: Room 322, 1201 Capitol Access Rd.
504/379-1248; FAX: 504/379-1962

Tim J. Koller, General Sales Manager
Construction Division
Neenah Foundry Company
Box 729
Neenah, WI 54957
414/729-3629; FAX: 414/729-3661

Paul J. Mack, Deputy Chief Engineer
Director, Technical Services Division
New York Dept. of Transportation
1220 Washington Avenue
Albany, NY 12232
518/457-4445; FAX: 518/457-8171

Brian C. Roberts, Chief Engineer
National Corrugated Steel Pipe Association
1255 23rd Street, NW, Suite #850
Washington, DC 20037-1174
202/452-1700; FAX: 202/833-3656

G.R. Van Schooneveld, Consultant
Government Services
Contech Construction Products, Inc.
6607 Rosecroft Place
Falls Church, VA 22043
703/237-0637 (Home); 703/534-9630 (Office)
FAX: 703/237-5645

Billy C. Wade, Engineer of Products Evaluation
Illinois Dept. of Transportation
Bureau of Materials & Physical Research
126 E. Ash Street
Springfield, IL 62706-4766
217/782-6734; FAX: 217/782-2572

ACKNOWLEDGEMENTS

The Task Force wishes to express its thanks to the personnel in the State Highway agencies who have assisted in the preparation of this guide through the submission of plans and their reviews of the guide in draft form.

Thanks are also extended to the manufacturers and associations that provided advice and many of the details incorporated in this guide.

CONTENTS

	<u>PAGES</u>
Preface	i
Task Force No. 13 Members	ii
Drainage Hardware Committee Members	iii
Acknowledgements	iv
Introduction	1
Index to Drawings	3
Section CP—Concrete Drainage Products	9
Section CM—Corrugated Metal Drainage Products	37
Section SP—Structural Plate Drainage Products	95
Section DH—Drainage Hardware & Accessories	137
Section P—Plastic Drainage Products	175

INTRODUCTION

This guide was prepared by Task Force No. 13 of the American Association of State Highway and Transportation Officials—Associated General Contractors of America—American Road and Transportation Builders' Association (AASHTO-AGC-ARTBA) Joint Committee's Subcommittee on New Materials. It supersedes the 1986 edition of this publication, *A Guide to Standardized Highway Drainage Products*. A new section, "Part 5-Plastic Drainage Products," has been added in this new edition of the publication. Please note, also, that, because of drawing deletions and additions, some of the drawing numbers in this edition do not match those for nominally the same items in the previous edition. This guide is one of a series of guides prepared by Task Force No. 13 in an effort to promote beneficial standardization of details for bridge and road hardware. There is no intent that this guide be viewed as a national standard. It is provided as a supplement to existing agency specifications. It is intended to provide guidance for users and specifiers of highway drainage products who may not have ready access to information contained herein or who may be looking for potentially more economical specifications or details that are in use for these products. It is hoped the guide will spare some from having to "reinvent the wheel." Additionally, the ultimate goal is to reduce highway costs to the public by reducing manufacturing and inventory costs. These costs are often higher than necessary because manufacturers cannot achieve the same efficiency in supplying several versions of essentially the same product as they can with one. Therefore, designers and specifiers of highway drainage products are invited to consider the products shown in this guide to see if they will efficiently meet their needs, especially before developing new specifications or details.

In general, the Task Force has not attempted to address the hydraulic, structural, or durability requirements associated with the items shown in this guide. These are beyond the scope of the guide and are the responsibility of the highway designer. For information on design or for sources of such information, see the *Standard Specifications for Highway Bridges* and the *Hydraulic Engineering Circular No. 1—Selected Bibliography of Hydraulic and Hydrologic Subjects*. These are available, respectively, from:

American Association of State Highway and
Transportation Officials
444 North Capitol Street, NW, Suite 249
Washington, DC 20001

and

Office of Engineering, HNG-31
Federal Highway Administration
Washington, DC 20590

A potential problem of standardization is stagnation. The Task Force is aware of this problem and wishes to avoid this resulting as a product of its activities. It, therefore, invites comments on the contents of this guide and information on needs and new developments in highway drainage products that should be considered in preparing future editions of this guide.

INDEX TO DRAWINGS

PART 1 CONCRETE DRAINAGE PRODUCTS (CP)

<u>TITLE</u>	<u>DRAWING NO.</u>	<u>PAGE</u>
SECTION CPS-SHAPES		10
Circular Concrete Pipe	CPS-1-96	11
Arch Concrete Pipe	CPS-2-96	12
Elliptical Concrete Pipe	CPS-3-96	13
Precast Concrete Box Sections °	CPS-4-96	14
SECTION CPJ—JOINTING MATERIALS		15
Types of Joints for Concrete Pipe	CPJ-1-96	16
Jointing Materials for Concrete Pipe	CPJ-2-96	17
SECTION CPF—STANDARD FITTINGS		18
Concrete Pipe "Y" Fitting	CPF-1-96	19
Concrete Pipe Tee Fitting	CPF-2-96	20
Concrete Radius Pipe	CPF-3-96	21
Concrete Pipe Bends	CPF-4-96	22
SECTION CPE—END TREATMENTS		23
Precast Concrete End Section °	CPE-1-96	24
Precast Concrete End Section °	CPE-2-96	25
Precast Concrete End Section °	CPE-3-96	26
Precast Concrete Flared Inlet °	CPE-4-96	27
Concrete Pipe Skew Joints	CPE-5-96	28
Concrete Pipe 1:6 Sloped End Section	CPE-6-96	29
Precast Concrete Sloped End Section Grate	CPE-7-96	30
Concrete Pipe Sloped End Sections	CPE-8-96	31
SECTION CPA—APPURTENANCES		32
Precast Concrete Manhole Sections °	CPA-1-96	33
3-m 2-Piece Precast Curb Inlet °	CPA-2-96	34
1.5-m 2-Piece Precast Curb Inlet °	CPA-3-96	35

PART 2
CORRUGATED METAL DRAINAGE PRODUCTS (CM)

<u>TITLE</u>	<u>DRAWING NO.</u>	<u>PAGE</u>
SECTION CMC—SHAPES		38
Corrugated Steel Pipe—Type 1 Standard Corrugations	CMCS-1-96	39
Corrugated Steel Pipe—Type 1A Standard Corrugations	CMCS-2-96	40
Corrugated Steel Pipe—Type 1R 191-mm Spiral Rib Configuration	CMCS-3-96	41
Corrugated Steel Pipe—Type 1R 292-mm Spiral Rib Configuration	CMCS-4-96	42
Concrete Lined—Corrugated Steel Pipe	CMCS-5-96	43
Corrugated Aluminum Pipe—Type 1 Standard Corrugations	CMCA-6-96	44
Corrugated Aluminum Pipe—Type 1A Standard Corrugations	CMCA-7-96	45
Corrugated Aluminum Alloy Pipe—Type 1R Spiral Rib Corrugations	CMCA-8-96	46
SECTION CMF—PIPE ARCH DIMENSIONS & FITTINGS, CIRCULAR PIPE FITTINGS		47
Corrugated Steel Pipe Arch (Type II, IIA)	CMFS-1-96	48
Corrugated Steel Pipe Arch (Type IIR)	CMFS-2-96	48A
Corrugated Aluminum Pipe Arch (Type II, IIA)	CMFA-1-96	49
Corrugated Aluminum Pipe Arch (Type IIR)	CMFA-2-96	50
Pipe Arch CMP Elbow Fittings	CMF-3-96	51
Circular CMP Tee Fittings	CMF-4-96	52
Circular CMP Cross Fittings	CMF-5-96	53
Circular CMP Lateral Fittings	CMF-6-96	54
Circular CMP Wye Fittings	CMF-7-96	55
Circular CMP 10°-45° Elbows	CMF-8-96	56
Circular CMP 50°-90° Elbows	CMF-9-96	57
Circular CMP 3-Piece 90° Elbow	CMF-10-96	58
Circular CMP Reducer	CMF-11-96	59
SECTION CME—END SECTIONS		60
End Sections for Circular Pipe	CME-1-96	61
End Sections for Pipe Arch	CME-2-96	62
End Section Connections Circular and Arch Shapes	CME-3-96	63
Sloped End Section—Type A	CME-4-96	64
Sloped End Section—Type B	CME-5-96	65
Sloped End Section—Type B without Safety Bars	CME-6-96	66
Sloped End Section—Type C Cross Drainage Structure with Safety Bars	CME-7-96	67
Sloped End Section—Type C Parallel Drainage Structure with Safety Bars	CME-8-96	68
Sloped End Section—Type C Pipe Arch Cross Drainage Structure with Safety Bars	CME-9-96	69
Sloped End Section—Type C Pipe Arch Parallel Drainage Structure with Safety Bars	CME-10-96	70

<u>TITLE</u>	<u>DRAWING NO.</u>	<u>PAGE</u>
SECTION CMB—COUPLING BANDS		71
Corrugated Steel Coupling Band 2-Piece Integral Band	CMBS-1-96	72
Corrugated Steel Coupling Band Annular Band	CMBS-2-96	73
Corrugated Steel Coupling Band Helical Band	CMBS-3-96	74
Corrugated Steel Coupling Band Universal Band—Angle Connection	CMBS-4-96	75
Corrugated Steel Coupling Band Universal Band—Bar and Strap Connection	CMBS-5-96	76
Corrugated Steel Coupling Band Universal Band—Wedge and Strap Connection	CMBS-6-96	77
Corrugated Steel Coupling Band for Reformed Helical Pipe	CMBS-7-96	78
Corrugated Steel Coupling Band Hat Band for Flanged End Pipe	CMBS-8-96	79
Corrugated Steel Coupling Band Hugger Band for Annular or Reformed End Helical Pipe	CMBS-9-96	80
Corrugated Steel Coupling Band Rod and Lug Details	CMBS-10-96	81
Corrugated Steel Coupling Band Coupling Details 51 x 51 x 5 mm Angle Clips	CMBS-11-96	82
Corrugated Steel Coupling Band—305 mm 51 x 54 x 2.77 mm "SCAFCO" Angle Clip	CMBS-12-96	83
Corrugated Steel Coupling Band—178 mm 51 x 54 x 2.77 mm "SCAFCO" Angle Clip	CMBS-13-96	84
Corrugated Steel Coupling Band—100 mm 51 x 73 x 2.77 mm "SCAFCO" Angle Clip	CMBS-14-96	85
Coupling Band Hardware	CMB-15-96	86
Corrugated Aluminum Coupling Band 2-Piece Integral Flange Band	CMBA-16-96	87
Corrugated Aluminum Coupling Band Annular Band	CMBA-17-96	88
Corrugated Aluminum Coupling Band Hugger Band for Annular or Reformed End Helical Pipe	CMBA-18-96	89
Corrugated Aluminum Coupling Band Helical Band	CMBA-19-96	90
Corrugated Aluminum Coupling Band Universal Band	CMBA-20-96	91
Ring Gaskets	CMBS-21-96	92
Flat Bands & Gaskets	CMBS-22-96	93
Sleeve Gaskets	CMBS-23-96	94

PART 3
STRUCTURAL PLATE DRAINAGE PRODUCTS (SP)

<u>TITLE</u>	<u>DRAWING NO.</u>	<u>PAGE</u>
SECTION SPC—STANDARD CORRUGATIONS		97
Steel Structural Plate Standard Corrugations	SPCS-1-96	98
Aluminum Alloy Structural Plate Standard Corrugations	SPCA-2-96	99
SECTION SPP—STANDARD PARTS		100
Steel Structure Plate Standard Plate Details	SPPS-1-96	101
Steel Structure Plate Unbalanced Channel Detail	SPPS-2-96	102
Steel Structure Plate Culvert Bolt and Nut	SPPS-3-96	103
Aluminum or Steel Structure Plate Anchor Bolts	SPP-4-96	104
Aluminum or Steel Structure Plate Joint Sealant Tape	SPP-5-96	105
Aluminum Structure Plate Standard Plate Details	SPPA-6-96	106
Aluminum Structural Plate Footing Connection Angle	SPPA-7-96	107
Aluminum Structural Plate Box Culvert Receiving Channel	SPPA-8-96	108
Aluminum Structural Plate Wale Beam	SPPA-9-96	109
Aluminum Structural Plate Connecting Plate for Wale Beam	SPPA-10-96	110
Aluminum Structural Plate Bolts and Nuts	SPPA-11-96	111
Aluminum Structural Plate Circumferential Stiffener	SPPA-12-96	112
SECTION SPC—STANDARD SHAPES		113
Aluminum or Steel Structural Plate Pipe	SPS-1-96	114
Steel Structural Plate Pipe Arch—Series I	SPSS-2-96	115
Steel Structural Plate Pipe Arch—Series II	SPSS-3-96	116
Aluminum or Steel Structural Plate Arch	SPS-4-96	117
Steel Structural Plate Pedestrian Underpass	SPSS-5-96	118
Steel Structural Plate Vehicular Underpass	SPSS-6-96	119
Aluminum Structural Plate Pipe Arch	SPSA-7-96	120
Aluminum Structural Plate Vehicular Underpass	SPSA-8-96	121
Aluminum Structural Plate Pedestrian Underpass	SPSA-9-96	122
Aluminum or Steel Structural Plate Box Culvert	SPS-10-96	123
Various Sections Thru Steel or Aluminum Structural Plate Box Culverts	SPS-11-96	124
SECTION SPL—LONG SPANS		125
Aluminum or Steel Structural Plate Horizontal Ellipse	SPL-2-96	126
Aluminum or Steel Structural Plate Low-Profile Arch	SPL-3-96	127
Aluminum or Steel Structural Plate High-Profile Arch	SPL-4-96	128
Steel Structural Plate Pear Shape	SPL-5-96	129
Section Thru Steel and Aluminum Structural Plate Long Span Structures	SPL-6-96	130
SECTION SPE—END TREATMENTS AND SPECIAL FABRICATION		131
Aluminum or Steel Structural Plate End Conditions—Bevel	SPE-1-96	132
Aluminum or Steel Structural Plate End Conditions—Skews	SPE-2-96	133
Aluminum or Steel Structural Plate End Conditions—Skew Bevel	SPE-3-96	134
Aluminum or Steel Structural Plate Special Fabrications	SPE-4-96	135

PART 4
DRAIN HARDWARE & ACCESSORIES (DH)

<u>TITLE</u>	<u>DRAWING NO.</u>	<u>PAGE</u>
Design Considerations		138
SECTION DHD—DRAINS		139
Cast Curb Inlet, Frame and Grate	DHD-1-96	140
Cast Curb Inlet, Frame and Grate	DHD-2-96	141
Cast Curb Inlet, Frame and Grate	DHD-3-96	142
Cast Frame and Grate	DHD-4-96	143
Cast Frame and Grate	DHD-5-96	144
Grate Configurations Rectangular and Square Frames	DHD-6-96	145
Steel Grate Reticuline Configuration	DHD-7-96	146
Steel Frame and Grate	DHD-8-96	147
Corrugated Metal Slotted Drain Aluminum or Steel	DHD-9-96	148
Cast Iron Bridge Drain	DHD-10-96	149
Cast Iron Bridge Drain	DHD-11-96	150
Cast Iron Bridge Drain	DHD-12-96	151
Cast Iron Bridge Drain	DHD-13-96	152
Slotted Vane Drain	DHD-14-96	153
SECTION DHMF—MANHOLE FRAMES		154
Style "A" Frame	DHMF-1-96	155
Style "B" Frame	DHMF-2-96	156
Style "D" Frame	DHMF-3-96	157
Frame Adjusting Ring	DHMF-4-96	158
SECTION DHML—MANHOLE LIDS		159
Style 1 Lid	DHML-1-96	160
Style 2 Lid	DHML-2-96	161
Style 4 & 5 Lids	DHML-3-96	162
Style 6 Lid	DHML-4-96	163
Lid Lifting Devices	DHML-5-96	164
Lid Locking Devices	DHML-6-96	165
Selected Solid Lid Styles	DHML-7-96	166
Selected Grate Lid Styles	DHML-8-96	167
Gasket Seating System for Lids	DHML-9-96	168
SECTION DHMS—MANHOLE STEPS		169
Extruded Aluminum Manhole Step	DHMS-1-96	170
Cast Metal Manhole Step	DHMS-2-96	171
Cast Iron Manhole Step	DHMS-3-96	172
Plastic-Steel Reinforced Manhole Step	DHMS-4-96	173

PART 5
PLASTIC DRAINAGE PRODUCTS (P)

<u>TITLE</u>	<u>DRAWING NO.</u>	<u>PAGE</u>
Design Considerations		175
SECTION PE—POLYETHYLENE		177
Smooth Interior Corrugated Polyethylene Pipe	PE-1-96	178
Bell Couplers for SLCPP	PE-2-96	179
SLCPP Bends	PE-3-96	180
Split Couplers for SLCPP	PE-4-96	181
SLCPP 4-Piece 90° Bend	PE-5-96	182
SLCPP Tee Fittings	PE-6-96	183
SLCPP Lateral Fittings	PE-7-96	184
PE End Sections	PE-8-96	185
SECTION PVC—POLYVINYL CHLORIDE PIPE		186
Smooth Interior Polyvinyl Chloride (PVC) Pipe	PVC-1-96	187
Polyvinyl Chloride (PVC) Bends	PVC-2-96	188
Polyvinyl Chloride (PVC) Tees	PVC-3-96	189
Polyvinyl Chloride (PVC) Wyes	PVC-4-95	190