

SECTION 03150 — WATERSTOPS FOR CONCRETE JOINTS — rev. 05/07/11

******* MasterFormat™ 2004 — Section 03 15 13 *******

Note to Designer: Earth Shield® Chemical Resistant Waterstop is manufactured from proprietary compounds and polymers. It is strongly suggested that you specify Earth Shield as a sole source. There are no equals.

This specification is available in a variety of computer formats on CD-ROM or DVD. Contact Earth Shield Technical Sales for more information. It can also be found on the web at www.earthshield.com.

Suggested Short Form Guide Specification

Chemical Resistant Waterstop

Waterstop indicated in drawings and specifications for contraction (control), expansion and construction joints shall be Earth Shield® Thermoplastic Vulcanizate (TPV) **Part No. ####** [Designer insert appropriate part number here] as manufactured and available from **JP Specialties, Inc.** — 551 Birch Street, Lake Elsinore, CA 92530 — Phone 888-836-5778; International 951-674-6869; Fax 951-674-1315; Web www.earthshield.com; E-mail davidp@earthshield.com

1. *Thermoplastic Vulcanizate (TPV) Waterstop shall be certified for use in potable water per NSF/ANSI Standard 61. Third-party certified documentation to be provided by manufacturer.*
2. *No equals or substitutions allowed.*

Shop Made Fittings

Intersection and change of direction waterstops shall be shop fabricated as manufactured and available from **JP Specialties, Inc.** — 551 Birch Street, Lake Elsinore, CA 92530 — Phone 888-836-5778; International 951-674-6869; Fax 951-674-1315; Web www.earthshield.com; E-mail davidp@earthshield.com and installed at all locations on the drawing by the Contractor.
No equals or substitutions allowed.

Suggested Long Form Guide Specification

PART 1 GENERAL

1.01 Provision Includes

- A. Embedded waterstop in concrete including contraction, expansion and construction joints creating a continuous diaphragm to prevent the passage of fluid.
- B. The use of nonmetallic waterstops for use in concrete joints subjected to chlorinated water, sea water, oils, solvents, acids, salts, fuels and many other aggressive chemicals and fluids.

1.02 References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

- A. American Society for Testing and Materials (ASTM)
 1. ASTM D 395 — Test Methods for Rubber Property – Compression Set.
 2. ASTM D 412 — Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers — Tension.
 3. ASTM D 471 — Test Method for Rubber Properties – Effects of Chemicals.
 4. ASTM D 624 — Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

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5. ASTM D 746 — Test Method for Brittleness Temperature of Plastics by Impact.
 6. ASTM D 792 — Test Method for Specific Gravity (Gravity Density) and Density of Plastics by Displacement.
 7. ASTM D 1171 — Test Method for Ozone Resistance at 500 pphm.
 8. ASTM D 2240 — Test Method for Shore Hardness.
 - B. Federal Specifications
 1. COE CEGS-03250 July 1995 Guide Specification for Military Construction.
 2. EPA Title 40 CFR Section 265.193.
 - C. American Concrete Institute
 1. ACI 350.2R-04 — Concrete Structures for Containment of Hazardous Wastes.
 - D. NSF International
 1. NSF/ANSI Standard 61 Certification for Drinking Water System Components — Health Effects.
 - E. Canadian Council of Ministers of the Environment
 1. Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
 - F. BuildingGreen, Inc.
 1. GreenSpec® — GreenSpec® Directory, 6th Edition.
- 1.03 Submittal Procedures
- A. Chemical Resistant Waterstops
 1. Earth Shield TPV Waterstop submittal shall contain the following:
 - a. Samples of each size and shape to be used.
 - b. Plate drawings of the waterstop profile indicating all dimensions.
 - c. Shop drawings of shop made fittings to be provided by the manufacturer or prepared by the contractor.
 - d. Copy of test results of ASTM D 471 Chemical Resistance showing compliance with Appendix A.
 - e. Copy of independent certification to NSF/ANSI Standard 61 Certification for Drinking Water System Components — Health Effects.
 - f. Copy of independent testing to ASTM D 1171 Ozone Resistance to 500 pphm concentration.
 - g. Manufacturer's Literature, including MSDS sheets, installation instructions and splicing instructions.
 - h. Certificate of compliance to physical properties outlined in this specification.
 2. Non-metallic Waterstop and Splices — Specimens identified to indicate manufacturer, type of material, size, quantity of material, and shipment or lot represented. Each sample shall be a piece not less than 6 inches long of each type, size, and lot furnished. One splice sample of each size and type for every 50 splices made in the shop and every 10 splices made at the job site. The splice samples shall be made using straight run pieces with the splice located at the mid-length of the sample and finished as required for the installed waterstop. The total length of each splice shall be not less than 12 inches long.

1.04 Delivery and Storage

Material delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants.

PART 2 PRODUCTS

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2.01 Waterstops

Intersection and change of direction waterstops shall be shop fabricated.

A. Manufacturer:

JP Specialties, Inc. — 551 Birch Street, Lake Elsinore, CA 92530 — Phone 888-836-5778; International 951-674-6869; Fax 951-674-1315; Web www.earthshield.com; E-mail davidp@earthshield.com





B. Non-Metallic Waterstops — Non-metallic waterstops shall be manufactured from a fully cross-linked thermoplastic vulcanizate, containing no scrap or reclaimed material.

1. Thermoplastic Vulcanizate (TPV) Waterstop shall conform to EPA Title 40 CFR Section 265.193. The suitability of the waterstop for a specific application should be determined by specific testing for that particular requirement by ASTM D 471.
2. Thermoplastic Vulcanizate (TPV) Waterstop shall be certified for use in potable water per NSF/ANSI Standard 61. Third-party certified documentation to be provided by manufacturer.

Thermoplastic Vulcanizate (TPV) Waterstop shall conform to the following typical physical properties:

Property	Test Method	Required Results
Specific Gravity	ASTM D 792	.96
Shore A Hardness (5 sec.)	ASTM D 2240	90±3 at 25°C (77°F)
Tensile Strength	ASTM D 412	2,300 psi
Ultimate Elongation	ASTM D 412	530%
100% Modulus	ASTM D 746	1,000 psi
Tear Strength	ASTM D 624	278 pli at 25°C (77°F)
Compression Set	ASTM D 395	29% at 25°C (77°F)
Brittle Point	ASTM D 746	-73°C (-164°F)
Drinking Water Safe	NSF/ANSI 61	Certified for use in potable water (see Appendix B).
Ozone Resistance	ASTM D 1171	Passed, no cracking at 500 pphm
Chemical Resistance	ASTM D 471	Meet or exceed specific testing standards for contained fluids as required by Owner and certified by Manufacturer.
Green Certification	GreenSpec	Approved

Unless otherwise specified or indicated on the drawings provide the following types:

1. **Part No. JP436** — 4" x 3/16" ribbed centerbulb, as manufactured by **JP Specialties, Inc.** (all-purpose waterstop; if specified with factory installed brass eyelets use part no. EYJP436) 
2. **Part No. JP636** — 6" x 3/16" ribbed centerbulb, as manufactured by **JP Specialties, Inc.** (all-purpose waterstop; if specified with factory installed brass eyelets use part no. EYJP636) 
3. **Part No. JP936** — 9" x 3/16" ribbed centerbulb, as manufactured **JP Specialties, Inc.** (all-purpose waterstop; if specified with factory installed brass eyelets use part no. EYJP936) 
4. **Part No. JP678** — 6" x 3/16" ribbed tear web, as manufactured by **JP Specialties, Inc.** (for extreme joint movement; if specified with factory installed brass eyelets use part no. EYJP678) 

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5. **Part No. JP978** — 9" x 3/16" ribbed tear web, as manufactured by **JP Specialties, Inc.** (for extreme joint movement; if specified with factory installed brass eyelets use part no. EYJP978) ^{NSF}
6. **Part No. JP211** — 9" x 3/16" base seal, as manufactured by **JP Specialties, Inc.** (for runway and pavement applications) ^{NSF}
7. **Part No. JP320L** — 3" x 3/16" tear web retrofit, as manufactured by **JP Specialties, Inc.** (for joining concrete to existing surface; if specified with factory installed brass eyelets use part no. EYJP320L) ^{NSF}
8. **Part No. JP325T** — 3" x 3/16" T-shaped retrofit, as manufactured by **JP Specialties, Inc.** (for joining concrete to existing surface; if specified with factory installed brass eyelets use part no. EYJP325T) ^{NSF}
9. **Part No. JP336L** — 3" x 3/16" retrofit, as manufactured by **JP Specialties, Inc.** (for joining concrete to existing surface; if specified with factory installed brass eyelets use part no. EYJP336L) ^{NSF}
10. **Part No. JP621L** — 4-1/2" x 3/16" large movement retrofit, as manufactured by **JP Specialties, Inc.** (for joining concrete to existing surface; large shear movements) ^{NSF}
11. **Part No. JP450T** — 5" x 3/16" T-shaped retrofit, as manufactured by **JP Specialties, Inc.** (for joining concrete to existing surface; if specified with factory installed brass eyelets use part no. EYJP450T) ^{NSF}
12. **Part No. JP540L** — 4.5" x 3/16" post-applied corner retrofit, as manufactured by **JP Specialties, Inc.** (for joining concrete to existing surface; if specified with factory installed brass eyelets use part no. EYJP450T)
13. **Part No. JP647** — 6" x 1/4" dumbbell, as manufactured by **JP Specialties, Inc.** (for construction joints) ^{NSF}
14. **Part No. JP648** — 6" x 3/8" dumbbell, as manufactured by **JP Specialties, Inc.** (especially designed for Carollo Engineers [construction joints]) ^{NSF}
15. **Part No. JP948** — 9" x 3/8" dumbbell, as manufactured by **JP Specialties, Inc.** (for construction joints) ^{NSF}
16. **Part No. JP949** — 9" x 3/8" dumbbell centerbulb, as manufactured by **JP Specialties, Inc.** (especially designed for Carollo Engineers [expansion joints]) ^{NSF}
17. **Part No. JP1149** — 12" x 3/8" dumbbell centerbulb, as manufactured by **JP Specialties, Inc.** (especially designed for Carollo Engineers [expansion joints]) ^{NSF}
18. **Part No. JP158** — 1" screed key cap, as manufactured by **JP Specialties, Inc.** (designed for keyed joints) ^{NSF}
19. **Part No. JP1225** — 1" integrated screed key cap seal waterstop, as manufactured by **JP Specialties, Inc.** (designed for keyed joints; if specified with factory installed brass eyelets use part no. EYJP1225)
20. **Part No. JPEB350** — 1/2" integrated cap seal waterstop, as manufactured by **JP Specialties, Inc.** (designed for expansion joints; if specified with factory installed brass eyelets use part no. EYJPEB350)
21. **Part No. JPEB375** — 3/4" integrated cap seal waterstop, as manufactured by **JP Specialties, Inc.** (designed for expansion joints; if specified with factory installed brass eyelets use part no. EYJPEB375)
22. **Part No. JPEB375R** — 3/4" integrated cap seal retrofit waterstop, as manufactured by **JP Specialties, Inc.** (designed for expansion joints; if specified with factory installed brass eyelets use part no. EYJPEB375R)

PART 3 EXECUTION

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- 3.01 Waterstop, Installations and Splices — Waterstops shall be installed at the locations shown to form a continuous fluid-tight diaphragm. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. Any waterstop punctured or damaged shall be repaired or replaced. Exposed waterstops shall be protected during application of form release agents to avoid being coated. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued. Splices shall be made by certified, trained personnel using approved equipment and procedures.
- A. Non-Metallic Shop Made Fittings — Fittings shall be shop made using a machine specifically designed to mechanically weld the waterstop. A miter guide, proper fixturing (profile dependent), and portable power saw shall be used to miter cut the ends to be joined to ensure good alignment and contact between joined surfaces. The splicing of straight lengths shall be done by squaring the ends to be joined and using an ST-10® waterstop splicing tool. Continuity of the characteristic features of the cross section of the waterstop (ribs, tabular center axis, protrusions, etc.) shall be maintained across the splice.
 - B. Thermoplastic Vulcanizate Waterstop — The splicing of straight lengths shall be done by squaring the ends to be joined and using an ST-10 waterstop splicing tool utilizing a thermoplastic splicing iron with a non-stick surface specifically designed for waterstop welding. The correct temperature (410°F to 430°F) shall be used to sufficiently melt without charring the plastic. The spliced area, when cooled, shall show no signs of separation, holes, or other imperfections when bent by hand in as sharp an angle as possible.
- 3.02 Preparation
- A. Uncoil waterstop 24 hours prior to installation for ease of handling and fabrication.
 - B. Position waterstop to ensure proper distance from steel reinforcing bars to prevent rock pockets and honeycomb (see installation section 3.04).
 - C. Protect waterstop from damage during progress of work.
 - D. Clean concrete joint after first pour to remove debris and dirt.
- 3.03 Examination/Inspection
- A. Prior to placement of concrete notify engineer for field inspection approval.
 - B. Inspect waterstop and field splices for defects and conformance to Quality Assurance Standard section 3.05.
 - C. Upon inspection of waterstop installation, replace any damaged or unacceptable waterstop and dispose of defective material.
- 3.04 Installation
- A. Position waterstop in joint as indicated on drawings.
 - B. Center waterstop on joint, with approximately one-half of waterstop width to be embedded in concrete on each side of the joint.
 - C. Allow clearance between waterstop and reinforcing steel of a minimum two times the largest aggregate size. Prevent rock pockets and air voids caused by aggregate bridging.
 - D. Ensure centerbulb is not embedded at expansion joints.
 - E. Secure waterstop in correct position using optional factory-installed brass eyelets (or JPS hog rings crimped between last two ribs on 12 inch maximum centers), and wire tie to adjacent reinforcing steel. Center-to-center spacing may be increased upon written request and approval from ENGINEER.
 - F. Carefully place concrete without displacing waterstop from proper position.

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- G. Thoroughly and systematically vibrate concrete in the vicinity of the joint, and to maximized intimate contact between concrete and waterstop.
 - H. After first pour, clean unembedded waterstop leg to ensure full contact of second concrete pour. Remove laitance, spillage, form oil and dirt.
- 3.05 Quality Assurance — Edge welding will not be permitted. Centerbulbs shall be compressed or closed when welding to non-centerbulb type. Waterstop splicing defects which are unacceptable include, but are not limited to the following:
- A. Tensile strength not less than 60 percent of parent sections.
 - B. Free lap joints.
 - C. Misalignment of centerbulb, ribs, and end bulbs greater than 1/16 inch.
 - D. Misalignment which reduces waterstop cross section ore than 15 percent.
 - E. Bond failure at joint deeper than 1/16 inch or 15 percent of material thickness.
 - F. Misalignment of waterstop splice resulting in misalignment of waterstop in excess of 1/2 inch in 10 feet.
 - G. Visible porosity in the weld.
 - H. Charred or burnt material.
 - I. Bubbles or inadequate bonding.
 - J. Visible signs of splice separation when cooled splice (24 hours or greater) is bent by hand at sharp angle.

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APPENDIX A

Earth Shield® Thermoplastic Vulcanizate Waterstop (TPER/TPV) — Effect of 166 hour immersion (ASTM D-471) on properties of Earth Shield® Thermoplastic Vulcanizate Waterstop

Fluids	Temp., °C	Ultimate Elongation Percent Retention	Ultimate Tensile Strength Percent Retention	100% Modulus Percent Retention	Hardness, Change, Shore A Units	Weight Change Percent
98% Sulfuric Acid	23	77	82	108	-1	2.1
10% Hydrochloric Acid	23	88	87	85	6	0.3
50% Sodium Hydroxide	23	101	107	104	-4	-0.1
10% Potassium Hydroxide	23	101	101	106	-1	0.1
Water	100	84	94	106	4	2.9
10% Zinc Chloride	23	89	87	83	5	0
Sea Water	23	98	107	99	4	0.3
15% Sodium Chloride	23	93	90	94	5	0.7
18% Calcium Chloride/14% Calcium Bromide, 2.5% Detergent (Tide®)	150	71	86	110	-2	-0.1
Acetic Acid	23	103	103	103	0	-0.1
Acetic Acid	23	103	102	102	-2	3.2
Acrylonitrile	23	102	104	110	-4	0.9
Aniline	23	99	94	99	-2	1.5
Bromobenzene	23	94	91	88	-3	41.9
n-Butyl Acetate	23	95	92	80	5	0.3
Carbon Disulfide	23	94	68	82	-19	60.4
Cyclohexane	23	63	58	62	-6	45.3
Diethyl Ether	23	98	97	95	-7	-1.8
Dimethylformamide	23	96	105	100	6	0
Dioctyl Phthalate	23	101	97	103	-1	-0.2
1,4-Dioxane	23	98	94	95	-3	1.1
95% Ethanol	23	106	98	99	0	-1.7
Glycerol	23	102	101	103	-2	-0.2
n-Hexane	23	90	92	94	-10	5.7
Isophorone Diisocyanate	23	101	92	105	7.2	.30
Methylethylketone	23	95	94	79	6	-4.8
Nitrobenzene	23	100	98	102	-2	-1.5
Piperidene	23	98	105	94	6	-1.9
1-Propanol	23	93	98	100	6	-4.3
Toluene Diisocyanate	23	88	98	103	7.2	4.93
Pyridine	23	98	105	94	6	-1.9
Trichloroethylene	23	101	105	85	-13	97.2
Turpentine	23	80	75	85	-10	34.8
Xylene	23	84	85	90	-11	24.9
ASTM #1 Oil	100	88	91	99	1	13.5

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Fluids	Temp., °C	Ultimate Elongation Percent Retention	Ultimate Tensile Strength Percent Retention	100% Modulus Percent Retention	Hardness , Change, Shore A Units	Weight Change Percent
ASTM #1 Oil	125	70	78	91	-1	21.6
ASTM #2 Oil	100	82	86	93	-2	27.1
ASTM #2 Oil	125	65	79	93	-6	40.1
ASTM #3 Oil	100	72	75	80	-6	41.6
ASTM #3 Oil	125	60	71	83	-13	59.8
IRM 902	100	85	86	100	-5	20.8
IRM 902 ²	125	71	79	97	-7	29.3
IRM 903	100	76	78	91	-9	35.4
IRM 903 ²	125	60	69	84	-15	50.6
Reference Fuel A (Isooctane)	23	86	85	82	-1	13.2
Reference Fuel B (Isooctane/Toluene, 70/30)	23	82	84	81	-7	24.5
Reference Fuel C (Isooctane/Toluene, 50/50)	23	67	68	75	-4	29.4
Diesel	23	89	81	87	-11	17
JP4 Jet Fuel	23	100	71	79	-11	17
JP8 Jet Fuel	23	100	93	95	-7	8
Kerosene	23	92	85	88	-10	15
Automatic Transmission Fluid	125	63	77	82	-11	43.4
Hydraulic Brake Fluid	23	95	102	95	5	-1.8
Hydraulic Brake Fluid 2	100	89	94	97	6	-12.8
Lithium Grease	23	93	98	92	5	3.5
Lithium Grease	100	88	88	92	-7	18.8
Power Steering Fluid	125	54	59	68	-12	52.2
Antifreeze, 50/50 Ethylene Glycol (Prestone®)/water	125	84	99	96	2	3.1
Pydraul® 312	125	79	85	90	0	17.6
Skydrol® 500 B4	125	93	104	101	4	-4.2
Sunvis® 706 Fluid	125	67	77	84	-8	39.9
Ucon® CC732	125	91	99	96	2	5.3
Ucon® 50HB5100	125	91	99	96	2	5.3
Freon® 11	5	92	88	88	-9	32.3

All solution concentrations by weight.

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APPENDIX B

Earth Shield® Thermoplastic Vulcanizate Waterstop (TPER/TPV) — NSF International Drinking Water System Components — Health Effects.

NSF International (NSF)
DRINKING WATER ADDITIVES AUTHORIZED REGISTERED FORMULATION
AUTHORIZED REGISTERED FORMULATION - STANDARD 61
TOXICOLOGY INFORMATION SHEET

REVISED Revised function and listing footnote

DCC: IA12497
Verified By: Jennifer Duhan (1455) Page 1 of 2
Issue Date 1-OCT-03

Corp. No. 1D630
Plant No. 1D631

Company Name JP SPECIALTIES, INC. / EARTH SHIELD WATE
Plant Address 551 BIRCH STREET
LAKE ELSINORE CA 92530

Category: JOINING AND SEALING MATERIALS
Function: Waterstop

Trade Designation	Size
Earth Shield Waterstop	
JP158	
JP211	
JP320L	
JP336L	
JP325T	
JP450T	
JP436	
JP636	
JP647	
JP936	
JP949	
JP678	
JP1149	
JP948	
JP648	

Water Contact Temp. CLD 23
Water Contact Material and Code TPE

Listing Footnotes:
This material is approved as a waterstop for use in any potable water treatment or retaining structure.

All information is presented in good faith and the results are believed to be accurate. All testing was done independently of Earth Shield and JP Specialties, Inc.; therefore, neither Earth Shield nor JP Specialties, Inc. makes any guarantee as to the testing data accuracy or the results obtained.

 NSF mark denotes NSF Standard 61 certification.



END OF SECTION