

All the Advantages are with Anotec

Advantages of Anotec Z-SERIES Tubular Anodes

Keynote Advantages (in comparison to Traditional Tubular anodes)

- ✓ **Anode Diameters** to optimize anode functionality.

Inside Diameter: Rationalized to limit sealant diameter for cure shrinkage control. The largest inside diameter of Z-Series anodes is 1.8 inch (46mm), no matter the Z-anode weight. This means heavier anodes require less sealant to make better seals. The payoff: Better quality and economy.

Outside Diameter: Reduced for heavier sizes, releasing more space for cables and backfill within the deep-well diameter selected.

- ✓ **Zinc Anchored Cable Connection.** No Lead alloy content. Low Resistance. Unequaled Strength. Positively always On-Center.

Advantages in Detail

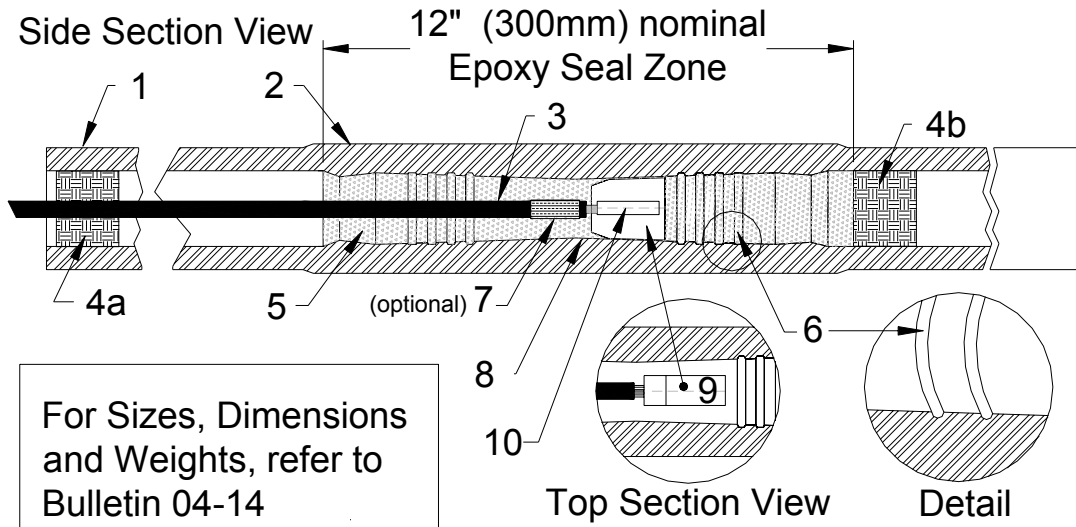
- ◆ **ISO 9001:2000 Quality Control** applies to all Anotec anodes produced in accordance with Anotec's Product Specifications.
- ◆ **Comprehensive Testing and Development** applied to each and every improvement.
- ◆ **Anodes are Traceable** by production lot code to production, testing and quality records.
- ◆ **State-of-Art Spectrometer for Quality Assurance** verifies chemistry compliance to ASTM A518 Grade 3 and BS 1519 14-4, based on uniquely qualified High Silicon Iron standardization specimens.
- ◆ **Chill Cast Metal Mold Process.** Anotec's North American plant is reserved and dedicated exclusively to production of High Silicon Cast Iron Anodes, with unwavering concentration.
- ◆ **Anotec's Chill Casting Process has been continuously applied and improved since 1987, to assure a chill cast metallurgy with optimal grain structure, without significant alloy segregation.** Optimum structure and longer life result from molten metal solidification (chill) that is even more rapid than centrifugal casting. Independent third party expert evaluations substantiate that Anotec's Chill Cast structure is superior to centrifugally cast structure according to objective metallographic criteria.

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- ◆ **Better Structure means Improved Impact Strength and Longer Working Life.** Objective Tests backed up by anecdotal evidence from the field support the conclusion that Chill Cast anodes are robust en route to the groundbed, and last longer in cathodic protection service.
- ◆ **Expanded Wall Thickness around the Cable Connection** enhances corrosion resistance and impact strength.
- ◆ **Internal Features are Precision Cast** in Z-Series Tubular Anodes by the shell process. In inspections of randomly selected Chill Cast Anodes, weight deviation was approximately one half of one percent. In contrast, centrifugally cast anodes are featureless straight walled tubes, without dimensional control by a precisely defined mold cavity. In the centrifugal process, the amount of molten metal poured into the “open” space is manually decided. Consequently, centrifugally cast anodes vary more widely in wall thickness, inner diameter and weight. This fact puts extra onus on the cable-connection mechanism for centrifugal anodes.
- ◆ **An integral conical cable-anchor seat is located at the center of Z-Series anodes.** Centrifugal anodes lack both a specific seat location, and positive retention features. Instead, centrifugal anodes rely solely on friction between the anchor and the anode wall to secure the cable.
- ◆ **A controlled hydraulic process seats each Z-Series die-cast zinc anchor** like a Morse taper drill locking into a drill press spindle.
- ◆ **Anotec Z-Series die cast zinc anchors cannot be pulled through the anode seat** under forces many times greater than the breaking strength of the copper conductors in use for cathodic protection.
- ◆ **Cable-to-anchor connection strength exceeds 1.5 times the breaking strength of the copper conductor.** A controlled hydraulic cable-crimping process assures consistency.
- ◆ **Hydraulic assembly assures that the Z-Series cable connection resistance is less than a fraction of 0.001 ohms.** Industry experience has long established that resistances less than 0.003 ohms give long-term reliability.
- ◆ **Z-Series Tubulars use sealant retention grooves and pressure-tightening taper to positively lock epoxy.** In contrast, Centrifugal tubulars rely solely on sealant adhesion to resist penetration and shear forces created by electrolyte head pressure.

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Features & Attributes of Z-Series Tubulars



For Sizes, Dimensions and Weights, refer to Bulletin 04-14

Item	Name	Z-Series Standard Features	Special Attributes of Z-Series Features	
1	Z-Series Tubular Anode	ASTM A 518 Grade 3, BS1519 14-4	Chill cast in metal molds with precision shell cored interior for consistent weight & dimensions	
		Inner Diameter	Rationalized	ID limit: 1.8" (43mm) max. for seal quality
		Outer Diameter	Figure 2 page 4	OD is reduced for deep well clearance.
2	Expanded Head	Extra wall thickness	Strength and cable connection protection	
3	Cable	Accepts AWG 8 and 6, 7 strand ASTM B3 ASTM B8	Larger Sizes may be accommodated by application to Anotec.	
4a 4b	Cable Guide Poly Plug	Polyethylene, closed cell foam	Centralizes & protects cable. Firm, forgiving, no sharp edges	
5	Sealant	Epoxy or Polyurethane, compounded for cathodic protection	Sealant cavity dimensions limit Bulk Modulus Shrinkage and extend Seal Path Length per unit volume.	
6	Retention Gooves	Standard	Positively locks epoxy & enhances seal	
7	Cable Sleeve	Hydraulic press compression.	Positively seals HMWPE Insulation interface.	
8	Anchor Seat	Conical self-locking taper, at center of anode	Strength: Anchor to Anode 2500lb / 1100kg	Resistance: Less than 0.001 ohms
9	Zinc Anchor	Taper-Locks conductor to anode		
10	Connection Sleeve	Hydraulic press compression.	Exceeds 1.5 times Conductor Strength	

Tests made by Anotec on connections are completed in accordance with Anotec's Formal Quality Control Procedures ISO 9001.2000

RESULTS EXCEED INDUSTRY CRITERIA

Typical Cathodic Protection Industry Test Criteria For Cable Connections:

Resistance: 0.002 – 0.004 OHMS
Pull Strength: 1.5 x Cable Strength