

It's Your Water Podcast Show Notes

Quick Tips: Freeboard & Minimum Bed Depth

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Series: Quick Tips

Episode Overview

In this Quick Tips episode, Mike and Denise Urbans break down two of the most misunderstood — yet critically important — concepts in water treatment system design: freeboard and minimum bed depth. These two factors directly impact proper backwashing, media expansion, system efficiency, valve protection, resin retention, and long-term equipment reliability.

Top 5 Dealer Takeaways

1. Freeboard is the empty space above the media bed.
2. Overfilling a tank can destroy a control valve.
3. Minimum bed depth is critical for contaminant removal.
4. Tank diameter affects hydraulic behavior more than media weight.
5. Anion resin often requires upper screens.

What Is Freeboard?

Freeboard is the distance between the top of the media bed and the top of the mineral tank. This empty space allows the media bed to expand upward during backwash. Without enough freeboard, media can enter the control valve and damage pistons and seals.

Why Freeboard Matters

Most media manufacturers target approximately 40% bed expansion during backwash. Too little freeboard reduces expansion space and can lead to media loss, valve damage, poor cleaning, and reduced system performance.

Backwash Rates & Tank Area

Backwash requirements are based on gallons per minute per square foot of tank area — not simply the weight of the media. Tanks behave as hydraulic cylinders, and proper expansion depends on hydraulic lift.

Water Temperature Effects

Warm water requires more backwash energy than cold water because density changes affect media lift and expansion.

What Is Minimum Bed Depth?

Minimum bed depth refers to the minimum vertical depth of media required for effective treatment. Many media manufacturers specify 25-inch, 30-inch, or greater minimum depths depending on the application.

Activated Carbon

The minimum bed depth is going to depend on the contaminant concentrations and flow rate. It's not a simple, single number. Use EBCT as a general guideline recommendation.

Why Tall Tanks Matter

Tall tanks such as 10x54 mineral tanks provide room for both proper media depth and adequate freeboard. Shorter tanks may not allow enough room for safe expansion.

Anion Resin Challenges

Anion resin is extremely light and can easily backwash out of the tank. Smaller residential nitrate systems often require upper screens to prevent resin loss.

Upper Screens & Diffusion

Upper screens improve water distribution and help diffuse flow more evenly through the bed. Commercial systems commonly use upper diffusers to reduce channeling and uneven flow paths.

Final Thoughts

Freeboard, minimum bed depth, tank diameter, expansion percentage, and backwash rates all work together hydraulically. Understanding these fundamentals helps dealers build more reliable systems and avoid expensive valve failures.

Comparison Table: Freeboard vs Minimum Bed Depth

Topic	Freeboard	Minimum Bed Depth
Definition	Empty space above media	Active media depth
Purpose	Allows expansion during backwash	Provides treatment contact time
Too Little Causes	Media loss and valve damage	Poor contaminant removal
Typical Target	~40% expansion	~30 inches minimum