

How Many Antennas Are Too Many?

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Introduction



Multiple provider antenna systems on the same tank is commonplace today

How can a tank owner know before there are too many antennas?

Keep in Mind:

Most existing water tanks were not designed to support antenna equipment

At some point, *too many* antennas can overload the tank or make it unsafe

AWWA D100 Provisions for Antennas

- General
- Health and Safety
- Workmanship

AWWA D100 Provisions for Antennas

General

- Assess structural condition
- Distribute loads to prevent structural distress
- Limit application of epoxy & stud welding
- Mount antenna cables properly
- Installation must comply with FAA requirements
- Installation details must prevent corrosion damage

AWWA D100 Provisions for Antennas

Health and Safety

- Radio frequency exposure of personnel
- Proper disinfection if entry to tank is required
- Check for hazardous materials in coatings
- Access to antennas must satisfy OSHA regulations
- Antenna equipment must not obstruct ladders, access openings, or vents

AWWA D100 Provisions for Antennas

General Workmanship

- Antenna equipment must not obstruct ladders, access openings, or vents
- Holes cut must be properly reinforced
- Multiple penetrations should be done one at a time
- Adequate clearance must be provided for welder access

Other Antenna Equipment Standards

TIA/EIA-222-G, “Structural Standards for Steel Antenna Towers and Supporting Structures”

- Intended for structures that are dedicated to antenna and communications equipment support
- Uses same or equivalent engineering codes and standards as tank standards (AWWA, API, e.g.) for loads and design methods

Structural Considerations

- What is the structural condition of the tank and foundation?
- What are the effects of the existing and proposed new antenna equipment loads on the tank and foundation?
- Acceptance criteria for antenna equipment loading should be based on current tank standards.

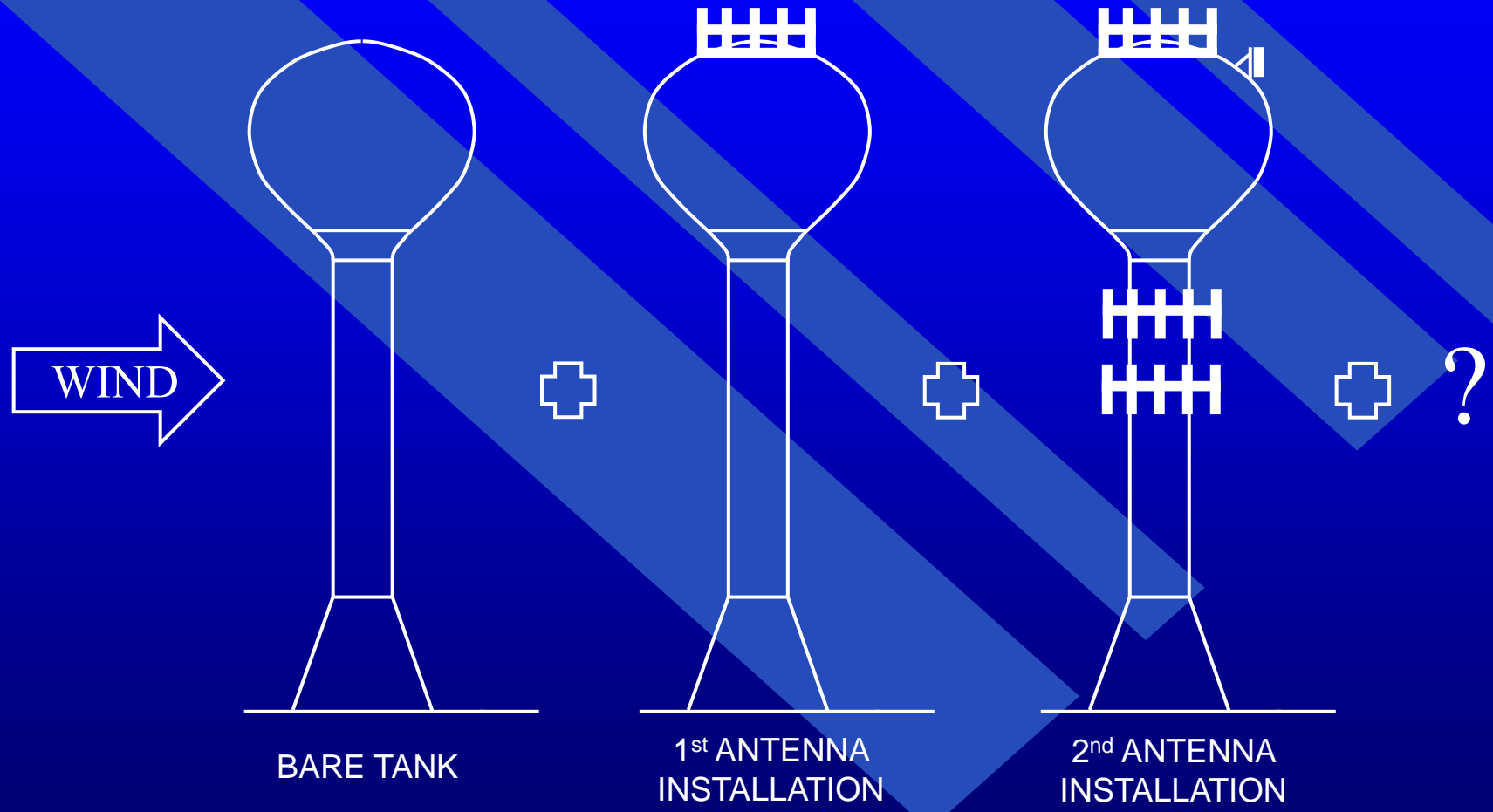
Structural Condition of Tank/Foundation



Structural Considerations

- Amount of antenna equipment a tank will support is limited by design/construction of tank and foundation.
- Additional antenna equipment may result in localized overstress, distortion, or general instability of the tank – or any combination of these.

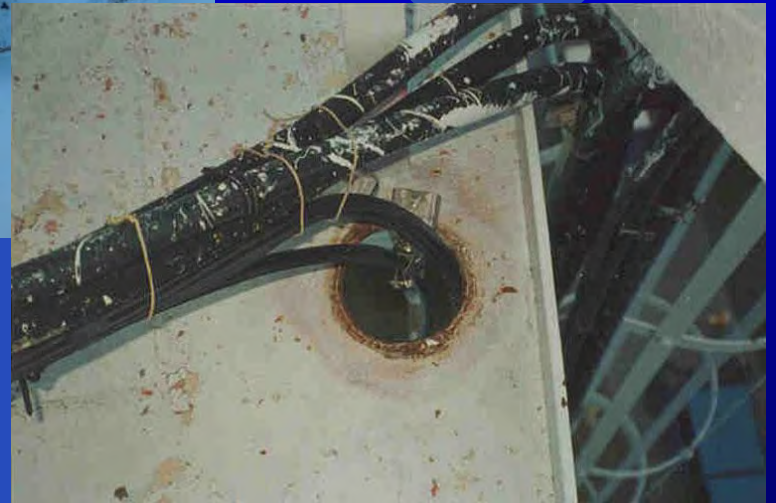
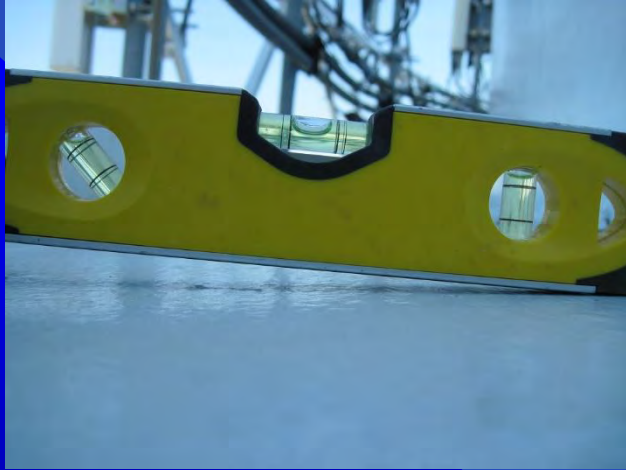
Cumulative Effects of Antenna Equipment



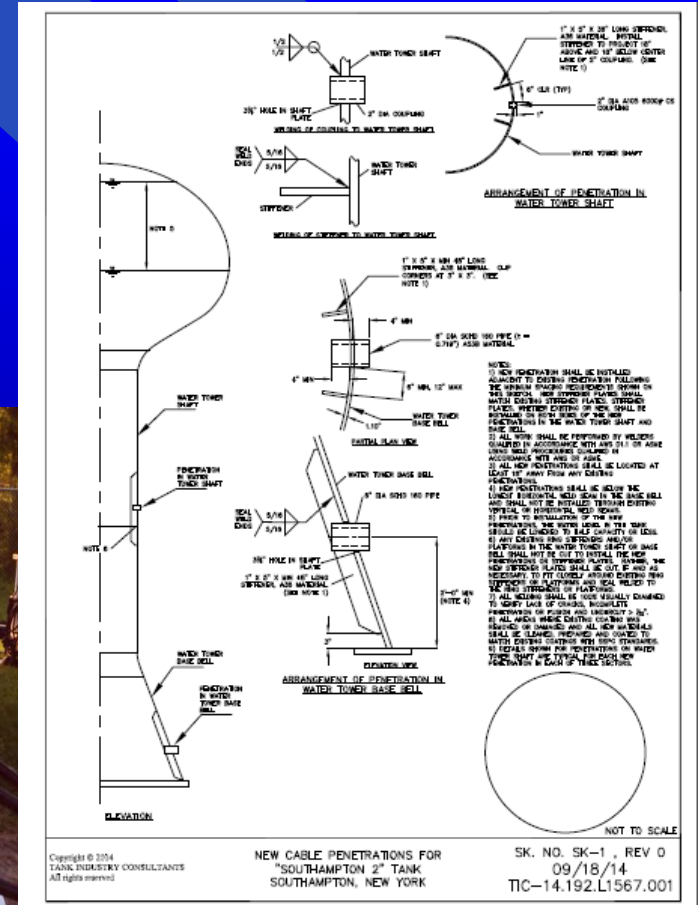
Wind Loads

- Multiple Antenna Systems
 - ◆ Greater increase in loads
 - ◆ Stress on anchorage system
 - ◆ Cumulative effect

Effects on Structural Integrity of Tank



Effects on Structural Integrity of Tank



When Are There Too Many Antennas?

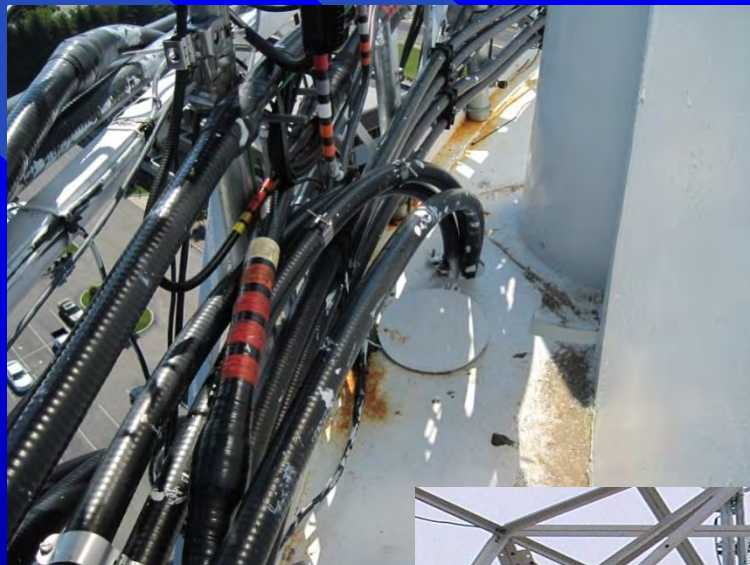
- When structural modifications are necessary to reduce stress to acceptable levels.
- When antenna weight and wind loads cause distortion of tank components.
- When overturning stability exceeds acceptance criteria of current industry standards.

When Are There Too Many Antennas?

- When cumulative amount of antenna equipment, including cables, prevents:
 - ◆ Safe access to ladders, access openings, etc.
 - ◆ Proper maintenance of tank interior and exterior coatings



Effects on Access for Maintenance



Effects on Access for Coating



What Should a Tank Owner Expect?

- A functional, reliable installation that is easy to maintain and does not interfere with the operation or maintenance of components of the tank on which the antenna equipment is mounted
- Proper planning, execution, and verification of the antenna installation is performed

Planning

- Perform structural evaluation to determine the condition of the tank and foundation & assess any deterioration
- Will antenna equipment installation overload the tank or foundation?
- Will antenna equipment installation interfere with operation or maintenance of the tank?
- Structural evaluation & design review should be performed by 3rd party professional engineer (P.E.)

Planning

- Antenna service provider must provide detailed plans & specifications for all proposed new antenna equipment
- All existing antenna equipment must also be considered

Detailed Plans & Specifications



PROJECT: 2.5 EQUIPMENT DEPLOYMENT

SPRINT SITE NAME:

SPRINT SITE CASCADE:

SITE ADDRESS:



SITE TYPE:



5500 Sprint Parkway
Overland Park, Kansas 66251



5449 BELLS FERRY ROAD
ACMORTH, GEORGIA 30102
770-791-2500, FAX: 770-701-2501

SITE INFORMATION	AREA MAP	PROJECT DESCRIPTION	DRAWING INDEX																																																																				
<p>TOWER OWNER: CITY OF JOHNSON CITY WATER AND SEWER SERVICES</p> <p>LATITUDE (NAD83): 37° 19' 22.00" N 98.32338887</p> <p>LONGITUDE (NAD83): 87° 27' 48.98" W -90.46378000</p> <p>COUNTY: WASHINGTON</p> <p>ZONING JURISDICTION: JOHNSON CITY</p> <p>ZONING CLASSIFICATION: R-4</p> <p>POWER COMPANY: JOHNSON CITY POWER BOARD 620-534-4800</p> <p>RAW PROVIDER: QUARTER 986-965-9850</p> <p>SPRINT CAC: JOHN W. TITTY JOHN.AUTY@SPRINT.COM 913-980-0000</p> <p>NATHAN LANCASTER NATHAN.LANCASTER@SPRINT.COM 913-980-0000</p>	 <p>LOCATION MAP</p>	<ul style="list-style-type: none"> • INSTALL (1) LTE 2.6GHz ERL • INSTALL (3) PANEL ANTENNAS • INSTALL (3) RAILS TO ANTENNA MOUNT FRAME • INSTALL (27) AMPSERS • INSTALL (3) RIBBY CHAINS 	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>SHEET NO.</th> <th>SHEET TITLE</th> <th>REV</th> <th>DESIGNER</th> </tr> </thead> <tbody> <tr><td>0-1</td><td>TITLE SHEET & PROJECT DATA</td><td>0</td><td>AD</td></tr> <tr><td>SP-1</td><td>SPRINT SPECIFICATIONS</td><td>0</td><td>AD</td></tr> <tr><td>SP-2</td><td>SPRINT SPECIFICATIONS</td><td>0</td><td>AD</td></tr> <tr><td>A-1</td><td>SITE PLAN</td><td>0</td><td>AD</td></tr> <tr><td>A-1A</td><td>DETAIL EQUIPMENT PLAN</td><td>0</td><td>AD</td></tr> <tr><td>A-2</td><td>TOWER ELEVATION & CABLE TOWER</td><td>0</td><td>AD</td></tr> <tr><td>A-3</td><td>ANTENNA LAYOUT & GROUNDING DETAILS</td><td>0</td><td>AD</td></tr> <tr><td>A-4</td><td>RF DATA SHEET EQUIPMENT INFORMATION</td><td>0</td><td>AD</td></tr> <tr><td>A-5</td><td>PLUMBING DIAGRAM</td><td>0</td><td>AD</td></tr> <tr><td>A-6</td><td>COLOR CODING</td><td>0</td><td>AD</td></tr> <tr><td>A-7</td><td>EQUIPMENT DETAILS</td><td>0</td><td>AD</td></tr> <tr><td>A-8</td><td>EQUIPMENT DETAILS</td><td>0</td><td>AD</td></tr> <tr><td>E-1</td><td>GROUNDING & ELECTRICAL PLAN</td><td>0</td><td>AD</td></tr> <tr><td>E-2</td><td>GROUNDING DETAILS</td><td>0</td><td>AD</td></tr> <tr><td>E-3</td><td>DC POWER & DISTRIBUTION</td><td>0</td><td>AD</td></tr> <tr><td>E-4</td><td>AC POWER DISTRIBUTION</td><td>0</td><td>AD</td></tr> </tbody> </table>	SHEET NO.	SHEET TITLE	REV	DESIGNER	0-1	TITLE SHEET & PROJECT DATA	0	AD	SP-1	SPRINT SPECIFICATIONS	0	AD	SP-2	SPRINT SPECIFICATIONS	0	AD	A-1	SITE PLAN	0	AD	A-1A	DETAIL EQUIPMENT PLAN	0	AD	A-2	TOWER ELEVATION & CABLE TOWER	0	AD	A-3	ANTENNA LAYOUT & GROUNDING DETAILS	0	AD	A-4	RF DATA SHEET EQUIPMENT INFORMATION	0	AD	A-5	PLUMBING DIAGRAM	0	AD	A-6	COLOR CODING	0	AD	A-7	EQUIPMENT DETAILS	0	AD	A-8	EQUIPMENT DETAILS	0	AD	E-1	GROUNDING & ELECTRICAL PLAN	0	AD	E-2	GROUNDING DETAILS	0	AD	E-3	DC POWER & DISTRIBUTION	0	AD	E-4	AC POWER DISTRIBUTION	0	AD
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ISSUANCE LOG

NO.	DESCRIPTION	DATE	BY	FOR
01	ISSUED FOR PERMIT	07/24/14	AD	J

PROJECT NUMBER: **IPCS-KX03HO058-A**

PROJECT CODE: **KX03HO058-A**

PROJECT ADDRESS: **1409 FACTO LAS RD
JOHNSON, TN 37604
WASHINGTON COUNTY**

TITLE SHEET

PROJECT NUMBER: **T-1**

Information Required for Analysis

- Drawings from Proposed Installer
 - ◆ Layout and dimensions
 - ◆ Weight of equipment
- Site Evaluation
 - ◆ Measurements of existing equipment locations
 - ◆ Photographs
 - ◆ Datasheets of installed equipment

Execution

- Antenna equipment installation should not commence until structural, safety, and maintenance issues have been resolved.
- Installation should be performed by qualified contractors.
- Installation should be in strict accordance with final plans and specifications certified by P.E.

Verification

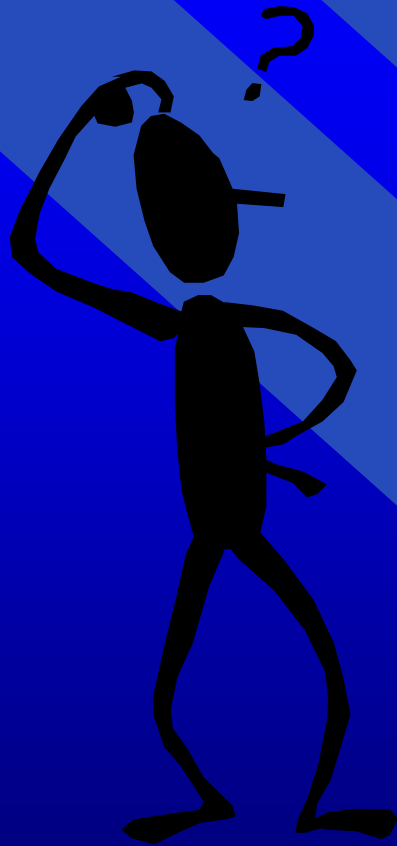
- Installation work should be verified by 3rd party inspection company or P.E. to ensure compliance with final plans & specifications
- Any non-compliance should be corrected to satisfaction of tank owner and 3rd party P.E.

Structural Inspection/Field Verification



Summary

Careful planning, execution, and verification of antenna equipment installations will enable the tank owner to maximize the amount of antenna equipment a tank can support without harmful effects on the structural integrity, safety, and maintenance.



Questions or Comments?

