

humidity in your house, turn on your stove.

Here are explanations and answers for each:

Question 1: Most people associate humidity with “heavy” air. That is because when the relative humidity is higher, we perspire less, our bodies feel warmer and perceive the air to be more dense. In fact, it is slightly less dense at higher humidity because the water vapor molecules ( $H_2O$ ) in the air that cause humidity displace denser molecules (like  $O_2$  and  $CO_2$ ). Less density results in less drag, less drag equals more distance. Therefore, the answer is true.

Question 2: “Relative” humidity is a measure of the amount of water vapor in the air in relation to the total amount of water vapor the air can hold before it becomes satu-

rated (i.e., when the air is oversaturated, it rains). Hotter air can hold more water vapor, so if heat is added, the room temperature will go up and the absolute moisture relative to the total moisture the hotter air can hold is now less. The answer to this is also true.

Just because HVAC engineering is not intuitive does not make it rocket science, but it is plagued with conditions that are difficult to predict by those less informed and other conditions that are completely out of the engineers control. The fact that one out of five individuals is likely to be dissatisfied with your best results makes it a unique challenge. This only exacerbates the common challenge of getting the proper monies budgeted for a good system installation and maintenance (i.e., battling the dreaded “value engineering”).

You may ask, “why would anyone go into this business?” Well, the impact on many peoples’ lives with regard to their comfort and the positive effect one can have on the environment through energy efficient design makes it very rewarding, and overcomes the downside of the all too frequent “too hot” and “too cold” complaints.

So the next time you are uncomfortable at work or at home, you may not have to hate the HVAC system (or the engineer). Buy a good thermometer to make sure the HVAC system is working, adjust your thermostat one or two degrees at a time (and be patient), and adjust your clothing as much as you can for the season. In the end, you may be more comfortable and you might even save some energy.

## Utility Planning for Aging Infrastructure and Changing Water Quality Legislation

Donna Kaluzniak, CEP, City of Atlantic Beach

Grant Mysterly, P.E, Applied Technology & Management, Inc.

John Collins, P.E., J. Collins Engineering Associates

Engineering on the First Coast involves helping local utilities expand, maintain, and improve their water, wastewater, and stormwater infrastructure. Applied Technology & Management, Inc. and J. Collins Engineering Associates recently worked with the City of Atlantic Beach to help identify and plan for necessary future improvements to their sewer system. Util-

ity planning involves not only making improvements to accommodate future growth, but also identifying projects necessary to continue reliable operation of existing facilities and addressing anticipated regulatory changes.

### Sewer Systems 101

A sewer system consists of two basic components: the collection system and the wastewater treatment plant (WWTP; Figure 1). The collection system collects and transports wastewater from homes and businesses to the WWTP. As wastewater leaves a house, it flows through a sloped gravity pipe. Along the gravity pipe, manholes

provide inspection and cleaning access. When the depth of the pipe becomes excessive, a lift station is installed. A lift station is a buried tank that collects wastewater and pumps it through a force-main (pressurized pipe) to the WWTP. At the WWTP, the wastewater undergoes physical, biological, and chemical treatment to reduce its organic strength and inactivate pathogens. Treated wastewater from the WWTP is typically discharged to surface water or used for irrigation.

### Aging Infrastructure

Portions of the City of Atlantic Beach’s collection system date back to the 1950’s, when vitrified clay pipe (similar to terra cotta) was used for gravity piping. It can be brittle and is prone to leaking through cracks and degraded joints. These cracks allow inflow and infiltration of groundwater

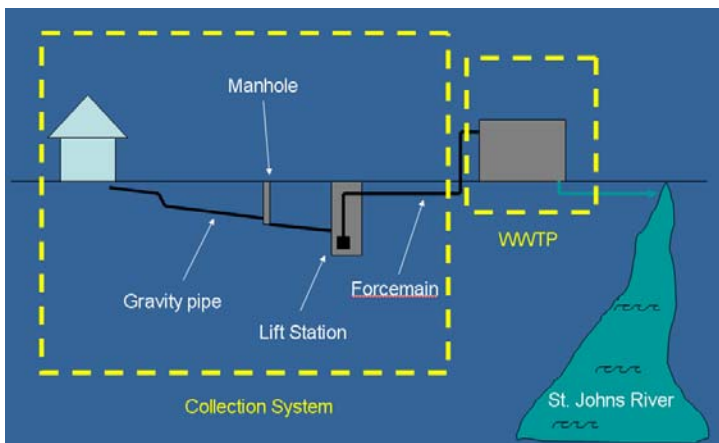


Figure 1 - Components of a Sewer System

## Utility Planning *(continued...)*

and rainwater into the pipes (Figure 2), which reduces the system's capacity. Groundwater *(continued on page 10)*

rushing into the pipe can also cause deterioration of the surrounding soil leading to a cave-in



Figure 3 – Cave-in

(similar to a sinkhole; Figure 3). Today, PVC pipe with gasketed joints is typically used, which is flexible and less prone to leakage.

To address its aging infrastructure, the City is beginning a 10 year program to systematically rehabilitate its collection system. The options for rehabilitating aging piping in-

clude point repairs, open cut replacement, and newer trenchless technologies. As engineers, we will assist in the prioritization of projects, design and determination of the appropriate rehabilitation technique, regulatory permitting, and construction oversight.

### Changing Water Quality Legislation

Excessive nutrients in the St. Johns River have caused prolific algal blooms in recent summers and turned the River green. Not only is this aesthetically negative for the First Coast, but also it is detrimental to the environment, economy, and people's health. The main sources of the nutrients are discharges from WWTPs, stormwater systems, and agricultural areas. To limit the amount of nutrients entering the River from these sources, regulatory agencies are establishing Total Maximum Daily Loads (TMDLs) for certain water quality parameters such as nitrogen and phosphorous.

To meet the anticipated nitrogen TMDL, area utilities must reduce the mass of nitrogen their WWTPs

discharge to the River by roughly half. For Atlantic Beach, meeting the limit involves significant upgrades to their existing WWTPs (Figure 4), including implementing a reclaimed water program, upgrading to tertiary wastewater treatment, and optimizing the wastewater process. Designing these WWTP improvements will involve multiple engineering facets and disciplines including environmental, civil, structural, and electrical engineers.



Atlantic Beach WWTP

To effectively meet the current and future needs of their customers while minimally impacting the environment, local utilities must proactively plan for and address the capacity, condition, and capabilities of their infrastructure. As engineers, we play an important role in helping them make informed, responsible, and cost effective decisions that will continue to positively shape the First Coast.

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Jacksonville, FL 32257

Telephone: (904) 443-2730  
Facsimile: (904) 443-7335

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# Engineering the First Coast

Celebrating Engineers Week 2007

www.nefl-eweek.org

## Chairperson's Message



Engineers Make a World of Difference – what a great theme for Engineers Week 2007.

As professional engineers, we spend much of our time solving problems and changing the world around us. We design buildings to provide places of business and residence, we create systems to improve communications, and we develop better ways to do just about everything. Engineers are at the forefront of the emphasis on the conservation of natural resources – we work to make our world more energy efficient, try to find new ways to recycle used materials, as well as strive to be better stewards of the limited resources that we have available. Engineers are the key to a client's needs, an industry's success, and the world's economic future.

Engineers Week was established in 1951 by the National Society of Professional Engineers to raise public awareness of the contributions that the engineering professions make to enhance the quality of life within our communities and around the world. It is a time for engineers to celebrate our profession, to show the public what we do, and to encourage young people to consider a career in engineering.

In Jacksonville, we celebrate Engineers Week with a calendar of events that include engineering society meetings, service projects, educational programs, and social events that raise money for student scholarships. I want to thank

the following engineering societies for their interest and support in making Engineers Week a time for each of us to acknowledge the differences that engineers make in our world.

American Concrete Institute

American Public Works Association

American Railway Engineering and Maintenance of Way Association

American Segmental Bridge Institute

American Society of Civil Engineers

American Society of Heating, Refrigerating & Air Conditioning Engineers

American Society of Mechanical Engineers

American Water Works Association

Florida Engineering Society

Florida Structural Engineers Association

Florida Water Environment Association

Institute of Transportation Engineers

National Society of Black Engineers, Jr. Community Chapter

Society of American Military Engineers

Society of Marketing Professional Services

Society of Women Engineers

University of North Florida

U.S. Army Corps of Engineers

Joe Watson

Planning Committee Chairperson

Northeast Florida Engineers Week 2007

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