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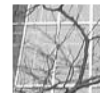
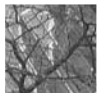


Ethanol Fuel Storage Protection

By Bryce Wentworth, PE.

The commitment to include ethanol and ethanol blends in the nation's motor fuel supply has required gasoline storage facilities to address new fire protection strategies for storage tanks and truck loading racks. Many gasoline storage facilities are well protected against fires involving standard gasoline and diesel fuels through the installation of traditional Aqueous Film Forming Foam (AFFF) systems. However, since ethanol is an alcohol,

(continued on page 2)





Ethanol Fuel Storage Protection (continued from page 1)

the chemical properties of this class of liquids severely diminish the effectiveness of traditional foams.

The intent of AFFF is to create a foam coating over the surface of a liquid fuel fire to interrupt the interaction of the fuel vapors and the oxygen supply. A barrier of water is formed beneath the foam layer which contributes to cooling of the fuel. Without interjecting excessive technical descriptions, alcohols are water soluble and reduce the effectiveness of AFFF at maintaining the foam properties essential for effective fire suppression.

Foam manufacturers have responded to the challenge and developed Alcohol Resistant AFFF (AR AFFF) that is effective on alcohol-based and typical hydrocarbon fuel fires. The physical properties of AR AFFF vary from standard AFFF however. As such, simple replacement of AFFF with AR AFFF may not be possible without evaluation of installed piping and foam-making devices.

The two focal points with regard to protection systems at fuel storage facilities are the fuel loading racks and the storage tanks. At loading racks, tanker trucks are loaded with a specific amount and type of fuel for distribution to local gasoline stations. Fire protection equipment at loading racks often includes overhead sprinklers and spray nozzles directed under the trailers. Initiation of the system may be through automatic detection or manual means.

Fuel storage tanks are often equipped with foam chambers located at the top of the tanks that are supplied via a piping network. The foam supply can either be supplied automatically or through fire fighting apparatus.



Prior to fuel storage facilities accepting deliveries of ethanol fuel, AR AFFF should be supplied to the site and suppression systems configured to protect against a fire from either a hydrocarbon or alcohol based fuel. National Fire Protection Association Standards including NFPA 11 *Standard for Low, Medium and High Expansion Foam*, NFPA 16 *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems* and NFPA 30 *Flammable and Combustible Liquids Code* provide general guidance for fire protection strategies for fuel storage. However, as with the application of any general code, there will be challenges that are not specifically addressed by the codes on application to a specific facility.

With the addition of ethanol to a storage site, the current complement of foam equipment should be reviewed to insure

compliance with the requirements of prevailing codes and standards as well as the listing of the AR AFFF to be used.

To determine if existing piping and equipment may be used, it is necessary to work backwards from the application rate to the water supply to determine if the system can hydraulically perform as required for the new AR AFFF. If as-built documentation is available, and record drawings reflect the actual installation of equipment and piping, the calculations are straight-forward. Without adequate documentation, evaluating the systems can be much more challenging.

Foam concentrate is supplied to a suppression system via one of several proportioning methods. The majority of the systems experienced in the field are fixed permanent installations; however there are portable methods that may be encountered.

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Tough Times Demand Top Performers

It's now obvious that the crisis in the U.S. residential marketplace has triggered an economic recession that is also impacting the commercial/institutional/industrial sector. As tighter credit threatens new and existing projects, building owners, operators and their A&E and construction firms are facing tough decisions. Which projects should move forward? How can costs be contained and production schedules tightened in order to deliver a return on investment quicker?

One way is to select only the top performers to participate on the project team. These can be firms who can staff the project with technically excellent talent. Firms who have a proven track record of on-time,

within-budget performance. And firms who can provide a wider scope of services and a demonstrated ability to integrate their solutions to the benefit of the project stakeholders.

RJA fits this description. We have superior technical talent in life safety, fire protection, security and media technology. Our veteran consultants have earned client trust on more than 30,000 projects throughout the world. And we can bring a wider scope of integrated solutions to bear on any project, anywhere in the world. Now is not the time to take unnecessary risks. In a tough economy you need your top talent. We can help you make more out of less. 

Mickey Reiss, P.E., FSPPE



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*Call us today at
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FROM THE NEWS DESK...

Promotions

Alex Kline, P.E. named Operations Manager of the RJA/Raleigh office

Kelly Eisenstein, P.E. named Operations Manager of the RJA/San Diego office

New Office Locations

Rolf Jensen & Associates, Inc. is pleased to announce our new office locations and relocations

RJA/Atlanta

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RJA/San Diego

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Fax: +1 619 488-9811

SAKO/Baltimore

14502 Greenview Drive
Suite 500
Laurel, MD 20708
Phone: +1 301-490-3901
Fax: +1 301-490-4763



Ethanol Fuel Storage Protection (continued from page 2)

Presently, there are seven fixed foam concentrate proportioning systems:

- 1) Balanced pressure proportioner,
- 2) In-line balanced pressure proportioner,
- 3) Pressure proportioner,
- 4) Venturi type,
- 5) Bladder tank proportioner,
- 6) Around the pump proportioner,
- 7) Jet pump proportioner.

The systems described above range widely in the complexity required for proper operation. Site surveys must include a thorough evaluation of the proportioning system. In most cases, the foam concentrate storage capacity and arrangement must also be reviewed. Due to the variance in UL requirements for AFFF and AR AFFF application rates, it is not uncommon for AR AFFF concentrate storage capacities to increase to account for higher application rates. This may be a challenge for existing facilities that have buildings designed around the current style of suppression system.

The type of proportioner being used in the system can be an important factor in determining the adequacy of the current sprinkler system. If the AR AFFF concentration will be the same as for the AFFF, then likely the proportioner can be

reused for the new application. The UL listing of the current proportioner should be reviewed to ensure that the retrofit will also provide a UL listed system with the AR AFFF.

Hydraulic calculations of the existing system must be performed to determine the adequacy of all equipment, in its installed form. For retrofits that replace AFFF with AR AFFF at the same concentrations, the viscosity of the new foam should not be an issue. However, should the protection strategy require a higher concentration rate, the manufacturer should be consulted to determine if the AR AFFF viscosity should be included as a factor in the hydraulic calculations.

Once the entire analysis has been completed the retrofit for the AR AFFF can range from simple to complex. Likely the sprinklers and floor nozzles currently installed will require replacement to maintain the UL Listing. Modifications to the piping may be required to meet the design requirements. Fire pumps and water supplies must also be reviewed for adequacy.

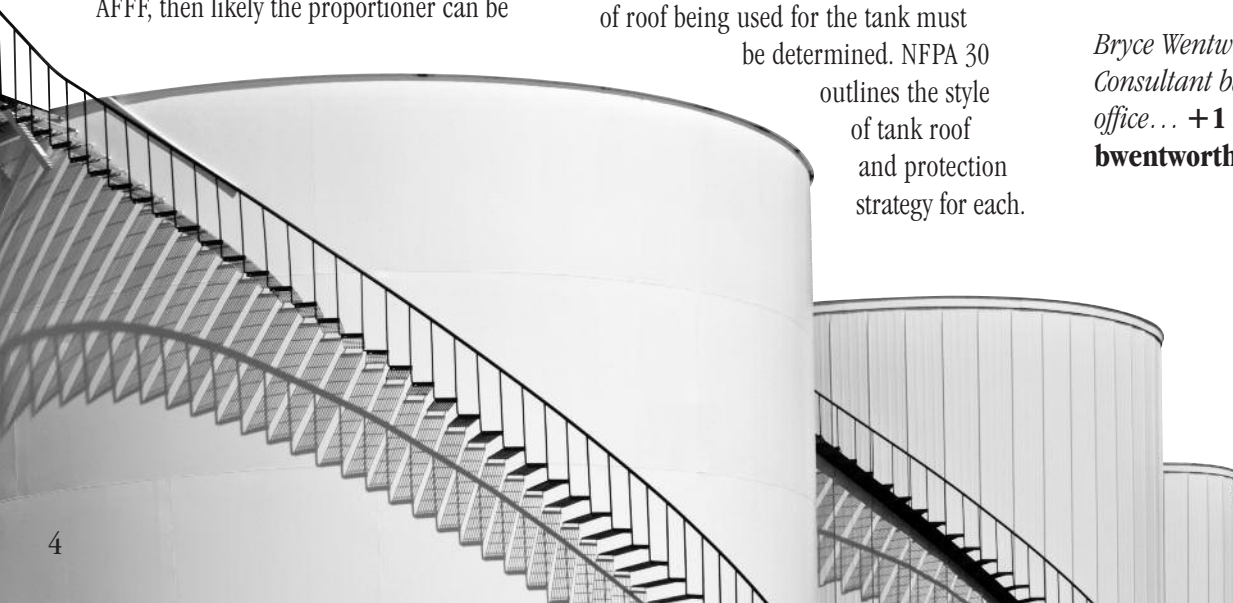
Liquid storage tanks require important parameters to be evaluated to determine what, if any, modifications may be required. First and foremost the style of roof being used for the tank must

be determined. NFPA 30 outlines the style of tank roof and protection strategy for each.

For instance there may be a 1) fixed roof, 2) floating roof, or 3) non-steel floating roof. The fixed roof style of tank requires the foam be introduced in a capacity to completely cover the surface of the fuel being stored. For tanks that can exceed 120 feet in diameter this equates to a significant amount of foam. The floating roof style of tank requires that only the rim of the roof be protected. The intent is to provide a barrier along the interface of the roof to the storage tank where fuel vapors may escape.

The local building and fire departments always play an important role with any well-planned project. Retrofit projects for ethanol fuel storage facilities especially require their involvement due to the relationship the fire department will assume should a fire occur. Successful containment of the fire, protection of adjacent properties and eventual suppression requires they have detailed knowledge of what they are facing and what is required to control the situation. Ethanol will likely be a significant fuel or fuel additive in the foreseeable future. As facilities are converted for this fuel, the items outlined above will play an important role in the successful transition of fire protection strategies. 🚒

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Prymak Joins RJA as VP-Regional Business Development Manager



RJA is pleased to announce that **Thomas Prymak** has joined the firm as Vice President, Regional Business Development Manager for the Houston, Dallas, Denver and Phoenix offices. Prymak, who took over this position effective October 1, 2008, will be based in the RJA/Dallas office. In his new role, he will be responsible for building relationships and pursuing opportunities in regional, national and International markets. He will also serve as a mentor for local business development staff.

Prymak has a long and distinguished career in the fire protection industry, most recently serving as VP of Marketing for Tyco Fire and Building Products. **Robert Libby, P.E.**, Executive Vice President in charge of Business Development, said, "With his extensive knowledge and industry experience, Tom's talent and past success have proven he is a leader who can help RJA grow and achieve our goals. We are very excited to have him as part of our team."


Prymak holds a Bachelor of Science Degree in Aeronautical and Astronautical Engineering from Purdue University. He is a member of the Society of Fire Protection Engineers (SFPE), the National Fire Protection Association (NFPA), the National Fire Sprinkler Association (NFSA) and the American Fire Sprinkler Association (AFSA). 

Kaufmann Appointed To inFire Committee

RJA is pleased to announce that **Sarah Kaufmann**, Information Services Manager, has been selected to serve on the Executive Committee of inFire—the International Network of Fire Information and Reference Exchange. Kaufmann was nominated by current Executive Committee members based on her active participation in the organization throughout the years and her willingness to step up, be accountable, and surpass the expectations set for their members.



In her new role with inFire, Kaufmann will be responsible for managing the business aspects of the organization, approving membership applications, reviewing and approving conference presentation abstracts, and long-range conference planning, feedback and evaluation. She will serve a 3-year term on the Executive Committee.

InFire is a worldwide association that grants membership to libraries or information centers in organizations that are involved in fire research, testing, education and training, as well as fire protection consulting firms, fire insurance firms and fire associations. The focus of inFire is to share resources between member organizations. This resource sharing culminates in an annual conference where professionals from around the world gather to network and learn about advancements in library activities and fire research. 



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RJA Becomes the Key Sponsor of New WPI Fire Science Laboratory

Rolf Jensen & Associates is pleased to be working with Worcester Polytechnic Institute (WPI) and their Fire Protection Engineering Department to fund a new, state-of-the-art Fire Sciences Laboratory. RJA has committed to a 5-year endowment in support of this great project.

George Toth, Chief Operating Officer of The RJA Group and Chair of the WPI Fire Protection Engineering Advisory Board, said, "We recognize the integral role WPI plays in educating and training the future leaders of our profession. Their programs, professors and students are first-rate, and we couldn't be more excited to be involved at the beginning stages of this new development."

If you are interested in learning more about the new Fire Sciences Laboratory at WPI, or would be interested in assisting with a donation or sponsorship, please contact **Karen Bean, Director of Development, at +1 508-831-4169 or email at kbean@wpi.edu**.

RJA is dedicated to furthering the educational curriculum and professional opportunities available to Fire Protection Engineering students. In recent years, RJA has supported program advancements and new laboratories at Oklahoma State University and the University of Maryland. 

The Phoenix Society: How One Organization is Making Great Strides in the Burn Survivor Community

The RJA Group is proud to be a Platinum Sponsor of the Phoenix Society, an organization focused on providing support, information and education for burn survivors and their families. Their hospital-based Survivors Offering Assistance in Recovery (SOAR) program provides training for survivors and their family members who want to volunteer to assist other burn patients in their recovery.

The generosity of sponsors and individual donations to the SOAR program has made a difference this year. The Phoenix Society completed training at nine new burn centers across the country, from New York Presbyterian to Fresno, California, and they have increased access to peer support for those who find themselves in a burn center. They have also partnered with the University of Kentucky and will be completing research to evaluate the impact of SOAR at five hospitals over the next year and a half. SOAR programs are now present in over 43 burn centers across the country, and their hope is to assure that peer support becomes a standard of burn care in this country.



Photo used with permission from the Phoenix Society

In addition to SOAR, the Phoenix Society provides invaluable programs and services, including the Journey Back program aimed




Phoenix Society
for burn survivors

at assisting young burn survivors with their transition from the hospital back to school, a quarterly news publication focused on burn recovery and The Phoenix Education Grant, the first national scholarship endowment fund created for burn survivor students.

The Phoenix Society's World Burn Congress is an annual event that brings together survivors, families, care givers, burn professionals and firefighters. This is a forum to meet, exchange stories and increase knowledge of burn recovery. The 2009 World Burn Congress will take place August 26-29, 2009 in New York City.

The RJA Group looks forward to expanding our partnership and involvement with this great organization, and supporting their ever-expanding commitment to the burn community. If you would like to learn more about the Phoenix Society and their efforts in the burn community, or would like to become a sponsor or make a donation yourself, please contact:

Amy Acton

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Sun Valley Music Pavilion **By Sean Donohue**

The Sun Valley Music Pavilion is an outdoor amphitheatre with seating capacity of approximately 1,500 located in the heart of the Sun Valley resort, a year-round destination for recreation including golfing, biking and skiing.

The pavilion was commissioned in 2007 by the Sun Valley Company primarily to provide a permanent home for the Sun Valley Summer Symphony, the largest privately funded free admission symphony in America. It is anticipated that the pavilion will host additional ticketed venues as well. The pavilion includes an outdoor seating area and stage and indoor back-of-house spaces including green rooms, changing rooms, staging, storage, docks, offices and support spaces. The building has three indoor levels and measures approximately 50,000 gross square feet.

A cable-supported membrane drapes over the 1,500 fixed seating area and covers approximately 16,000 square feet of exterior seating space. The membrane is designed to shield sunlight and shed water

but is not designed for the region's significant snow loads. The amphitheatre will primarily host events during the warmer months with the membrane and seats in place, but is also capable of winter use without the membrane and seats.

Because the membrane structure shelters the assembly seating when the building is occupied, it is considered part of the floor area of the building with the same code requirements as the rest of the building, specifically, allowable area and automatic sprinkler protection. As designed and constructed, any portion of the building with a solid roof structure is sprinkler protected. However, the membrane structure does not have a solid frame from which to attach sprinkler piping, therefore protection is impractical.

Rolf Jensen & Associates (RJA) was retained by local architects Ruscitto/Latham/Blanton Architectura (RLB) to investigate whether sprinkler protection could be omitted within the seating area. RJA conducted an extensive

code analysis and plan review as well as ongoing code consulting services. Adopted building and fire codes included the 2003 editions of the International Building and Fire Code.

RJA also produced a Request for Alternate Means of Protection to allow a cable-supported membrane to hang lower than 20 feet from a surface below and to allow the omission of sprinkler protection beneath the membrane. RJA accomplished this task with two different quantitative exercises, both aimed at showing that the building meets the intent of the code as designed.

To prove that a membrane in an open venue could hang lower than 20 feet from a space below, RJA conducted a critical analysis of three probable fire scenarios to show that the membrane fabric would not ignite or propagate combustion. The intent of this evaluation was to demonstrate that a margin of safety was created through conservative assumptions.

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Sun Valley Music Pavilion (continued from page 7)

The three likely fire scenarios evaluated included:

1. A fire in the seating area involving 3 seats;
2. A fire in the sound booth located centrally within the seating area; and
3. A trash fire along the exterior perimeter of the membrane.

The membrane material evaluated was a polyester weave coated with PVC, and treated with a flame-retardant in order to meet NFPA 701 requirements.

Results indicated that for the worst case fire condition, a one megawatt fire within the sound booth, a center line plume temperature produced enough heat to cause localized softening and possible melting of the membrane but would not ignite the membrane. The concern had been that a fire would cause massive melting and dripping of the membrane onto the audience. Ultimately, RJA determined that during events, there was not a significant fuel source present beneath the membrane large enough to cause a fire sufficient to threaten the stability of the fabric. The area where the fabric was within 20 feet of the adjacent ground level, the surface serves as a walkway and seating area. In this seating and walkway areas, storage of combustible materials in substantial quantities would be detrimental to the mission of the venue. The pavilion is also fully vented on all sides and at the connection to rigid structure; therefore a buildup of products of combustion is not possible.

There were other code requirements to be satisfied. First, this is a Group A assembly occupancy with over 300 occupants and requires sprinkler protection on that basis alone. Second, the code does not make provisions for meeting the requirements of allowable area for partially sprinklered buildings. IBC Section 506.3 requires that a building be sprinkler protected *throughout*

in order to take advantage of allowable area increases due to sprinkler protection.

This was a problem because, although 70% of the building is sprinkler protected, the code would not give any credit for sprinkler protection nor would the building meet the requirements of IBC Section 506 for allowable area. Further, the open nature of the building would not realistically permit the construction of a fire wall per IBC Section 705.

Therefore, RJA proposed to use a weighted average approach, similar to the *sum of ratios* calculation required for separated uses in IBC Section 302.3.2. RJA proposed to show that summing the ratios of actual to tabular allowable floor areas of both the sprinkler protected and non-sprinkler protected portions of the building would not exceed one, as follows:

$$\frac{A_{as}}{A_{ts}} + \frac{A_{ans}}{A_{tns}} \leq 1.0$$

- Where: A_{as} = Actual floor area of the sprinkler protected portion
 A_{ts} = Tabular (allowable) floor area of the sprinkler protected portion
 A_{ans} = Actual floor area of the non-sprinkler protected portion
 A_{tns} = Tabular (allowable) floor area of the non-sprinkler protected portion

The most restrictive tabular area from IBC Table 503, a Group A-1 occupancy of type II-B construction, was used for the entire building. The reasoning would follow that if a weighted average between sprinkler protected and non-sprinkler protected portions of a building falls below 1.0 for the most restrictive occupancy group, then the building would meet the intent of requirements for building size limitations.



For the weighted average analysis, the proposed calculation showed that the building produced weighted areas of less than 1.0.

Another important factor to consider with regards to the seating area was how egress capacity and travel distance were calculated. Since the seating area is mostly without automatic fire sprinkler protection, it was felt that the egress width factors in IBC Table 1005.1 should be applied *without sprinkler system*.

The code also recognizes another form of calculating occupant loads within assembly spaces per IBC Section 1024.6. This assumes that the space is smoke protected. RJA did not assume smoke protected assembly seating even though the open nature of the design provided sufficient smoke and heat venting to protect the seating areas. The seating area of the Pavilion met the most stringent requirements of the code with regards to egress capacity and travel distance.

Based on the results of this analysis, RJA concluded that the inherent risk of draping a membrane fabric to within 10 feet of a floor and omitting sprinkler protection within the seating area was no higher than that allowed by the adopted code. RJA recommended that this pavilion be permitted as described herein provided that the remainder of the building is fully sprinkler protected in accordance with NFPA 13. The Sun Valley Music Pavilion opened its doors to the public on August 3 for the 2008 summer concert series to much local acclaim. 🎵

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Rolf Jensen & Associates (RJA) consultants are at work on leading fire protection, security and media technology projects around the world...



Image Credit: Toshiko Mori Architect

Syracuse University Center of Excellence – Syracuse, NY

When completed, the new headquarters for the Syracuse University Center of Excellence (CoE) will be a five-story, 55,000-square-foot building that will house a high hazard biofuels laboratory on the first floor and numerous classrooms, learning labs and offices throughout the rest of the building. This will allow researchers working in Environmental and Energy systems to be able to continue their studies into biofuels and alternative energy sources at this new facility. Sustainability was also a high priority for the design team on this project.


Since the researchers work with large quantities of flammable liquids, RJA was tasked with finding unique ways to protect this high hazard occupancy. In addition to planning protection, they also assisted in planning explosion venting, which is required by code when a building contains certain gases or liquids. The Sustainable building design also presented a challenge in that the first floor was classified as high hazard while other floors were for business occupancy.

To address explosion venting, RJA recommended explosion vent panels that would pop out when a maximum pressure point is reached. RJA also specified a dedicated exhaust system that is separate

from the rest of the building and is continuously ventilated as to prevent a buildup of flammable vapors and harmful noxious fumes.

RJA and the design team had to work together to incorporate the sustainable design while ensuring code compliance and maximum safety. For example, the design called for a green roof for the biofuels lab that can reduce storm water runoff and reflect heat. The plan called for a large ramp running up the side of the building allowing access to the roof. Because the design only had one approved means of egress, RJA noted that the roof would have to limit access to 50 occupants at a time.

The design also specified the use of a curtainwall system to optimize daylight and use the solar gain to keep the building cooler in summer and warmer in winter. The curtainwall needed to be fire rated due to the building lot separation distance. RJA was able to justify this type of curtainwall by translating how its manufacturer's testing applied to the reference building code.

Working with Sustainable building components and a high hazard occupancy demonstrated RJA's ability to analyze options, work diligently to meet code and work with local building officials for approval, while always protecting the CoE's occupants and property. 



Downtown Burj Dubai—Dubai, United Arab Emirates

Downtown Burj Dubai is a 1 km mixed-use development which, upon completion, will include the Burj Dubai (World's Tallest Building), Dubai Mall (World's Largest Mall) and over 80 other residential/commercial/office buildings. Downtown Burj Dubai will house over 100,000 residents and entertain an average of 150,000 visitors a day.

Emaar Properties PJSC, Downtown Burj Dubai's developer, identified a concern on how various building management teams could effectively manage and

coordinate crisis response efforts in the event of a crisis, whether it be a single building or the entire Downtown Burj Dubai. Emaar Properties requested RJA to develop comprehensive crisis management plans on both a site-wide and building-specific level to manage various crises that could adversely affect the site's operations, tenants, guests and staff. These response plans, to be utilized upon opening of the various buildings, have been designed to provide a coordinated approach between the individual building management teams, a Downtown Burj Dubai Site-Wide Crisis

Management Team and the various Dubai Local Authorities that may be required to respond to a crisis situation occurring at Downtown Burj Dubai.

RJA has developed a standardized approach that can be incorporated into the various types of buildings in Downtown Burj Dubai including retail, residential, hotel and commercial. This standardized approach is now being developed into an Emaar Corporate Crisis Management Standard that will be implemented on a global basis throughout their portfolio, located in 35 different countries. 



Stater Brothers New Distribution Warehouse – San Bernardino, California

Stater Brothers, a popular Southern California grocery store chain, had plans

to build more than one million square feet of warehouse space, featuring two major buildings and several smaller structures, on property that would be shared with the company's existing




headquarters. RJA was hired to deal with the fire protection challenges related to such a large storage facility.

The owners were looking for an alternative to the in-rack sprinkler system for the cold storage areas of the facility. RJA was asked to review a new surround-and-drown sprinkler system, ideal for use in cold storage heights above 25 feet. This system, which RJA approved for use on this project, meant that an in-rack system would not be required. Since the surround-and-drown system was so new, RJA had to quickly develop a working knowledge of the system and be able to explain it to others to ensure everything was in an acceptable arrangement in time for construction.

RJA worked with the client, the City of San Bernardino and the San Bernardino Fire Department to create and ensure fire protection engineering judgments and recommendations were appropriate. RJA also worked closely with the Authorities Having Jurisdiction and Stater Brothers to identify all the issues that would impact the final system arrangement regarding fire suppression in the storage facility. In addition, all plans were targeted to be completed in a short amount of time without compromising the design and safety requirements.

The new surround-and-drown suppression systems met code requirements and fit the warehouses' purposes perfectly. The fire protection solution also gave the property owners flexibility when arranging items within the warehouse.

RJA also created an innovative solution involving a dry-pipe fire suppression system that will enable storage higher than 25 feet, without requiring in-rack sprinklers. This type of dedication, knowledge acquisition and inventive approach to challenges can only benefit the clients who work with RJA. 



Elleven – The South Collection – Los Angeles, California

Elleven, a 13-story condominium structure on Grand Avenue in Los Angeles, is the first new residential high rise in the city's downtown area in 20 years. Elleven

also made another type of history—it's the first multi-residential building in Los Angeles to receive the LEED Gold certification from the U.S. Green Building Council (USGBC) for its sustainability features. To help achieve this certification, RJA was hired for third party inspection services and were relied on especially for our smoke control expertise.

A challenge for this 395,000-square-foot structure, which includes four parking levels, four two-story townhouse units and 176 loft units, was meeting California and Los Angeles code requirements while also fulfilling USGBC requirements to achieve LEED status. To assist, RJA served in a construction manager capacity to oversee details

regarding smoke control. RJA provided services including smoke control inspection, review of the smoke control system package, review of equipment submittals and control diagrams, assistance in providing a test procedure for garage levels, and witnessing functional tests of the smoke control components for a temporary certificate of occupancy.

Due to the assistance RJA provided on Elleven, the developer retained RJA for services on two additional building phases for this project: a 19-story, 472,000-square-foot condominium building that has also received Gold LEED certification, and a 23-story building. ➤



ROLF JENSEN & ASSOCIATES, INC.
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Horizon

***Expanding The Horizons of Fire Protection,
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