



Rantoul Village Board of Trustees
Regular Study Session
April 4, 2023
6:00 PM

Order of Business

1. Call to Order

2. Roll Call

3. Mayoral Proclamation

(A) Autism Awareness and Acceptance Month

(B) Arbor Day | Friday, April 28, 2023

4. Approval of Agenda

5. Public Participation

Citizens wishing to address the Village Board with respect to any item of business listed upon the agenda, or any matter not appearing on the agenda, are asked to complete a public participation form, and submit it to the Village Clerk prior to the meeting. Comments will be limited to three minutes for each speaker.

6. Items from Trustees

7. Items from the Mayor

8. Items from the Clerk

All Minutes are draft versions until approved during the Regular Board Meeting. The Village is required to post the approved minutes on the website within ten days of approval.

(A) Minutes of the March 7, 2023 Board Study Session

(B) Minutes of the March 14, 2023 Board Meeting

(C) Minutes of the March 17, 2023 Special Board Meeting

9. Items from Human Resources

(A) March 2023 Village Applicant Demographics Report

10. Items from Police Department

11. Items from Fire Department

(A) Agreement for the Design Build Contractor for the Rantoul Fire Department Fire Sub-Station Addition with Roessler Construction & Contracting, Inc. in the amount not-to-exceed \$750,000.00

12. Items from Comptroller

13. Items from Building & Environmental Safety

14. Items from Community Development

15. Items from Recreation

(A) Engineering Agreement for the Heritage Lake Boat Access Area Development Grant with Engineering Resource Associates, Inc. in the amount of \$20,000.00



Rantoul Village Board of Trustees
Regular Study Session
April 4, 2023
6:00 PM

Order of Business

16. Items from Public Works

- (A) Amendment to the Engineering Agreement for the Wastewater Nutrient Assessment Reduction Plan Study Project with Donohue & Associates, Inc in the amount of \$33,740.00

17. Items from the Administrator

- (A) Ordinance 2736, An Ordinance to Readopt, Ratify, and Reaffirm the License, Permit, and Service Fees, and Administrative Penalties Schedule with Amendments
- (B) Discussion Regarding Fiscal Year 2023-2024 Budget

18. Items from Counsel

- (A) Legal Update Presentation

19. Items for Closed Session

- (A) Motion to enter into Closed Session pursuant to 5 ILCS 120/2 (C) 2, to consider collective negotiating matters between the public body and its employees or their representatives, or deliberations concerning salary schedules for one or more classes of employees
- (B) Motion to enter into Closed Session pursuant to 5 ILCS 120/2 (C) 1, to consider the employment, compensation, discipline, performance, or dismissal of an employee

20. Adjournment

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

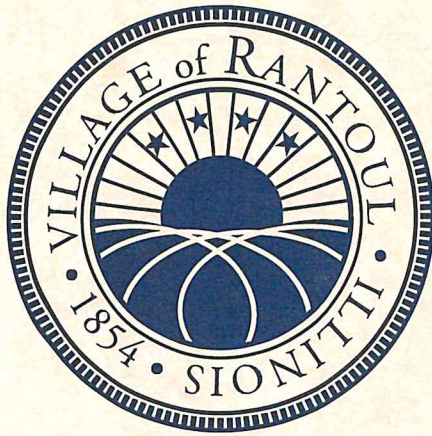
AGENDA ITEM

ITEM: Mayoral Proclamation	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS:	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Autism Awareness and Acceptance Month	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS: 1. Proclamation - Autism Awareness and Acceptance Month 0423	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR



Proclamation

by the Mayor of Rantoul, Illinois

To All to Whom these Presents Shall Come:

Whereas, Autism Spectrum Disorder is the fastest growing developmental disability. The Centers for Disease Control and Prevention estimate that one in 44 Americans currently live with the disability, increasing in US children by 119.4% since 2010. Autism knows no racial, ethnic, or social boundaries, and it affects the young and old alike.

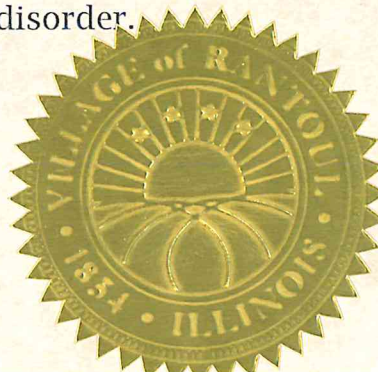
Whereas, Autism is a lifelong neurological disorder that affects each individual differently, ranging from very mild to severe. The learning, thinking, and problem-solving abilities of this disorder can range from gifted to severely challenged. Autism can cause significant social, communication, and behavioral challenges.

Whereas, our understanding of Autism has grown tremendously since it was first diagnosed by psychiatrist in 1943, there is no known cure for Autism. Accurate, early diagnosis, and the resulting appropriate education and intervention, are vital to the future growth and development of the individual.

Whereas, there is a need for continued research into this disorder, hope currently lies in a broad spectrum of treatments, and in an informed public and community committed to providing support and service to individuals diagnosed with Autism Spectrum Disorder.

Whereas, during the month of April, we strive to promote autism awareness, inclusion, and self-determination for all, and assure that each person with Autism Spectrum Disorder is provided an opportunity to achieve the highest possible quality of life.

Now therefore, I, Charles Smith, Mayor of Rantoul, do hereby proclaim the month of April 2023 to be designated as **Autism Awareness and Acceptance Month**, and I urge our Village to participate in this annual observance to celebrate the differences of, learn more about, and empower Autistic individuals in the hope that it will lead to a better understanding of this disorder.



Given Under my hand and the
Corporate Seal of said Rantoul, Illinois
this 7th day of April 2023

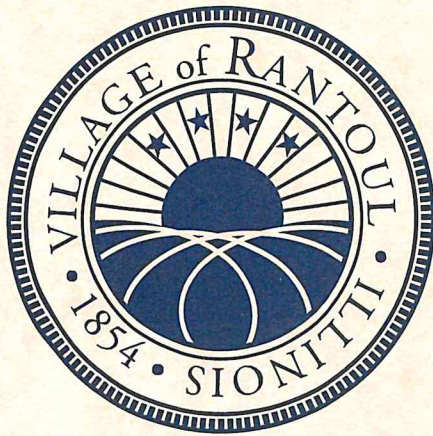
Charles Smith

Mayor and President of the Village Board of Trustees

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Arbor Day Friday, April 28, 2023	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS: 1. Proclamation - Arbor Day 0423	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR



Proclamation

by the Mayor of
Rantoul, Illinois

To All to Whom these Presents Shall Come:

Whereas, in 1872, J. Sterling Morton had an enthusiasm for trees, and he advocated strongly for a special day to be set aside for the planting of trees. That first Arbor Day was observed by the planting of an estimated one million trees, reminding us that one person's initiative can make a lasting and meaningful difference.

Whereas, the last Friday in April has been designated as Arbor Day annually throughout the nation and the world to celebrate trees, and to encourage the planting of trees for a greener tomorrow.

Whereas, the Rantoul Garden Club has led the Village-wide Arbor Day program in observance for more than fifty years, which is committed to tree planting, conservation, and environmental stewardship.

Whereas, the Village of Rantoul is one of 191 communities in Illinois that have recently earned the status of Tree City USA, a high honor bestowed by the Arbor Day Foundation, and one that Rantoul has held for the last thirty-eight years.

Now **therefore**, I, Charles Smith, Mayor of Rantoul, do hereby declare Friday, April 28, 2023 as **Arbor Day** in the Village of Rantoul encouraging residents to plant and care for their trees now and for future generations.



Given Under my hand and the
Corporate Seal of said Rantoul, Illinois
this 28 day of April 2023

Charles Smith

Mayor and President of the Village Board of Trustees

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Public Participation	DEPARTMENT:
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS:	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Items from the Clerk	DEPARTMENT:
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS:	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Minutes of the March 7, 2023 Board Study Session	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS: 1. March 7 Minutes - draft	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL Janet Gray	VILLAGE ADMINISTRATOR Scott Eisenhower

**RANTOUL VILLAGE BOARD OF TRUSTEES
REGULAR STUDY SESSION
March 7, 2023**

LOUIS B. SCHELLING MEMORIAL BOARD ROOM
RANTOUL MUNICIPAL BUILDING, 333 S. TANNER, RANTOUL, IL

A Regular Study Session of the Board of Trustees of the Village of Rantoul was held at at 6:00 P.M. Mayor Smith called the proceeding to order.

Roll Call

The Clerk called the roll, finding the following members present:

Mayor Smith, and Trustees Crider, Wilkerson, Hall, Robertson, Weathersby and Johnson – 7

The following representatives of Village departments were also present:

Scott Eisenhauer, Administrator; Debbie Sage, Human Resources; Tony Brown, Police Chief; Chad Smith, Fire Chief; Jolene Gensler, Comptroller; Jake McCoy, Assistant Public Works Director; Chris Milliken, Zoning and Planning; Brian Hunt, Community Development; David Wesner, Attorney, and Janet Gray, Village Clerk.

Approval of Agenda

Trustee Hall moved to approve the agenda. Trustee Weathersby seconded the motion. On a roll call vote:

 AYE: Hall, Robertson, Weathersby, Johnson, Crider and Wilkerson – 6.

 NAYS: None – 0.

The motion carried 6-0.

Public Participation

- Sheldon Lashley said he took part in the Citizens Police Academy at the U. of I. Police Institute. He would encourage other citizens to participate in this program.
- Terry Workman stated that there are three Trustees to be elected this year and citizens can only vote for one Trustee and half of the voters of Rantoul cannot vote in this election.
- Kristian Hopkins is working on a Community Development survey which is done every 5 years. Surveys will go out in the utility bills for citizens to complete.
- Loise Haines invited citizens to a meet and greet of the candidates. The event will be March 21 at 6:00 pm in the Board Room at Village Hall.

Items from Trustees

Trustee Hall

- Thanked the Public Works employees for the job they did in restoring power during the storm.

Trustee Johnson

- Thanked the employees who worked through the storm. Asked what the cost of overtime was and if any transformers needed repair. The Assistant Public Works Director said no transformers were damaged. The department is just now getting the overtime and equipment costs together.

Items from the Mayor

- A. Habitat for Humanity will start building a house at 1308 Sunset Drive on April 15. Anyone interested in helping should contact the Director of Habitat for Humanity. The Village Administrator can provide that phone number.

Items from the Clerk

- A. Minutes of February 7, 2023 Regular Study Session
- B. Minutes of February 14, 2023 Board Meeting

These minutes will go to the Board for approval.

Items from Human Resources

- A. The February 2023 Village Applicant Demographics Report is in the Board Packet.

Items from Police Department

No items to report.

Items from Fire Department

No items to report.

Items from Comptroller

No items to report.

Items from Building & Environmental Safety

No items to report.

Items from Community Development

Chris Milliken introduced Brian Hunt who started with the Village in January. He reviewed the responsibilities of the Community Development Department. They include overseeing the HUD Community Development Block Grant program, Grant Management and Marketing and Property Management.

Items from Recreation

- A. The department requested the approval of an Architecture and Engineering Contract with Cordogan Clark for the ARPA funded Youth Center renovation in the amount of \$89,800.00. Four companies responded to requests for proposals for the project. Cordogan submitted the lowest proposal and has worked with the Village on the recent Forum Fitness Center PARC project.

This item will go to the Board for approval.

Items from Public Works

- A. The department requested the approval to purchase a new Yanmar Mini Excavator for the Electric Division from Vermeer Midwest in the amount of \$33,568.00. The current excavator is over 20 years old and at the end of its useful life. This excavator is used daily by the Electric Division. This purchase is budgeted in the FY23-24 Budget.
- B. The department requested the approval of an agreement with Utility Financial Services to perform a cost-of-service review of the Village's electric, gas, water and wastewater utilities. This type of review is usually done every 3-5 years. The cost would be not-to-exceed \$57,000.00.
- C. The department requested the approval of a Local Agency Agreement between the Village and the Illinois Department of Transportation to allocate funding for the proposed overlay of US Rt. 136 from Maplewood Dr. to the Village limits on the east side. The cost is \$3,708,348.00 for the project. The Village's cost is \$79,998.00. The stop light will be removed at Lon Drive.

These items will go to the Board for approval.

Items from the Administrator

- A. The Administrator requested the approval of adding 102 East Champaign Ave. to the Vacant Lot Purchasing Program.
- B. The Administrator presented an Ordinance for review regarding non-medical response for lift assistance. It would allow the Fire Department to charge \$300 per lift assist incident when responding to any Assisted-Living facility and/or Nursing Care Facility for non-medical assistance.
- C. The Administrator presented an Ordinance for review regarding a fee for the response to a hazardous materials call. The initial fee would be \$300 along with an hourly fee of \$100 through the duration on site, and reimbursement of all costs associated with the response.

These items will go to the Board for approval.

Fiscal Year 2023-2024 Budget Presentation

The budget as presented is a balanced budget. It includes both the revenue and expenses as they relate to the ARPA funds. A copy of the budget and the presentation from the Study Session will be on the web site on March 8. The Budget Hearing will be at 5:45 pm on April 11 and the Budget needs to be approved prior to April 29. The goal is to approve it at the April 11 Board Meeting.

Items from Counsel

The Attorney will provide an update on collections at the April meeting.

Meeting Adjourned

The Mayor adjourned the meeting at 8:09 pm.

Respectfully submitted,

Janet E. Gray, MMC
Village Clerk

Approved

Charles Smith
Village President

ATTEST:

Janet E. Gray, MMC
Village Clerk

I, Janet E. Gray, Village Clerk of the Village of Rantoul, Illinois, do hereby certify that the foregoing minutes are a true and correct copy of the Study Session of the Board of Trustees held March 7, 2023 as the same appears on the records of the Village now in my custody and keeping.

Janet E. Gray, MMC
Village Clerk

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Minutes of the March 17, 2023 Special Board Meeting	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS: 1. March 17 Minutes - draft	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL Janet Gray	VILLAGE ADMINISTRATOR Scott Eisenhower

**-RANTOUL VILLAGE BOARD OF TRUSTEES
SPECIAL BOARD MEETING
March 17, 2023**

LOUIS B. SCHELLING MEMORIAL BOARD ROOM
RANTOUL MUNICIPAL BUILDING, 333 S. TANNER, RANTOUL, IL

A Special Meeting of the Board of Trustees of the Village of Rantoul was held at 12:00 noon virtually as authorized by Governor Pritzker's Executive Order during the COVID-19 pandemic. President Charles Smith presiding. President Smith called the meeting to order.

Roll Call

The Clerk called the roll, finding the following members present:

Mayor Smith, and Trustees Crider, Hall, Robertson, Weathersby and Johnson – 5.

The following representatives of Village departments were also present:

Scott Eisenhauer, Administrator; Jake McCoy, Assistant Public Works Director and Janet Gray, Village Clerk.

Approval of the Agenda

Trustee Hall moved to approve the agenda for the meeting as presented. Trustee Weathersby seconded the motion. On a Roll Call vote:

YEAS: Hall, Robertson, Weathersby, Johnson and Crider – 5.

NAYS: None – 0.

ABSENT: Wilkerson – 1.

The motion carried 5-0.

Public Participation

There was no public participation.

Consideration of Bids, Contacts and other Expenditures

Trustee Johnson moved to authorize and approve the purchase of two (2) 2500 KVA pad-mounted transformers from Jerry's Electric in the amount of \$128,400.00. Trustee Hall seconded the motion. On a Roll Call vote:

YEAS: Johnson, Crider, Hall, Robertson and Weathersby – 5.

NAYS: None – 0.

ABSENT: Wilkerson - 1

The motion carried 5-0.

Trustee Weathersby moved to authorize and approve the Agreement with Utility Financial Solutions for the amount not to exceed \$57,000.00 for the purpose of performing a Cost of Service Study for the Village's Electric, Gas, Water and Wastewater utilities. Trustee Hall seconded the motion. On a Roll Call vote:

YEAS: Weathersby, Johnson, Crider, Hall and Robertson – 5.

NAYS: None – 0.

ABSENT: Wilkerson – 1.

The motion carried 5-0.

Adjournment

There being no further business to come before the Board, Trustee Johnson moved to adjourn the meeting. Trustee Weathersby seconded the motion. On a Roll Call vote:

YEAS: Johnson, Crider, Hall, Robertson and Weathersby – 5.

NAYS: None – 0.

ABSENT: Wilkerson – 1.

The motion carried 5-0.

The meeting was adjourned at 12:13 pm.

Janet E. Gray, MMC
Village Clerk

Approved

Charles Smith
Village President

ATTEST:

Janet E. Gray, MMC
Village Clerk

I, Janet E. Gray, Village Clerk of the Village of Rantoul, Illinois, do hereby certify that the foregoing minutes are a true and correct copy of the Special Meeting of the Board of Trustees held March 17, 2023 as the same appears on the records of the Village now in my custody and keeping.

Janet E. Gray, MMC
Village Clerk

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: March 2023 Village Applicant Demographics Report	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS: 1. HR Report - March 2023	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR

Open Positions for Village of Rantoul

March 26, 2022 to March 27, 2023

Position					
	Census Report 2021	Police Officer		Experienced Police Officer	
Race		Number	Percentage	Number	Percentage
White	61.5%	27	57%	3	49%
African American	19.6%	14	31%	1	17%
Asian	1.6%	1	2%	0	0%
Native Hawaiian/Pacific Islander	0.0%	0	0%	0	0%
Hispanic/Latino	12.7%	3	6%	1	17%
American Indian	0.3%	0	0%	0	0%
Two or More Races	16.2%	2	4%	1	17%
Unknown	0.0%	0	0%	0	0%
Gender					
Male	46.8%	32	68%	6	100%
Female	53.2%	15	32%	0	0%
Unknown	0.0%	0	0%	0	0%
Total Applications					
Population Estimate, 07/01/2021	12,119	47		6	
Open / Filled					
		Full Time Position		Full Time Position	
		Police		Police	

Position					
	Census Report 2021	Firefighter		Utility Cashier Clerk	
Race		Number	Percentage	Number	Percentage
White	61.5%	15	54%	48	53%
African American	19.6%	7	25%	21	23%
Asian	1.6%	0	0%	0	0%
Native Hawaiian/Pacific Islander	0.0%	0	0%	1	1%
Hispanic/Latino	12.7%	2	7%	9	10%
American Indian	0.3%	0	0%	0	0%
Two or More Races	16.2%	3	11%	8	9%
Unknown	0.0%	1	4%	4	4%
Gender					
Male	46.8%	22	79%	11	12%
Female	53.2%	5	18%	77	80%
Unknown	0.0%	1	4%	3	3%
Total Applications					
Population Estimate, 07/01/2021	12,119	28		91	
Open / Filled					
		Volunteer Position		Full Time Position	
		Fire		Public Works	

Open Positions for Village of Rantoul

March 26, 2022 to March 27, 2023

Position					
	Census Report 2021	Public Works Director		Chief of Operations - Wastewater	
Race		Number	Percentage	Number	Percentage
White	61.5%	4	67%	4	67%
African American	19.6%	1	17%	1	17%
Asian	1.6%	1	17%	1	17%
Native Hawaiian/Pacific Islander	0.0%	0	0%	0	0%
Hispanic/Latino	12.7%	0	0%	0	0%
American Indian	0.3%	0	0%	0	0%
Two or More Races	16.2%	0	0%	0	0%
Unknown	0.0%	0	0%	0	0%
Gender					
Male	46.8%	6	100%	4	67%
Female	53.2%	0	0%	2	33%
Unknown	0.0%	0	0%	0	0%
Total Applications					
Population Estimate, 07/01/2021	12,119	6		6	
Open / Filled					
		Full Time Position		Full Time Position	
		Public Works		Public Works	

Position					
	Census Report 2021	Wastewater Treatment Operator		Street & System Operator	
Race		Number	Percentage	Number	Percentage
White	61.5%	9	69%	13	76%
African American	19.6%	1	8%	3	18%
Asian	1.6%	0	0%	0	0%
Native Hawaiian/Pacific Islander	0.0%	0	0%	0	0%
Hispanic/Latino	12.7%	3	23%	0	0%
American Indian	0.3%	0	0%	0	0%
Two or More Races	16.2%	0	0%	1	6%
Unknown	0.0%	0	0%	0	0%
Gender					
Male	46.8%	11	85%	16	94%
Female	53.2%	2	15%	1	6%
Unknown	0.0%	0	0%	0	0%
Total Applications					
Population Estimate, 07/01/2021	12,119	13		17	
Open / Filled					
		Full Time Position		Full Time Position	
		Public Works		Public Works	

Open Positions for Village of Rantoul

March 26, 2022 to March 27, 2023

Position					
	Census Report 2021	Grounds Maintenance		Lifeguard	
Race					
White	61.5%	12	44%	25	89%
African American	19.6%	8	30%	0	0%
Asian	1.6%	0	0%	0	0%
Native Hawaiian/Pacific Islander	0.0%	0	0%	0	0%
Hispanic/Latino	12.7%	3	11%	0	0%
American Indian	0.3%	1	4%	0	0%
Two or More Races	16.2%	1	4%	2	7%
Unknown	0.0%	2	7%	1	4%
Gender					
Male	46.8%	24	89%	11	39%
Female	53.2%	2	7%	17	61%
Unknown	0.0%	1	4%	0	0%
Total Applications					
Population Estimate, 07/01/2021	12,119	27		28	
Open / Filled					
		Seasonal Position		Seasonal Position	
		Recreation		Recreation	

Position					
	Census Report 2021	Aquatic Group Fitness Instructor		Sports Complex Operations Support	
Race					
White	61.5%	2	100%	7	39%
African American	19.6%	0	0%	6	33%
Asian	1.6%	0	0%	0	0%
Native Hawaiian/Pacific Islander	0.0%	0	0%	0	0%
Hispanic/Latino	12.7%	0	0%	2	11%
American Indian	0.3%	0	0%	0	0%
Two or More Races	16.2%	0	0%	1	6%
Unknown	0.0%	0	0%	2	11%
Gender					
Male	46.8%	0	0%	9	50%
Female	53.2%	2	100%	7	39%
Unknown	0.0%	0	0%	2	11%
Total Applications					
Population Estimate, 07/01/2021	12,119	2		18	
Open / Filled					
		Seasonal Position		Seasonal Position	
		Recreation		Recreation	

Open Positions for Village of Rantoul

March 26, 2022 to March 27, 2023

Position					
	Census Report 2021	Group Fitness Instructor		Sports Complex Maintenance Staff	
Race					
White	61.5%	3	43%	14	48%
African American	19.6%	3	43%	9	31%
Asian	1.6%	0	0%	0	0%
Native Hawaiian/Pacific Islander	0.0%	0	0%	0	0%
Hispanic/Latino	12.7%	0	0%	1	3%
American Indian	0.3%	0	0%	0	0%
Two or More Races	16.2%	0	0%	5	17%
Unknown	0.0%	1	14%	0	0%
Gender					
Male	46.8%	5	71%	22	76%
Female	53.2%	2	29%	7	24%
Unknown	0.0%	0	0%	0	0%
Total Applications					
Population Estimate, 07/01/2021	12,119	7		29	
Sports					
		Part Time Position		Seasonal Position	
		Recreation		Recreation	

Position					
	Census Report 2021	Total Applicants March 26, 2022 to March 27, 2023		January to March 2023 New Hires	
Race					
White	61.5%	93	60%	79	65%
African American	19.6%	32	21%	28	23%
Asian	1.6%	2	1%	0	0%
Native Hawaiian/Pacific Islander	0.0%	0	0%	0	0%
Hispanic/Latino	12.7%	9	6%	14	12%
American Indian	0.3%	1	1%	0	0%
Two or More Races	16.2%	10	7%	0	0%
Unknown	0.0%	6	4%	0	0%
Gender					
Male	46.8%	108	71%	52	43%
Female	53.2%	42	27%	69	57%
Unknown	0.0%	3	2%	0	0%
Total Applications					
Population Estimate, 07/01/2021	12,119	153		121	
Open / Filled					

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Agreement for the Design Build Contractor for the Rantoul Fire Department Fire Sub-Station Addition with Roessler Construction & Contracting, Inc. in the amount not-to-exceed \$750,000.00	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT: Not-to-Exceed \$750,000.00
ATTACHMENTS: 1. Rantoul Fire Department Sub-Station Addition RFQ 012523 2. Roessler Construction & Contracting, Inc Proposed Pricing Schedule 3. Roessler Construction & Contracting, Inc Estimate 032323 4. Healthy In Healthy Out 5. Cardiovascular & Chemical Exposure Risks in Modern Firefighting	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS: This agenda item provides for a Design I Build Contractor contract for the purpose of providing planning, preliminary, design and construction phases including special services for the items with Roessler Construction and Contracting, Inc. for ARPA Funded Fire Sub Station Addition. The Village of Rantoul issued an RFQ seeking qualification and experience from Design /Build Contractors on January 25,2023. Proposals were due February 9, 2023 by 2:00pm prevailing time. Two proposals were received which were reviewed by Village staff. Roessler Construction and Contracting, Inc. provided a proposal that met the requirements and funding allocated for the use of ARPA funds approved by the Village of Rantoul Board of Trustees. With your approval, staff will begin the design /build process with Roessler Construction and Contracting, Inc. All funds are not allocated in the current Fiscal Year 2023 Budget, but they are allocated in the Fiscal Year 2024 Budget pending Village Board approval.	
RECOMMENDED ACTION:	

	DEPARTMENT HEAD APPROVAL Chad Smith, Fire Chief VILLAGE ADMINISTRATOR Scott Eisenhauer
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RFQ# VRNTL-23-Q-0001
Rantoul Fire Department
Fire Sub-Station addition

January 25, 2023

Dear Sir/Madam:

Re: Request for Qualifications to Perform Design Build Services
Rantoul Fire Department
Rantoul, IL 61866

Statement of Qualifications Guidelines

The Village of Rantoul is soliciting statements of qualifications and experience from Design / Build Contractors for the purpose of providing planning, preliminary, design and construction phases including special services for the items indicated in the attached Preliminary Scope of Services at the Rantoul Fire Department sub-station.

If your firm wishes to be considered for the services referenced above, please submit five (5) copies of the following information by the time and date of **2:00 P.M. Thursday FEB 9, 2023** to:

Village of Rantoul
333 S. Tanner St.
Rantoul, IL 61866-0038
Mr. Chad Smith, Fire Chief – chad.smith@village.rantoul.il.us

1. Name, size and description of firm.
2. Location of main office and office where work will be accomplished.
3. Qualifications and previous experience in Design / Build Projects.
4. Resumes of key personnel assigned to the projects.
5. Names, addresses and telephone numbers of references associated with the previous work experience by your firm.
6. Provide any additional comments you believe are relevant.

Please limit your submittals to 30 pages or less, exclusive of cover sheet and transmittal letter.

Please note that this is NOT a request for proposal. No elaborate or special presentation brochures or cost information are expected at this time. An evaluation of qualified firms will be undertaken following receipt of submittals. Interviews may be required. It is the intent of the Village of Rantoul to select a contractor to perform Design/ Build Contractor services.

Sincerely,

Mr. Chad Smith
Fire Chief
Village of Rantoul

RFQ# VRNTL-23-Q-0001
Rantoul Fire Department
Fire Sub-Station Addition

SCOPE OF SERVICES

**Rantoul Fire Department Sub- Station
500 North Maplewood
Rantoul, IL**

The Village of Rantoul is soliciting statements of qualifications and experience from design professionals for the purpose of providing planning, preliminary, design and construction phases including special services for the items indicated in the attached Preliminary Scope of Services at the Rantoul Fire Department Sub-station.

The scope of work to be included in the will include, but not be limited to, the following:

1. Two bay station addition.
2. Back in bays (bays at a minimum of 55 feet in depth and 18-foot clear openings).
3. Kitchen and Day Room for 12 individuals.
4. Server room with dedicated HVAC.
5. Parking spaces for at least 20 vehicles.
6. Training Props incorporated into the building.
7. Dedicated PPE Storage room off the apparatus bay.
8. Dedicated decontamination room off the apparatus bay.
9. Future pandemic preparedness and response

PROPOSED PRICING SCHEDULE:

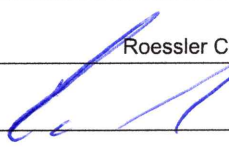
For Reference, the total budget allocation for the **RANTOUL FIRE DEPT STATION 2 ADDITION**
\$750,000

PHASE	Description	Amount
PHASE I	PRELIMINARY DESIGN & PROBABLE CONSTRUCTION COSTS _____ Dollars	\$ 9,400.00
PHASE II	SCOPE OF SERVICES _____ Dollars	\$ 23,000.00
PHASE III	BIDDING & CONSTRUCTION ADMINISTRATION _____ Dollars	\$ 14,800.00
PHASE IV	RESIDENT INSPECTION SERVICES _____ Dollars Progress Meetings	\$ 2,900.00

TOTAL \$ 50,100.00

DATE: _____ March 30, 2023 _____

SUBMITTED BY: _____

BY:  _____

BUSINESS ADDRESS: _____

EMAIL ADDRESS: _____

PHONE NUMBER: _____

Roessler Construction & Contracting, Inc.
Name of Company

President
Signature and Title

318 S. Tanner Street, Rantoul, IL 61866

Kenny@RoesslerConstruction.com

(217) 893-3355

	Quantity	Unit	Estimated Cost
Division 01 - General Conditions			
Safety			\$ 6,500.00
Poject Drawings			\$ 5,000.00
		Civil	\$ 4,000.00
		Structural	\$ 10,000.00
		Architectural	\$ 4,000.00
		Mechanical	\$ 5,000.00
Building / Site Layout			\$ 2,000.00
Supervision			\$ 23,000.00
Testing			\$ 5,000.00
General Clean Up			\$ 6,000.00
General Purpose Dumpster			\$ 2,600.00
Weather Protection			\$ 1,500.00
Dust Protection			\$ 2,000.00
Barriers			\$ 1,500.00
Temporary Utilities			
		Toilets	\$ 800.00
Division 02 - Existing Conditions			\$ 20,000.00
Site Demolition			
		Existing Paving	
		Misc. Other	
Building Demolition			
Division 03 - Concrete			\$ 80,000.00
Footing / Foundation			
Concrete Slab			
		8" Conc Slab w / Rock Base	
		5" Interior Floor Replacement	
Division 04 - Masonry			\$ 6,000.00
Unit Masonry			
		Brick Veneer	
Division 05 - Metals			\$ 18,000.00
Metal Fabrications			
6" Dia. Standard Steel Bollards	5	Ea.	
Division 06 - Carpentry			\$ 20,000.00
Rough Carpentry			
Casework / Tops			
Division 07 - Thermal and Moisture Protection			\$ 40,000.00
Tie-Into Existing Building			
Insulation Systems			
Metal Roof Sheathing			
Metal Wall Sheathing / Interior Liner At Int Wall			
Misc. Metal Trim / Flashing			
Gutters / Downspouts			
Fire and Smoke Protection			
Caulking			
Division 08 - Openings			\$ 32,000.00
Metal Doors & Frames	7	Ea.	
Door Hardware	7	Ea.	
Overhead Doors (12' Width x 14' Height)	2	Ea.	
Division 09 - Finishes			\$ 18,000.00
Gypsum Board Assemblies			
Painting and Coatings			
Division 10 - Specialties			\$ 3,000.00
Signage			
Toilet & Bath Accessories			
Fire Protection Specialties			

Division 13 - Special Construction			\$	145,000.00
Pre-Engineered Metal Buildings				
Material Package				
Misc. Materials / Anchor Bolts				
Erection				
Division 22 - Plumbing			\$	75,000.00
Plumbing				
Oil Separator				
Division 23 - HVAC			\$	40,000.00
HVAC Systems				
Division 26 - Electrical			\$	50,000.00
Electrical				
Division 31 - Earthwork			\$	15,000.00
Cut Site At Building				
Excavation / Backfill for Foundations				
Division 32 - Exterior Improvements			\$	45,000.00
Site Paving	3800	S.F.		
Sidewalks	250	S.F.		
Landscaping				
Division 33 - Site Utilities			\$	5,000.00
Storm Water Systems				
Totals			\$	690,900.00
RCCI			\$	75,000.00
Estimated Project Cost			\$	765,900.00

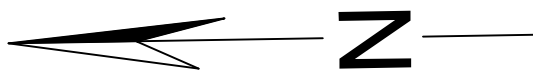
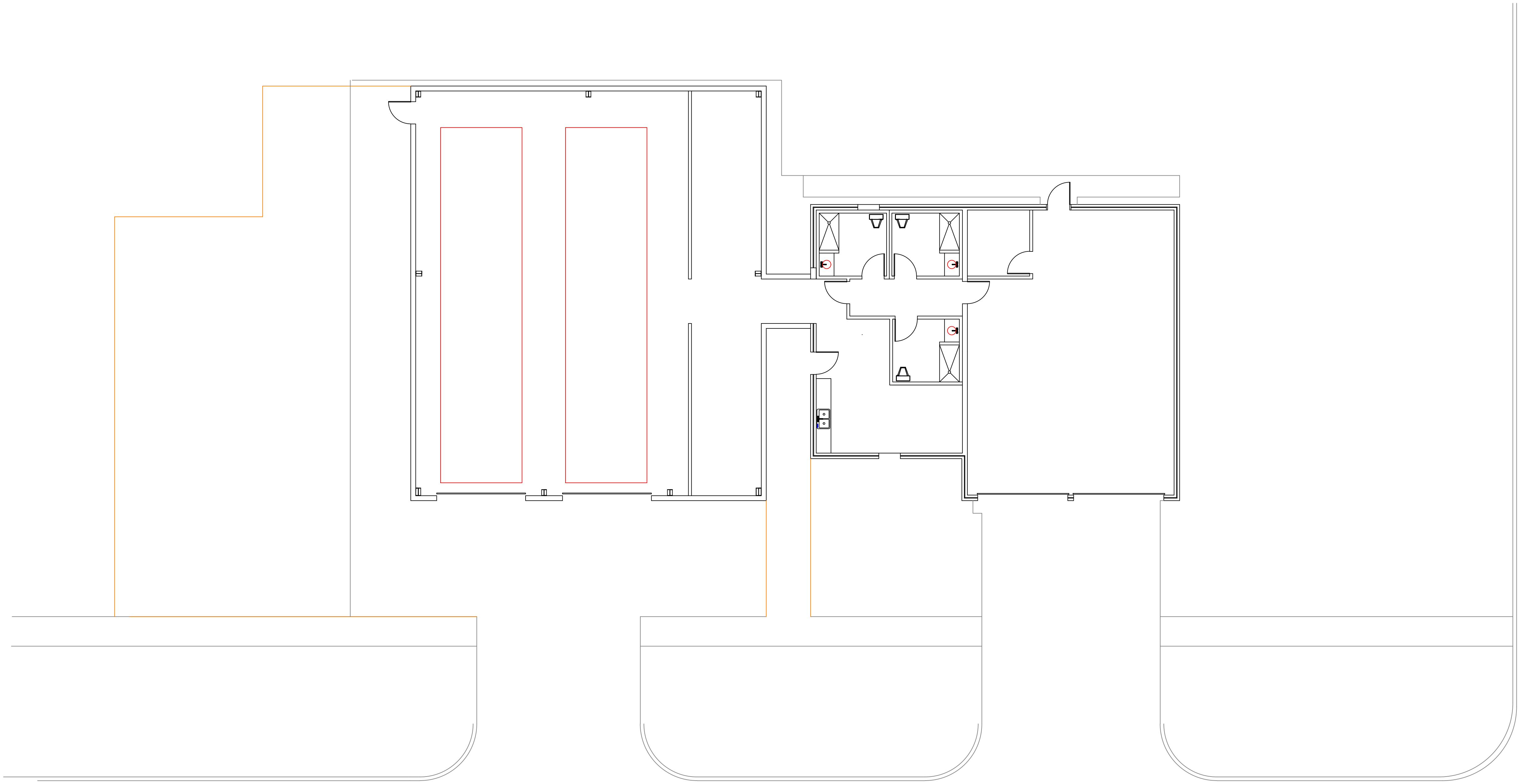
Rantoul Fire Dept.
Station 2 Addition
500 N. Maplewood Rd.
Rantoul, IL 61866

OWNER:
Village Of Rantoul
333 South Tanner
Rantoul, IL 61866

Roessler Construction &
Contracting, Inc.

CONCEPTUAL
LAYOUT - 1

SHEET - G1



ROESSLER CONSTRUCTION & CONTRACTING, INC
PHONE # (217) 202-3357
WEB ADDRESS: roesslerconstruction.com

PAPER SIZE - D (24" X 36")

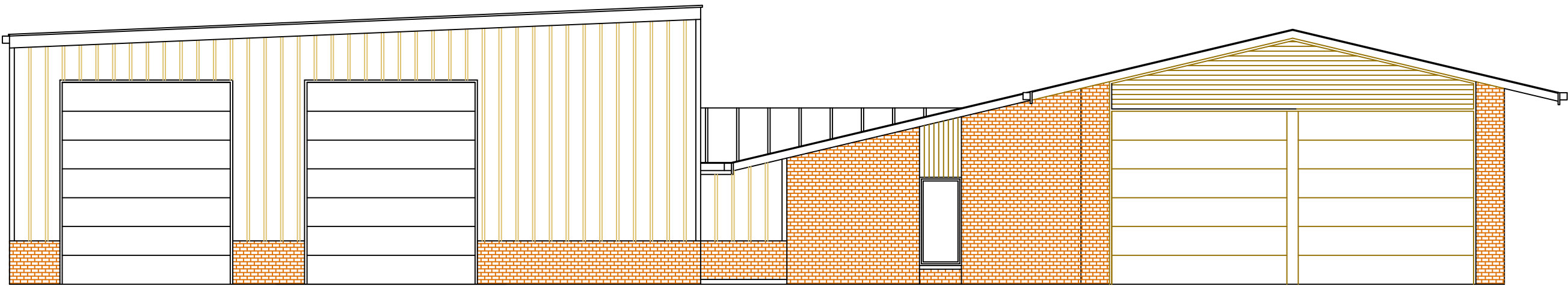
Rantoul Fire Dept.
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333 South Tanner
Rantoul, IL 61866

Roessler Construction &
Contracting, Inc.

CONCEPTUAL
ELEVATION - 1

SHEET - A3



SCALE - 1" = 8'-0"

ROESSLER CONSTRUCTION & CONTRACTING, INC
PHONE # (217) 202-3357
WEB ADDRESS: roesslerconstruction.com

PAPER SIZE - D (24" X 36")



HEALTHY IN. HEALTHY OUT

**Best Practices for Reducing Fire Fighter
Risk of Exposures to Carcinogens**

Mission Statement:

The goal of this **best practices** manual is to encourage safe and healthy practices from the first day as a fire fighter to retirement. A career in the fire service exposes fire fighters to deadly carcinogens at every fire. This manual identifies the **best practices** that reduce fire fighter risk of exposure to carcinogens.

Cancer may never be eliminated from the fire service, but steps must be taken to reduce the number of fire fighters being diagnosed and dying every year. Common sense practices, equipment and guidelines are all components of these **best practices**.

Funding:

Funding and support for this project has been provided by the State of Washington, Department of Labor & Industries, Safety & Health Investment Projects.





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8 || PLANNING

The collection, evaluation and dissemination of information pertaining to the fire department.



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HEALTHY IN. HEALTHY OUT.

**Best Practices for Reducing Fire Fighter
Risk of Exposures to Carcinogens**



In 2014, a Safety & Health Investment Projects (SHIP) grant project received the funds to establish a manual on the “**Best Practices** for Reducing Fire Fighter Risk of Exposures to Carcinogens.” The Washington State Council of Fire Fighters (WSCFF) provided the technical panel with members from the International Association of Fire Fighters (IAFF) locally across the state of Washington.

This technical panel searched fire service agencies across the state, the country and the world to identify the current practices that will, to the greatest extent possible, reduce the risk of exposures to carcinogens for fire fighting activities. The Kent Fire Department and the WSCFF jointly applied to the State of Washington Labor & Industries', Safety & Health Investment Projects (SHIP) and were awarded this grant in 2014.

A **best practice** is a method or technique that identifies a standard way of doing something that multiple organizations can use and adopt. A **best practice** can, and will, evolve to become better as improvements are discovered.

Today, structural hood manufacturers are designing prototypes that will help reduce dermal absorption. An AFG-funded research project is currently underway to address fire fighter personal protective equipment (PPE) cleaning validation.

A best practice is a method or technique that identifies a standard way of doing something that multiple organizations can use and adopt.

“If I had any advice for you, (it) is to pay as close attention to your body as you can. Even the tiniest bump could prove to be much worse than you ever could imagine it would be. When you do get that unfortunate news, go straight away to the best people in the area... This program can absolutely save your life.”

Donovan Eckhardt, Renton Fire and Emergency Services Department Fire Fighter, passed August 24, 2015 after a two-year battle with squamous cell carcinoma.

The University of Illinois Fire Service Institute (IFSI) has received a grant from the Federal Emergency Management Agency (FEMA) to continue its research on fire fighting exposures to occupational cardiovascular and chemical risks. In 2016, the University of Washington hopes to validate this **best practices** manual by testing the efficacy of methods identified within through another SHIP grant. This topic will be revisited periodically to identify the next practices that will continue to reduce fire fighter exposures to carcinogens.

This document is organized in the format of the Incident Management System (IMS) with Finance, Command, Planning, Operations and Logistics sections.

While not every fire department will have the capability or the budget capacity to implement these practices, this document refers to the **best practices** that have been identified to reduce exposures to carcinogens in the hopes of propagating potential change.

FINANCE

“An ounce of prevention is worth a pound of cure.”

BENJAMIN FRANKLIN



Over time, it has been shown that sick and injured members create financial costs to their organizations. The overall concept of this manual is to keep members safe from exposures, while protecting organizations from long-term injury, illness and even death.

Considering these various **best practices** and their implementation, fire departments may use a phased-in approach as necessary. While many of the practices identify low cost items like garbage bags, other items have a significant cost.

A fiscal analysis considers the money available, the money requested and the money actually spent. Fire departments are unique, they are funded differently—some are municipalities, some are fire districts, some employ career fire fighters, some have volunteers and some are combinations. In seeking a funding solution to implement the **best practices**, a “one size fits all” approach will not work for all fire departments. A fiscal analysis should be conducted to determine the level of participation for each individual department.

Funding sources to consider include local fees associated with fire and building permits as allowed, sales tax, real estate excise tax, impact fees, bonds, levies and fees for service. Grants, including Assistance to Firefighters Grant (AFG) may be considered for alternative funding for major/capital purchases.



IN THE LOW COST CATEGORY, ITEMS CAN INCLUDE:

- 2-3 mil, 42-gallon garbage bags for transporting contaminated PPE, equipment and hose; can be purchased for approximately 50 cents per bag
- Emergency Medical Services (EMS) latex or nitrile gloves
- N95 respirator for protection
- Splash gown
- Disposable wipes
- Hand wash station on every fire engine; retrofitting with time and materials for approximately \$300
- Station shoes; can range from \$30 to \$60



ON THE HIGHER COST END, ITEMS TO FUND CAN INCLUDE:

- Annual physicals for all suppression personnel, including cancer screening
- Initiating wellness/fitness programs
- Purchasing two sets of turnouts for all suppression personnel; having a variety of sizes available to wear while contaminated set is being cleaned is an option
- Direct source diesel exhaust capture and removal systems
- PPE cleaning by an independent service provider (ISP) or purchase extractor
- Ultrasonic helmet and self-contained breathing apparatus (SCBA) mask cleaner
- Steam cleaner for hard-to-clean soft surfaces, like cloth apparatus seats



ABOVE: Steam cleaning is capable of killing bacteria, like MRSA, and other pathogens while thoroughly cleaning surfaces by removing deeply embedded contaminants.

COMMAND

**“Leaders don't create
followers, they create more
leaders.”**

**TOM PETERS, BUSINESS AUTHOR
AND SPEAKER**

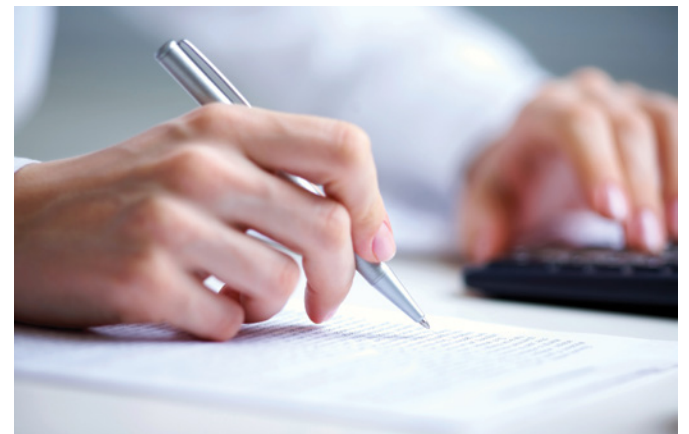
HEALTH AND SAFETY OFFICER

An important aspect of an organizational cancer prevention effort is developing the comprehensive accident, injury, illness and exposure policies and procedures as required by WAC 296-305-01501 and 01503. Such policies and procedures meet the dual needs of managing on-the-job injury processes, as well as providing organizations with data that may prevent future events. In the context of cancer prevention, it is desirable that an organization's policy and culture support precautionary reporting of exposure to carcinogens as a way to identify and mitigate hazards. Similar to near miss reporting, precautionary reporting of exposure to carcinogens allows organizations to identify the root causes of the exposure and to design and implement corrective interventions.

In developing policy that encourages precautionary reporting, it is important to clearly define the parameters of the organization's reporting system. The Washington State Council of Fire Fighters' Personal Injury, Illness and Exposure Reporting System (PIIERS) allows members to record all incidents where there is the potential to have been exposed to the products of combustion. An organizational reporting system, however, should only be used when an exposure actually occurs.

For example, acting as a pump operator upwind of a large commercial fire may warrant a PIIERS report, but may not warrant the filing of an organizational precautionary report. On the other hand, if the wind shifts and the pump operator suddenly finds himself engulfed in acrid smoke, then the member needs to fill out a PIIERS report as well as an internal report. These distinctions are clearly not black and white, and must be supported by good policy along with a culture of mutual trust within an organization.

From Labor's perspective, a robust organizational reporting system may reinforce the organization's commitment to transparency and safety. Labor must also recognize, however, that management may feel exposed to increased scrutiny if every "routine" fire call generated a wave of exposure reports. Because of this, a collaborative effort between Labor and management can be undertaken to clearly define the formal and informal parameters of reporting policy. After all, both groups





have a shared interest: the health and safety of the organization and its members. An additional benefit of maintaining a collaborative approach to precautionary reporting is that it moves training, policy and operational norms towards a culture of safety.

EXPOSURE REPORTING WITHIN FIRE DEPARTMENTS

In addition to strong policy, organizations are encouraged to develop strong processes for precautionary reporting. This begins by creating forms and other documents that are logical, accessible and user-friendly. In addition, these forms should not only support ease of use, but should also allow for advantageous data collection by the department. Check boxes, drop down menus and practical narrative prompts are methods that reduce subjectivity and allow for easier retrieval of data.

Exposure report forms should also have clean approval queues that require input from multiple layers within the organization. For example, the pump operator who breathed acrid smoke but did not require immediate medical attention should initiate the report and thoroughly complete all sections related directly to his experience. His company officer would then receive the report and would “proof” the pump operator’s work by checking it for completeness and accuracy, and would also provide their own version of events and recommendations to prevent future occurrences. This process should continue through a logical queue that involves all relevant individuals in the affected member’s chain of command.

WAC 296-305-01505 requires organizations to develop an accident prevention program. As part of this program, the statute includes language mandating both a safety orientation process as well as the development of a Safety Committee. The final review

of a precautionary report should lie with these groups. This policy states that the Safety Committee should be tasked with identifying the root causes of the event and, in doing so; it should suggest action items via the organization’s Health and Safety Officer (HSO). These items may include policy, procedural, training and/or operational changes to prevent future occurrences. All Safety Committee and HSO recommendations should be documented, managed and revisited until such a time that the corrective actions are complete.

A confidential document library is the final step for the precautionary report and associated Safety Committee and HSO records. The document library can be accessed should a precautionary report become relevant to an injury or illness that occurs downstream. At this point, both the organization and employee will have a record that the initiating event was reported, reviewed and acted upon.

**An additional benefit of maintaining
a collaborative approach to
precautionary reporting is that it
moves training, policy and operational
norms towards a culture of safety.**

PLANNING

“By failing to prepare, you are preparing to fail.”

BENJAMIN FRANKLIN

FIRE STATION DESIGN

When designing a fire station, consideration should be given to finding ways to reduce exposures and prevent the cross-contamination of possible carcinogens and other harmful agents. Existing stations can be retrofitted to best accomplish this where possible.

- Within the station, zones are easily established:

RED zone: A designated area, as per WAC 296-305-06505, for contaminated equipment including SCBA, EMS equipment from medical calls, fire hose, turnouts, etc., to be cleaned. When cleaning contaminated equipment, always wear appropriate PPE (gloves, splash gown and N95 if appropriate) to protect against exposures from contaminated equipment.

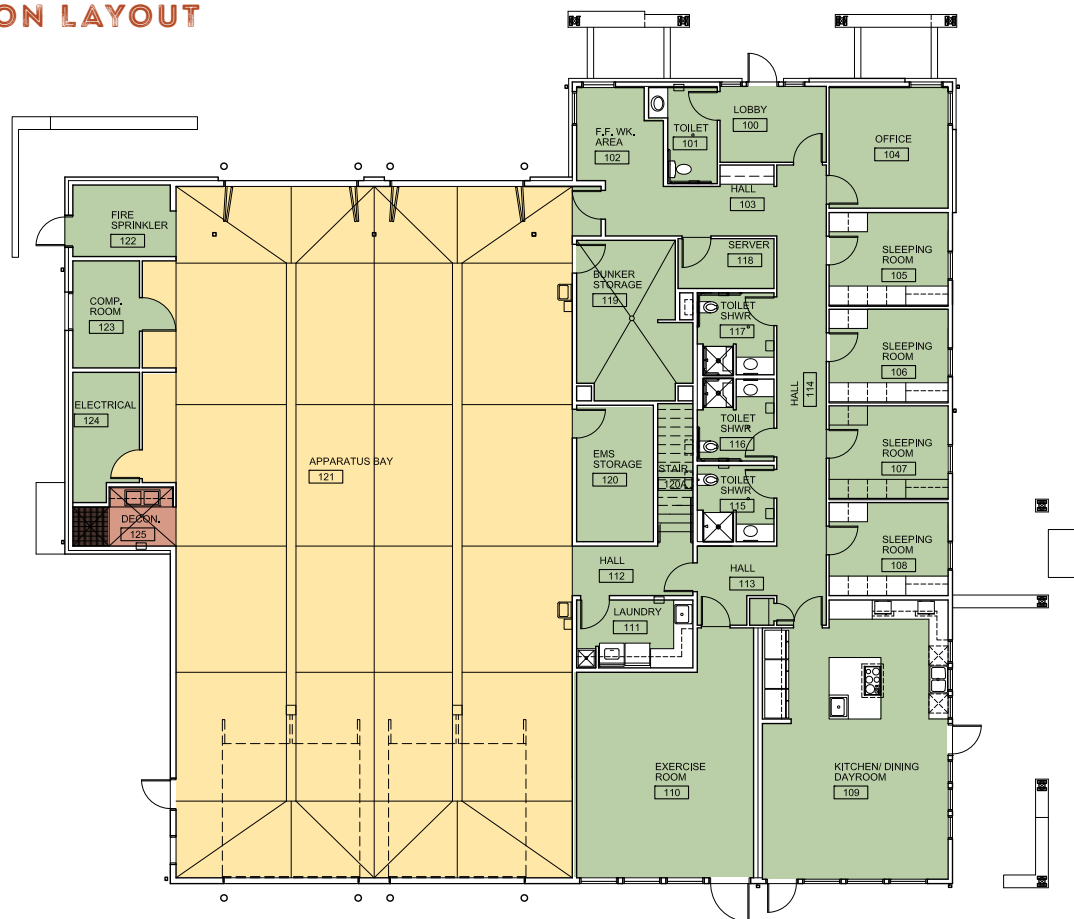
YELLOW zone: This is typically the apparatus bay. Equipment, cleaned in the red zone, can now be stored in the yellow zone.

GREEN zone: “Keep it clean in the green.” The green zone is the living quarters of the fire station including the kitchen, living, sleeping, personal hygiene and office. Contaminated EMS equipment, turnouts, etc., are never allowed.

- Direct source capture diesel exhaust handling systems for all vehicles and for every apparatus bay can be included in all new station design and retrofitted into existing stations.
- The air pressure in the living quarters should be higher than that of the apparatus bay to prevent airborne contaminants from entering the living quarters or green zone in general.
- To avoid exposures to UV light, turnout gear storage should be stored in an enclosed ventilated room (NFPA 1851).
- Carpet in fire stations acts like a sponge, collecting dirt, soot, feces, MRSA, staph, blood and OPIM from response footwear worn by fire and EMS personnel. Installing hard surface flooring, such as polished concrete, is one way to mitigate these exposures, as solid surfaces are easier to clean than carpet.



FIRE STATION LAYOUT



- Similarly, furniture and fixtures in fire stations attract and collect dirt and biological toxins. A 2011 study by the University of Washington Field Research and Consultation Group found MRSA on chairs, phones, computers and kitchen counters in fire stations in western Washington. This study shows the importance of keeping frequently touched items clean and disinfected.

- For new fire station design, plan adequate space requirements for turnout cleaning extractors to clean turnouts in-house, or provide an area to package turnouts at the station prior to shipping to an Independent Service Provider (ISP) for third party cleaning. Follow manufacturer's instructions on methods for cleaning turnouts.

FACILITIES MAINTENANCE

Initial and/or periodic testing should be conducted at fire stations to ensure a safe environment for fire and EMS personnel working in those stations.

- **Diesel exhaust:** Engineered systems such as direct source capture systems need to be maintained to ensure they are exhausting the gasses and particulate matter to the outside atmosphere. Diesel exhaust is classified by the International Agency for Research on Cancer (IARC) as carcinogenic to humans (Group 1).

- **Staph, VRE, C Diff and MRSA:** Chronic health effects from bloodborne exposures that are persistent in the fire service.

- **Asbestos:** Older fire stations should be assessed for asbestos encapsulated pipe wrap. If the wrap is damaged, it needs to be repaired or replaced.

- **Radon:** A radioactive gas that occurs naturally in the ground. It can enter into living spaces—especially basements, through ground water or cracks in foundations—and congregate there. It is known to cause lung cancer. If found above EPA guidelines, mitigation options should be considered.

Diesel exhaust is classified by the International Agency for Research on Cancer (IARC) as carcinogenic to humans (Group 1).



STATION SHOES VS. WORK BOOTS

Fire and EMS personnel regularly respond to incidents in which exposures to biologics and carcinogens can occur. It is not uncommon for personnel to step in hazardous substances (e.g., soot, blood, urine, vomitus, feces, etc.) with their response footwear during a call.

- To further reduce contamination that may be brought into the stations on the soles of response footwear, an alternate form of footwear (the station shoe) is authorized for wear inside the stations. An example of a station shoe could be black in color, closed-toed and a non-safety shoe that is easy to clean if needed.
- The station shoe can be changed into and out of quickly without delaying response to a call.

Carpet in fire stations acts like a sponge—installing hard surface flooring, such as polished concrete, is one way to mitigate these exposures.

- Station shoes shall not be worn while performing apparatus checks, while responding to calls or when performing work where safety shoes (impact and crush protection) are required.

APPARATUS DESIGN

Apparatus can be designed with careful thought given to biological and chemical contamination and the potential for cross-contamination. The cab of the apparatus should be kept free of toxins, both in the hard and soft surfaces as well as in the air.

- SCBAs and turnouts should have their own compartment away from the cab. SCBAs that are designed into the seat should also come with provisions for decontamination and cleaning prior to placing back into the seat after a fire.
- All seat material should be of vinyl or other material to reduce absorption of toxins and for an easy clean.
- Apparatus can be adapted to have a warm water outlet, which provides a personal washing station. Prior to 2016, NFPA 1901 required a heat exchanger for the engine coolant, most apparatus manufacturers accomplish this with water from the tank through a heat exchanger. A simple diverter valve to the pump panel can create a warm water outlet for a personal hand washing station.
- All flooring can be designed with a waterproof material that can be washed with a hose and scrubbed out.
- Exhaust pipes can be designed to exit where fire fighters are least affected when opening cabinets and accessing pump panel controls.
- Pre-packaged water bottles carried on apparatus for personnel to rehydrate are a handy solution. A reusable water cooler container can be safely utilized, provided a timely cleaning and disinfecting plan is in place.
- All interior material used in the cab should be easily cleaned and designed to repel moisture. They must also be durable





ABOVE: SCBAs and turnouts should have their own compartment away from the cab.

enough to be cleaned weekly with disinfecting agents, soap and water. Do not use cloth for the apparatus seat materials.

- Contaminated equipment (SCBAs, fire hose, TICs, etc.) should not be allowed in the cab of the apparatus until the equipment has been properly decontaminated. This may involve arranging transportation for the contaminated equipment from the incident to the fire station for proper for decontamination.
- As a **best practice**, groceries should not be routinely transported in fire department apparatus due to potential cross-contamination. Because this is a common practice while working 24-hour shifts, a designated cooler or insulated zippered container can be used to minimize cross-contamination.

APPARATUS TURNOUT STORAGE

- All apparatus should have a designated turnout compartment that is separate from the cab.

- Turnouts should not be routinely allowed in the cab of the apparatus with the exception of responding to emergencies or participating in trainings.
- No contaminated turnouts should be allowed in any apparatus cab.
- After an incident or training that involves contaminants, all turnouts should be grossly decontaminated on scene, encapsulated in a designated disposable bag and be transported to a fire station for proper cleaning.

Apparatus can be designed with careful thought given to biological and chemical contamination and the potential for cross-contamination

OPERATIONS: EMERGENCY

“We are what we repeatedly
do. Excellence therefore is not
an act but a habit.”

ARISTOTLE

Conduct a risk/benefit analysis that takes into consideration the risk of fire fighters being unnecessarily exposed to carcinogens. Limit toxic exposures to personnel on scene. Incident Commanders (IC) can cancel units who are not needed.

- Upon arrival at the incident, units should stage uphill and upwind to the fire when practical. Keep apparatus windows closed, air conditioner and heat turned off to minimize airborne contaminants from entering the cab and contaminating the interior.
- If the apparatus is not involved in an integral process of fireground operations (pumping, supplying or aerial operations), turn off the motor to reduce the diesel exhaust on the scene.
- On-deck and Rapid Intervention Crews (RIC) can be readily available without standing in the smoke. Stay outside of the smoke envelope—the area surrounding the scene where airborne contaminants are present—and be aware of the greater picture. This envelope depends on atmospheric conditions. For example, on low wind days with atmospheric inversion, the smoke envelope may surround a fire scene with a large spread of emissions in all directions.
- Responders should wear appropriate PPE whenever the situation warrants, including the pump operator/engineer and IC, and may have to wear SCBA whenever exposed to the products of combustion or hazardous materials.
- All personnel engaged in fire fighting shall utilize SCBA from initial attack throughout overhaul. FCSN 2011 states that not wearing SCBA is the “single most dangerous voluntary activity” in today’s fire service. Such usage should include not only interior structural fire fighting, but also for car fires and dumpster fires.

GROSS DECONTAMINATION (DECON)

- Prior to removing fire fighting ensembles worn in the hot zone, a gross decontamination shall be performed to remove potentially harmful contaminants (WAC 296-305-05002 (15)).
 - **Wet Decon:** Members should brush large debris first, and then spray each other with water to remove loose particulates from turnouts and equipment. Utilizing the pump operator for decontamination should not be allowed due to their lack of respiratory protection. The designated Gross Decon line should be deployed approximately 50 feet from the pump panel, towards the egress of the IDLH and designated by a cone. Do not connect decontamination line to a foam discharge port during foam operations.
 - **Dry Decon:** During cold weather operations, dry brushing should be conducted to remove the toxic products of combustions from the fire fighters prior to going off air and removing SCBA face pieces.
- All fire fighters engaged in suppression activities, overhaul or exposure to smoke should exchange their contaminated



LEFT: RTI conducted a fluorescent aerosol test that found aerosol particles can penetrate a firefighter's hood and deposit on the skin. There were very heavy aerosol deposits on the neck, cheeks, ears, and hair due to penetration through the hood. The dark bands below the ears were relatively clean areas that were covered by the mask straps.

Test conducted by: RTI International, Research Triangle Park, NC sponsored by the International Association of Fire Fighters.

hood for a clean one every time they exit the IDLH. Replacement hoods should be readily available on scene.

- After Gross Decon and before eating or drinking, a personal hand washing station, including hand soap and towels, will be set up. In lieu of soap and water, utilize disposable wipes for hands, face and neck. Personnel should wash their hands before Rehab, at the end of suppression activities including overhaul and before returning to the living quarters. The hand wash station or wipes should be available at the entry point to Rehab.
- When released from the incident, fire fighters need to bag their contaminated turnouts in large, encapsulating leak-proof bags for transport back to the station. Wearing contaminated turnouts back to the fire station will transfer contaminants to apparatus seats, resulting in exposure to the next member who sits there due to cross-contamination.
- To protect hands from dermal absorption of contaminants while packaging turnouts, wear a minimum of EMS latex or nitrile gloves. Personnel must shower upon returning to quarters, or as soon as practical. Keep a reserve set of turnouts at assigned stations. Clean contaminated turnouts, including hood, gloves, boots and helmets in accordance with NFPA 1851; or send them out to designated station or an ISP for cleaning.
- When cleaning contaminated equipment, always wear appropriate PPE (gloves, splash gown and N95 if equipment is dry and particles could become airborne) to protect against exposures from contaminated equipment (WAC 296.62).

INCIDENT REHABILITATION (REHAB)

Provide rehabilitation and medical monitoring to establish the mental and physical condition of personnel participating in tactical operations and training at the scene. Carcinogens can be absorbed, inhaled and ingested on a fire scene. Proper decontamination and rehabilitation procedures reduce exposures to carcinogens during these critical times.

- Rehab must be located in a place that allows enough space and protection from adverse environmental conditions including fire, smoke, exhaust, extreme heat and cold. An ideal location would be out of direct sight of the working incident, with room for separate areas to remove PPE, a rest and evaluation area, a treatment area and access to a restroom when possible.

INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) CONTAMINANTS & CLASSIFICATIONS

CONTAMINANT	NOTE
Acetaldehyde	IARC Group 2B carcinogens
Acrolein	IARC Group 3 carcinogens
Aniline	IARC Group 3 carcinogens
Antimony compounds	Toxicity similar to arsenic poisoning
Arsenic	IARC Group 1 Carcinogens, endocrine disruptor
Benzene	ARC Group 1 Carcinogens
Beryllium compounds	IARC Group 1 Carcinogens
1,3-Butadiene	IARC Group 2A carcinogens
Cadmium	IARC Group 1 Carcinogens, endocrine disruptor
Dibutyl phthalate	Endocrine disruptor
1,8-dinitropyrene	Sufficient evidence in experimental animals
Dioxins and dibenzofurans	Are suspected human carcinogens
Formaldehyde	IARC Group 1 Carcinogens
Mercury compounds	IARC Group 3 carcinogens
Naphthalene	IARC Group 2B carcinogens
Nickel	IARC Group 2B carcinogens
3-Nitrobenzanthrone	One of the strongest carcinogens known
Benzo(e)pyrene	IARC group 3 carcinogens
Benzo(a)pyrene	IARC Group 1 carcinogen
Styrene	IARC Group 2B carcinogens
Toluene	IARC Group 3 carcinogens
Xylene isomers and mixtures: o-ylenes, m-xylenes, p-xylenes	IARC Group 3 carcinogens

- Personnel are to rotate through Rehab after IDLH work period of 2/30s or 1/45-minute SCBA cylinder or anytime the environment, workload and/or atmospheric conditions indicate the probability of injury or temperature related illness to personnel. This includes, but is not limited to, working fires and haz mat incidents when encapsulating suits are worn.
- At the entry point prior to entering Rehab, fire fighters are to use a personal hand washing station with water, hand soap and towels. In lieu of soap and water, utilize disposable wipes for hands, face and neck.
- An evaluation will occur each time a fire fighter enters Rehab to include the following: time, name, unit, mental status, any symptoms such as chief complaint, shortness of breath, poor gait, confusion, dizziness, nausea or vomiting, cramps, aches and pains. All symptoms will be thoroughly evaluated by the appropriate EMS level of care.
- Personnel not in the IDLH but within the hazard zone (pump operators, IC, etc.) should be observed and periodically monitored for potential exposure to toxic gasses and/or heat and cold stress.
- In warm weather, removal of turnout gear is necessary in order to allow the body's temperature regulating mechanism to function properly. The duration of the ventilation process will depend on the workload and atmospheric air temperatures.
- The use of tarps for shade and electric fans to provide airflow may be necessary during hot weather, and other appropriate shelter should be utilized during inclement weather.
- Fluid replacement is necessary in order to maintain the high metabolic demand placed on fire fighters during emergency operations. It is recommended that members drink one liter of water per hour in order to replace fluids lost due to dehydration. After one hour, electrolyte additives should be added to the water source (NFPA 1584).
- Caffeinated beverages and "energy drinks" should be avoided during the emergency incident due to their diuretic effect.

Accumulation of soot and chemicals on turnouts can lead to persistent exposures of carcinogens to fire fighters. Turnouts should then be cleaned after each exposure to toxic products of combustions.



'SCBA DURING OVERHAUL IS FOR PANSIES! BESIDES, WHAT'S THE WORST THAT CAN HAPPEN?'

OVERHAUL

The primary emphasis during post-fire operations should be the safety of all fire personnel operating on the scene. Decontamination, rehabilitation and rehydration procedures should already be in place. When crews are able to exit the structure as soon as reasonably possible, they allow for the chemicals to dissipate naturally and their overall exposure will be reduced. An additional benefit of timely crew removal is that it will allow Fire Investigators to gather information before a scene is further disturbed by overhaul.

As a **best practice**, the most contaminated crews should be sent home first for showers and change of clothing to remove the toxic products of combustion that accumulate on fire fighters during fire fighting operations. The Jacksonville (Florida) Fire and Rescue Department (JFRD) has had a policy in place since 2010 (SOG 437) that designates a new crew be dispatched to the scene of working fires as a CUT Team. An acronym for "Clean Up Team," the primary job of CUT is to "perform overhaul duties and assist the Fire Investigator at structure fires." This allows the original fire fighting crews to return to quarters and clean up after their fire fighting operations.

- During the structural cooling off period, the IC can develop an overhaul plan that includes the identification of safety issues like holes in floors or unstable walls/roofs and the establishment of hot, warm and cold zones.
- SCBA is mandatory to be used for any work performed inside the structure for duration of overhaul. Monitor for fatigue, hydrate and cool crews.
- Fire investigators can begin interviews and investigation outside the structure during the structural cooling off period.
- Fire investigators are subject to the same toxic environments as other fire fighting personnel. They must be protected from respiratory and dermal absorption hazards when operating inside the hot zone (WAC 296-305-05002 (16)).

continued on page 16

COMMUNITY ACTIVIST: ADAM VILLARD PREACHES BETTER PRACTICES

BY ERIN JAMES

I was that guy in the department who had the dirtiest helmet, the dirtiest gear and I was proud of it," says Adam Villard, union president and Fire Fighter EMT for Spokane County Fire District 8.

Villard admits he wore his ash-clad gear until he was instructed to clean it by his chief. However, in 2012, he went to a class hosted by the Firefighter Cancer Support Network and heard Washington State network director Eric Monroe speak about dirty gear and absorption through the skin. "He spoke about how if you don't shower and clean yourself after a fire, that exposure is in your system for a longer period of time," Villard says. "He opened my eyes—opened them enough to change my ways. I went back to the station and cleaned my gear and thought to myself that I might have dodged a bullet."

With a history of kidney stones and a specialist he visited regularly, Villard went in for a somewhat routine ultrasound shortly after he attended the cancer support class. His doctor found a mass on his left kidney and planned for him to monitor it on an annual basis. A few months after that first one-year mark, Villard developed another kidney stone and went to see his specialist who recommended doing an MRI. The mass was later diagnosed as left renal cell carcinoma. In May of 2014, Villard had the upper back slope of his left kidney removed, totaling as a third of the organ.

"The doctor says this would have gone asymptomatic for years but when they become symptomatic, we got real problems," Villard says. "I started doing research and all the guys from on the job that passed away from kidney cancer were 46- or 47-years-old, which would have put me right in that range."

Villard brought his investigation to his doctor and asked if he thought it was a result of his job. "He said he didn't have enough research but that it was probable and I was awfully young to get this," Villard remembers. "I said that was kind of my point."

He showed the specialist the RCW presumptive cancer list and the science backing from IAFF resident oncologists specifically on carcinogens and kidney cancer. "He read it and filled out the paperwork saying it was more probable than not that the job causes cancer," he says.

For a small department like his, Villard's diagnosis had a colossal impact on the practices in place—so much that policy changes were made and the department purchased additional turnout extractors to clean gear properly at all four stations.

"They are doing the best they can to limit the problem," Villard says. "I think the industry is coming around more and more as more tragic events and diagnoses take place. It's opening a lot of people's eyes."



Villard predicts a major culture shift that leans more toward cleanliness and safety than the "tough guy mantra."

"I'm a ten-year fire fighter, we're right in the middle of Gen X and we have a certain mindset," he says, tongue-in-cheek. "I think that mindset is starting to change. With this manual coming out, most of this class of the fire service is going to be open to the change."

Outspoken and active, Villard says he is not shy about discussing his own trials and tribulations with cancer as a fire fighter and regularly speaks to new recruit classes in his district.

"I want folks to know that I was the guy who kind of had a bad attitude about it but someone changed my mind, but at that time, I had already gotten sick," he says. "I'm just trying to prevent someone else from having the blinders on."



TRANSPORTING CONTAMINATED EQUIPMENT

Contaminated equipment, turnouts and hose should be transported back to the fire station in a manner, designed to reduce cross-contamination.

- Gear should be encapsulated utilizing a single-use, heavy-duty plastic bag. The bag should be of sufficient size (42-gallon) and strength (2-3 mil) to contain all contaminated gear, including turnouts, helmet, mask, gloves and boots.
- The encapsulated gear should be placed outside of the passenger compartment, in an external compartment. Transport gear in a similar manner to a facility with an extractor or to an ISP.
- Upon arrival back at fire station, and prior to personnel taking showers, open the turnout bag and let the turnouts off-gas outside the

fire station. After showering and changing to a clean uniform, remove any tools from turnouts and launder in extractor or repackage for transport to designated cleaning station or ISP.

- Transporting contaminated equipment, hose and turnouts in the bed of a utility pickup will not need to be encapsulated. Be sure to wear appropriate PPE when handling contaminated equipment and clean the transport vehicle after use.

CLEANING TURNOUTS

Gross Decon happens at the fire scene first. Turnouts should then be cleaned after each exposure to toxic products of combustions. Exposures can be from car fires, dumpster fires, structure fires and training burns. Accumulation of soot and chemicals on turnouts can lead to persistent exposures of carcinogens to fire fighters. Structural turnouts, including gloves, helmet, hood, boots, pant and coat, should be cleaned according to manufacturer's recommendation and NFPA 1851.

BELOW: Bagging up contaminated turnouts and SCBAs prevents cross-contamination.



IMMEDIATE ACTION: JEFF GREENE'S ROAD TO RECOVERY

BY ERIN JAMES

The great outdoors have always spoken to Jeff Greene. Growing up in Lake Stevens, Washington and moving to Wenatchee later in his childhood, he found his calling in the open air and fire fighting seemed the perfect fit for a career. He is an avid fisherman and hunter, has worked in departments throughout the Pacific Northwest and spent eight years on the haz mat team in an industrial area of Kent.

In December of 2014, at the prime age of 32, Greene was diagnosed with chromophobe renal cell carcinoma. A rare sub-type of the greater renal cell carcinoma umbrella, Greene's type of cancer holds up just 5 percent of all kidney cancers and only seen in 60 cases a year on average.

After waking up with a side pain he soothed with a heating pad six months prior, the second occurrence of the pain was too much to bear and Greene's wife insisted he visit his primary care doctor. Several screenings and tests later, his doctor determined there was a spot on his kidney that was renal cell carcinoma, but it was weeks out until he was able to see a specialist.

"When I got the news, I was sitting at work and called Seattle Cancer Care, told them my story and asked if I could come in," Greene says, noting he was in their hospital just three days later. "I met

with a surgeon there, he looked at my file and said that it really didn't matter at this point what it was. That at my age, it's going to grow to a point that it's going to be in the way, whether that's just a tumor or cancer. We had to cut it out."

This type of cancer forms in the cells lining the small tubules that help filter waste from the blood and produce urine in the kidney—and the only treatment is surgery. Thankfully for Greene, the procedure was simple; the affected portion was cut out and he quickly returned to the world he loved.

Unlike many other fire fighters who battle cancer, Greene, who is an Engineer/driver for the Kent Fire Department, always had his best practices dialed in. He says he can only recall a singular, yet distinctive, time when his safety might have been in jeopardy.

"When I was on probation my very first year, we went to a pipeline fire and we were breathing the fumes with raw fuel spraying everywhere," he says. "One of the possible causes of kidney cancers is benzenes (a natural part of crude oil and gasoline)... We were only 100-200 feet away from the active fuel, we were breathing fumes the entire time. It wasn't until hours later when they realized the potential of it and moved everybody back."



With a heightened sense of consciousness, Greene encourages his fellow fire fighters to be aware of everything they do on the job. "Don't bring that home to your kids, you don't want carcinogens at home," he says. "If you can smell it, you know carcinogens are all over everything."

Today, Greene is behind the fire service's movement toward cancer awareness. He says he understands it might take time for change to be reinforced, but for now, he shares his story to help better practices sink in on a personal level.

"As long as we are getting this data and information out there, maybe there will be more looked into as far as finding a definitive cause," Greene says. "If it's something that we are doing—at the station or on calls—that's causing it, it'd be nice to know so that somebody else doesn't have to go through with this."

OPERATIONS: ROUTINE

“Take care of yourself,
take care of each other and
be safe.”

MARTY HAUER,
KENT FIRE DEPARTMENT ENGINEER
PASSED JUNE 3, 2008

WELLNESS COMPONENT

How the body performs is the best indicator of what is going on inside of it. If it doesn't feel right, it might not be. It is encouraged that all fire fighters listen to their bodies and get checked at the first signs of abnormal issues and symptoms.

There are many important components to help the body stay cancer-free in the fire service. A key step is to never start using tobacco products, of any kind. If a member occasionally smokes cigarettes, e-cigs, cigars or dips smokeless tobacco, it is encouraged they stop immediately. Regular use of a sunscreen or sunblock can help protect from skin cancer. General wellness can be achieved by regular exercise, a healthy diet and, most of all, awareness of what is going on in the body.

Physical fitness is extremely important as a fire fighter. Being physically fit can prevent or reduce injury, increase performance, increase career longevity and help improve one's quality of retirement. There is a physical fitness standard that must be reached when someone initially joins the fire service, but fitness throughout one's career is just as important.

Research has demonstrated the need for high levels of aerobic fitness, muscular endurance, muscular strength, muscular power and flexibility in order to perform safely and effectively in the fire service. The activities required while performing work on the fireground are physically demanding and can put stress on the heart. Heart attacks are one of the leading causes of fire fighter fatalities. Healthier, physically fit and conditioned fire fighters will lead to fewer injuries and improved performance on the fireground. Staying in shape and working out throughout one's tenure will also lead to a healthier life after retirement and allow the retiree to have a higher quality of life during their retirement years. Working out while on shift also provides camaraderie within a crew and station.

Sleep habits are another consideration for fire fighters. This chosen profession often makes regular sleeping habits difficult or impossible. Long shifts of 24 or 48 hours contribute to irregular sleep habits, which have been shown to have a negative impact on health. As recommended by the National Institute of Occupational Safety and Health (NIOSH), fire fighters should focus on getting plenty of rest while off-duty, rather than exacerbating potential health hazards by going without sleep or limiting the opportunity to get adequate rest when available.

According to the Center for Disease Control, **alcohol** is a leading cause, as well as a contributing factor, to many forms of cancer. Over time, excessive alcohol use can lead to the development of chronic diseases and other serious problems including high blood pressure, heart disease, stroke, liver disease, digestive problems and cancers of the breast, mouth, throat, esophagus, liver and colon. Limit alcohol consumption to not more than one drink per day for women, two drinks per day for men.



ANNUAL PHYSICALS

Fire fighters enter toxic atmospheres, perform strenuous physical activities and do so over an expansive 20-30 year career. WAC 296-842 mandates respiratory protection if a member is entering an atmosphere with toxic products of combustion. WAC 296-842-14005 requires a medical evaluation prior to being fitted for

ABOVE: Research shows that aerobic fitness and muscular strength and endurance help members to perform safely and effectively in the fire service.

respiratory protection. WAC 296-62-07314 also requires a medical exam for any employee prior to being assigned to work in an area that may release carcinogens. For fire fighters, members often enter unknown carcinogenic environments including structure fires, car fires or dumpster fires. These exams are to be provided at no cost to the employee and provided annually after an initial examination.

A sample recommendation of an annual physical provided by the Firefighter Cancer Support Network (FCSN) is included in Appendix C. The IAFF/IAFC Joint Wellness Fitness Initiative (WFI) also provides an annual recommended physical for incumbent fire fighters. Specific tests such as red and white blood cell count tests, heavy metals screenings and cancer screenings can assist with early detection of many common cancers seen in the fire service today. These simple exams can determine if cancer is a risk, as well as if it is present. Having this annual exam is imperative to early detection and aggressive action to address any problems.



THE LIFESAVING PHYSICAL: HOW FAMILY MAN CHRIS LINES SURVIVES MULTIPLE MYELOMA

BY ERIN JAMES

In the 20th year of Chris Lines' fire fighting tenure, he was diagnosed with multiple myeloma, a rare and incurable blood cancer. Myeloma makes up just 1 percent of cancers, but it is the second most prevalent blood cancer after lymphoma. According to multiple studies, it is 1.5 times more likely a fire fighter will develop multiple myeloma compared to the general population.

Multiple myeloma begins when plasma cells, white blood cells found in bone marrow, mutate and start to reproduce themselves. According to Lines' doctor who handed the now 52-year-old the diagnosis eight years ago, his line of work caused his cancer.

"I got a call from the doctor and he said I was anemic and my red blood cells were low," Lines says. "I did a blood test and a bone marrow biopsy and they gave me the big diagnosis. They caught it real early, not early enough to cure, but before it caused really any damage to the bones or organs or anything."

The Vancouver Fire Department requires its members to take annual wellness tests—a requirement that saved Lines' life. He says if his doctor hadn't done the extra tests after the red flags rose from his physical, he wouldn't have known until it was too late to even medicate. The immediate solution was for a stem cell transplant, modern medicine's "golden ticket" for putting cancer into remission and keeping it at bay for a few years.

"The kind I have always comes back, it never goes away forever," the Battalion Chief explains. "When they

offered the transplant to me, I had a nine-year-old boy getting ready to play All-Star little league—I wasn't going to go into the hospital for a couple weeks and be out of commission for four months. I said I wasn't going to do the transplant, I'll take all the stem cells out and freeze them and watch this kid play baseball."

Considering himself lucky, Lines' treatment consists of 14 pills per month that have helped him to continue on with his life, without pulling him away from his family or his passion in the fire service. Today, he uses that fervor to tell his story and encourage better practices in the field.

"I tell the guys at work all the time the best thing that can happen to you is to pull in the driveway in the morning and have two little screaming kids come out and give you a big hug," says the father of two teenage boys, the eldest currently enrolled in fire school. "You guys want to make sure you get to that in life and don't jeopardize your future by doing anything crazy in the fire service or the same thing with taking care of yourself."

Steadfast to the rules of better practices, Lines says he never took any risks when it came to his time on calls, but recognizes that his education of carcinogen exposure was limited prior to his diagnosis. He strives to change that mindset as younger fire fighter classes come on board, encouraging them to take care of themselves and for his own generation to adapt to new safety precautions.



"I think the fire service has really taken a positive role in getting their members tested, buying some of the best practices available," Lines says. "Fire fighting is always going to be dangerous because of the chemicals you're involved with. After talking to some experts, you don't know how bad you're exposed to something until 20 years down the road. If you can do what you can do in the mean time, then I think that's a huge benefit and I do think that's happening now in the fire service."

His advice to fire fighters on carcinogen exposure? Check yourself constantly. "If you're in a fire, take the time, not just for you but for your family, to do all the best practices even if you're tired," Lines says. "But if I could give any kind of encouragement, it is to continually get a physical every year. Make sure you do it."



BASIC NUTRITION

Diet is a primary consideration. It is the responsibility of every member to try to follow a diet that helps minimize a cancer-related occurrence. The best nutrition for the body is to eat as many whole foods as possible for each meal. Whole foods naturally provide necessary vitamins, minerals and other nutrients that are vital to keeping the human body healthy and free of disease. Processed foods, on the other hand, tend to have fewer nutrients and more unhealthy fats, sugars and other additives, which can increase the risk for diseases such as diabetes, heart disease and certain types of cancer. The cleaner the diet, the better the body will run and the immune system will be more effective when it has to deal with viruses, bacteria and other toxic exposures.

Most fire fighters get adequate amounts of proteins and grains but tend to lack vegetables. Vegetables help the body process food and should be eaten prior to the bulk of your meal, such as having a salad before dinner. When presented with an opportunity to select vegetables, choose a variety of colors, as each different colored vegetable provides a different health benefit when consumed.

Most nutritionists will tell you to eat three meals a day (breakfast, lunch and dinner) with two to three snacks in between the larger meals and avoid eating past the hour of 8 p.m. In the fire service, this can be difficult, if not impossible, due to the erratic schedule, and the use of food as a comfort to a high stress job.

In general, it is advised to eat a large breakfast and start off the day well nourished, and then as the day unfolds, try to hold to the ideal of lunch around noon and dinner around 6 or 7 p.m. When snacking, try to pick a low sugar snack, especially the closer it is to the sleeping hours. Caffeinated beverages, especially energy drinks, and a high sugar diet at night will increase the inability to fall asleep, coupled with calls, this can lead to severe sleep deprivation.

Lastly, getting 64-88 ounces of water per day helps the body process and move food/fuel through the digestive system, and has a huge impact on nutrition overall. A good rule is to drink a glass of water prior to each meal, prior to training and after any call that requires physical exertion or the donning of bunker gear.

TRAINING: CANCER AWARENESS

Training, education and recognition of the epidemic of cancer in the fire service has been a goal of the Firefighter Cancer Support Network for many years. It is imperative that new generations of fire fighters are made aware of how large and impactful this problem is. The following is a list of the highlights that are taught during these cancer awareness outreach classes. This curriculum should be taught at every recruit school, and annually at every fire department. WAC 296.62 also requires an awareness of the hazards of carcinogens on the job and annual refresher training is required prior to entering any live fire training scenario or actual fire scenario.

- Carcinogenic hazards of chemicals encountered on the fireground including local and systemic toxicity.
- Benefits of personal wellness efforts including exercise, nutrition and annual physicals.
- The most common types of cancer in the fire service that fire fighters are more likely to develop than the general population: multiple myeloma, non-Hodgkin's lymphoma, esophageal cancer, brain cancer, colon cancer, prostate cancer, skin cancer and testicular cancer.
- Supporting research and findings demonstrating the scope of cancer in the fire service.
- Laws and standards applicable in the specific state and jurisdiction regarding cancer in the fire service.
- Common materials that pose a risk to fire fighters.
- Methods of reducing exposures to carcinogens at incident scenes.
- Benefits of Gross Decontamination, such as hand, face and neck washing on scene.
- Methods for cleaning turnouts and self after an incident.
- Methods of documentation of exposures after an incident.
- Education on exposures and cancer risks before any training or incidents that have the potential to expose fire fighters to known carcinogens, asphyxiates, poisons, irritants and allergens.
- Provision of all appropriate PPE to minimize exposures.
- Requirements to use all appropriate PPE to minimize exposures.
- All staff that participates in the training of fire fighters should conform to the practices listed in this document.





DOCUMENTING EXPOSURES FOR INDIVIDUALS

It's no secret this profession puts its members in environments filled with known and unknown chemicals, carcinogens, toxins and diseases. As a result, it has been proven that fire fighters are more prone to certain illnesses and cancers than the general population.

At Convention in 2014, the WSCFF passed a resolution to create an exposure tracking system for its membership. The Personal Injury, Illness and Exposure Reporting System (PIERS) was created and is designed to follow fire fighters throughout their career and into retirement. It is a one-stop place to record

PIERS is a one-stop place to record injuries, illnesses and exposures experienced while on the job.

injuries, illnesses and exposures experienced while on the job. Confidentiality of information will always be safeguarded, only the user will have access to personal information.

As a PIERS user, one can track their exposures to chemicals, smoke, toxins and diseases throughout their career. The system can be used to track work-related injury claim information such as sprains, strains and broken bones, along with illnesses such as any cardiac events. Users have access to the results of preventative and wellness exams into the PIERS program as part of a complete health history. Before annual physicals, users can download a report including current exposures to share with their doctor. PIERS may show changes over time, and throughout a career.

For the WSCFF, PIERS provides the ability to run reports on non-protected and generic information to track trends and to develop health education or prevention materials. PIERS can also be used for legislative and safe work-place initiatives.



ALL IN THE FAMILY: JACK WALLER'S FIRE SERVICE SUPPORT SYSTEM

BY ERIN JAMES

Brotherhood" is a term that pulls its weight in the fire service. Among shifts, pushing throughout the station, into the department and out into the state as a whole, the family that is the fire service ties its members in through the job's passion, dedication and loyalty. This is something Jack Waller witnessed first hand when he was diagnosed with Hodgkin's lymphoma in 2014 at the age of 49.

Waller had been positioned at the South King County Training Consortium as a Captain for only a handful of months when he received his diagnosis. When talking about his health verdict, he lists off more than a dozen names of fellow servicemen and women that took him in as their own.

"They just bear-hugged me, they treated me like family and I think that was huge in my ultimate positive outcome," says Waller, who is in his second year of remission. "I got lucky that I got a cancer I could get rid of but I think that having them working with me—that support—was crucial for me and was a positive part of the process."

Hodgkin's lymphoma, like its sibling type non-Hodgkin's lymphoma, is a cancer of the lymphatic system, a vital component of the defense of the immune system. Hodgkin's causes abnormal cell growth in the lymphatic

system and, as it progresses, compromises the body's ability to fight off infection.

For Waller, after finally coming to terms with the abnormalities occurring in his body, he spoke with his sister, a former oncology nurse. She insisted he see a specialist, as he was showing textbook symptoms for lymphoma, like unexpected weight loss and a persistent cough.

"In the fire service historically, we're all 10-feet-tall and bulletproof and nothing can happen to us," Waller says. "So when goofy, funky things start happening to your body that we can't explain, we deny it and try to explain it away. If something is happening to your body that you can't explain, don't wait, go to your doctor and don't stop with your doctor until you get an answer."

Although this type of lymphoma is not on the RCW's list of presumptive fire fighter cancers, it lists a primary cause as farm chemicals, something that Waller was exposed to growing up as a child and young adult in Eastern Washington as well as on the job. He plans to file an L&I claim over the diagnosis so the data is documented. "The more of us that come forward in this profession, at some point, there's a tipping point where they'll go 'wow, there are 5,000 fire fighters who've got

Hodgkin's lymphoma.'"

More common among people half his age, Waller's diagnosis was a statistical oddity and struck a chord with his colleagues. "I was told there was a pretty sizable uptick in tenured people my age in the service that were going to the doctor for physicals," he says. "If nothing else, it got people to go to the doctor."

Waller, now a Battalion Chief at the Tukwila Fire Department, understands that the change in policy, especially on a statewide level, will take both time and money. "You're fighting 100 years of tradition unhampered by progress," he says. "It'll be gradual but our probationary fire fighters and the recruits that are coming in now won't know any different. As time goes by, we advance technology and our understanding of the disease and how it's affecting us as an occupation."

Cancer is an epidemic within this brotherhood of fire fighters, Waller insists as he counts the number of cancer-related funerals within the last few months. "Cancer is not discriminatory," he says. "It's not the 50-somethings or the 20-somethings in the service, it's all of us. Any little thing, no matter how inconvenient it might be at the time, if it's going to prevent you from what I had to go through and increase your quality of life when you retire, I'd have to say it's worth it."

LOGISTICS

“I never see what has
been done. I only see what
remains to be done.”

BUDDHA



LAUNDRY

The employer will provide personnel with uniforms. This uniform is not designed to protect against hazardous materials, toxins or bloodborne pathogens, although these contaminants will occasionally come in direct contact with uniforms. Under no circumstances will employees take home uniforms that have been worn in a contaminated environment, nor those that are soiled with blood or other potentially infectious materials (OPIM).

- Washers, dryers or laundry services are to be provided by the employer. No equipment, detergents or disinfectants should be used other than those provided by the employer.
- Contaminated uniforms and linens should be washed with detergent in water between 140 and 160 degrees Fahrenheit for a minimum of 25 minutes. If low temperature laundry cycles are used, chemicals suitable for low temperature washing at proper concentration must be used.

HOUSEKEEPING

Develop cleaning procedures to mitigate contamination and to avoid cross-contamination from fire incident scenes to living quarters. Employees handling contaminated equipment, hose and turnouts will wear appropriate PPE (gloves, splash gown and N95 if appropriate) to protect against exposures from contaminated equipment.

Written schedules for station cleaning and methods of equipment decontamination, cleaning and disinfecting should be located at each work site.

DECONTAMINATION, CLEANING AND DISINFECTING

Gross Decontamination occurs at the scene and removes many of the toxic products of combustion or biological contaminants. Cleaning occurs back at the fire station and uses soap, other cleaning products and warm water rinses. Disinfection can only happen after the object has been cleaned. Contact, or dwell, time is the amount of time required to “kill” the microorganisms. Disinfection products vary widely on their contact time, read the labels before using.

EQUIPMENT CLEANING

SCBA facemasks and tools are exposed to the same products of combustion as turnout gear. They are contaminated any time they are exposed to a smoky atmosphere, including, but not limited, to structure fires, car fires, dumpster fires, training fires or burnt food on the stove. If not properly cleaned, contaminated equipment will continue to expose personnel to carcinogens long after the fire.

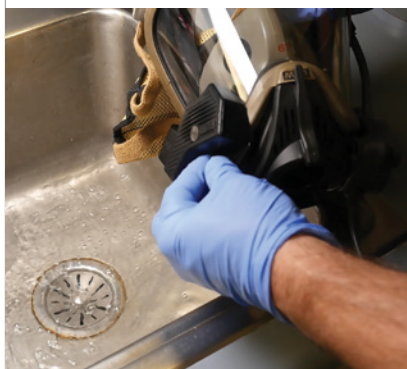
- Gross decontamination of equipment should be done at the scene.
- Any time contact is made with the contaminated equipment at the scene or while cleaning, proper PPE that will limit dermal absorption should be used.
- Transportation of contaminated SCBAs, masks and other equipment:
 - Contaminated equipment should be grossly decontaminated first, then encapsulated if transporting in the fire engine to further reduce exposure or contamination to uncontaminated areas.
 - Contaminated equipment does not need to be encapsulated if it can be transported to the cleaning facility in a vehicle (e.g., pickup) that will not allow further cross-contamination of the apparatus cab, compartments or exposure to personnel.
- Equipment should be cleaned in a location that will allow for proper cleaning without further exposure to personnel or living quarters.
- After each use, all equipment will be cleaned according to manufacturer's recommendations.
- For most hand tools (axe, hooligan, shovel, etc.), use mild soap and water.
 - If necessary, scrub with a soft to medium bristled brush to remove stubborn contaminants.
 - Using a garden hose, completely rinse the soap from the tools.
- Gas powered equipment can be wiped free of smoke, soot and debris.



COMMON CHEMICALS FOUND IN RESIDENTIAL HOUSE FIRES:

- | | |
|--------------------|---------------------|
| • Acrolein | • Hydrogen chloride |
| • Aldehydes | • Mercury vapor |
| • Ammonia | • Naphthalene |
| • Arsenic | • Nitrogen dioxide |
| • Benzene | • Nitrogen monoxide |
| • Benzyl chloride | • Ozone |
| • Carbon disulfide | • Phenol |
| • Carbon monoxide | • Sulfur dioxide |
| • Formaldehyde | • Styrene |
| • Furfural | • Toluene |
| • Glutaraldehyde | • Particulates |

BELOW: To clean SCBA masks, remove electronic components and use a damp sponge or cloth to clean those parts. Scrub face piece with a brush, then ensure exhalation valve moves freely and hang mask to dry.



SPECIFICS ON SCBA AND FACEMASKS CLEANING:

- The cylinder needs to be removed from the backpack for proper cleaning. It should be washed with warm, soapy water and thoroughly rinsed, making sure to clean all components of the cylinder (i.e., cylinder valve, gauge and cylinder body). After cleaning, the cylinder valve should be cracked opened to blow out any moisture that has collected in the valve opening.
- Masks can be cleaned in a commercial mask washer or ultrasonic cleaner designed specifically for SCBA masks, if allowed by the specific manufacturer; otherwise it can be cleaned inside and out to remove all contaminants and sanitized prior to being placed back in service.
- The backpack (minus cylinder) should be thoroughly cleaned in accordance to the manufacturer's recommendations. Warm soapy water, sponge and soft bristled brush should be used, with care taken to make sure all surfaces are thoroughly cleaned, including hard and soft surfaces (WAC 296-842).

SPECIFICS ON HOSE CLEANING:

- Contaminated fire hose should be cleaned per NFPA 1962 Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose.
- It is recommended to "dry" brush the hose using a soft/medium bristle brush. However, if the dirt cannot be thoroughly brushed from the hose, or if the hose has come in contact with harmful materials, the hose should be washed. Covered (nitrile, rubber) hoses are can be wiped dry.
- Unroll the hose and stretch it out in its entirety on a clean, level surface. Thoroughly rinse the fire hose with clean water.

Preliminary results presented in the Illinois Fire Service Institute's 2015 Cardiovascular & Chemical Exposure Risks in Modern Firefighting Interim Report indicate that "gross on-scene decon with water/detergent and scrubbing appears to be effective in bringing the PAH (polycyclic aromatic hydrocarbons) contamination to pre-fire levels."



- Fill a large bucket with mild, soapy water. The water should be ambient temperature. Using a long-handled brush with soft to medium bristles, scrub the entire length of hose.
- Turn the hose over to the opposite side and scrub.
- Using a garden hose, completely rinse the soap from the hose on both sides.
- Dry the hose thoroughly using the method best suited for the weather conditions and facility equipment (hanging in hose tower, hose dryer, etc.).

APPARATUS DECONTAMINATION, CLEANING AND DISINFECTING

Proper apparatus decontamination, cleaning and disinfecting are vital in limiting fire fighter exposure to contaminants.

- All apparatus cabs, compartments and equipment should be cleaned weekly and decontaminated after every incident or training that involved contaminants.
- Parking upwind, keeping windows closed and heaters and air conditioners off during fireground operations will minimize airborne contaminants from entering the cab.
- All cleaning can be done utilizing cleaning solutions, designated rags, mop buckets, brushes and disinfectants. HEPA vacuums are useful tools to pick up soot and other loose debris prior to cleaning with wet agents.



HOW TO CLEAN STRUCTURAL FIRE FIGHTING GLOVES

- 1 ||** Wear appropriate PPE, EMS nitrile or latex gloves for dermal protection.
- 2 ||** Fill a decon sink with approximately two inches of warm water and detergent of choice.
- 3 ||** Grab gloves by gauntlet, pinching off end or wear one glove at a time.
- 4 ||** Using a medium bristled brush, submerge the glove and scrub the exterior of the glove; working from gauntlet toward tip. Turn glove over and repeat on other side. Continue until glove is clean then rinse under running water. Perform same procedure on other glove.
- 5 ||** Empty sink and fill with clean water and approved sanitizer to clean the inside of the glove.
- 6 ||** Do not wring as the lining may become dislodged from the shell.
- 7 ||** Hang upside down to dry.

- Apparatus cab cleaning should utilize a top-down cleaning method followed by disinfecting. Special attention should be paid to computers, radios, map books, seats, steering wheel, floorboards and headsets. Disinfecting is intended to prevent the spread of contagious illnesses such as C Diff, MRSA, staph, etc.
- All cloth surfaces should be cleaned using a vacuum and/or steam extractor.
- Remove all equipment and use the top-down method to clean apparatus compartments. All equipment should be cleaned prior to being placed back on the apparatus.
- After cleaning is complete, utilize the department's cleaning program for the rags and mops. Wash hands, face and neck or shower.

PERSONAL VEHICLE

Contaminated turnouts should never be transported at any time in a personal vehicle. Use a fire department vehicle to transport contaminated turnouts to a designated facility for cleaning. By transporting contaminated turnouts in a personal vehicle, a member can subject their family and/or household to potential cross-contamination from the fireground.

Clean turnout gear may be transported in a personal vehicle in an enclosed container or encapsulated in a designated bag to avoid cross-contamination to personal belongings.



MODEL GUIDELINE

Purpose:

Numerous studies have proven that fire fighters are at greater risk of contracting many cancers as a result of their assigned duties. These studies have shown that proper use of the PPE, SCBA and a gross decontamination process are beneficial in limiting the duration of fire fighter exposure to toxic carcinogens. The (insert Fire Department) is committed to the overall health of employees; the (insert Fire Department) recognizes the increased risk of cancer associated with fire fighting activities. In an effort to provide a safe and healthy work environment, the (insert Fire Department) has created the following guideline to reduce the cancer risk to its employees.

Scope:

This guideline applies to all (insert Fire Department) employees.

References:

NFPA, Jurisdiction Policy, WAC, RCW, FCSN and IAFF.

Definitions:

See Appendix B.

Statement of Intent:

It is the intent of (insert Fire Department) to take proactive and reasonable steps to limit employee exposures to carcinogens.





COMMAND

1. Develop comprehensive accident, injury, illness and exposure policies and procedures
2. The Safety Committee can identify root cause and suggest changes to prevent future occurrences.

FINANCE

1. Budget for two sets of turnouts for all emergency response personnel.
2. Budget for PPE cleaning by an ISP or by purchasing the necessary equipment to clean PPE in an area designated as safe and appropriate to do so.
3. Consider grants, including AFG, for alternative funding for major/capital purchases.
4. Provide engineering controls and associated equipment to reduce or eliminate exhaust from internal combustion equipment in living and work areas.
5. Budget for annual physicals, other wellness programs and equipment.

PLANNING

1. Develop an exposure control plan to include green zones in stations and apparatus.
2. Use an apparatus design that reduces exposures and prevents cross-contamination by using solid, cleanable surfaces whenever possible.
3. Provide a hand washing station on every fire apparatus.
4. Design fire station to address exposure reduction and cross-contamination prevention.
5. Conduct testing to ensure a hazard-free work environment: MRSA, radon, asbestos, diesel exhaust, etc.

OPERATIONS: EMERGENCY

1. Ensure that all personnel are wearing full PPE and SCBA on all fire calls.
2. Establish hot, warm and cold hazard zones at the scene. Limit entry to necessary personnel only, and limit time in hot zone.
3. Limit the time support personnel (including driver/engineer, rehab, incident commander and other support staff) are in potentially contaminated areas.
4. Establish Gross Decontamination for every entry into a toxic smoke environment (including car fires and dumpster fires).

5. Provide warm water and soap, or if unavailable, use disposable wipes to clean hands, face and neck.

6. Establish Rehabilitation with medical surveillance when work event exceeds 2/30s or 1/45 cylinder or 45 minutes of strenuous labor, or as needed.

7. Release most contaminated personnel first to reduce continued exposures to toxic products of combustion. First in, first home.

8. Transport contaminated PPE in encapsulated bag to prevent further exposure to apparatus and personnel.

9. Allow personnel to return to fire station out of service to shower and change into clean PPE. Monitor dispatch frequency and do not pass a critical call returning to quarters.

OPERATIONS: ROUTINE ACTIVITIES

1. Ensure diesel exhaust capture systems or similar engineering controls are used every time the apparatus enters and/or exits the fire station.

2. To further reduce contamination that may be brought into the stations by response footwear, it is encouraged a station shoe be worn inside the living quarters of the fire stations.

3. Practice wellness in general. Conduct annual physicals including cancer screenings. Use sunscreen when outdoors, don't use tobacco and participate in daily exercise.

4. Document exposures, injuries and illness throughout career.

5. Conduct initial recruit and annual refresher training to include cancer awareness, wellness and fitness.

6. The Safety Committee will review occupational exposures in order to identify root causes and/or necessary mitigation efforts.

LOGISTICS

1. Establish PPE and uniform cleaning program for all entries into contaminated environments.

2. Provide a second set of turnouts for all emergency response personnel.

3. Institute an on-scene hood exchange program.

4. Maintain the exposure control plan to include cleaning, disinfecting and maintenance programs to reduce exposures in the fire station.

DEFINITIONS

APPARATUS: A mobile piece of fire equipment such as a pumper, aerial, tender, automobile, etc.

APPROVED: A method, equipment, procedure, practice, tool, etc., that is sanctioned, consented to, confirmed or accepted as good or satisfactory for a particular purpose or use by a person, or organization authorized to make such a judgment.

BLOODBORNE PATHOGENS: Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV), human immunodeficiency virus (HIV) and other potentially infectious materials (OPIM).

CBRN: Chemical, biological, radiological and nuclear.

CHRONIC HEALTH EFFECT: An adverse health effect resulting from long-term exposure to a substance. The term is also applied to a persistent (months, years or permanent) adverse health effect resulting from a short-term (acute) exposure.

CLEANING: To make (something or someone) free of dirt, marks or mess, especially by washing, wiping or brushing.

CONTAMINATED: The presence or the reasonably anticipated presence of materials foreign to the normal atmospheres, blood, hazardous waste or other potentially infectious materials on an item or surface.

CONTAMINATION: The process of transferring a hazardous material from its source to people, animals, the

environment or equipment, which may act as a carrier.

DECONTAMINATION: The physical or chemical process of cleansing an object to remove contaminants such as microorganisms or hazardous materials, including chemicals, radioactive substances and infectious diseases. Decontamination is sometimes abbreviated as "Decon." Also prevents the spread of contamination to other persons or equipment.

DISINFECTION: A procedure that inactivates virtually all recognized pathogenic microorganisms, but not necessarily all microbial forms (i.e., bacterial endospores) on inanimate objects.

ENGINE (PUMPER): A piece of apparatus equipped with hose and a pump for the purpose of supplying water under pressure through hose lines.



EXPOSURE OR EXPOSED: When an employee is subjected in the course of employment to a chemical that is a physical or health hazard, and includes potential (e.g., accidental or possible) exposure. "Subjected" in terms of health hazards includes any route of entry like inhalation, ingestion, skin contact or absorption (OSHA - 29 CFR 1910.1200).

FIRE APPARATUS: A fire department emergency vehicle used for rescue, fire suppression or other specialized functions.

FIRE DEPARTMENT FACILITY: Any building or area owned, operated, occupied or used by a fire department on a routine basis.

GROSS DECONTAMINATION: The initial phase of the decontamination process during which the amount of surface contaminant is significantly reduced.

HAZARD CONTROL ZONES:

- **COLD zone:** The control zone of an incident that contains the command post and such other support functions as are deemed necessary to control the incident.
- **WARM zone:** The control zone outside the hot zone where personnel and equipment undergo decontamination and the hot zone support takes place.
- **HOT zone:** The control zone immediately surrounding the hazard area, which extends far enough to prevent adverse effects to personnel outside the zone. The hot zone is presenting the greatest risk to members and will often be classified as an IDLH atmosphere.

HEALTH AND SAFETY OFFICER:

The member of the fire department assigned and authorized as the administrator of the fire department health and safety program.

IDLH: Immediately dangerous to life and health. Exposure to airborne contaminants that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment.



INCIDENT COMMANDER:

The person in overall command of an emergency incident. This person is responsible for the direction and coordination of the response effort.

INCIDENT SAFETY OFFICER:

The person assigned the command staff function of safety officer in the incident command system.

ISP: Independent Service Provider, relating to NFPA 1851 for the care and maintenance of structural fire fighting ensembles.

NFPA: National Fire Protection Association.

NIOSH: National Institute of Occupational Safety and Health.

OCCUPATIONAL EXPOSURE:

Reasonably anticipated skin, eye, mucous membrane or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

OSHA: Occupational Safety and Health Administration.

OPIM: Other potentially infectious materials, which include the following body fluids: semen, vaginal secretions,

cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva, any body fluid that is visibly contaminated with blood and all body fluids in situations where it is difficult or impossible to differentiate between body fluids.

OVERHAUL: A fire fighting term involving the process of final extinguishment after the main body of a fire has been knocked down. All traces of fire must be extinguished at this time.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

- The equipment acts to shield or isolate a person from the chemical, physical and thermal hazards that may be encountered at a hazardous materials incident.
- Personal protective equipment includes both personal protective clothing and respiratory protection. Adequate personal protective equipment should protect the respiratory system, skin, eyes, face, hands, feet, head, body and hearing.
- Specialized clothing or equipment worn by an employee for protection against a hazard. General work clothes (e.g., uniforms, pants, shirts or blouses) not intended to function as protection against a hazard are not considered to be personal protective equipment.

RCW: Revised Code of Washington.

REHABILITATION: The process of providing mental and medical evaluation, rest, hydration and nourishment to members who are engaged in emergency operations.

RESPIRATORY PROTECTION:

Equipment designed to protect the wearer from the inhalation of contaminants.

RISK ASSESSMENT: To set or determine the possibility of suffering harm or loss, and to what extent.

SCBA: Self-contained breathing apparatus.

STATION (FIRE STATION):

Structure in which fire service apparatus and/or personnel are housed.

STRUCTURAL FIRE FIGHTING

PROTECTIVE CLOTHING: This category of clothing, often called turnout or bunker gear, refers to the protective clothing normally worn by fire fighters during structural fire fighting operations. It includes a helmet, coat, pants, boots, gloves and a hood. Structural fire fighters' protective clothing provides limited protection from heat but may not provide adequate protection from the harmful gases, vapors, liquids or dusts that are encountered during hazardous materials incidents.

TLV/TWA: Threshold limit values/ time weighted average.

TURNOUT CLOTHING: See structural fire fighting protective clothing.

VAPOR BARRIER: Material used to prevent or substantially inhibit the transfer of water, corrosive liquids and steam or other hot vapors from the outside of a garment to the wearer's body.

WAC: Washington Administrative Code.

WISHA: Washington Industrial Safety Health Act.

SAMPLE WELLNESS MEDICAL PHYSICAL EXAM (FCSN)

HANDS-ON PHYSICAL EXAMINATION

- **Vital Signs:** Head, neck, eyes, ears, nose and throat
- **Cardiovascular:** Inspection, auscultation, percussion and palpation
- **Pulmonary:** Inspection, auscultation, percussion and palpation
- **Gastrointestinal:** Inspection, auscultation, percussion and palpation
- **Genitourinary:** Hernia exam (see cancer screening)
- **Lymph Nodes:** The examination of organ systems must be supplemented with an evaluation of lymph nodes in the cervical, auxiliary and inguinal regions.
- **Neurological:** The neurologic exam for uniformed personnel must include a general mental status evaluation and general assessment of the major cranial/peripheral nerves (motor, sensory, reflexes).
- **Musculoskeletal:** Includes an overall assessment of range of motion (ROM) of all joints. Additionally, observation of the personnel performing certain standard office exercises or functions is helpful in assessing joint mobility and function.

BLOOD ANALYSIS

The following are components of the blood analysis. At a minimum, laboratory services must provide these components in their automated chemistry panel (SMAC 20) and complete blood count (CBC) protocols:

- White Blood Cell Count, Differential, Red Blood Cell Count (Hematocrit) and Platelet Count
- Liver Function Tests, which includes SGOT/AST, SGPT/ALT, LDH, Alkaline

Phosphatase and Bilirubin

- C-Reactive Protein and Triglycerides
- Cholesterol, which includes Total Cholesterol, Low Density Lipoprotein (LDL-C) level, High Density Lipoprotein (HDL-C) level and Total Cholesterol/HDL Ratio
- Glucose, if over 120 then HbA1c
- Blood Urea Nitrogen, Creatinine, Sodium, Potassium, Carbon Dioxide, Total Protein, Albumin and Calcium

URINALYSIS

- **Dip Stick:** Includes pH, Glucose, Ketones, Protein, Blood and Bilirubin
- **Microscopic:** Includes WBC, RBC, WBC Casts, RBC Casts and Crystals

VISION TESTS

Assessment of vision must include evaluation of distance, near, peripheral and color vision. Evaluate for common visual disorders.

PULMONARY (SPIOGRAM)

- Every year for smokers
- Every three years for nonsmoker

CHEST X-RAY

- Every five years

STRESS EKG* WITH VO2 VALUE CALCULATED

- Members 30-years-old and under will be tested on treadmill every third year.
- Those 30 to 39-years-old will be tested on treadmill every other year.
- Those 40 and older will be tested yearly.

**Abnormal Cardiac Follow-up — Electron Beam Tomography (EBT)*

ONCOLOGY SCREENING ELEMENTS

- Prostate Specific Antigen (PSA), fecal occult blood testing and skin exam
- Additional screenings based on need or at the request of the patient may also be provided during the base-line exam.

CANCER SCREENING

- Digital rectal exam
- Testicular exam
- Clinical breast examination
- Pap smear

IMMUNIZATIONS AND INFECTIOUS DISEASE SCREENING

- Tuberculosis Screen (Annual PPD)
- Hepatitis C Virus Screen
- Hepatitis B Virus Vaccine
- Tetanus/Diphtheria Vaccine (Booster)
- Measles, Mumps, Rubella Vaccine (MMR)
- Measles Vaccine, Mumps Vaccine
- Rubella Vaccine, Polio Vaccine, Hepatitis A Vaccine
- Varicella Vaccine, Influenza Vaccine
- HIV Screening (required to be offered)

HEAVY METAL AND SPECIAL EXPOSURE SCREENING (AS NEEDED)

Arsenic (urine), Mercury (urine), Lead (urine), Lead (blood), Aluminum, Antimony, Bismuth, Cadmium, Chromium, Copper, Nickel, Zinc - Organophosphates (RBC cholinesterase), Polychlorinated Biphenyls (blood)

(i) A work history and medical history with special attention to skin, respiratory and gastrointestinal systems, and those nonspecific symptoms, such as headache, nausea, vomiting, dizziness, weakness or other central nervous system dysfunctions that may be associated with acute or chronic exposure to AN.

(ii) A physical examination giving particular attention to central nervous system, gastrointestinal system, respiratory system, skin and thyroid.

(iii) A 14" x 17" posteroanterior chest x-ray.

(iv) Further tests of the intestinal tract, including fecal occult blood screening and proctosigmoidoscopy, for all workers 40 years of age or older, and for any other affected employees for whom, in the opinion of the physician, such testing is appropriate.

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Interim Report

Cardiovascular & Chemical Exposure Risks in Modern Firefighting



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IFSI Research; UL FSRI; NIOSH; UIC
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Cardiovascular & Chemical Exposure Risks in Modern Firefighting
Interim Report

Foreword

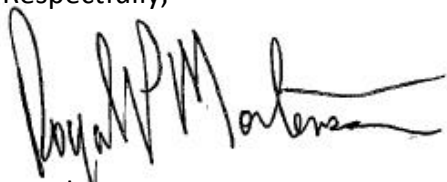
The health and safety risks and hazards of firefighting on the men and women that make up the profession is increasingly well studied and documented. Meaningful and sound research has led to changes in individual fitness priorities, personal protective equipment, first responder personnel activities on the fire-ground, and a better understanding of the overall health risks increasingly associated with firefighting.

Cardiovascular and chemical exposure risks from the combustion of common household contents inside modern structures is understood to be very real. However, researchers have yet to be able to recreate the physical environment of a real modern day fire in such a way that meaningful data could be collected and analyzed.

This study, through amazing partnerships and collaboration between the Illinois Fire Service Institute, UL Firefighter Safety Research Institute, National Institute for Occupational Safety and Health, Globe Manufacturing Company and U.S. Department of Homeland Security - Federal Emergency Management Agency Assistance to Firefighters Grants Program, has recreated virtually every aspect of firefighting realistically, yet safely and in a way that researchers could capture essential data. Using modern building materials and room contents; employing real firefighters executing commonly employed tactics, techniques, and procedures of entry, search, extinguishment, ventilation and overhaul, this study will enable researchers to truly assess risk.

This study is the logical next step in our refinement of what we know, what we think, and what we suspect. It will inform the next steps in research and more importantly, it will help the firefighting profession better protect its most important resource - the firefighter.

Respectfully,



Royal P. Mortenson

Director

Illinois Fire Service Institute, University of Illinois-Urbana/Champaign



Cardiovascular & Chemical Exposure Risks in Modern Firefighting
Interim Report

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Cardiovascular & Chemical Exposure Risks in Modern Firefighting

Interim Report

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Cardiovascular & Chemical Exposure Risks in Modern Firefighting

Interim Report

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Cardiovascular & Chemical Exposure Risks in Modern Firefighting
Interim Report

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Abstract

Firefighting poses immediate and long-term health risks to firefighters. While we and others have documented the thermal and cardiovascular strain of firefighting activity in training buildings, there is limited information available on the thermal and cardiovascular responses of firefighters responding to realistic modern fire environments. Given the well-documented concerns about cardiovascular events (NFPA reports ~45% LODD each year) and cancer in the fire service (781 IAFF LODD [2004-2014]), there is an urgent need to consider both the acute thermal and cardiovascular strain of firefighting and the long-term exposure to products of combustion. In order for this work to be relevant to different departments and to individual firefighters, it is critical to understand how the acute and chronic risks of firefighting are modulated by tactical choices and firefighting assignment. This study examined acute physiological responses and markers of toxic exposure of firefighters for 12 hours following realistic modern fire scenarios and how these outcomes were affected by fire size,

firefighting tactics and firefighting assignments.

The purposes of this interim report are to:

- 1. Provide an introduction to the project along with motivating factors,**
- 2. Describe the instrumentation that was used to address these risks on the fireground, and**
- 3. Introduce some preliminary data and examples for the Fire Service in advance of full results that will be made available in the coming months.**

While this document is intended for a Fire Service audience, the description of instrumentation and methods is provided at a high level in order for the Fire Service to understand the rigor necessary to conduct such research. While this chapter was written with significant scientific terminology, the latter chapters are intended to help begin the translation process. As the project progresses over the coming years, specific outcomes will be translated and disseminated broadly in a means that would allow incorporation into tactics and operating procedures.



1. Introduction & Motivation

There has been a tremendous increase in scientific research to support the adoption of evidence-based strategies and best practice in the fire service. These advances have largely been the result of Assistance to Firefighter Grant (AFG)-funded studies. Specifically, in recent years we have:

- Dramatically increased our understanding of the cardiovascular strain of firefighting;
- Documented increased risk of specific cancers among firefighters and markers of toxic exposure associated with firefighting;
- Made remarkable advances in scientific understanding of fire dynamics. Fires with modern furnishings progress more rapidly and produce more toxic products of combustion than fires with legacy furnishings.

Despite all these advances, what is still sorely missing—and desperately needed to devise policies and create technologies to protect firefighters— is meaningful integration of these three important lines of research. What we really need is rigorous scientific data describing the effects of firefighting in modern structures with realistic fuel loads on firefighter cardiovascular and cancer risk. Furthermore, we need to know how these risks are affected by firefighting tactics and assignment. At the National Fallen Firefighters Foundation (NFFF) 2nd Fire

Service Research Agenda Symposium, the key need identified by the Technology & Science task group was, “Identify and disseminate standard best practices for structural firefighting operations based on science.” This broad, multi-disciplinary project scientifically investigated the impact of real structural firefighting operations on the most important clinical health concerns of the fire service— cardiovascular risk and toxic exposures.



The vast majority of research that has investigated the physiological responses to firefighting has been done in training structures using wood and straw (Class A materials) as fuel or in laboratory conditions in a warm room. These were of course the logical place to begin rigorous, well-controlled examination of physiological

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responses, and have conclusively shown that firefighting caused significant cardiovascular strain and several changes that could be linked with sudden cardiac events in vulnerable individuals. However, the physiological disruption caused by actual firefighting activities could result in even more exaggerated physiological experiences. Recent work by the National Institute of Standards and Technology (NIST) and Underwriters Laboratories (UL) has shown temperatures during live burns in buildings using modern construction materials and polymer based furnishings are far in excess of temperatures reported using legacy furnishings of natural materials, similar to the pallet and straw fuels used during the existing physiological response research studies. Realistic modern fire environments also produce products of combustion that contain far more toxicants and carcinogens that may have multiple effects on the human body. Despite all the efforts in the Fire Service to develop protective equipment and clothing and to devise policies and procedures to protect firefighters from exposure to the detrimental effects of heat and toxic

exposures, there are no good scientific data on the physiological responses of firefighters who perform their work in a realistic modern fire environment. Such information is critical to developing protective tools and to enacting policies and procedures that minimize or mitigate risks.



This research study leveraged our position as a State Training Academy located in a nationally recognized research university to bring together a multidisciplinary team of researchers with expertise in fire dynamics, cardiovascular physiology, engineering and industrial hygiene. This comprehensive study investigated realistic fireground conditions using sophisticated, state-of-the-art equipment and considered firefighting tactics and assignment to better characterize fireground risk.



I.A. Sudden Cardiac Events in the Fire Service

Based on reporting from the National Fire Protection Association (NFPA) and the United States Fire Administration (USFA), it is well established that sudden cardiac events are the leading cause of duty-related deaths among firefighters [1]. Research has also found that sudden cardiac events are far more likely to occur after fire suppression activity. Kales et al determined that firefighters spend 1–5% of their professional time each year involved in fire suppression activity, yet, fire suppression activities led to 32% of deaths from coronary heart disease [2]. Thus, fire fighting was associated with a 10–100 times greater risk of suffering sudden cardiac death compared with the risk associated with non-emergency duties [2]. These data clearly suggest that fire suppression activities can *trigger* sudden cardiac events in vulnerable individuals with underlying heart disease.

Epidemiological evidence obtained over the past several years indicates that strenuous physical activity can serve as a *trigger* for an acute cardiac event [3-5]. Triggers represent the final step in the pathological process leading to cardiovascular events [6]. Disruption of plaque and the development of a procoagulatory state are well-characterized mechanisms by which a trigger may lead to an occlusive thrombus and a sudden cardiac event [7]. However, even in the absence of an occlusive thrombus, triggers may lower the threshold for cardiac electric instability thereby evoking fatal arrhythmias [6]. These

two important mechanisms of sudden cardiac events strongly suggest the need for clinically relevant measures of coagulatory potential and electrocardiogram (ECG) during and after firefighting to better understand sudden cardiac events in the fire service.



I.A.1. Cardiovascular Strain of Fire Fighting

It is well known that firefighting is strenuous work that results in significant cardiovascular strain. Over the past 15 years, we have conducted a series of studies documenting that cardiovascular strain. Specifically, we have shown that firefighting produced rapid increases in heart rate (HR) and maximal or near-maximal heart rates were achieved during strenuous firefighting activities [8-11]. In addition, we have shown that firefighting resulted in decreased stroke volume, impaired diastolic function and increased arterial stiffness [12-14]. We have documented a reduction in plasma volume (-14.8%) following only 18 minutes of firefighting [8]. Hypovolemia increases blood viscosity, thereby increasing the risk for negative cardiovascular outcomes.

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Importantly, we have documented that firefighting increased platelet aggregation and coagulation potential [15,16], increasing the risk of thrombus formation. Despite the importance of this work, these studies likely underestimated the true physiological burden imposed by modern fires because they were conducted in concrete training structures and used only wood and straw fuel sources. The fires we face in the 21st century use energy efficient building materials and methods along with polymer based furnishings that have been shown to result in more rapid fire growth, higher heat release rates and additional toxic exposures that may exacerbate cardiovascular strain.



Despite the high risk of cardiac events associated with firefighting, relatively few studies have employed ambulatory ECG monitoring during firefighting activity. Barnard and Duncan (1975) monitored ECG

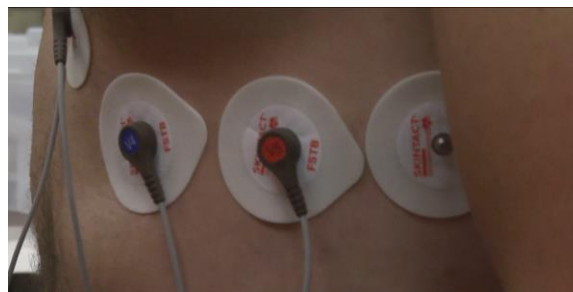
and HR responses for firefighters during a normal 24-hour shift and obtained data on 35 firefighters who responded to 185 alarms. In many cases movement artifact prevented the accurate analysis of the ECG; however, some ECG changes were noted 15 to 30 seconds post-alarm [17]. Kournika and Korhonen (1981) investigated 22 firefighters' reactions to alarm with 24-hour ECG monitoring [18]. The researchers analyzed ECGs during the 2 minutes prior to the fire alarm and the 5 minutes after the alarm. Although no signs of coronary ischemia or related S-T or T changes were seen, several nonpathological deviations were identified. Kurt and Peters (1975) obtained Holter ECGs from 28 firefighters during 12-hour periods at work [19]. The researchers reported arrhythmias in 11 firefighters, S-T depression (> 1.0 mm) in 5 firefighters, and S-T elevation in 1 firefighter; however, the activity at the time of the occurrences was not indicated.

Angerer et al. (2008) used Holter monitors to obtain ECGs on 29 young (age: 24.5 ± 3.3 years; range 19–32 years), professional firefighters during a 30-minute simulated live-fire operation [20]. In contrast to previous studies, the investigators did not identify abnormal ECG changes or signs of disordered heart rhythm. Absence of identifiable ECG changes could be attributed in part to the subject population as the participants in the study by Angerer et al. were younger than participants in previous studies [17-19]. Carey and colleagues (2 studies) used a 12-lead ECG to obtain high-

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resolution ECG tracings from firefighters during 24-hour shifts. In the pilot feasibility study [21], 28 firefighters (age range 35–56 years) wore the 12-lead ECG Holter monitor for 24 hours (16 on-duty and 8 post-duty). On average, 92% of recording were able to be analyzed. Six episodes of nonsustained ventricular tachycardia (NSVT) were identified, with the episodes occurring among three (11%) of the firefighters. Although most episodes of NSVT occurred during sitting/talking activities, one episode occurred during emergency activities. The mean spatial QRS-T angle was 104 ± 17 degrees (range 78–132 degrees). The QRS-T angles (an indicator of risk from cardiac death) reported by Carey and Thevenin suggest some firefighters may be at increased risk for a fatal cardiac event [21]. In a follow-up study with 112 firefighters wearing 12-lead ECGs during 24-hour shifts, Al-Zaiti and Carey et al. (2015) reported the presence of a widened QRS-T angle in 10% of firefighters [22]. In this larger study population, only one episode of NSVT was identified. The study also determined that eight other ECG variables exceeded the cut-point for cardiovascular risk.



Studies that have investigated the effects of prolonged strenuous exercise have found increased electromechanical delay (an increased delay from electrical activation to the onset of mechanical left ventricular (LV) contraction) and this was associated with reduced systolic and diastolic function. This is consistent with our data showing acute strenuous exercise increases the time of depolarization–repolarization of the left ventricle, as evidenced by a prolonged the QT-interval [23,24]. Overall, these changes are linked to exercise induced left ventricular vulnerability, as an increase in QT-interval is associated with electrical instability and sudden death. However, there have been no studies to assess ECG responses during and following live-fire in modern environments. This is an important need since toxicants in the smoke are one factor that may affect ECG changes resulting from firefighting work. In addition to causing changes in the



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ECG, we have recently shown that live firefighting decreases both systolic and diastolic function in young firefighters [25].

Summary

In summary, it is known that sudden cardiac events are the leading cause of line of duty death among firefighters, and substantial evidence suggests that firefighting leads to significant cardiovascular strain. However, there are several critical gaps that still exist in the scientific literature. Key questions that remain include:

- How do clinically relevant cardiovascular parameters (ECG and coagulatory variables) change with firefighting activity in realistic modern environments? This is an important distinction since most previous research has been done in training buildings using only wood and straw.
- How do parameters related to firefighting (firefighting tactical decisions, assignment) affect the cardiovascular responses to firefighting? There is likely considerable variability in cardiovascular responses based on the type of tactics used by the department and the individual work that is performed.
- How do these cardiovascular parameters change over the 12-hour period post-firefighting? A large portion of firefighter fatalities occur *after* fire suppression activities.

I.B. Toxic Exposures Associated with Fire Fighting

Several epidemiology studies have been conducted to determine the risk of cancer in the fire service. In the largest cohort mortality study ever conducted in firefighters (involving 30,000 career firefighters), the National Institute for Occupational Safety and Health (NIOSH) found statistically significant mortality and incidence rates of all cancers and cancers of

the esophagus, intestine, lung, kidney, and oral cavity, as well as mesothelioma for firefighters compared with the general population [26]. The NIOSH study also found excess risk of bladder and prostate cancers at younger ages. LeMasters et al. (2006) conducted a meta-analysis of several epidemiology studies from 1975–2003 and found an elevated risk for multiple types of



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cancer [27]. Recent studies conducted throughout the world (Nordic countries, Australia, and California) identified increased risks among firefighters for multiple types of cancer [28-30], many of which were also identified in the NIOSH study [26]. Comparing cancer rates to surrogates for exposure, NIOSH found an exposure-response relationship between fire hours and lung cancer mortality and incidence, and a similar relationship between fire runs and leukemia [31]. These are important findings because if the risk of disease increases with increasing exposure, the likelihood of causality is enhanced. All together, these studies suggest that the firefighting occupation may put firefighters at an increased risk for multiple types of cancer.



There are a number of factors that can increase someone's risk of cancer. These include smoking, alcohol consumption, diet, obesity, sun exposure, and exposure to chemical carcinogens. Several studies have been conducted to assess firefighters' exposure to combustion byproducts [32-36]. These studies have identified numerous carcinogenic compounds in the fire atmosphere, including benzene, certain

polycyclic aromatic hydrocarbons (PAHs), 1,3-butadiene, formaldehyde, vinyl chloride, and other halogenated compounds [37-41]. Firefighters can also be exposed to diesel exhaust, a known human carcinogen [42], at the fire ground or fire station. When firefighters wear positive-pressure self-contained breathing apparatus (SCBA), inhalation of these toxicants is essentially eliminated [43]. However, it has been observed that firefighters do not always wear SCBA, for example, when sizing up the fire, when working as the engineer or incident commander, or when conducting overhaul operations. Some of these compounds can also be absorbed through the skin either directly in vapor form (e.g., benzene) or through deposition or contact-transfer of particulate to the skin (e.g., PAHs) [34,44,45]. In a recent study, NIOSH measured firefighters' dermal exposure to PAHs on the neck, face, arms, and scrotum following controlled burns where laundered or new gear was used. NIOSH found a statistically significant increase in PAHs on the neck, which the investigators attributed to the lower dermal exposure protection afforded by fire hoods [34]. In this same study, PAH metabolites in urine appeared to be elevated 3 hours after firefighting (most likely from dermal uptake) and exhaled breath levels of benzene were significantly elevated immediately after firefighting. The NIOSH investigators postulated that the increased breath levels of benzene were due to absorption of vapor through skin or inhalation of benzene off-gassing from contaminated gear. Other studies have

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found elevated biological levels of PAHs and benzene after firefighting activities despite the use of turnout gear and SCBA [46,47].



Firefighting gear that becomes contaminated may be an important source for dermal exposure, whereby firefighters touch the contaminated gear and spread it to other areas of their bodies. Studies have quantified numerous contaminants on firefighting gear including PAHs, phthalates, flame retardants, and metals [48-50]. Two studies have found elevated levels of a variety of brominated flame retardants in the serum of California firefighters compared with the general population [51,52]. In the most recent study, routine cleaning of turnout gear after use in firefighting was associated with reduced serum levels of some flame retardants, while interior fire suppression within the last month was associated with elevated levels of these compounds in serum [51]. Chlorinated and brominated dioxins and furans, which can be produced from the combustion of halogenated organic compounds, have also been detected in firefighters' serum. Some types of flame

retardants, dioxins, and furans are persistent organic pollutants, meaning they can remain unchanged in the environment for long periods of time and can bioaccumulate in the body. These findings suggest that the act of firefighting and contamination of gear may contribute to the internal dose of these persistent organic pollutants. However, the magnitude and biological significance of this contribution to firefighters' internal dose are not well understood.



In addition to the concern for dermal exposure, contaminated gear may increase firefighters' exposure through the inhalation route. Two recent studies found elevated levels (compared to background) of several volatile organic compounds (VOCs) off-gassing from contaminated gear soon after doffing [53-54]. This off-gassing of VOCs could expose firefighters if they rehab near contaminated gear, continued to wear their gear post-fire, or wear or store their gear in the apparatus cabin on the drive back to the station. Although not evaluated in either of these studies, contamination and off-gassing of semi-volatile compounds could result in even longer term inhalation exposures.

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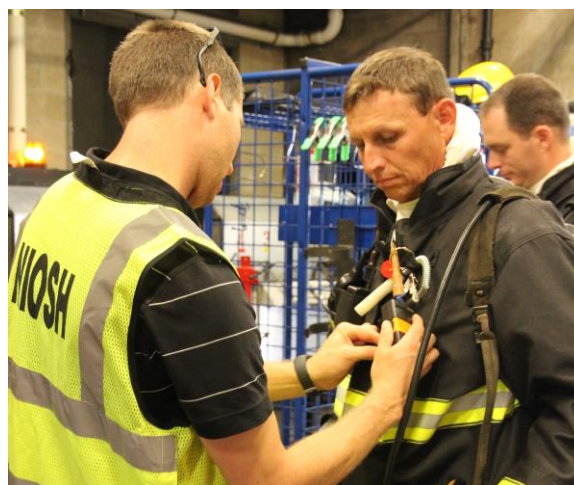
Summary

In summary, it is known that exposure to chemicals produced in fires may lead to significant health risks including statistically significant increase in certain cancers among firefighters. However, a number of knowledge gaps still exist in the scientific literature. Key questions that remain include:

- What is the effect of different attack methods on firefighters' airborne, dermal, or systemic exposures as well as turnout gear contamination and off-gassing? This is important information because it could provide direction for policy and procedures.
- How are these exposure risks modified by a firefighter's specific role or position? For example, we do not have sufficient data on chemical exposures among firefighters or other personnel at the scene who do not enter the structure (e.g., pump operator, truck company operating on the roof). Collecting chemical exposure and determinant information (e.g., effect of wind direction) on these individuals is especially important because they often do not wear respiratory protection in these positions.
- What is the effectiveness of decontaminating turnout gear in reducing dermal exposures (due to contaminant transfer) or inhalation exposures (due to off-gassing)?
- How effective are skin cleaning towellettes at removing fireground

contamination from the firefighters' skin immediately after firefighting activities?

By monitoring firefighters' airborne, dermal, and systemic exposures to these compounds, it is possible to fill in many of the knowledge gaps that exist, particularly with respect to the effect of attack methods, firefighter's job task, and skin cleaning on his/her chemical exposure levels under field conditions. Additionally, assessing the contamination of turnout gear before and after fires as well as before and after decontamination by measuring surface levels of PAHs, flame retardants, dioxins and furans, and by measuring concentrations of VOCs off-gassing from the gear, will provide an indication of the non-volatile and volatile contamination levels that may be expected following common structural fire responses and will also provide quantitative evidence of the effectiveness of on-scene fire ground decontamination.



I.C. Fire Dynamics and Fireground Tactics

A significant contributing factor to the continued tragic loss of firefighters' and civilian lives is the lack of understanding of fire behavior in residential structures resulting from the changes that have taken place in several components of residential fire dynamics. The changing dynamics of residential fires as a result of revolutions in home size, geometry, contents and construction materials over the past 50 years add complexity to the fire behavior [55].

NFPA estimates that from 2009-2013, U.S. fire departments responded to an average of 357,000 residential fires annually [56]. These fires caused an estimated annual average of 2,470 civilian deaths and 12,890 civilian injuries. More than 70% of the reported home fires and 84% of the fatal

home fire injuries occurred in one- or two-family dwellings, with the remainder in apartments or similar properties. For the 2007-2011 period, there were an estimated annual average 34,065 firefighter fire ground injuries in the U.S. [57]. The rate for firefighter deaths' occurring inside structures has continued to climb over the past 30 years [58]. Additionally, on average firefighters in the United States receive less than 1% of their training on the subject of fire behavior [59]. The changes in the residential fire environment combined with the lack of fire behavior training are significant factors that are contributing to the continued climb in firefighter traumatic deaths and injuries.

As homes become more energy efficient and fuel loads increase, fires will become

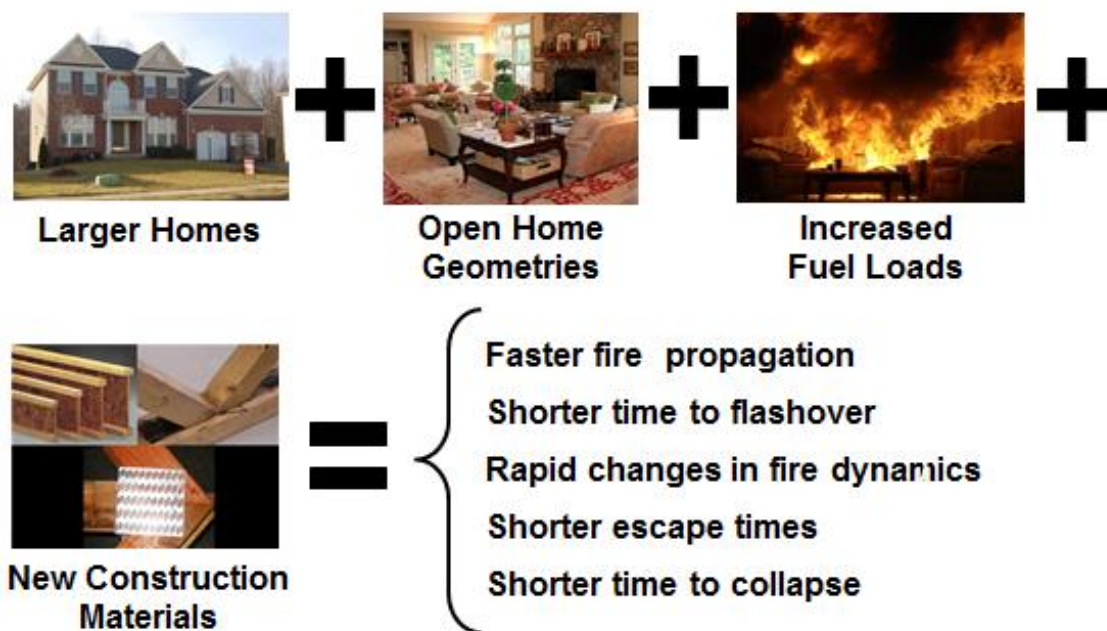


Figure 1. Modern Fire Formula [55]

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ventilation limited making the introduction of air during a house fire extremely important. If ventilation is increased, either through tactical action of firefighters or unplanned ventilation resulting from effects of the fire (e.g., failure of a window) or human action (e.g., door opened by a neighbor), heat release will increase, potentially resulting in flashover conditions. These ventilation induced fire conditions are sometimes unexpectedly swift, providing little time for firefighters to react and respond.

Firefighters today are being challenged by different fireground hazards due to today's construction practices and the use of synthetic materials in furniture and building products [60]. These changes have made structure fires more challenging than ever before and have led to reevaluation of firefighting tactics. One of these considerations is the location from which water is applied to the fire. Exterior attack tactics matter because, although they go against traditional practices, they represent an effective way to make the fireground safer for both building occupants and firefighters.

The changes in modern building design and materials have altered the nature of structure fires, with modern homes able to reach flashover eight times faster than homes built 50 years ago [60]. This change is largely behind the 67% increase in the rate of firefighter deaths due to traumatic injuries while operating inside of structures over the past 30 years [58]. And although the

overall fire death rate in the U.S. has decreased by 64% during the same period [61], it is clear that modern structure fires can be deadly to both firefighters and building occupants.



Many of the tactics employed by the American fire service have been developed based on personal experience—of individual firefighters and as passed down by their predecessors [62]. As mentioned by Kerber and Sendelbach (2013), “To the credit of many, these tactics have proven successful in controlling and mitigating the hazards of fire for more than 250 years” [62]. However, the number of structure fires has decreased by 53% over the past 30 years [58], which has had an unintended consequence of limiting the opportunities for firefighters and fire officers to gain the necessary experience

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to understand the increasingly complex fires they fight [63].

UL has long been in the forefront of fire safety research to support efforts that prevent unnecessary fire-related deaths. Much of this research has been directed toward developing a better understanding of the characteristics of the modern residential fire, and providing members of the fire service with the information and knowledge needed to modify key firefighting tactics. While firefighting will never be without risk, UL research represents a vital contribution to overall efforts to reduce risks and to save lives.

UL and UL FSRI have conducted research on many aspects of the fireground, with specific focus on risk faced in 21st century firefighting. A series of studies has improved understanding the impacts of engineered structural components under fire conditions [64] with specific emphasis on basement fires [65]. Lightweight wood trusses and engineered lumber are increasingly replacing conventional solid joist construction in roof and floor designs in residential structures. UL researchers



compared the fire performance of conventional solid joist lumber with that of lightweight lumber and demonstrated that, under controlled conditions, fire containment performance of an assembly supported by solid joist construction was significantly better than an assembly supported by an engineered I joist. Standard integrity assessments, such as sounding the floor, floor sag, gas temperatures on the floor above and thermal imaging, are often misguided indicators of the actual integrity of a floor over a burning fire. A number of tactical issues were identified for firefighters to consider when making a determination about dealing with residential basement fires.



The impact of firefighting tactics such as ventilation (horizontal [66], vertical [67] and positive pressure [68]) and water application from the exterior [69,70] have been carefully studied. Among the important findings of these studies is the critical importance of coordinating ventilation with the application of water or another type of fire suppressant in achieving a successful firefighting outcome. The studies also affirmed that the simple act of closing a door between a firefighter and a fire can provide tenable

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temperature and oxygen concentrations behind the closed door, increasing the chances of survival. These data will be disseminated to provide education and guidance to the fire service in proper use of ventilation as a firefighting tactic that will result in reduction of the risk of firefighter injury and death associated with improper use of ventilation and to better understand the relationship between ventilation and suppression operations. As part of this series of studies, UL partnered with the National Institute of Standards and Technology (NIST), the Fire Department, City of New York (FDNY), and the Governors Island Preservation and Education Corporation to utilize rigorous scientific methods to advance firefighter safety. Ventilation and suppression procedures were analyzed during basement, first floor and second floor fires during 20 townhouse fire experiments. The live burn tests were aimed at quantifying emerging theories about how fires are different today, largely due to new building construction and the composition of home furnishings and products that in the past were mainly composed of natural materials, such as wood and cotton, but now contain large

quantities of petroleum-based products and synthetics that burn faster and hotter.

UL also conducted a seminal study on firefighter exposures to smoke particulates in 2011 [71]. In this study, UL partnered with the Chicago Fire Department and the University of Cincinnati, College of Medicine to collect data on the smoke and gas effluents to which firefighters are exposed during routine firefighting operations and from contact with contaminated personal protective equipment. The project included investigations on three fire scales: 1) fires in the Chicago metropolitan area; 2) residential room content and automobile fires; and 3) material-level fire tests. The study determined that the combustion of materials in a fire generates asphyxiants, irritants and airborne carcinogenic byproducts that can be debilitating to firefighters. These byproducts are also found in smoke during the suppression and overhaul phases of firefighting, and carcinogenic materials can be inhaled from



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the air or absorbed through the skin through contact with contaminated equipment.

The full reports on the above completed studies are available at the UL Firefighter Safety Research Institute website at www.ULfirefightersafety.com.

Summary

As the above research demonstrates, significant progress has been made understanding the modern residential fire environment and the fire service has been provided with important tactical guidance that can increase firefighter effectiveness. However, there is still much to learn and it is through partnerships like the one between

UL FSRI, IFSI and NIOSH that are necessary to understand firefighting holistically. Key questions that remain include:

- How do the tactical choices made by the fire service impact their risk for cardiovascular and chemical exposure?
- What is the physiological and chemical impact of the different exposures experienced by different roles on the fireground?
- What is the best way to train firefighters when it is not possible to create a “realistic” fire environment during training?
- Under which variables should a transitional attack be chosen versus and interior attack?

II. Goals, Objectives & Specific Aims

II.A. Goals and Objectives

The goal of this study was to conduct an integrated, comprehensive research project to investigate the effects of modern fire environments on the two most pressing concerns in the fire service, namely cardiovascular and carcinogenic risks (Figure 2). This research was needed so that policies and procedures to minimize these risks to

firefighters can be developed. In order to ensure that our findings are broadly applicable across the fire service, we worked with our Advisory Committee of national leaders to investigate how fire size, tactical decisions, and job assignment affected cardiovascular parameters and carcinogenic markers following firefighting work.

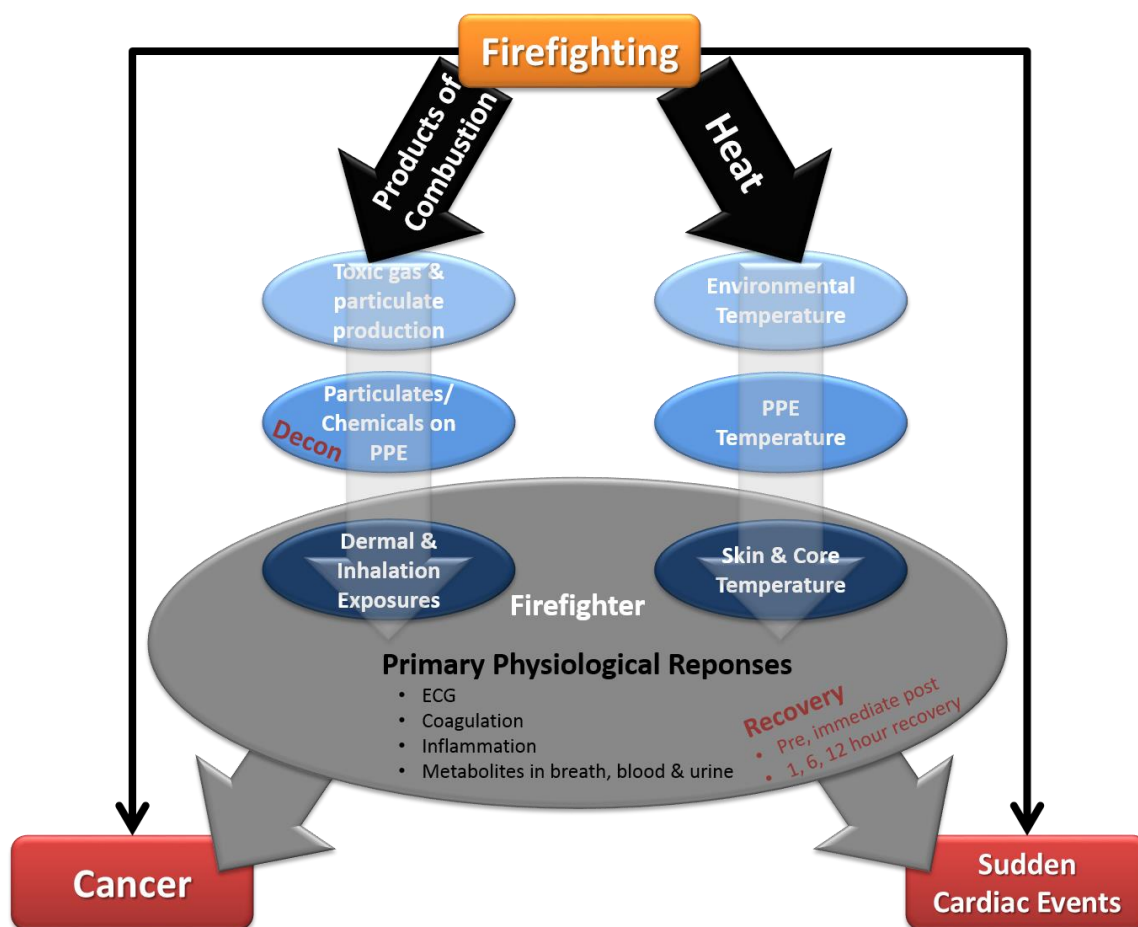


Figure 2. Comprehensive model of Cardiovascular and Chemical Exposure Risks in Modern Firefighting goals and objectives.

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II.B. Specific Aims

The specific aims of the study were to:

- Conduct realistic firefighting tactics with 12-person teams responding to residential fire environments that contain building materials and furnishings common in the 21st century.
- Measure the production and transfer of thermal energy and products of combustion through modern personal protective equipment (PPE) and onto/into firefighters' bodies and evaluate how these variables are influenced by:
 - Tactical decision (interior only vs. transitional attack)
 - Operating location (interior fire suppression/search vs. exterior operations vs. interior overhaul)
- Measure cardiovascular disruption (ECG, coagulatory variables) for up to 12 hours following firefighting and evaluate how these variables and recovery from firefighting activities are influenced by:
 - Tactical decision (interior only vs. transitional attack)
 - Operating location (interior fire suppression/search vs. exterior operations vs. interior overhaul)
 - Skin cleaning and/or use of decontaminated gear
- Evaluate effectiveness of:
 - Skin cleaning procedures in reducing contamination on the skin, particularly on the neck.
 - Gross on-scene fireground decon procedures in minimizing secondary exposure risk from off-gassing PPE.



III. Methods

Participants were recruited through a nationwide recruiting effort along with a focused effort by a statewide network of firefighters who teach and train at the Illinois Fire Service Institute's (IFSI) Champaign campus. As a result, 40 firefighters participated in this study from departments in Illinois, Georgia, Indiana, Ohio, South Dakota and Wisconsin. Most firefighters attended four sessions of the study, although a small group were only available for a single pair of experiments. For each 'pair' of experiments, the firefighters operated in the same job assignment (e.g. attack, overhaul), but the fires were suppressed with a different tactic (interior vs exterior transitioning to interior) on the two days. For firefighters who participated in two pairs of experiments, they completed a different job assignment for the second experiment 'pair'.



Figure 3 provides a rough schematic of the study protocol. Following recruitment, subjects completed all required paperwork (including an informed consent document, health history questionnaire, and diet recall)

and anthropomorphic measurements (height, weight) were collected. Firefighters received a core temperature pill that they ingested 6–12 hours prior to data collection. After they arrived at IFSI (at least one hour prior to firefighting), the firefighters were instrumented with a portable ECG monitor that they wore throughout the study period.



Multiple pretest measures were collected prior to the initiation of live fire training. Venous blood samples were drawn from the antecubital vein by a trained phlebotomist at various times throughout the study. Blood samples were subsequently analyzed to assess hemostatic balance (via platelet number and function and coagulatory variables - section III.B.2.), as well as markers of toxic exposure.

The firefighter subjects then commenced their firefighting work in a purpose-built live-fire research test fixture (see section III.A). Teams of 12 firefighters completed different scenarios that included a fire involving multiple rooms (M. Bedroom, BR2) with windows vented using two

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separate firefighting strategies: (a) traditional interior attack from the “unburned side” and (b) initial exterior attack to darken the fire, then transitioning to interior attack. The teams were separated into pairs that completed specific tasks. The first arriving complement of 4 firefighters was split into: Engine 1 – interior firefighters responsible for the attack line and exterior based command and pump operator positions. One minute later the second group of 4 firefighters arrived and was split into: Truck A – interior firefighters responsible for forcible entry into the structure as well as search and rescue and Truck B that conducted exterior ventilation (horizontal and vertical). The last arriving complement of 4 firefighters was split up into initial exterior tasks that transitioned into overhaul. Engine 2A pulled a back-up line and supported the first-in engine prior to overhaul operations. Engine 2B initially set up as a rapid intervention team (RIT) then transitioned to overhaul operations after the fire was suppressed.

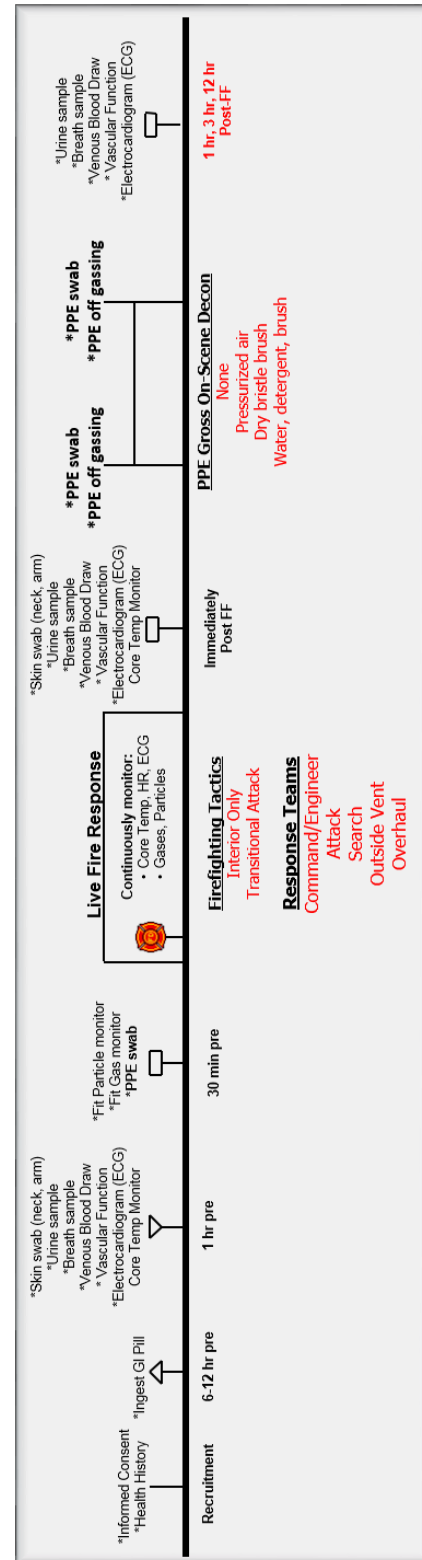


Figure 3. Data collection protocol and timeline.

III.A. Live Fire Research Test Fixture Design

In order to safely and reliably conduct this study, we designed and built a structure that had all of the interior finishes and features of a single family dwelling, yet contained safety systems and hardened construction techniques that ensured our participants' safety. In their laboratory-based research, UL has repeated burns in a structure simulating a common one-story ranch type house. The house was designed by a residential architectural company to be representative of a home constructed in the mid-twentieth century with walls and doorways separating all of the rooms and 8 ft. ceilings. To allow for the potential comparison between our live-response results and their laboratory burns, our research structure replicated their design with some modification.

The original UL design was modified slightly to allow burns to be conducted on consecutive days. The house had an area of 1200 ft², with 4 bedrooms, 1 bathroom (closed off during experiments) and 8 total rooms. The home was a wood frame, type 5 structure with a wood truss constructed roof, finished with ½" oriented strand board and shingles. To maximize the use of the structure and minimize time between experiments the house was mirrored so that there were 2 bedrooms on each side where the fire would be ignited. During each experiment a wall was constructed at the end of the hallway to isolate 2 bedrooms so that they could be repaired and readied for

the next experiment. Figure 4 shows the two configurations used. Bedrooms 1 and 6, Bedrooms 2 and 5, Bedrooms 3 and 4, and the Living Room and Dining Room were interchangeable between experiments. The front and rear of the structure were covered with cement board to limit exterior fire spread (Figure 5). Figure 4 is a 3D rendering of the house with the roof cut away to show the interior layout with furniture and floor coverings. The tan floor shows the carpet placement and the grey floor shows the cement floor or simulated tile locations.

To ensure safety of the participants, all structural elements in the burn rooms were protected by a layer of ⅝" Type X gypsum board with a second layer of ⅝" fiberglass mat gypsum sheathing. Furring strips (2×4) were then attached to the walls and ceiling and another layer of ⅝" Type X gypsum board was attached to the ceiling and ½" gypsum board was attached to the walls. After each fire, the overhaul teams completely stripped the finish layer down to the 2×4 furring strips. Between each scenario, the structure was inspected to ensure the base layer had not been penetrated to the structural elements. A deluge style sprinkler system was installed in the burn rooms and charged prior to each scenario. An exterior safety officer was stationed by this valve to immediately suppress the fires if any scenario arose that required rapid suppression.

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Figure 4. Layout of burn structure showing false wall set up for the (top) right side experiment layout and (bottom) left side experiment layout.

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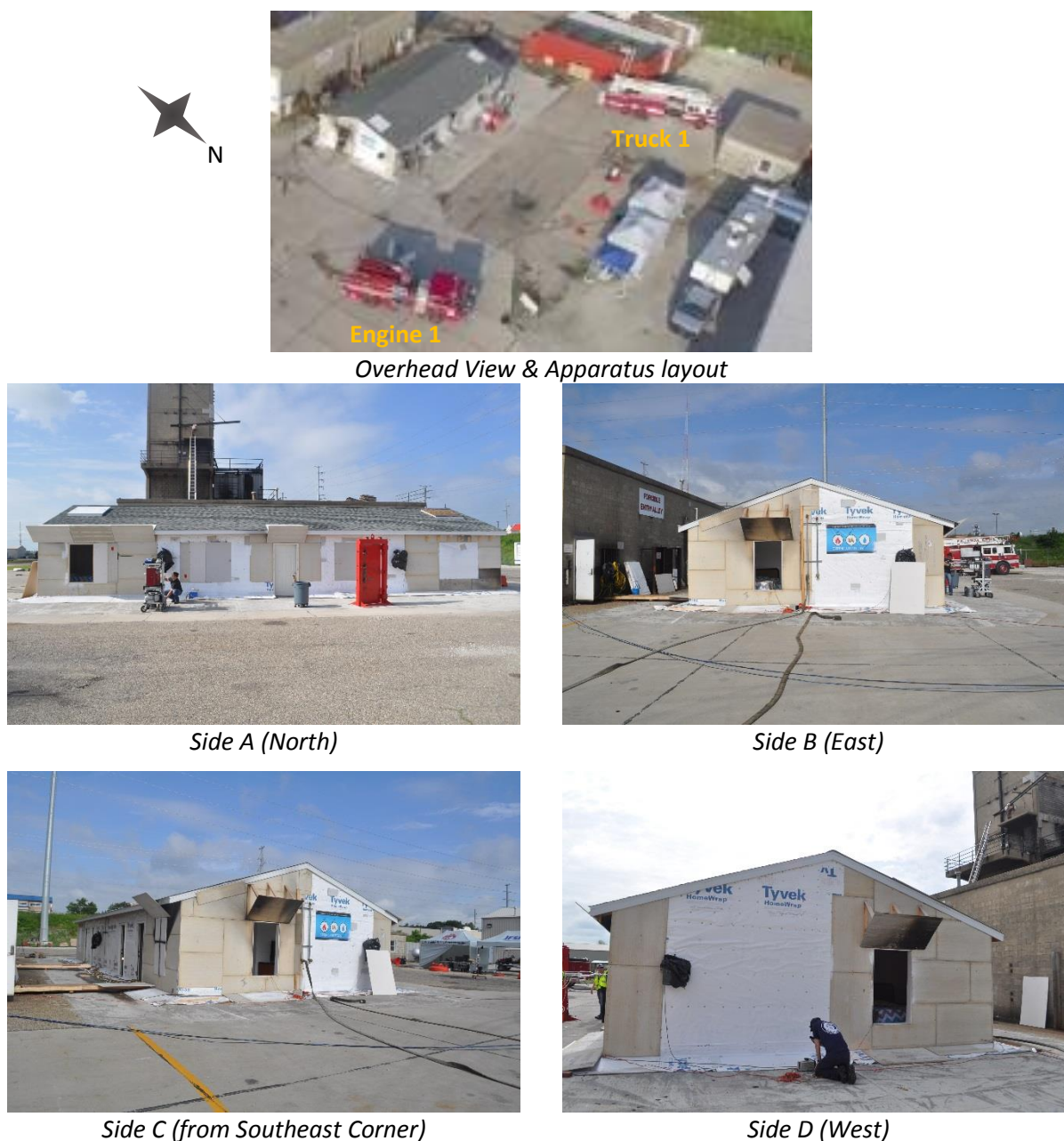


Figure 5. Exterior photographs of the test structure.

III.A.1. Fuel load

Furniture was acquired for the experiments such that each room of furniture was the same from experiment to experiment (Figure 6). Bedrooms 1/6 and 2/5 were furnished with a double bed (covered with a

foam mattress topper, comforter and pillow), stuffed chair, side table, lamp, dresser and flat screen television. The floors were covered with polyurethane foam padding and polyester carpet. Bedrooms 3 and 4 were furnished with a double bed

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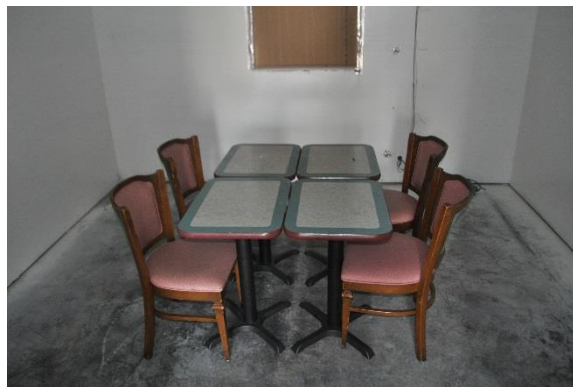
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(covered with a comforter and pillow), side table, lamp, and dresser. The living room was furnished with a sleeper sofa, 2 stuffed chairs, end table, coffee table, television stand and flat screen television. The living



Living Room

room floor was also covered with padding and carpet. The kitchen and dining room were both furnished with a table and 4 chairs.



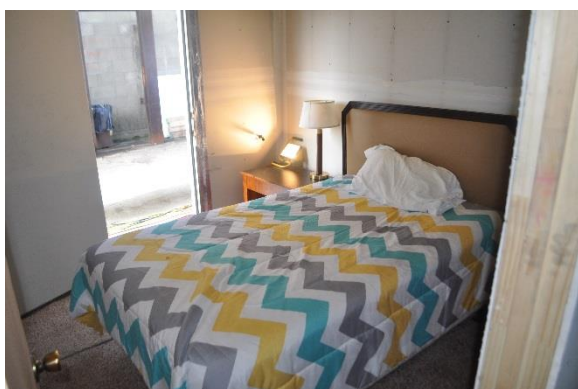
Kitchen



Bedroom 1/6



Bedroom 2/5



Bedroom 3/4



Dining Room

Figure 6. Fuel load in each of the rooms of the structure – identical for every experiment.

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Fires were ignited in the stuffed chair in both Bedroom 1/6 and Bedroom 2/5 depending on which side was being utilized (Figure 7). The fire was ignited using a remote ignition device comprising of a book of matches and electrically energized with a fine wire to heat the match heads, and create a small flaming ignition source. The ignition source was placed on the back corner of the seat of the chair that was adjacent to the bed in each bedroom.



Figure 7. Ignition location and setup in the bedrooms

III.A.2. Live fire response timeline

The experimental timeline for all scenarios was consistently timed and executed to standardize the scenarios and response timeframe as closely as possible (see Figure 8 for an example). Typical fireground conditions at critical time points can be seen in Figure 9. All of the experiments started with the front window open in Bedroom 1/6 and the side window open on Bedroom 2/5 and both doors to the common hallway open. Bedroom 3 and 4 doors and all other exterior doors and windows were closed. The fire was ignited using a remote ignition device in the chair of Bedroom 1/6 followed 2 minutes later by ignition in the stuffed chair in Bedroom 2/5. The flaming fire was allowed to grow until it began to become ventilation limited and the fire department was dispatched. The time of dispatch was between 4 minutes and 5 minutes after ignition for all 12 experiments.

Prior to dispatch the firefighters were given their responsibilities which included either a transitional fire attack (water applied into Bedroom 1/6 and Bedroom 2/5 prior to advancing through the front door to extinguish the fire) or interior fire attack (advancement through the front door to extinguish the fire). At the time of dispatch 4 firefighters walked approximately 500 ft to the structure and began their operations. The first 4 firefighters assumed the roles of incident commander, pump operator, fire attack (nozzle firefighter, back-up firefighter). The incident commander completed a 360 degree lap of the structure and gave a radio return and orders to his team. The attack team deployed a 200 ft, 1¾" hoseline with a smooth bore nozzle and conducted either a transitional or interior attack.

One minute after the dispatch of the first 4 firefighters, a second 4 firefighters were released to walk to the scene. Two of these

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firefighters were the search team. They were responsible for forcing entry through a door prop so that the attack team could enter and for conducting search and rescue. They had to locate and remove 2 occupants from the structure. The second 2 firefighters were the outside ventilation team. They were tasked with coordinating horizontal ventilation with the attack team and performing vertical ventilation after placing 2 ladders.

One minute after the dispatch of the second 4 firefighters a third 4 firefighters were released to walk to the scene. Two of these firefighters were the backup team. They were responsible for deploying a second hoseline to the front of the structure and assisting with overhaul. The second 2 firefighters were the RIT team. They were tasked with deploying their tools, conducting a 360 size up and performing overhaul.

Time (mm:ss)	Description
00:00	Ignition BR 6/1
02:00	Ignition BR 5/2
04:30	FD Dispatch
06:39	Water in BR 6/1 Window Start
06:54	Water in BR 6/1 Window Stop
07:01	Water in BR 5/2 Window Start
07:17	Water in BR 5/2 Window Stop
07:56	Front Door Open
09:12	Nozzle FF Reaches Hallway
09:27	BR 6/1 Window Cleared
09:34	BR 5/2 Rear Window Open
11:28	Victim 1 Out
16:12	Victim 2 Out
19:34	Living Room Right Window Open
19:39	Living Room Left Window Open
20:33	Kitchen Window Open
35:32	End of Experiment
08:12	Fire Attack Enters
18:17	Fire Attack Exits
08:30	Search Enters
18:02	Search Exits
19:58	Overhaul Enters
35:38	Overhaul E2A Exits
35:42	Overhaul E2B Exits

Figure 8. Experimental timeline from a transitional attack scenario conducted on 06/14/2015.

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Conditions at dispatch



Attack Team deploying transitional attack



Attack Team transitions to front door as Search Team forced door prop



Attack Team makes entry followed by Search Team



Backup line is deployed as outside ventilation is taking place



Roof is ventilated as fire is suppressed

Figure 9. Images from typical fireground operations incorporating a transitional attack

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Simulated occupant is rescued by Search Team



Overhaul Teams remove debris and drywall from fire rooms

Figure 9 cont. Images from typical fireground operations incorporating a transitional attack

III.A.3. Operational Safety Protocols before and during Response

To further ensure participant safety, strict adherence to best practices in the fire service for command and control of large events and live-fire training was mandated. Throughout the scenarios, the research team followed National Incident Management System (NIMS) procedures, including utilization of IFSI's Incident Management Team trainers and the development of an Incident Action Plan (IAP). A single incident commander from IFSI who had intimate knowledge of IFSI safety policies and procedures as well as intimate working knowledge of the live-burn structure was the overall Incident Command for the event. An interior safety officer accompanied each of the interior teams operating as attack/search and then during overhaul operations. They both carried portable thermal imaging cameras to allow assessment. Additional exterior safety officers were assigned to maintain contact

with the deluge system valve, to maintain visual awareness of the Charlie-side conditions and to provide an overall Safety Officer role. Prior to initiating any of the drills, a dedicated RIT team (with no responsibilities as part of the study) was established. An additional exterior back-up line was staged and manned for additional water if it became necessary.



UL staff continuously monitored temperatures, heat flux values, visible light and infrared camera feeds to ensure progress was being made during the scenario. An exterior safety officer was stationed at the deluge system valve to

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immediately activate the interior system had any of the interior camera views or radio transmission from the firefighting teams indicated its need. Finally, prior to completing any activity, the firefighters were escorted through the burn structure to ensure their familiarity with the structural layout. Prior to each scenario, a command briefing was conducted with all staff and participants to ensure safety policies were understood and expectations were clear. In addition to reviewing the safety plan for each day, the following potential scenarios requiring exiting the structure before completion of assigned tasks were reviewed.

- If conditions did not improve as expected upon initial interior attack, operations would be halted by Incident Command (as determined by Safety) and all interior personnel would retreat from the building in an orderly manner. Interior operations would again resume once tenable conditions were established through the safety team.
- If a Mayday was called at any point during the scenario, the research tasks were immediately halted and the Responses Team would be deployed as RIT under the command of Interior. All personnel were to immediately evacuate the building and a personnel accountability report (PAR) was to be conducted.

Neither of these conditions were experienced during any of the study evolutions.



III.A.4. Human Subject Protections

The health of the research subject population was ensured through a strict inclusion criteria in order to minimize the likelihood of a cardiac event. All participants were required to have completed an NFPA 1582 based physical examination prior to enrolling in the study. Many of the firefighters had this completed by their home departments, while others were provided by the study. We recruited relatively experienced firefighters who had up to date training, could complete the assigned tasks as directed, and were familiar with live-fire policies and procedures. Throughout the study protocol, all firefighters were required to wear their SCBA prior to entering the structure. The research team supplied all PPE for the research participants to ensure that all protective equipment passed required NFPA standards.



III.B. Project Measurements

Measurements of cardiovascular function (hemostatic balance, ECG, autonomic function) and toxic exposure (metabolites in blood, breath and urine) were obtained before, immediately post-firefighting activity, and after 2 or 12 hours of recovery.

III.B.1. Assessment of Core and Skin Temperature

Skin (neck and arm) and core body temperature was continuously measured throughout all data collection sessions. Prior to completing each firefighting scenario, participants were provided with a Mini Mitter VitalSense Monitor to carry in their bunker coat. This unit communicated with and recorded data from the core temperature pill and local skin temperature patches. Participants swallowed a small disposable core temperature sensor capsule (the size of a multivitamin), which is designed to pass through the body and be eliminated in feces within ~24 hours. While the sensor was in the GI tract it transmitted temperature information to the remote recording device.

III.B.2. Assessment of Cardiovascular Function

Hemostatic Balance

Blood samples were collected by trained phlebotomists before, immediately after, and 2 or 12 hours post-firefighting activity.

Venous blood samples were drawn from the antecubital vein directly into vacutainers with little or no stasis using a 21-gauge needle.



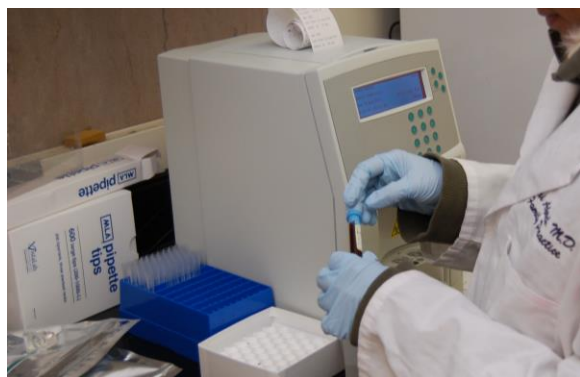
Platelet Number and Function

Platelet count, total leukocyte count, and differential leukocyte analysis were conducted from venous whole blood as part of a complete blood count (CBC) analysis, using the electrical impedance method (with an instrument such as the COULTER® LH 700 Series (Beckman Coulter, Inc., Fullerton, California) to analyze cell number and size. Platelet function was assessed by epinephrine (EPI)-induced and adenosine 5'-diphosphate (ADP)-induced platelet aggregability using a platelet function analyzer (PFA-100, Dade Behring; Deerfield, Illinois, USA). The PFA-100 aspirated whole blood under high shear rates through an aperture cut into the membrane coated with collagen and ADP (collagen-ADP) or EPI (collagen-EPI) (12). Blood was pipetted (800µl) into the disposable cartridges containing collagen-EPI and collagen-ADP

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within 2 hours of sampling and was analyzed for time to occlusion (in seconds).



Coagulation

Activated partial thromboplastin time (aPTT), a measure of functional coagulation, was assessed with the use of an automated coagulation machine (Sysmex CA-1500 - Sysmex America, Inc, Mundlein, Illinois).

Electrocardiogram

Firefighters wore a Holter monitor during firefighting activity and for up to 12 hours post-firefighting. Firefighters also wore a Holter monitor for a 12-hour period (control) that did not include firefighting as a baseline for comparison. The ECGs were reviewed by an investigator with expertise in ECG analysis and blinded to subject identity and to condition (firefighting and control). The ECGs were characterized as no arrhythmia, atrial arrhythmia or ventricular arrhythmia. The QT-interval analysis was conducted from Lead II (or V₅ if Lead II were technically unsatisfactory). A 2-minute ectopy free epoch was evaluated using commercially available software (Win CPRS, Turku,

Finland) as we have previously described [72]. The QT-interval was defined as the time difference between the Q peak and the end of the T-wave. Autonomic function was assessed as we have previously described [73] using beat-to-beat HR variability recorded using ECG.



III.B.3. Assessment of Toxic Exposure

NIOSH conducted comprehensive exposure monitoring that included:

- (1) Bulk sampling
- (2) Area air sampling
- (3) Personal air sampling
- (4) Skin wipe sampling
- (5) Biological monitoring (exhaled breath, urine, and blood)
- (6) Turnout gear sampling (off-gas air sampling and surface wipe sampling)

Bulk sampling

Samples of foams and plastics as components of the furnishings and other items used in the bedrooms as fuel for the fires were collected for the analysis of flame retardants. There are many different types of flame retardants and they are commonly

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known by their abbreviations. Our analyses focused on polybrominated diphenyl ethers (BDE-28, 47, 66, 85, 99, 100, 153, 154, 183, 206, and 209), other brominated flame retardants (TBB, TBPH, BTBPE, DBDPE, HBCD, and TBBPA), and phosphorylated flame retardants (TCEP, TCPP, TDCPP, TDCPP, TPP, and TCP). Most PBDEs have been phased out, but are likely to be present in existing material stock for years, including the fuel packages such as those used in this study.



Area air sampling

Area air sampling was conducted during all 12 burns. Table 1 provides a summary of the direct-reading and substrate-collected samples that were taken. Direct-reading meters provided an immediate and continuous measurement of the air contamination, while substrate-collected samples amassed air contaminants on a filter or other substrate for subsequent analysis in

a laboratory. Air was drawn from the living room during active fire and from either bedroom 1 or 6 (depending on location of the fire) during overhaul.



Samples collected at the fire ground were positioned near Engine 1 or Truck 1 (Figure 5), depending on the wind direction, to maximize the potential of being within the path of the smoke plume, while also representing areas where firefighters were commonly stationed during a response.



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Table 1. Summary of area air sampling performed during the burns.

	Number of samples collected		
	Within living room during active fire	Within one of the bedrooms during overhaul	Fire ground (downwind of structure)
Direct reading samples			
Particle number concentration	12	12	12
Particle mass concentration	12	12	12
Particle active surface area	12	12	12
Particle bound PAH concentration	12	12	
Substrate-collected samples			
PAHs	12	12	12
Volatile organic compounds	12	12	12
Hydrogen cyanide (HCN)	12	12	
Flame retardants	12	12	
Acid gases	12	12	
Dioxins and furans	12		
Perfluorinated compounds	12		

Personal air sampling

Each firefighter wore three sampling trains on the exterior of the turnout jacket for measuring air concentrations of PAHs, hydrogen cyanide (HCN), and aromatic



hydrocarbons (e.g., benzene, toluene, xylenes). The sampling pumps were started before firefighting commenced and stopped when the firefighters returned to the bay for doffing of their gear. Air concentrations were determined based on the time that the sampling pumps operated during the fire response. A total of 144 personal air samples for each class of compounds was collected.

Skin wipe sampling

Table 2 presents the total number of skin wipe samples collected. Wipe sampling of one side of the neck and both hands was conducted to assess firefighters' dermal

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exposure to PAHs. The wipes used corn oil as a wetting agent to facilitate the collection of PAHs, which are fat soluble. Before each scenario, firefighters first cleaned their neck and hand skin with commercial baby wipes. After this cleaning step, pre-exposure wipe samples were collected from the neck and hand of the nozzle firefighter (as a representative of the entire team). This was done to ensure firefighters' skin was virtually free of PAH contamination. After each scenario, once the firefighters had doffed their gear, post-exposure wipe samples were collected from their neck and hands. Four firefighters in each group then cleaned their

neck skin using baby wipes, after which subsequent wipe samples were collected from their neck (opposing side as the previous wipe sample). This was done to assess the cleaning efficiency of baby wipes.



Table 2. Total number of skin wipe samples collected for PAH analysis.

Pre-exposure neck wipe samples	Post-exposure neck wipe samples	Post-exposure hand wipe samples	Post-cleaning neck wipe samples
12	142*	142*	48

* One participant dropped out during the group's first scenario and was replaced in time for the group's third scenario.

Biological monitoring: exhaled breath sampling

Firefighters gave an exhaled breath sample for the analysis of VOCs approximately 1 hour before ($n = 143$), immediately after ($n = 142$), and 1-hour after ($n = 142$) each scenario. The firefighters exhaled into a collection device until they were out of breath. This measurement technique collected alveolar air from the gas-exchange region of the lungs and was an effective way of measuring systemic exposure to volatile substances. The four firefighters assigned to attack and search in each scenario were

instructed to remain on air after being released from the exercise, during doffing of their gear (with assistance), and until they got to the breath collection station. This was done to eliminate the inhalation route of VOCs from off-gassing gear. Theoretically,



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any elevated VOCs in the exhaled breath of these particular firefighters would be due to dermal absorption or, in some cases, inhalation exposure during the sizing up of the fire.

Biological monitoring: urine sampling

Urine samples were collected from firefighters approximately 1 hour before and 3 hours after each scenario. Urine samples were also collected 6 hours and 12 hours

after firefighting during the extended observation period (EOP) from each group. The samples were analyzed as described in Table 3 for exposure biomarkers, cotinine (marker of tobacco smoke exposure), creatinine (marker of kidney function), and specific gravity (marker of hydration). Creatinine and specific gravity can be used for standardizing the urinary biomarker results.

Table 3. Summary of urine sampling and analysis.

Compounds measured	Collection periods
PAH and benzene metabolites, cotinine, creatinine, and specific gravity	Pre- and 3-hr post exposure for all scenarios except interior attack with EOP (n = 106* for each compound and collection period)
Compounds listed above and organophosphate flame retardant metabolites	Pre-, 3-hr post, 6-hr post, and 12-hr post exposure for interior attack with EOP (n = 36 for each compound and collection period)

** One participant dropped out during the group's first scenario and was replaced in time for the group's third (EOP) scenario.*

Biological monitoring: blood sampling

Blood samples were collected from firefighters approximately 1 hour before, immediately after, and 2 hours after each scenario. Blood samples were also collected 12 hours post-firefighting during the EOP scenario. The blood samples were analyzed

for exposure biomarkers as described in Table 4 and other metrics as described in section III.B.2. Because the analysis of dioxins and furans requires more blood than most analyses, the samples were pooled across job assignments (or similar exposure groups) for each group of firefighters.

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Table 4. Summary of blood sampling and analysis.

Compounds measured	Collection periods
HCN	Pre- and immediately post-exposure for all interior attack scenarios (n = 71*)
Flame retardants, dioxins and furans, perfluorinated compounds	Pre- and 24-hr post exposure during the EOP scenario (n = 36 for each compound)

* One participant dropped out during the group's first scenario and was replaced in time for the group's third (EOP) scenario.

Turnout gear sampling: off-gas air sampling

Turnout gear for each firefighting team was split evenly by job position into two groups: red or green. Red gear did not undergo field decontamination, while green gear did. Generally, the gear maintained these red or green assignments for the duration of the study. Before and after each scenario, the turnout gear was separated into the two groups and placed inside 250 ft³ enclosures for testing the off-gassing of substances contaminating the gear.



The enclosure was intended to represent the volume of a typical 6-seat apparatus cabin. Air sampling was conducted for VOCs (n = 12 for each group) and HCN (n = 12 for each group) over a 15-min period, intended to represent the driving time to and from the station.

Afterwards, the green gear was decontaminated in the field using a dry brush (4 scenarios), air-based (4 scenarios), or wet detergent method (4 scenarios).

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Following field decontamination, all of the gear (green and red gear) were returned to the enclosure and tested again for off-gassing VOCs (n = 12 for each group) and HCN (n = 12 for each group).



Turnout gear sampling: surface wipe sampling

In addition to off-gas sampling, wipe samples were collected from a variety of surfaces

from turnout gear, including jackets, gloves, and helmets. Table 5 summarizes the wipe samples that were collected. A 15 in² template was used to standardize the surface area for collection. Wipes pre-wetted with isopropanol were used for the collection of PAHs and flame retardants, while hexane was used as the wetting agent for collection of dioxins and furans.



Table 5. Summary of surface wipe samples collected from turnout gear.

Compounds measured	Wipe samples collected from:
PAHs	3 sets of green jackets per scenario, pre-exposure (n = 36), post-exposure (n = 36), and post-decontamination (n = 36)
	3 sets of red jackets per firefighting group after scenario 2 (n = 9)
	3 sets of red jackets per firefighting group after scenario 4 (n = 9)
	4 helmets from interior firefighters after scenario 4 (n = 4)
Flame retardants	6 sets of red jackets after scenario 4 (n = 6)
	6 sets of green jackets (post-decontamination) after scenario 4 (n = 6)
	3 red right gloves per firefighting group after scenario 4 (n = 9)
	1 helmet from an interior firefighter after scenario 4 (n = 1)
Dioxins and furans	3 red left gloves per firefighting group after scenario 4 (n = 9)
	1 helmet from an interior firefighter after scenario 4 (n = 1)

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III.B.4. Building Fire Dynamic Measurements

To assess fire dynamics throughout the fire scenarios, measurements included gas temperature, gas concentrations, pressure, heat flux, thermal imaging, and video recording. Detailed measurement locations can be found in Figure 10.

Gas temperature was measured with bare-bead, ChromelAlumel (type K) thermocouples with a 0.02-in nominal diameter. Thermocouple arrays were located in every room. The thermocouple locations in the living room, dining room, hallway, Bedroom 4, and kitchen had an array of thermocouples with measurement locations of 1 in, 1 ft, 2 ft, 3 ft, 4 ft, 5 ft, 6 ft and 7 ft below the ceiling. The thermocouple locations in Bedroom 1, Bedroom 2, and Bedroom 3 had an array of thermocouples with measurement locations of 1 ft, 3 ft, 5 ft, and 7 ft below the ceiling.



Gas concentrations of oxygen, carbon monoxide, and carbon dioxide were measured in 4 locations in the structure. Concentrations were measured at 1 ft from the floor in the hallway, Bedroom 3, Bedroom 4 and outside the door of Bedroom 4. Gas concentration measurements after water flow into the structure may not be accurate due to the impact of moisture on the gas measurement equipment.



Pressure measurements were made in every room at 3 elevations; 1 ft, 4 ft, and 7 ft above the floor. The pressure recorded was a differential pressure between the inside and outside of the structure.



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Heat flux (the speed of thermal energy transfer) measurements were made using a 1-in nominal diameter water-cooled Schmidt-Boelter heat flux gauge. The gauges measured the combined radiative and

convective heat flux. Heat flux was measured at 3 elevations, 1 ft, 4 ft, and 7 ft above the floor in two locations. The first was in the hallway wall facing Bedroom 2 and the second was in the wall outside Bedroom 4 facing away from the fire rooms. It should be noted that the convective contribution to the heat flux is dependent upon the surface temperature of the heat flux gauge. The manufacturer gives an uncertainty of $\pm 3\%$ and results from a study on heat flux calibration found the typical expanded uncertainty to be $\pm 8\%$.

Video cameras and a thermal imaging camera were placed inside and outside the building to monitor both smoke and fire conditions throughout each experiment. Six video camera views and two thermal imaging views were recorded during each experiment.

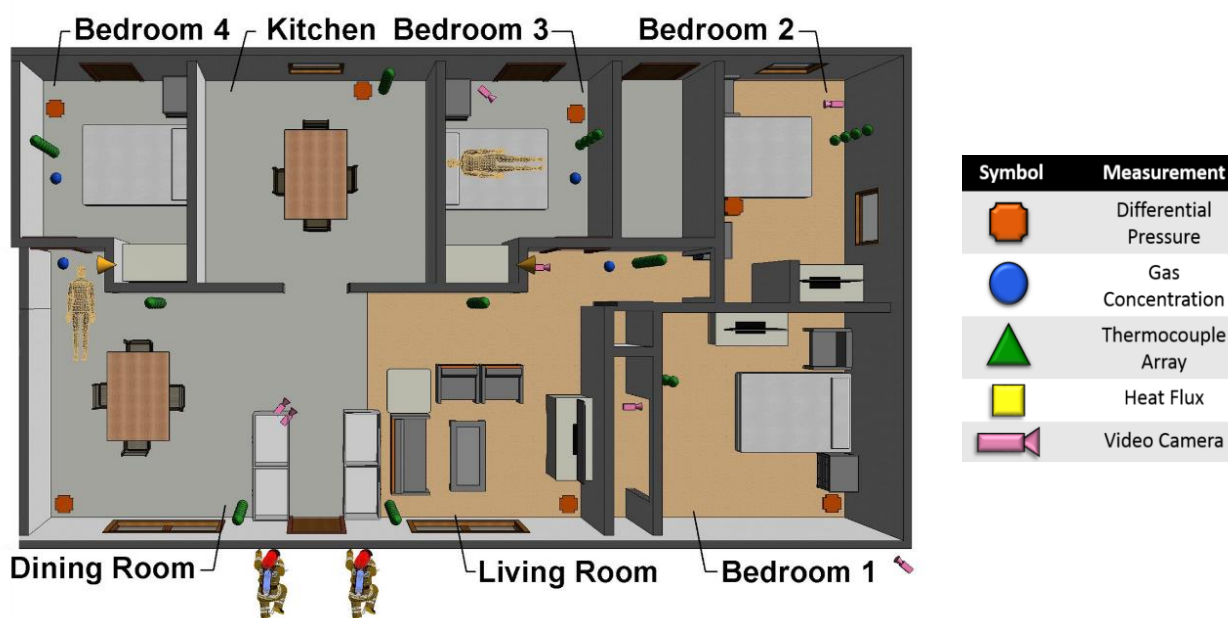


Figure 10. Measurement layout in the right side configuration

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III.B.5. Simulated Occupant Exposure Measurements

Additional measurements were made on 2 simulated occupants. Portable temperature sensors, gas meters and video cameras were fixed to the head of a fire service rescue mannequin. The mannequins were placed on the bed in Bedroom 3 and sitting directly outside of Bedroom 4. These measurements were unique in that they were wireless and were recorded through the duration of the experiment, including as the mannequins were rescued by the firefighters and removed from the structure.



Gas temperature was measured with bare-bead, Chromel/Alumel (Type K)



thermocouple with a 0.02-in nominal diameter located at the mouth of the mannequin. Carbon monoxide (CO), hydrogen sulfide (H₂S), oxygen (O₂), carbon dioxide (CO₂), and hydrogen cyanide (HCN) gases were analyzed using MX6 Ibrid portable personal gas monitor using electrochemical sensors. Electrochemical sensors operate by reacting with the gas of interest and producing an electrical signal proportional to the gas concentration. In order for gases to contact the sensor surface, they must pass through a small capillary-type opening and then diffuse through a hydrophobic barrier. Video was recorded utilizing a GoPro camera in a plastic protective casing.

IV. Example Results

The vast dataset that has been collected during this study is undergoing rigorous scrutiny to clean up any incorrect parameters, combine data sets and statistically analyze the outcomes. To provide the Fire Service with a glimpse of the powerful information to come, we have included a few sample values. Much of what

is presented here can be understood by the Fire Service and together we can start to discuss what this information means and how it can be implemented. After the entire analysis has been completed, we will be able to provide detailed recommendations and tactical considerations.

IV.A. Example of Physiological Data

IV.A.1. Core Temperature

Core temperature, along with neck and arm skin temperature were measured from each of the twelve participants from the time they arrived on campus to the end of their data collection session. Figure 11 shows core temperature data from firefighters who completed four different job assignments (Interior – search, Exterior – engineer, Outside Vent, and Overhaul) from a single scenario, which in this case utilized a Transitional Attack. The data presented are focused on the timeframe around the response to highlight important changes with time. Shortly after firefighting activities, all temperatures recovered to physiologically normal values.

From this dataset, calculations of maximum core temperatures experienced and rate of rise in core temperature throughout the activities was calculated. In some scenarios, core temperature rose quite rapidly, while others resulted in more modest increases

over the relatively short timeframes. For the first time, we will be able to compare the impact of different fireground job functions on core temperature as well as the effect of cooling the environment prior to the firefighter making entry on heat stress. While core temperature was expected to be elevated during interior firefighting operations, significant elevations were also seen for exterior vent and forcible entry operations as well as overhaul operations that required heavy muscular work. Consideration for the entirety of heat exposure is necessary. The rapid rate of rise should be considered during these operations if low manpower requires firefighters to conduct overhaul after they have completed interior suppression or rescue operations on their first cylinder of air.

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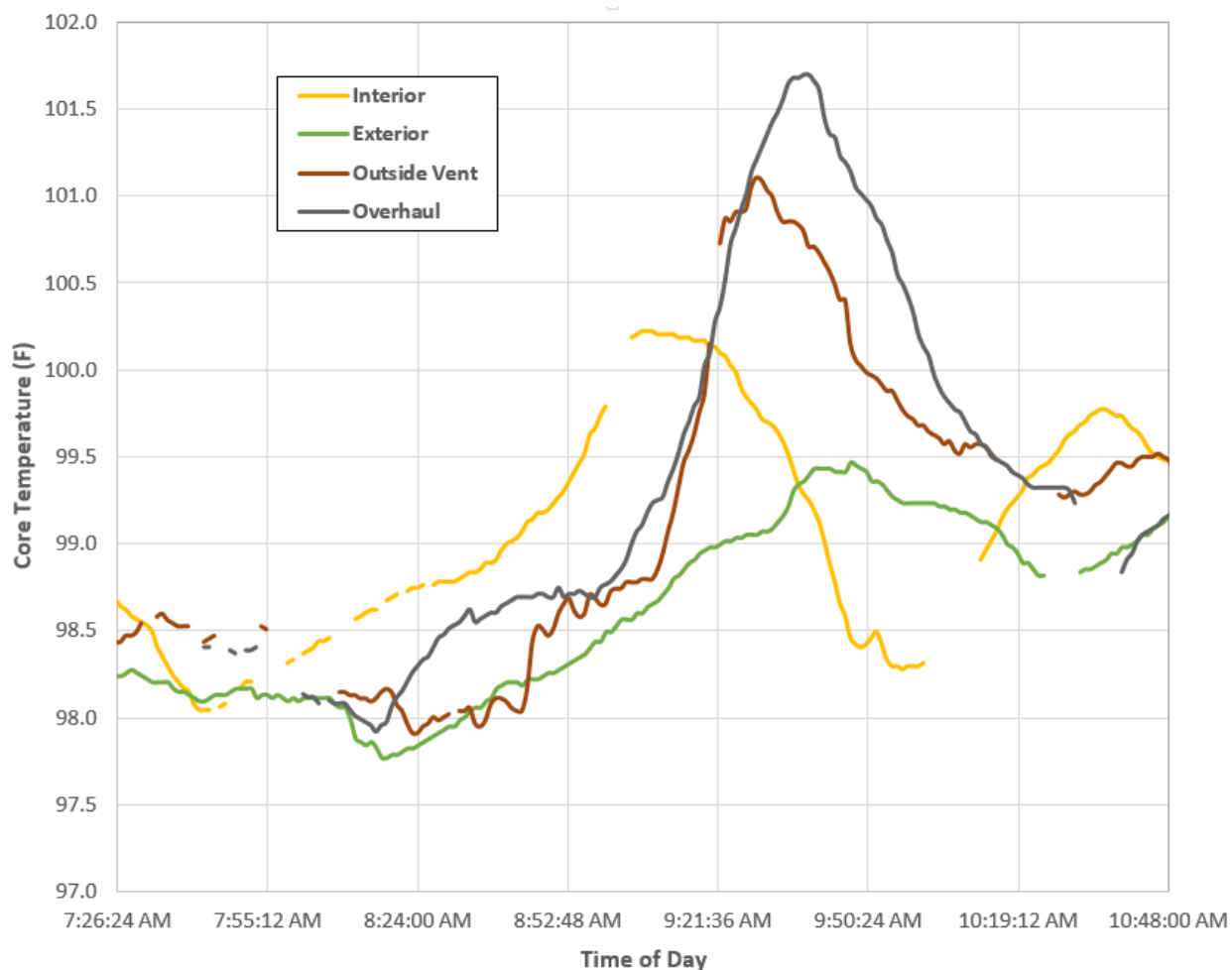


Figure 11. Typical core temperature data from firefighters operating at 4 different job assignments on the fireground. While data is collected throughout the study timeframe, this is shown around the time of the response to highlight differences in the acute responses to the different activities from 06/28/2015.

Maximum skin temperatures and core temperature values are shown as a function of job assignment and attack tactic in Figure 12. All firefighters completed the scenarios with interior attack (Blue – 06/27/2015) and transitional attack (Orange – 06/28/2015). The ability to quantify changes in skin temperature as a function of both tactic and assignment may be important when considering the body's ability to dissipate

heat as well as potential changes in the absorptivity of the skin for specific chemical exposures. The impact of tactic on skin temperature is of particular interest as the Transitional attack may theoretically reduce exposure to radiant heat as well as fire smoke, especially in the neck area for the interior firefighters. The neck is provided relatively less protection by a knit hood compared with other parts of the body.

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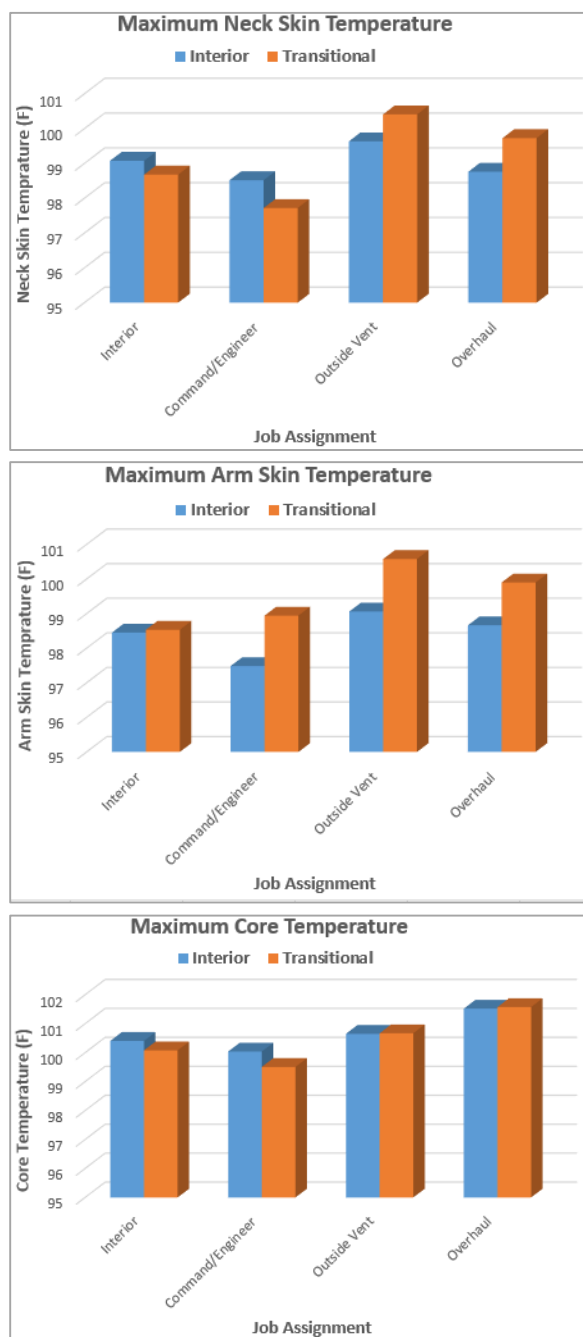


Figure 12. Typical maximum skin and core temperature data from firefighters completing different job assignments.

IV.A.2. Platelet Function

Platelet function was assessed when firefighters arrived for the beginning of the test session, immediately after firefighting.

Figure 13 shows one of the measures of platelet function (EPI) averaged over two scenarios from Group B firefighters working in four different job functions. While existing data have commonly characterized reductions in platelet function after live-fire training activities or simulated firefighting, these data provide the first glimpse into the impact of typical fireground activities by job assignment. The typical large decline in closure time is measured after Interior firefighting activities and Outside Vent, but interestingly did not result in as pronounced of a reduction after the Overhaul activity that resulted in the most significant elevation of core temperature during these response scenarios. By combining all of these data sets together, a more complete picture of the cardiovascular impact of firefighting activities and risk for sudden cardiac death will be available.

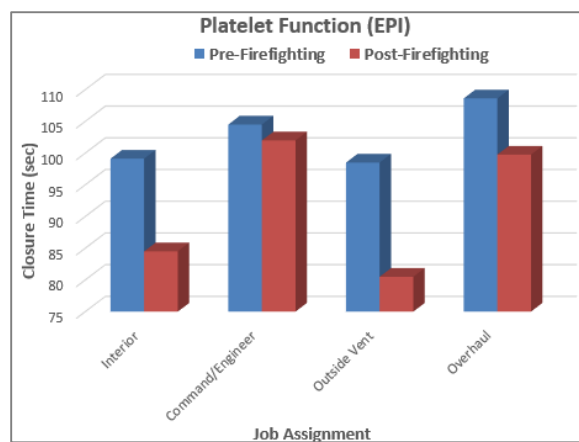


Figure 13. Typical platelet function data from firefighters completing different job assignments (Interior, Command/Engineer, Outside Ventilation, Overhaul). Blood is collected prior to firefighting activities (blue) and immediately after firefighting (red) from 06/24/2015 and 06/25/2015.

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IV.B. Preliminary Exposure Data

IV.B.1. Flame Retardants in Bulk Samples

Table 6 gives the range of concentrations of PBDEs and 9 other flame retardants measured in bulk samples of the fuel

package. Gray shading was used to identify the bulk items that contained the highest levels of each compound. For example, the headboard padding contained the highest levels of BDE-47 through BDE-183.

Table 6. Concentrations of flame retardants (ug/g)* in bulk samples of the burn room furnishings

Compound measured	Carpet padding (n = 3)	Curtain liner (n = 1)	Inner spring mattress foam (n = 2)	Foam topper for bed (n = 2)	Head-board padding (n = 1)	Chair cushion (n = 2)	Chair cushion liner (n = 1)	Flat screen TV plastic (n = 1)
Polybrominated diphenyl ethers								
BDE 47	< 0.1 - 0.41	0.19	< 0.1	< 0.1 - 0.74	5,600	< 0.1 - 4.1	< 0.1	< 0.1
BDE 85	< 0.1	< 0.1	< 0.1	< 0.1	840	< 0.1 - 1.6	< 0.1	< 0.1
BDE 99	0.11 - 0.56	0.25	< 0.1 - 0.44	< 0.1 - 2.9	15,000	< 0.1 - 25	< 0.1	< 0.1
BDE 100	< 0.1	< 0.1	< 0.1	< 0.1 - 0.6	2,500	< 0.1 - 3.8	< 0.1	< 0.1
BDE 153	< 0.1 - 5.6	< 0.1	< 0.1	< 0.1 - 2.0	2,000	< 0.1 - 13	< 0.1	< 0.1
BDE 154	< 0.1	< 0.1	< 0.1	< 0.1 - 0.69	1,400	< 0.1 - 5.0	< 0.1	< 0.1
BDE 183	< 0.1 - 1.1	< 0.1	< 0.1	< 0.1 - 2.0	67	< 0.1	< 0.1	< 0.1
BDE 206	< 0.1 - 14	2.8	< 0.1 - 6.3	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
BDE 209	0.41 - 102	440	< 0.1 - 61	< 0.1	< 0.1	< 0.1 - 0.68	< 0.1	< 0.1
Other brominated flame retardants								
TBBPA	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TBB	0.38 - 3.2	910	< 0.1 - 0.5	< 0.1 - 7.5	< 0.1	18,500 - 26,750	68.5	< 0.1
TBPH	0.22 - 5.7	340	< 0.1 - 1.2	< 0.1 - 3.7	< 0.1	5,800 - 6,380	19.6	< 0.1
DBDPE	< 0.1 - 0.53	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phosphorylated flame retardants								
TCEP	< 0.1	1.4	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TCPP	59 - 630	5.4	< 0.1	< 0.1	8.4	< 0.1 - 1.3	< 0.1	< 0.1
TDCPP	240 - 9,100	1.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPP	0.43 - 3.8	4.0	0.16 - 0.23	< 0.1 - 1.3	1,690	1,400 - 7,380	22.6	19
TCP	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

*Flame retardants analyzed but not listed (BDE-28, BDE-66, BTBPE, and HBCD) were not detected (< 0.1 ug/g). TBBPA = tetrabromobisphenol-A, TBB = 2-ethylhexyl 2,3,4,5-tetrabromobenzoate, TBPH = 2-ethylhexyl 2,3,4,5-tetrabromophthalate, DBDPE = decabromodiphenyl ethane, TCEP = tris (2-chloroethyl) phosphate, TCPP = tris (1-chloro-2-propyl) phosphate, TDCPP = tris (1,3-dichloro-2-propyl) phosphate, TPP = triphenyl phosphate, TCP = tricresyl phosphate

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IV.B.2. Air concentrations of contaminants measured from burn structure

Table 7 presents the air concentrations of PBDEs and 9 other flame retardants measured from the living room during active fire and from the initial burn room during overhaul for the scenario that took place on June 25, 2015. During this scenario, a variety of flame retardants were detected in the air during active fire. Only two flame retardants (TPP and TCP) were detected during overhaul. Interestingly, TCP and TBBPA were not detected in any of the bulk samples but were found in the air during the fire. This suggests that our bulk sampling regimen failed to capture all sources of flame retardants. This is not surprising given the wide-spread use of flame retardants. Note that the fire period results do not adjust for particle losses within the sample lines, which would cause a slight underestimation. We cannot compare these results to occupational exposure limits (OELs), because such limits do not currently exist.



Table 7. Flame retardant air concentrations ($\mu\text{g}/\text{m}^3$) measured from living room during active fire and from initial burn room (bedroom) during overhaul on 6/25/2015.

Compound measured	Fire period	Overhaul period
BDE 47	9.6	< 0.04
BDE 85	< 0.17	< 0.04
BDE 99	7.4	< 0.04
BDE 100	< 0.17	< 0.04
BDE 153	< 0.17	< 0.04
BDE 154	8.7	< 0.04
BDE 183	< 0.17	< 0.04
BDE 206	< 0.17	< 0.04
BDE 209	14	< 0.04
TBBPA	12	< 0.04
TBB	9.2	< 0.04
TBPH	1.2	< 0.04
DBDPE	< 0.17	< 0.04
TCEP	< 0.25	< 0.06
TCPP	< 0.25	< 0.06
TDCPP	< 0.25	< 0.06
TPP	2000	14
TCP	220	1.9

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Table 8 provides the HCN and VOC air concentrations measured from the living room during active fire and from the initial burn room during overhaul for the scenario taking place on June 25, 2015. Table 9 provides the applicable OELs and Immediately Dangerous to Life and Health (IDLH) values for these compounds. Because these measurements were collected over short periods of time (< 20 min), comparing them to IDLH and short-term exposure limits is most appropriate. The HCN concentration



during active fire was well above IDLH (NIOSH, 2010). The benzene concentration during active fire was above its short-term exposure limit. All other measurements collected during fire and overhaul were below short-term exposure limits.

Table 8. HCN and VOC air concentrations (ppm) measured from living room during active fire and from initial burn room (bedroom) during overhaul on 6/25/2015

Compound measured	Fire period	Overhaul period
HCN	340	1.2
Benzene	15	0.17
Toluene	0.069	0.0038
Ethyl benzene	< 0.0004	0.0014
Xylenes	< 0.0008	0.0038

Table 9. Occupational exposure limits and IDLH values for HCN and VOCs (ppm)

Compound	NIOSH REL	OSHA PEL	ACGIH TLV
HCN	ST 4.7, IDLH 50	TWA 10	C 4.7
Benzene	TWA 0.1, ST 1, IDLH 500	TWA 1, ST 5	TWA 0.5, ST 2.5
Toluene	TWA 100, ST 150, IDLH 500	TWA 200, C 300	TWA 20
Ethyl benzene	TWA 100, ST 125, IDLH 800	TWA 100	TWA 20
Xylenes	TWA 100, ST 150, IDLH 900	TWA 100	TWA 100, ST 150
Styrene	TWA 50, ST 100, IDLH 700	TWA 100, C 200	TWA 20, ST 40

ACGIH = American Conference of Governmental Industrial Hygienists, C = ceiling limit (should not be exceeded at any point in time), IDLH = immediately dangerous to life and health, OSHA = Occupational Safety and Health Administration, PEL = permissible exposure limit, REL = recommended exposure limit, ST = short-term exposure limit (should not be exceeded by measurements collected over 15 min), TLV = threshold limit value, TWA = time weighted average (over an 8-hr work shift)

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Other air measurements collected from the structure but not presented here include PAHs, acid gases, perfluorinated compounds, dioxins and furans, and particles (in real-time). Results from many of these measurements are still pending.

IV.B.3. Air concentrations of contaminants measured in the fire ground.

Table 10 presents the air concentrations of VOCs measured in the fire ground, just south of Engine 1 (see Figure 5), during two scenarios. Figures 14 and 15 present the particle number concentrations (for particles 0.01 to > 1 μm) measured in the fire ground for the same two scenarios. For the scenario on June 27, 2015, the wind was out of the north/northwest, so the fire ground samples were not directly in the path of the smoke plume from the structure fire, but were downwind of the engine's diesel exhaust. The diesel exhaust was the primary contributor to the particle counts that were well above background levels (background ~ 10,000 particles/cc) throughout this scenario. For the scenario on June 30, 2015, the wind was predominately out of the west, so the fire ground samples were in the path of the smoke plume for some of the time. The smoke plume was the primary contributor to the particle counts and VOC concentrations during active fire for this



scenario. The particle counts measured downwind of the structure fire on June 30, 2015 were similar to those measured downwind of the engine's exhaust on June 27, 2015. However, the VOC air concentrations were higher on June 30, 2015, which suggests that the structure fire emissions were the predominant source of VOCs on the fire ground. Because these measurements were collected over approximately 15 min, comparing them to short-term exposure limits is most appropriate. The VOC concentrations were well below applicable short-term exposure limits.

Table 10. Air concentrations of VOCs (ppm) measured in the fire ground (south of Engine 1) on 6/27/2015 and 6/30/2015.

Compound measured	6/27/2015	6/30/2015
Benzene	0.029	0.060
Toluene	0.0034	0.0061
Ethyl benzene	< 0.0004	0.0012
Xylenes	< 0.0008	0.0032

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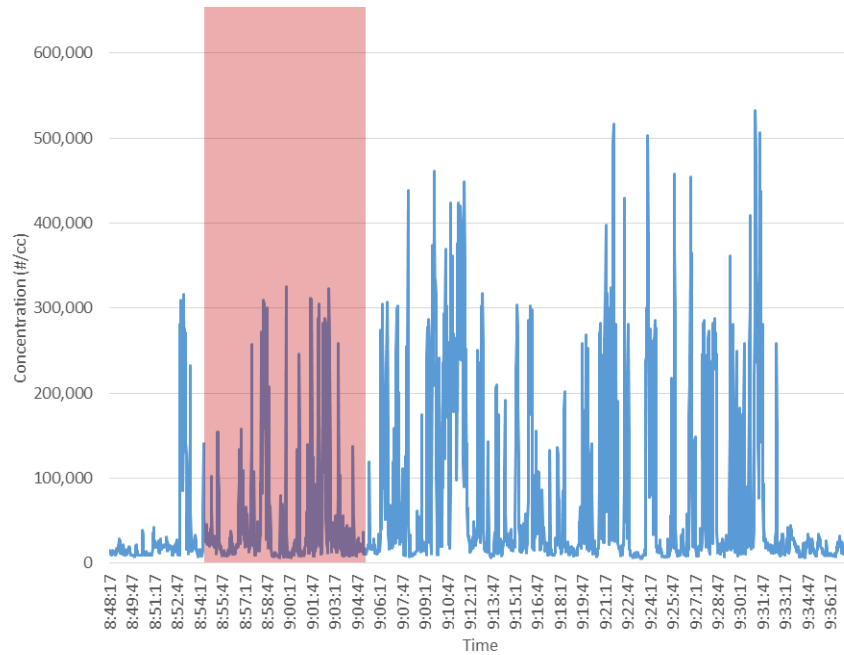


Figure 14. Particle number concentration (for particles 0.01 to $> 1 \mu\text{m}$) measured at the fire ground (south of Engine 1) on 6/27/2015. Red shading represents the period between structure fire ignition and suppression/start of overhaul.

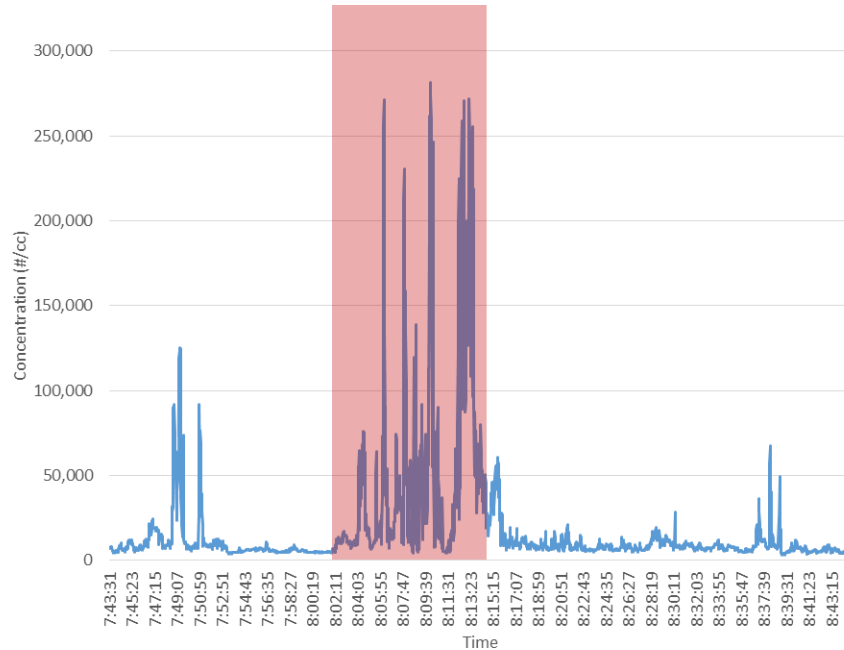


Figure 15. Particle number concentrations (for particles 0.01 to $> 1 \mu\text{m}$) measured at the fire ground (south of Engine 1) on 6/30/2015. Red shading represents the period between structure fire ignition and suppression/start of overhaul.

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IV.B.4. Turnout gear surface contamination

Tables 11 and 12 present the wipe sampling results collected from the surface of turnout gear worn by firefighters assigned to search during two scenarios. PAHs measured from the firefighter's "green" turnout jacket during his/her first scenario are intended to show the change in contamination from pre-fire (baseline) to post-fire to post-decontamination, where wet-detergent decontamination was employed.

Table 11. Surface contamination levels (ng/100 cm²) of total PAHs measured from "green" turnout jacket worn by search during the team's first scenario on 6/22/2015

Pre-fire	Post-fire	Post-decon
< 300*	3,800†	< 300*

* Based on limit of detection for fluoranthene.

† Sum of 15 PAHs; PAH measurements below their limit of detection were assigned zero values.

As expected, we see a marked increase in total PAHs post-fire, with a subsequent reduction post-decontamination. Flame retardants measured from the firefighter's "red" turnout jacket and glove after his/her last scenario are intended to show accumulation of the persistent chemicals over 4 scenarios, where no decontamination was employed. Several flame retardants were detected on the jacket and glove. Once we have all of the data, not only can we assess accumulation of PAHs, flame retardants, and other contaminants over time (red group data), but we can also

further assess the effectiveness of decontamination at reducing that accumulation (green group data).

Table 12. Surface contamination levels (ng/100 cm²) of flame retardants from "red" turnout gear worn by search during the team's last scenario on 6/30/2015.

Compound Measured	Post-fire (jacket)*	Post fire (glove)
BDE 47	48	35
BDE 85	< 1	< 1
BDE 99	< 1	40
BDE 100	< 1	12
BDE 153	< 1	< 1
BDE 154	< 1	< 1
BDE 183	< 1	< 1
BDE 206	< 1	< 1
BDE 209	1,200	1,200
TBBPA	< 1	30
TBB	22	30
TBPH	11	14
DBDPE	140	290
TCEP	5.5	< 1.5
TCPP	< 1.5	200
TDCPP	190	460
TPP	2	3,100
TCP	< 0.2	360

* Quality control samples were 60–80% less than expected, so measurements may be underestimated.

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IV.B.5. Off-gassing of turnout gear

Table 13 provides the VOC air concentrations measured off-gassing from turnout gear during the first scenario for Group C while Table 14 provides the off-gas concentrations of HCN during the first and last scenarios for Group C. As expected, the levels of VOCs and HCN increased post-fire, with a subsequent decrease post-decon. These results suggest that firefighters could be exposed to these compounds during the ride back to the station after firefighting. However, the post-fire concentrations (measured in ppb) were well below

applicable OELs (provided in ppm, Table 9). Because the compounds we measured are volatile, they are expected to evaporate from clothing within an hour. Nearly an hour passed between doffing and decontamination of gear. This probably explains why the post-decon measurements were comparable between the green (decon) and red (no decon) groups. It also explains why the HCN off-gas concentrations did not appear to increase with consecutive use over time (as evidenced by comparison between last scenario “red” pre-fire measurements and first scenario pre-fire measurements).

Table 13. Air concentrations of VOCs (ppb) measured off-gassing from green (wet decon) and red (no decon) gear pre-fire, post-fire, and post-decon during the first scenario (6/22/2015) for Group C.

Compound Measured	Green (wet decon)			Red (no decon/control)		
	Pre-fire	Post-fire*	Post-decon	Pre-fire	Post-fire*	Post-decon
Benzene	< 0.6	75	< 0.6	< 0.6	66	0.84
Toluene	< 0.5	19	< 0.5	< 0.5	16	< 0.5
Ethyl benzene	< 0.4	3.3	< 0.4	< 0.4	2.8	< 0.4
Xylenes	< 0.4	2.2	< 0.4	< 0.4	2.1	< 0.4
Styrene†	< 0.4	120	0.42	< 0.4	98	0.95

* Quality control samples were 50% less than expected, so measurements may be underestimated.

† Results based on calibration curve for toluene.

Table 14. Air concentrations of HCN (ppb) measured off-gassing from green (wet decon) and red (no decon) gear pre-fire, post-fire, and post-decon during first and last scenarios for Group C.

Scenario	Green (wet decon)			Red (no decon/control)		
	Pre-fire	Post-fire	Post-decon	Pre-fire	Post-fire	Post-decon
First (6/22/2015)	< 20	140	71	42	130	49
Last (6/30/2015)	< 20	120	< 20	< 20	120	< 20

IV.C. Preliminary Fire Dynamics Data

IV.C.1. Building Temperature profiles

Figure 16 provides the gas temperatures at each of the 10 different measurement locations at the ceiling (7 ft) and at the crawling level of a typical firefighter or trapped occupant (3 ft) for one scenario. In this scenario, firefighters initially applied water to the fire rooms from the exterior for a short period of time (~15 seconds per room) and then transitioned to the interior of the structure to complete suppression. Each fire room transitioned to flashover prior to firefighter intervention, yet temperatures in both rooms were quickly reduced upon application of approximately 35 gallons of water per room (on average). However, it is also apparent that in the time these firefighters transitioned back to the interior of the structure, the fire began to regrow and again flashed over in Bedroom 5. Each of the 6 different firefighting teams that conducted Interior and Transitional approaches had slightly different style and duration of water application, resulting in slightly different fire response and exposure

conditions. However, these scenarios represent a wide range of typical conditions that would be experienced on the fireground for some of the most realistic fireground fire dynamics data sets currently available.



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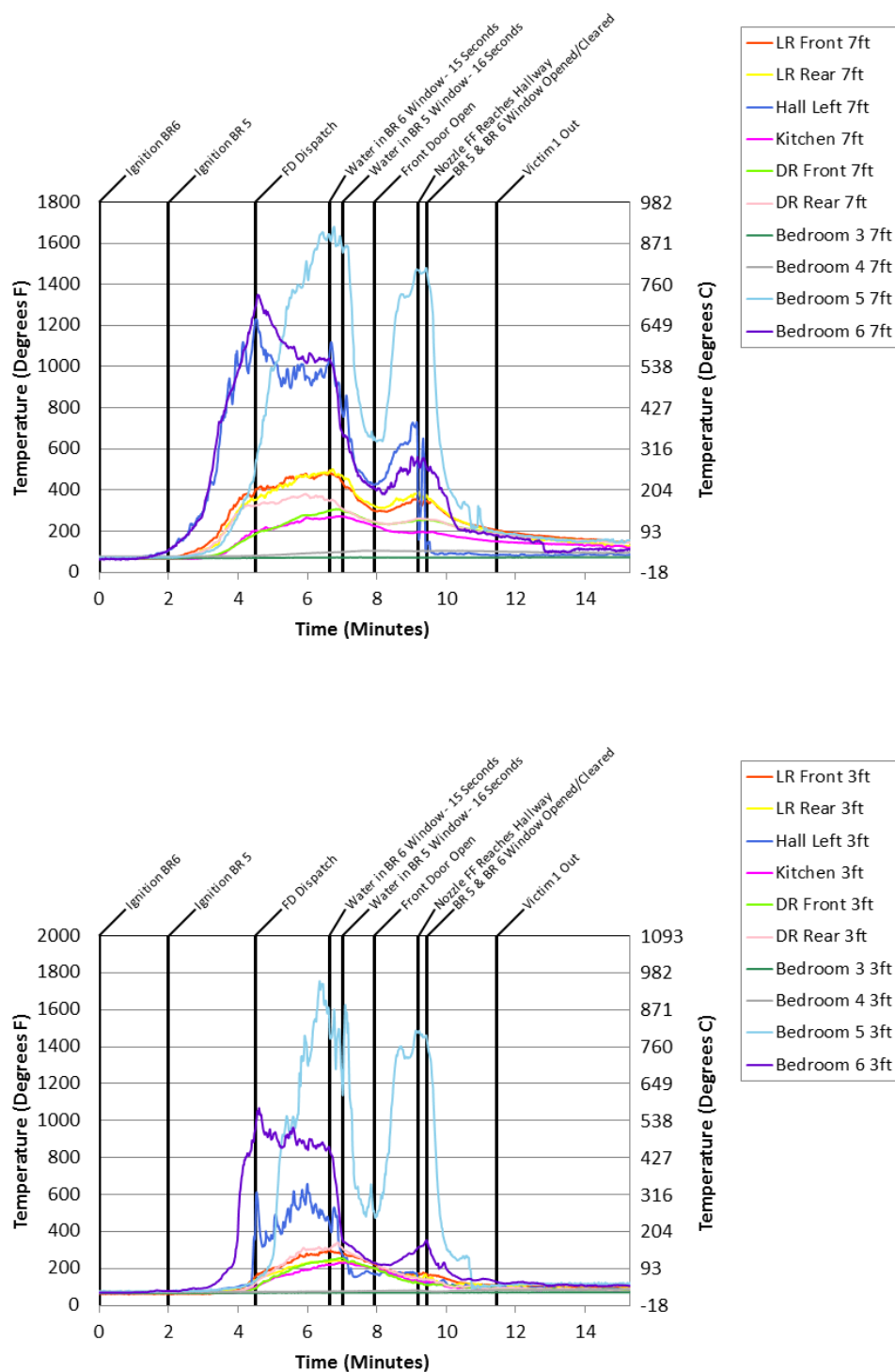


Figure 16. Building gas temperatures at each of the measurement locations of the structure (LR = Living Room, DR = Dining Room) for an example transitional attack scenario (06/14/2015).

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IV.C.2. Heat flux in hallway connecting fire rooms

Hallway heat flux data from this same scenario is shown in Figure 17. Data from 3 different heights in the hallway provides an indication of the heat flux that might be experienced by a victim attempting to self-evacuate prior to firefighter intervention

(i.e. 1-3 ft data prior to 8 minutes) and the heat flux firefighting PPE would be exposed to while making the hallway either standing (5 ft) or crawling (3 ft). One interesting observation from this data is that upon application of water into the Bedroom 5 and 6—which were immediately adjacent to this hallway, with doors open—there is no apparent increase in heat flux in the hallway.

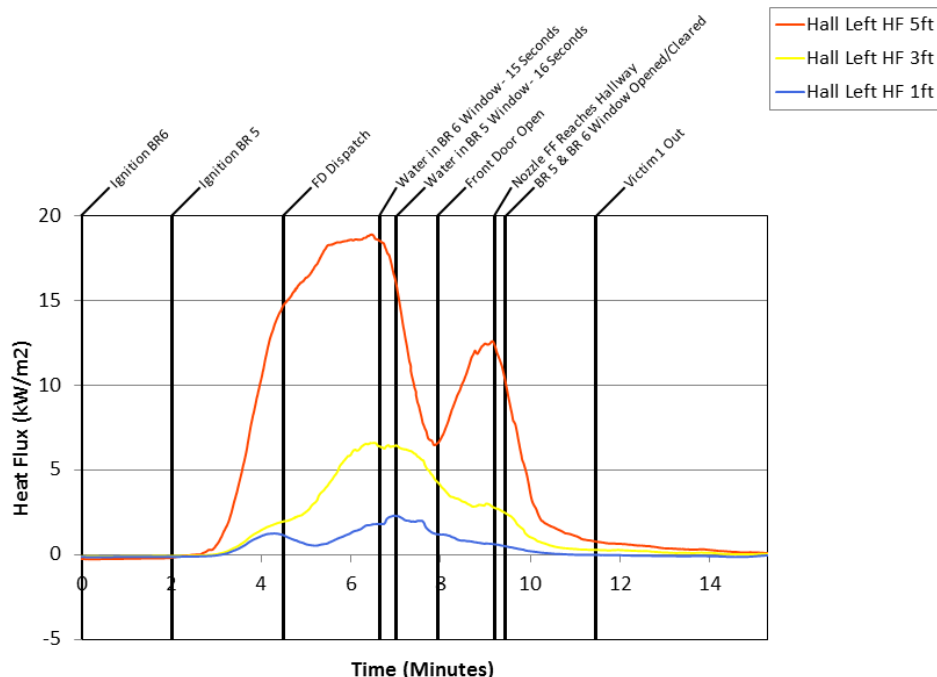


Figure 17. Heat flux measurements from the hallway immediately adjacent to the fire rooms (BR 5 and 6) with open doorways for an example transitional attack scenario (06/14/2015).

IV.C.3. Gas concentrations

Gas concentrations from the hallways and closed bedrooms from the same scenario are presented in Figure 18. These data provide important information regarding the toxic gas concentrations in survivable rooms as well as conditions in rooms through which victims might be

evacuated from the structure. Behind closed bedroom doors, the conditions remained relatively stable until the bedroom doors were open. However, even after the fire was largely suppressed (Figure 16), oxygen concentrations were low and CO concentrations elevated in the hallway

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outside of the closed bedroom, even as the first victim was being removed from the structure.

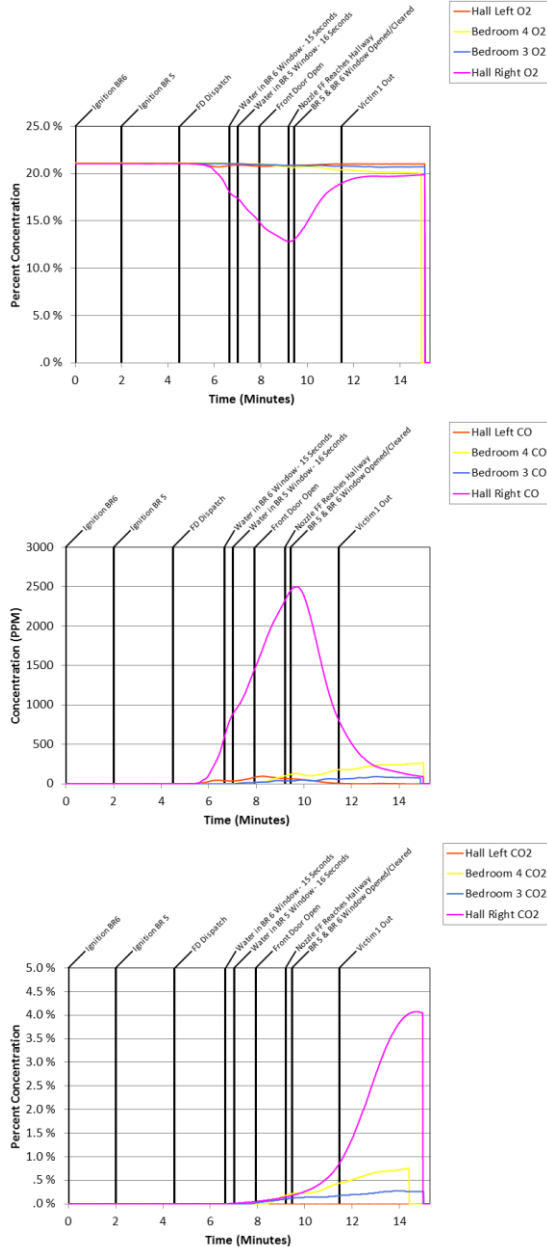


Figure 18. Gas concentrations from closed bedrooms and hallway locations, including (top) oxygen, (middle) carbon monoxide and (bottom) carbon dioxide (06/14/2015).

IV.C.4. Firefighter Temperature Exposure Data

Figure 19 provides the helmet mounted temperature sensors on the nozzle firefighter and lead search team member from the same scenario as above. In these plots, the orange data provides the gas temperature in which the firefighters were operating.

This data set provides the first measurement of thermal exposure to firefighters operating in a structure with typical room and contents fires. This information is valuable to understand the external thermal conditions as they compound heat stress and risk for compromised PPE. As the nozzle firefighter was operating much closer to the fire, his/her thermal exposure was much more severe than the search team even though they were both operating on the interior of the structure. Comparisons between thermal exposures for interior and transitional attack tactics on the nozzle firefighter will be completed in the near future.

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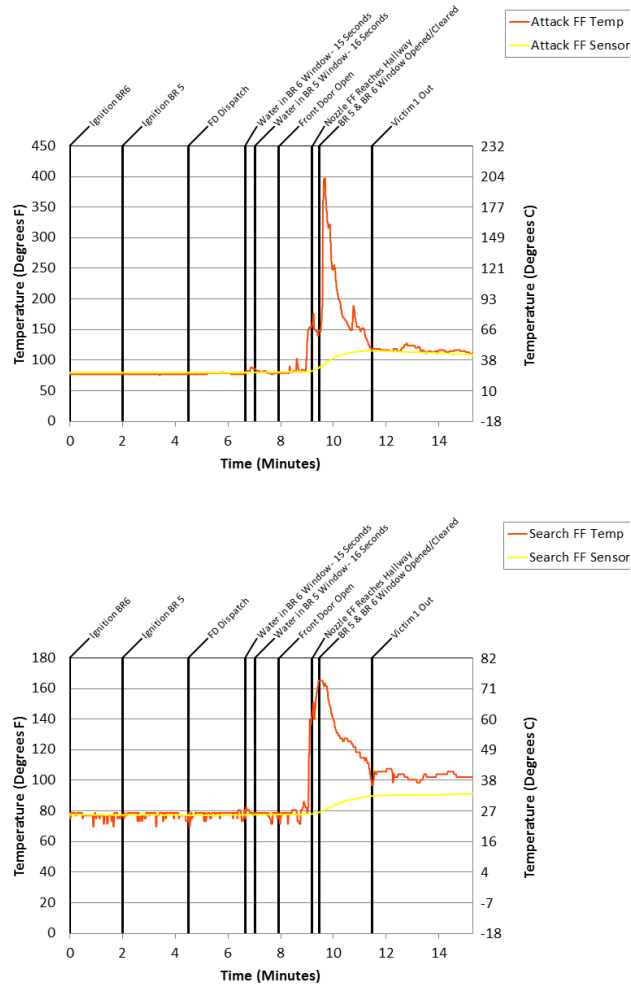


Figure 19. Helmet mounted temperature measurements collected from (top) nozzle firefighter on the attack team and (bottom) lead search team member (06/14/2015). The orange line is the gas temperature in the vicinity of the firefighter, while the yellow line is the internal sensor temperature (can be ignored for now).

IV.C.5. Simulated Occupant Exposure Data

Figure 20 includes the temperature profile from the portable sensors located on the simulated occupants (mannequins). These sensors were incorporated after the first scenario, so this data is provided from Day 2.

The simulated occupant (instrumented mannequin) behind a closed bedroom door but closer to the fire was exposed to much lower temperatures and gas concentrations than the other simulated occupant that was remote from the fire but not protected by a closed door.

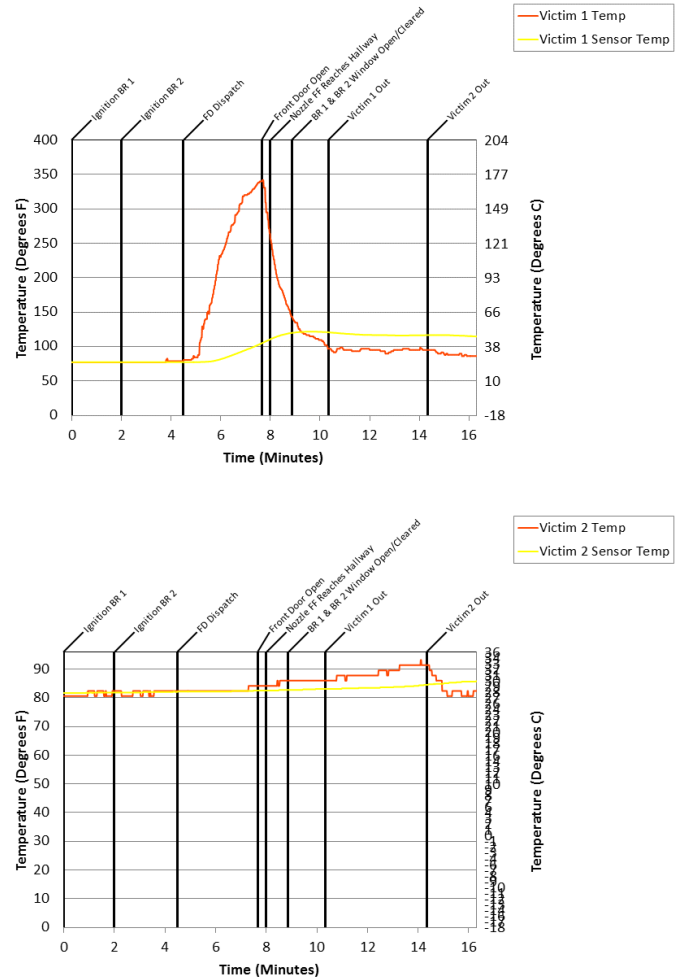


Figure 20. Mannequin temperature measurements collected from (top) outside Bedroom 4 and (bottom) inside Bedroom 3 (06/15/2015). The orange line is the gas temperature around the victim, while the yellow line is the internal sensor temperature (can be ignored for now).

V. Next Steps

The results presented in this interim report are only a snapshot of what has been collected and is currently being analyzed. For example, we did not present any of the personal exposure (air and dermal wipe) or biomarker (urine, blood, and breath) results. Many of the results presented herein are only from one or two days of the 12-day study. All results will need to be analyzed together to determine the statistical significance of our findings. The study design should allow us to answer the following questions:

V.I. Cardiovascular Strain



- 1) How are coagulatory and ECG responses affected by firefighting tactic and job assignment?



- 2) What is the variability in coagulatory and ECG changes? Do detrimental changes in these variables tend to occur in the same individual? That is, is a vulnerable individual likely to experience a change in both of these variables, or are they distinct phenomenon?
- 3) Is the magnitude of disruption affected by changes in core temperature?
- 4) What is the timecourse of recovery for changes in coagulatory measures and ECG variables?

V.II. Exposure Assessment

- 1) Are external exposure levels (air and dermal wipe) correlated with biomarker levels (urine, blood, and breath)?
- 2) What are the primary factors associated with the external exposure and biomarker levels?

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- a. Possible factors to be investigated include:
assignment, response tactic, use of SCBA, time in smoke plume, cleaning neck skin and wearing decontaminated turnout gear and laundered hoods.
- 3) What is the efficacy of using baby wipes to clean neck skin?



- 4) What are the composition and magnitude of the airborne particles, gases and vapors produced during the fires?
 - a. What are the air concentrations inside the building during fire and overhaul?
 - b. What are the personal air concentrations for each firefighter and how do those levels vary by position and tactic?
 - c. What are the air concentrations in the fire ground and how do those levels vary by environmental conditions?
 - d. How do the air concentrations compare to applicable OELs.



- 5) What are the composition and magnitude of contaminants depositing on and off-gassing from turnout gear?
 - a. How do the contamination levels vary by position and tactic?
 - b. How much contamination accumulates from repeated use of turnout gear?
- 6) What is the efficacy of field decontamination of turnout gear (based on surface contamination and off-gas measurements)?
 - a. How do the three decontamination methods compare?
 - b. What is the efficacy of field decontamination over repeated use of turnout gear?



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V.III. Fire Dynamics



- 1) Under which variables might a transitional attack be considered advantageous versus an interior attack in terms of:
 - a. Victim exposure risk
 - b. Firefighter health and safety
- 2) What is the impact of different scenario timing (based on differences in firefighter responses) to a similar controlled fire scenario?
 - a. Impact on thermal/gas concentration conditions in structure
 - b. Subsequent impact on chemical and cardiovascular exposure/risk
- 3) How do the tactical choices made by the fire service impact exposures for the victims being rescued?
- 4) What is the best way to train firefighters when it is not possible to create a

“realistic” fire environment during training?



V.IV. Firefighter toolkit

The project team will design and develop an interactive online training program with the fire service advisory panel. The course will contain data, pictures, video and professional narration and allow firefighters of all levels to navigate through the course at their own speed. This program will include results from this study and present them in a way that important lessons learned will be shared with the fire service community.



VI. Interim Recommendations

Although we have not yet performed an in depth analysis of the results, there are actions that the fire service can take now to better protect firefighters from chemical exposures, heat stress, and other stressors and lessen their risk of cardiovascular disease, cancer, and other illnesses or injuries.



VI.I. Cardiovascular Risk

To minimize cardiovascular strain associated with fire response and decrease the risk of a sudden cardiac event:

- Ensure that all firefighters have received a proper medical evaluation consistent with NFPA 1582 guidelines and performed by a physician familiar with the physiological demands of firefighting; and that cardiovascular risk factors, if present, are being aggressively treated.
- Utilize incident scene rehabilitation to provide rest, hydration and cooling; and medically monitor firefighters for signs

and symptoms of heat-related illness or cardiovascular events.

- Ensure that all firefighters are physically fit so that they can meet the physical demands of the job and so that they can do so with lower risk of cardiovascular events.

VI.II. Chemical Exposures

To minimize inhalation of contaminants during a fire response:

- Wear SCBA during knockdown, overhaul, and other firefighting activities where exposure to combustion byproducts is likely. This includes when walking through the smoke plume during the sizing up of the fire or when making openings to ventilate the structure.
- Remain upwind of fires if not directly involved in the fire attack. If this cannot be accomplished, SCBA should be worn. Fire personnel should also remain upwind of diesel exhaust emitted from the apparatus.



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To minimize inhalation of contaminants off-gassing from contaminated gear:

- Doff gear before entering the rehab area.
- Do not store or wear contaminated turnout gear inside the apparatus during the ride back to the station.
- Do not store gear in personal vehicles or living areas.



To minimize skin absorption of contaminants during (or after) a fire response:

- Decontaminate and/or launder turnout gear, fire hoods, and other equipment that readily contact the skin after each fire response. Do not take gear or other equipment home.
- Wash hands and neck skin immediately and shower as soon as possible after a fire response. Data acquired in this study

will help us determine the cleaning efficiency of commercial baby wipes, which can be used in the field to quickly clean skin.

VI.III. Fire Dynamics

- Apply water to the fire rapidly. Conditions improved throughout the structure after application regardless of where the water was from.
- Train on coordinated attack for successful response. From time of dispatch to water on the fire, front door forced open, victim 1 removal, victim 2 removal and attack team into the fire rooms varied widely amongst the crews. For example, the time to get both victims out of the house varied from 6:02 to 11:42.
- Stress the importance of closed doors to the public and firefighters. The simulated occupant behind a closed bedroom door but closer to the fire was exposed to much lower temperatures and gas concentrations than the simulated occupant remote from the fire but not protected by a closed door.



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**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Items from Building & Environmental Safety	DEPARTMENT:
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS:	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Engineering Agreement for the Heritage Lake Boat Access Area Development Grant with Engineering Resource Associates, Inc. in the amount of \$20,000.00	DEPARTMENT: Recreation
DATE: April 4, 2023	AMOUNT: \$20,000.00
ATTACHMENTS: 1. 04-23-1389 - Resolution Approving Services Contract with Engineering Resource Associates, Inc (Heritage Lake Boat Access Area) 2. Engineering Resource Associates, Inc - Heritage Lake Proposal 031323	ADMINISTRATIVE NOTES:

SUMMARY HIGHLIGHTS:

This agenda item provides for a professional services engineering agreement with Engineering Resource Associates, Inc. (ERA) for site survey and partial topographical plan, preliminary engineering plan, final engineering plans, technical specifications, permitting, bid phase services, and construction phase services for the Illinois Department of Natural Resources (IDNR) Boat Access Area Development (BAAD) Grant that the Village was awarded for Heritage Lake. ERA provided professional services for the Heritage Lake Master Plan, has in-depth knowledge, and they provided the required information for the BAAD Grant that was submitted and approved, and lastly, ERA has expertise in designing and adhering to the design handbook for recreational boating facilities.

The professional services are needed to provide for successful implementation of the language in the grant documents from the IDNR as listed below:

- Unless otherwise approved by the IDNR, the Grantee shall retain the services of a registered, professional engineer to make the necessary field surveys, prepare detailed construction plans, bid specifications and contract documents, and provide necessary construction supervision to help ensure proper project design and construction.
- The cost of necessary project engineering services shall not exceed 15.25% of the

approved project construction cost, unless otherwise approved by the IDNR. Costs for eligible reimbursement expenses (including construction supervision, if necessary) may be added in proportion to project complexity if approved by IDNR. The amount of construction supervision and its associated costs as well, as the method of compensation, must be included in the engineering agreement between the Grantee and project engineer. The IDNR shall not be responsible for any engineering costs if the Grantee, by unilateral action, terminates the project prior to completion as specified in the signed Project Agreement.

- Parking lots, restroom facilities, boat docks, etc. constructed with IDNR boating grant funds must be developed and designed in accordance with the Illinois Accessibility Code standards and the Americans with Disabilities Act (ADA) Accessibility Guidelines. A copy of the Illinois Code may be obtained at the following website: <https://www2.illinois.gov/cdb/business/codes/IllinoisAccessibilityCode/Pages/default.aspx>. Although the Illinois Accessibility Code does not address specific accessibility criteria for all outdoor recreation facilities, there is a "Recreation Boating Facilities" reference on Page 70. To supplement this information, the US Architectural and Transportation Barriers Compliance Board, pursuant to ADA, has developed final guidelines for recreation facilities and outdoor developed areas. Copies of the guidelines can be found at the following website: <https://www.access-board.gov/guidelines-and-standards/recreation-facilities>.
- The following design manual is an excellent reference to use in the designing/constructing the approved boat access facility: Design Handbook for Recreational Boating & Fishing Facilities, published by the States Organization for Boating Access (SOBA). More information on this publication can be found on SOBA's website: <http://www.sobaus.org>. The IDNR may be contacted regarding suggested facility design criteria.

Within the submitted grant documents that were approved, the estimated cost for Architectural/Engineering Services was \$20,000.00, which is also within the required IDNR not-to-exceed amount of 15.25%.

RECOMMENDED ACTION: Authorize approval of a professional service engineering agreement with ERA in the amount of \$20,000.00

DEPARTMENT HEAD APPROVAL Luke A. Humphrey	VILLAGE ADMINISTRATOR Scott Eisenhauer
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RESOLUTION NO. 04-23-1389

**A RESOLUTION
AUTHORIZING AND APPROVING A SERVICES CONTRACT BETWEEN
THE VILLAGE OF RANTOUL AND ENGINEERING RESOURCE ASSOCIATES, INC.**

WHEREAS, there has been presented to and there is now before this meeting of the President and the Board of Trustees (the **“Corporate Authorities”**) of the Village of Rantoul, Champaign County, Illinois (the **“Village”**) at which this Resolution is adopted, the form of a certain Services Contract (Heritage Lake Boat Access Project) (the **“Contract”**) by and between the Village and Engineering Resource Associates, Inc. (ERA) (the **“Contractor”**) in connection with the provision of certain land surveying and engineering services.

NOW THEREFORE, BE IT RESOLVED BY THE PRESIDENT AND BOARD OF TRUSTEES OF THE VILLAGE OF RANTOUL, CHAMPAIGN COUNTY, ILLINOIS, as follows:

Section 1. That the Contract by and between the Village and the Contractor, in substantially the form thereof which has been presented to and is now before the meeting of the Corporate Authorities of the Village at which this Resolution is adopted, be and the same is hereby authorized and approved.

Section 2. That for and on behalf of the Village, the Village President is hereby authorized to execute and deliver the Contract and the Village Clerk is hereby authorized to attest thereto, with such insertions, corrections and technical revisions in the form of such Contract as may be approved by such Village President, such execution or acceptance thereof, as the case may be, to constitute conclusive evidence of such approval of any and all such insertions, corrections or technical revisions therein from the form of the Contract now before the meeting of the Corporate Authorities at which this Resolution is adopted.

This Resolution is hereby passed, the “ayes” and “nays” being called, by the concurrence of a majority of the members of the Corporate Authorities then holding office at a regular meeting held on the date set forth below.

PASSED this 11th day of April, 2023.

Village Clerk

APPROVED this 11th day of April, 2023.

Village President

Mr. Luke Humphrey
Director, Village of Rantoul Recreation Department
333 South Tanner Street
Rantoul, IL 61866

March 13, 2023

Subject: Professional Services for the Heritage Lake Boat Access Area Development, Rantoul, IL

Dear Mr. Humphrey,

Engineering Resource Associates, Inc. (ERA) is pleased to submit this proposal for land surveying and site civil engineering for the proposed Heritage Lake Boat Access Area Development for the Village of Rantoul Recreation Department. This proposal is based upon your request, our knowledge of the project following a review of the BAAD grant submittal, and our experience on similar projects over recent years.

Project Understanding

The project is expected to consist of construction of a new 1 lane boat ramp, construction of a paddle boat/canoe launch, installation of a new floating dock, access paths along each item, and repair and possible reconfiguration of the existing parking lot at Heritage Lake in Rantoul, IL. ERA will complete site layout based on previously completed Master Planning Services and provide aid in meeting the requirements of the BAAD grant program used to fund the project.

Scope of Services

ERA will provide professional services in accordance with the following work plan:

- 1. Site Survey and Partial Topographical Plan** - ERA shall prepare a current plan of existing conditions based on a partial topographical survey of the subject site, limited to the areas of proposed improvements. The plan includes the following:
 - 1.1. Topography shall be based on a benchmark with a record description and year of datum clearly indicated on the survey, as provided by the Owner. Benchmark to be noted and shown graphically.
 - 1.2. Survey shall be limited to areas of proposed improvements. Topography shall consist of spot grades at all breaks and abrupt changes with contours plotted at one-foot intervals. All measured spot elevation will be depicted.
 - 1.3. The locations of existing structures and hard surfaces located within the area of proposed improvements.
 - 1.4. Elevations tied to NAVD88 vertical elevation datum.
 - 1.5. Survey shall include all topographic features visible and in plain sight, including but not limited to walkways, signage, paving, parking areas, curbs, and shoreline features.

2. **Preliminary Engineering Plan** - This task includes preparation of a preliminary engineering plan for review and coordination with Village of Rantoul staff to obtain input and feedback. This task also includes preparing a CAD drawing based on the concept plan in the approved BAAD grant submittal showing the desired location of the proposed items. Potential modifications to the approved concept plan will be reviewed, recommended, and discussed with the Owner to assure compliance with the grant requirements.
3. **Final Engineering Plans** - This task includes the design of site elements and preparation of final engineering plans. The plans will include the following information:
 - 3.1. Grading & Erosion Control – including proposed spot grades, access ramp grades, pavement grades, drainage, erosion control measures, etc.
 - 3.2. Site Geometrics – including layout of proposed boat access ramp, sidewalk layout to proposed floating dock, canoe launch access, road widths, sidewalk widths, etc.
 - 3.3. Structural design of the proposed boat access ramp in accordance with IDNR standards.
 - 3.4. Featured equipment details, construction details, material specifications, and general notes.
 - 3.5. Repairs to the existing parking lot or possible layout reconfiguration in accordance with ERA's previously submitted layout concept plan.
4. **Technical Specifications** - ERA will prepare technical specifications for any work related to ERA's design. Front end documents and general requirements shall be provided by the Owner.
5. **Permitting** - ERA will coordinate and assist the Owner with permit submittals including:
 - 5.1. Village of Rantoul Site Development and Stormwater Permit
 - 5.2. IEPA Notice of Intent (NOI)
 - 5.3. Village of Rantoul Building Permit
 - 5.4. IDNR/IHPA sign-off
6. **Bid Phase Services** – This phase shall consist of assisting the Owner with the bid advertisement, general bid requirements, addendum preparation, and responses to Contractor queries for bidding purposes.
7. **Construction Phase** – Anticipated services include: Consultation with Contractor during project construction, responses to Contractor RFIs, shop drawing submittal reviews, and aiding the Owner with required documentation to meet the requirements of the BAAD grant program. Full-time construction observation is **not** included in the Scope of Services, but shall consist of site visits on an as-needed basis and monthly project pay request reviews.

Schedule

The work described in this agreement will be performed as expeditiously as weather and other physical conditions permit. The Engineer shall not be liable to the Owner, if delayed in, or prevented from performing the work as specified herein through any cause or causes beyond the control of the Engineer and not caused by his own fault or negligence including acts of God, or the public enemy, inclement weather conditions, acts of the government after the effective date of this agreement, fires, floods, epidemics, strikes, jurisdictional disputes, lockouts, and freight embargoes.

Fees

The OWNER will pay ERA for professional time, as invoices are presented or at monthly intervals, at the hourly rates shown in the attached schedule.

A. Site Survey & Partial Topographical Plan	\$ 3,500
B. Preliminary Engineering	\$ 3,000
C. Final Engineering	\$ 6,500
D. Technical Specifications	\$ 2,000
E. Village Meetings & Permitting Assistance	\$ 500
F. Bid Phase Services	\$ 1,500
G. Construction Phase Services	\$ 2,500
H. <u>Expenses</u>	\$ 500

Total	\$20,000
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ERA agrees to a **Lump Sum Fee of \$20,000** for this Scope of Services without authorization from the OWNER for additional services. The OWNER will pay ERA for expenses at cost, including mileage, equipment rental, materials, supplies, shipping, and other such expenses necessary for implementation of the Scope of Services.

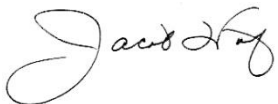
Additional services may be completed, following authorization by the OWNER, using the hourly rates shown in the attached schedule.

Please send payment(s) to:
2416 Galen Drive, Champaign, IL 61820

We appreciate the opportunity to submit this professional services agreement and trust that it meets with your approval. If acceptable, please sign this Acceptance & Authorization Form where indicated and return one (1) copy for our files. Receipt of executed agreement will serve as authorization to proceed with the project to the full extent of the contract. The attached General Terms and Conditions are expressly incorporated into and are an integral part of this agreement.

If you have any questions, please contact me at 217-351-6268 or jwolf@eraconsultants.com

Sincerely,
ENGINEERING RESOURCE ASSOCIATES, INC.



Jacob Wolf, PE Principal/Project Manager

Exhibit 1

Acceptance & Authorization Form – March 13, 2023 Proposal
Heritage Lake Boat Access Development, Rantoul, IL

ENGINEERING RESOURCE ASSOCIATES, INC.

RANTOUL RECREATION DEPARTMENT



Authorized Signature

Authorized Signature

Jacob Wolf, PE Principal/Project Manager

Printed Name and Title

Printed Name and Title

2416 Galen Drive
Champaign, Illinois 61820
217-351-6268 t, 217-355-1902 f

Date

Please Provide Contact Information:

Mailing Address:
(please provide street address for UPS
deliveries)

Telephone Number:

Email Address:

INVOICES should be sent via:

If different than above address,
invoices should be addressed to:

Invoice Email Address (if different than above):

Note any billing procedures/forms:

Email ☐ USPS Mail ☐ Email & USPS Mail ☐

Attn:

Exhibit 2

Engineering Resource Associates, Inc.

2022-2023 HOURLY RATES FOR PROFESSIONAL SERVICES

April 1, 2022 THROUGH December 31, 2023

<i>Staff Category</i>	<i>Average Hourly Billing Rate</i>
Professional Engineer VI	\$ 214.00
Professional Engineer V	\$ 202.00
Professional Engineer IV	\$ 195.00
Professional Engineer III	\$ 159.00
Professional Engineer II	\$ 139.00
Professional Engineer I	\$ 121.00
Structural Engineer IV	\$ 230.00
Structural Engineer III	\$ 200.00
Structural Engineer II	\$ 159.00
Staff Engineer III	\$ 129.00
Staff Engineer II	\$ 104.00
Staff Engineer I	\$ 97.00
Engineering Intern III	\$ 79.00
Engineering Intern II	\$ 60.00
Engineering Intern I	\$ 52.00
Engineering Technician V	\$ 131.00
Engineering Technician IV	\$ 106.00
Engineering Technician III	\$ 96.00
Engineering Technician II	\$ 77.00
Engineering Technician I	\$ 69.00
Ecological Services Director	\$ 163.00
Environmental Specialist IV	\$ 168.00
Environmental Specialist II	\$ 100.00
Environmental Specialist I	\$ 87.00
Professional Surveyor II	\$ 171.00
Professional Surveyor I	\$ 154.00
Surveyor IV	\$ 115.00
Surveyor III	\$ 106.00
Surveyor II	\$ 82.00
Surveyor I	\$ 62.00
GIS/Public Outreach	\$ 96.00
Administrative Director	\$ 157.00
Administrative Staff IV	\$ 117.00
Administrative Staff III	\$ 92.00
Administrative Staff II	\$ 83.00
Administrative Staff I	\$ 66.00

Engineering Resource Associates, Inc.

GENERAL TERMS AND CONDITIONS

1. **COMPLIANCE WITH LAWS:** Engineering Resource Associates, Inc. (Engineer) will strive to exercise usual and customary professional care in his efforts to comply with those laws, codes, ordinance and regulations which are in effect as of the date of this Agreement.

With specific respect to prescribed requirements of the Americans with Disabilities Act of 1990 or certified state or local accessibility regulations (ADA), Client understands ADA is a civil rights legislation and that interpretation of ADA is a legal issue and not a design issue and, accordingly, retention of legal counsel (by Client) for purposes of interpretation is advisable. As such and with respect to ADA, Client agrees to waive any action against Engineer, and to indemnify and defend Engineer against any claim arising from Engineer's alleged failure to meet ADA requirements prescribed.

2. **DESIGNATION OF AUTHORIZED REPRESENTATIVE:** Each party (to this Agreement) shall designate one or more persons to act with authority in its behalf in respect to appropriate aspects of the Project. The persons designated shall review and respond promptly to all communications received from the other party.
3. **STANDARD OF PRACTICE:** The Engineer will strive to conduct services under this Agreement in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as of the date of this Agreement. No other representation, express or implied, and no warranty or guarantee is included or intended in this Agreement, or in any report, opinion, document, or otherwise.
4. **GOVERNING LAW:** This Agreement shall be governed by and construed in accordance with Articles previously set forth by Item 1. of this Agreement, together with the laws of the State of Illinois.
5. **RESPONSIBILITY OF THE ENGINEER:** Notwithstanding anything to the contrary which may be contained in this Agreement or any other material incorporated herein by reference, or in any Agreement between the Client and any other party concerning the Project, the Engineer shall not have control or be in charge of and shall not be responsible for the means, methods, techniques, sequences or procedures of construction, or the safety, safety precautions or programs of the Client, the construction contractor, other contractors or subcontractors performing any of the work or providing any of the services on the Project. Nor shall the Engineer be responsible for the acts or omissions of the Client, or for the failure of the Client, any architect, engineer, consultant, contractor or subcontractor to carry out their respective responsibilities in accordance with the Project documents, this Agreement or any other agreement concerning the Project. Any provision which purports to amend this provision shall be without effect unless it contains a reference that the content of this condition is expressly amended for the purposes described in such amendment and is signed by the Engineer.
6. **CLIENT'S RESPONSIBILITIES:** The Client agrees to require the Contractor, to the fullest extent permitted by law, to indemnify, hold harmless, and defend the Engineer, its consultants, and the employees and agents of any of them from and against any and all claims, suits, demands, liabilities, losses, damages, and costs ("Losses"), including but not limited to costs of defense, to the extent arising in whole or in part out of the negligence of the Contractor, its subcontractors, the officers, employees, agents, and subcontractors of any of them, or anyone for whose acts any of them may be liable, regardless of whether or not such Losses are caused in part by a party indemnified hereunder. Specifically excluded from the foregoing are Losses arising out of the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs, or specifications, and the giving of or failure to give directions by the Engineer, its consultants, and the agents and employees of any of them, provided such giving or failure to give is the primary cause of Loss.

The Client further agrees to require the Contractor to name the Engineer, its agents and consultants as additional insureds on the Contractor's policy or policies of comprehensive or commercial general liability insurance. Such insurance shall include products and completed operations and contractual liability coverages, shall be primary and non-contributing with any insurance maintained by the Engineer or its agents and consultants, and shall provide that the Engineer be given thirty days, unqualified written notice prior to any cancellation thereof.

In the event the foregoing requirements, or any of them, are not established by the Client and met by the Contractor, the Client agrees to indemnify and hold harmless the Engineer, its employees, agents, and consultants from and against any and all Losses which would have been indemnified and insured against by the Contractor, but were not.

When Contract Documents prepared under the Scope of Services of this contract require insurance(s) to be provided, obtained and/or otherwise maintained by the Contractor, the Client agrees to be wholly responsible for setting forth any and all such insurance requirements. Furthermore, any document provided for Client review by the Engineer under this Contract related to such insurance(s) shall be considered as sample insurance requirements and not the recommendation of the Engineer. Client agrees to have their own risk management department review any and all insurance requirements for adequacy and to determine specific types of insurance(s) required for the project. Client further agrees that decisions concerning types and amounts of insurance are specific to the project and shall be the product of the Client. As such, any and all insurance requirements made part of Contract Documents prepared by the Engineer are not to be considered the Engineer's recommendation, and the Client shall make the final decision regarding insurance requirements.

7. **INFORMATION PROVIDED BY OTHERS:** The Engineer shall indicate to the Client the information needed for rendering of the services of this Agreement. The Client shall provide to the Engineer such information as is available to the Client and the Client's consultants and contractors, and the Engineer shall be entitled to rely upon the accuracy and completeness thereof. The Client recognizes that it is impossible for the Engineer to assure the accuracy, completeness and sufficiency of such information, either because it is impossible to verify or because of errors or omissions which may have occurred in assembling the information the Client is providing. Accordingly, the Client agrees, to the fullest extent permitted by law, to indemnify and hold the Engineer and the Engineer's subconsultants harmless from any claim, liability or cost (including reasonable attorneys' fees and cost of defense) for injury or loss arising or allegedly arising from errors, omissions or inaccuracies in documents or other information provided by the Client to the Engineer.
8. **CHANGES:** Client reserves the right by written change order or amendment to make changes in requirements, amount of work, or engineering time schedule adjustments, and Engineer and Client shall negotiate appropriate adjustments acceptable to both parties to accommodate any changes, if commercially possible.
9. **DOCUMENTS DELIVERED TO CLIENT:** Drawings, specifications, and reports prepared by Engineer in connection with any or all of the services furnished hereunder shall be delivered to the Client for the use of the Client. Engineer shall have the right to retain originals of all Project Documents and drawings for its files. Furthermore, it is understood and agreed that the Project Documents such as, but not limited to reports, calculations, drawings, and specifications prepared for the Project, whether in hard copy or machine readable form, are instruments of professional service intended for one-time use in the construction of this Project. These Project Documents are and shall remain the property of the Engineer. The Client may retain copies, including copies stored on magnetic tape or disk, for information and reference in connection with the occupancy and use of the Project.

It is also understood and agreed that because of the possibility that information and data delivered in machine readable form may be altered, whether inadvertently or otherwise, the Engineer reserves the right to retain the original tapes/disks and to remove from copies provided to the Client all identification reflecting the involvement of the Engineer in their preparation. The Engineer also reserves the right to retain hard copy originals of all Project Documentation delivered to the Client in machine readable form, which originals shall be referred to and shall govern in the event of any inconsistency between the two.

The Client understands that the automated conversion of information and data from the system and format used by the Engineer to an alternate system or format cannot be accomplished without the introduction of inexactitudes, anomalies, and errors. In the event Project Documentation provided to the Client in machine readable form is so converted, the Client agrees to assume all risks associated therewith and, to the fullest extent permitted by law, to hold harmless and indemnify the Engineer from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees, arising therefrom or in connection therewith.

The Client recognizes that changes or modifications to the Engineer's instruments of professional service introduced by anyone other than the Engineer may result in adverse consequences which the Engineer can neither predict nor control. Therefore, and in consideration of the Engineer's agreement to deliver its instruments of professional service in machine readable form, the Client agrees, to the fullest extent permitted by law, to hold harmless and indemnify the Engineer from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees, arising out of or in any way connected with the modification, misinterpretation, misuse, or reuse by others of the machine readable information and data provided by the Engineer under this Agreement. The foregoing indemnification applies, without limitation, to any use of the Project Documentation on other projects, for additions to this Project, or for completion of this Project by others, excepting only such use as may be authorized, in writing, by the Engineer.

10. **REUSE OF DOCUMENTS:** All Project Documents including but not limited to reports, original boring logs, field data, field notes, laboratory test data, calculations, opinions of probable costs, drawings and specifications furnished by Engineer pursuant to this Agreement are intended for use on the Project only. They cannot be used by Client or others on extensions of the Project or any other project. Any reuse, without specific written verification or adaptation by Engineer, shall be at Client's sole risk, and Client shall indemnify and hold harmless Engineer from all claims, damages, losses, and expenses including attorney's fees arising out of or resulting therefrom.
11. **FORCE MAJEURE:** Neither Client nor Engineer shall be liable for any fault or delay caused by any contingency beyond their control including but not limited to acts of God, wars, strikes, walkouts, fires, natural calamities, or demands or requirements of governmental agencies.
12. **RELATIONSHIP BETWEEN ENGINEER AND CLIENT:** Engineer shall serve as Clients professional engineer consultant in those phases of the Project to which this Agreement applies. This relationship is that of a buyer and seller of professional services and as such the Engineer is an independent contractor in the performance of this Agreement and it is understood that the parties have not entered into any joint venture or partnership with the other. The Engineer shall not be considered to be the agent of the Client.
13. **SUSPENSION OF SERVICES:** Client may, at any time, by written order to Engineer (Suspension of Services Order) require Engineer to stop all, or any part, of the services required by this Agreement. Upon receipt of such an order, Engineer shall immediately comply with its terms and take all reasonable steps to minimize the costs associated with the services affected by such order. Client, however, shall pay all costs incurred by the suspension, including all costs necessary to maintain continuity and for the resumption of the services upon expiration of the Suspension of Services Order. Engineer will not be obligated to provide the same personnel employed prior to suspension, when the services are resumed, in the event that the period of suspension is greater than thirty (30) days.
14. **TERMINATION:** This Agreement may be terminated by either party upon thirty (30) days written notice in the event of substantial failure by the other party to perform in accordance with the terms hereof through no fault of the terminating party. This Agreement may be terminated by Client, under the same terms, whenever Client shall determine that termination is in its best interests. Cost of termination, including salaries, overhead and fee, incurred by Engineer either before or after the termination date shall be reimbursed by Client.
15. **SUCCESSORS AND ASSIGNS:** The terms of this Agreement shall be binding upon and inure to the benefit of the parties and their respective successors and assigns; provided, however, that neither party shall assign this Agreement in whole or in part without the prior written approval of the other.
16. **ENTIRE UNDERSTANDING OF AGREEMENT:** This Agreement represents and incorporates the entire understanding of the parties hereto, and each party acknowledges that there are no warranties, representations, covenants or understandings of any kind, matter or description whatsoever, made by either party to the other except as expressly set forth herein. Client and the Engineer hereby agree that any purchase orders, invoices, confirmations, acknowledgments or other similar documents executed or delivered with respect to the subject matter hereof that conflict with the terms of the Agreement shall be null, void and without effect to the extent they conflict with the terms of this Agreement.
17. **AMENDMENT:** This Agreement shall not be subject to amendment unless another instrument is duly executed by duly authorized representatives of each of the parties and entitled "Amendment of Agreement".
18. **PAYMENT:** Client shall be invoiced once each month for work performed during the preceding period. Client agrees to pay each invoice within thirty (30) days of its receipt. The client further agrees to pay interest on all amounts invoiced and not paid or objected to for valid cause within said thirty (30) day period at the rate of eighteen (18) percent per annum (or the maximum interest rate permitted under applicable law, whichever is the lesser) until paid. Client further agrees to pay Engineer's cost of collection of all amounts due and unpaid after sixty (60) days, including court costs and reasonable attorney's fees, as well as costs attributed to suspension of services accordingly. In the event legal action is necessary to enforce the payment provisions of this Agreement, the Engineer shall be entitled to collect from the Client any judgement or settlement sums due, reasonable attorneys' fees, court costs and expenses incurred by the Engineer in connection therewith and, in addition, the reasonable value of the Engineer's time and expenses spent in connection with such collection action, computed at the Engineer's prevailing fee schedule and expense policies. If the Client fails to make payments when due or otherwise is in breach of this Agreement, the Engineer may suspend performance of services upon five (5) calendar days' notice to the Client. The Engineer shall have no liability whatsoever to the Client for any costs or damages as a result of such suspension caused by any breach of this Agreement by the Client. Client will reimburse

Engineer for all associated costs as previously set forth in Item 13 of this Agreement. Payments due Engineer are not contingent upon project approval or project financing and are the sole responsibility of the Client. If an invoice for work performed by Engineer remains unpaid sixty (60) days from the date of the invoice and, if there is no written resolution of payment from the client during the sixty (60) day period, Engineer will stop all work on the assignment.

19. **INDEMNIFICATION:** Engineer agrees, to the fullest extent permitted by law, to indemnify and hold harmless Client up to the amount of this contract fee (for services) from loss or expense, including reasonable attorney's fees to the extent caused by Engineer's negligent acts, errors or omissions in the performance of professional services under this Agreement. Client agrees, to the fullest extent permitted by law, to indemnify and hold harmless Engineer from any damage, liability or cost, including reasonable attorneys' fees and costs of defense, to the extent caused by the Client's negligent acts, errors or omissions and those of his or her contractors, subcontractors or consultants or anyone for whom the Client is legally liable, and arising from the project that is the subject of this Agreement. In the event of joint or concurrent negligence of Engineer and Client, each shall bear that portion of the loss or expense that its share of the joint or concurrent negligence bears to the total negligence (including that of third parties) which caused the personal injury or property damage. Engineer shall not be liable for special, incidental or consequential damages, including, but not limited to loss of profits, revenue, use of capital, claims of customers, cost of purchased or replacement power, or for any other loss of any nature, whether based on contract, tort, negligence, strict liability or otherwise, by reasons of the services rendered under this Agreement.
20. **LIMIT OF LIABILITY:** The Client and the Engineer have discussed the risks, rewards, and benefits of the project and the Engineer's total fee for services. In recognition of the relative risks and benefits of the Project to both the Client and the engineer, the risks have been allocated such that the Client agrees that to the fullest extent permitted by law, the Engineer's total aggregate liability to the Client for any and all injuries, claims, costs, losses, expenses, damages of any nature whatsoever or claim expenses arising out of this Agreement from any cause or causes, including attorney's fees and costs, and expert witness fees and costs, shall not exceed the total Engineer's fee for professional engineering services rendered on this project as made part of this Agreement. Such causes included but not limited to the Engineer's negligence, errors, omissions, strict liability or breach of contract. It is intended that this limitation apply to any and all liability or cause of action however alleged or arising, unless otherwise prohibited by law.
21. **NOTICES:** Any notice or designation required to be given to either party hereto shall be in writing, and unless receipt of such notice is expressly required by the terms hereof shall be deemed to be effectively served when deposited in the mail with sufficient first class postage affixed, and addressed to the party to whom such notice is directed at such party's place of business or such other address as either party shall hereafter furnish to the other party by written notice as herein provided.
22. **ACCESS AND PERMITS:** Client shall arrange for Engineer to enter upon public and private property and obtain all necessary approvals and permits required from all governmental authorities having jurisdiction over the Project. Client shall pay costs (including Engineer's employee salaries, overhead and fee) incident to any effort by Engineer toward assisting Client in such access, permits or approvals, if Engineer perform such services.
23. **WAIVER OF CONTRACT BREACH:** The waiver of one party of any breach of the Agreement or the failure of one party to enforce at any time, or for any period of time, any of the provisions hereof, shall be limited to the particular instance, shall not operate or be deemed to waive any future breaches of this Agreement and shall not be construed to be a waiver of any provision, except for the particular instance.
24. **OPINIONS OF PROBABLE COST:** Since Engineer has no control over the cost of labor, materials or equipment, or over the Contractor(s) method of determining process, or over competitive bidding or market conditions, his opinions of probable Project Construction Cost provided for herein are to be made on the basis of his experience and qualifications and represent his best judgement as a design professional familiar with the construction industry, but Engineer cannot and does not guarantee that proposal, bids or the Construction Cost will not vary from opinions of probable construction cost prepared by him. If prior to the Bidding or Negotiating Phase, Client wishes greater accuracy as to the Construction Cost, the Client shall employ an independent cost estimator Consultant for the purpose of obtaining a second construction cost opinion independent from Engineer.
25. **CONSTRUCTION OBSERVATION CLAUSE:** The Owner will include the following clause in the construction contract documents and Owner agrees not to modify or delete it:

Kotecki Waiver: Contractor (and any subcontractor into whose subcontract this clause is incorporated) agrees to assume the entire liability for all personal injury claims suffered by its own employees, including without limitation claims under the

Illinois Structural Work Act, asserted by persons allegedly injured on the Project; waives any limitation of liability defense based upon the Workers Compensation Act, court interpretations of said Act or otherwise; and agrees to indemnify and defend Owner and Engineer and their agents, employees and consultants (the "Indemnities") from and against all such loss, expense, damage or injury, including reasonable attorneys' fees, that the indemnities may sustain as a result of such claims, except to the extent that Illinois law prohibits indemnity for the indemnities' own negligence.

26. **SEVERABILITY OF INVALID PROVISIONS:** If any provision of the Agreement shall be held to contravene or to be invalid under the laws of any particular state, county or jurisdiction where used, such contravention shall not invalidate the entire Agreement, but it shall be construed as if not containing the particular provisions held to be invalid in the particular state, country or jurisdiction and the rights or obligations of the parties hereto shall be construed and enforced accordingly.
27. **HAZARDOUS MATERIALS:** It is acknowledged by both parties that Engineer's scope of services does not include any services related to asbestos or hazardous or toxic materials. In the event Engineer or any other party encounters asbestos or hazardous or toxic materials at the job site, or should it become known in any way that such materials may be present at the job site or any adjacent areas that may affect the performance of Engineer's services, Engineer may at his option and without liability for consequential or any other damages, suspend performance of services on the project until Client retains appropriate specialist consultant(s) or contractor(s) to identify, abate and/or remove the asbestos or hazardous or toxic materials, and warrant that the job site is in full compliance with applicable laws and regulations.
28. **RIGHT OF ENTRY:** Client hereby grants Engineer and its subcontractors or agents the right to enter from time to time property owned by Client and/or other(s) in order for Engineer to fulfill the scope of services included hereunder. Client understands that use of exploration equipment may cause some damage, the correction of which is not part of this Agreement. Client also understands that the discovery of certain hazardous conditions and/or taking preventive measures relative to these conditions may result in a reduction of the Property's value. Accordingly, Client waives any claim against Engineer and its subcontractors or agents, and agrees to defend, indemnify and hold Engineer harmless from any claim or liability for injury or loss allegedly arising from procedures associated with subsurface exploration activities or discovery of hazardous materials or suspected hazardous materials. In addition, Client agrees to compensate Engineer for any time spent or expenses incurred by Engineer in defense of any such claim with compensation to be based upon Engineer's prevailing fee schedule and expense reimbursement policy. Engineer shall not be liable for damage or injury from damage to subterranean structures (pipes, tanks, cables, or other utilities, etc.) which are not called to Engineer's attention in writing and correctly shown on the diagram(s) furnished by Client to Engineer.
29. **SAMPLES:** Soil, rock, water and/or other samples obtained from the Project site are the property of Client. Engineer shall preserve such samples for no longer than sixty (60) calendar days after the issuance of any document that includes the data obtained from them, unless other arrangements are mutually agreed upon in writing. Should any of these samples be contaminated by hazardous substances or suspected hazardous substances, it is Client's responsibility to select and arrange for lawful disposal procedures, that is, procedures which encompass removing the contaminated samples from Engineer's custody and transporting them to a disposal site. Client is advised that, in all cases, prudence and good judgment should be applied in selecting and arranging for lawful disposal procedures. Due to the risks to which Engineer is exposed, Client agrees to waive any claim against Engineer, and to defend, indemnify and hold Engineer harmless from any claim or liability for injury or loss arising from containing, labeling, transporting, testing, storing, or other handling of contaminated samples. Client also agrees to compensate Engineer for any time spent and expenses incurred by Engineer in defense of any such claim, with such compensation to be based upon Engineer's prevailing fee schedule and expense reimbursement policy.

END OF GENERAL TERMS AND CONDITIONS

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Amendment to the Engineering Agreement for the Wastewater Nutrient Assessment Reduction Plan Study Project with Donohue & Associates, Inc in the amount of \$33,740.00	DEPARTMENT: Public Works
DATE: April 4, 2023	AMOUNT: \$27,010.00 - Original \$33,740.00 - Amendment \$60,750.00 - Amended Total
ATTACHMENTS: 1. Donohue & Associates, Inc Engineering Agreement Amendment	ADMINISTRATIVE NOTES:

SUMMARY HIGHLIGHTS:

This Agenda Item provides for Amendment #1 to the engineering service agreement with Donohue & Associates, Inc. (Donohue) to increase the engineering services for the development of the Wastewater Nutrient Assessment Reduction Plan Study (Project) to a not-to-exceed amount of \$60,750.00 (an increase of \$33,740.00).

The United States Environmental Protection Agency (USEPA) has mandated the Village to develop a Nutrient Assessment and Reduction Plan (NARP), and the purpose of the NARP is to identify phosphorous reductions and other measures needed to help ensure the dissolved oxygen and aquatic life criteria are met throughout the watershed; to be completed by December 31, 2023.

Donohue completed the initial monitoring during 2022 and some impairments were found; the USEPA has requested that we supply more data to support our study. The services have been modified to include the following additional activities:

Updated Task 4 — Monitoring Program

- Follow-up monitoring in 2023 at Rantoul during critical periods in the summer of 2023
- Data management, analysis, and monitoring reports

Phase II - Task 1 (new task) — Preliminary Instream Water Quality Modeling

- Build QUAL2K water quality models
- Run nutrient, DO, and pH simulations to evaluate and guide NARP strategies

This item is included in the Fiscal Year 2023 Budget.

RECOMMENDED ACTION: Authorize the approval of Engineering Service Agreement Amendment #1 (\$33,740.00) with Donohue & Associates, Inc. for the development of the Wastewater Nutrient Assessment Reduction Plan Study (Project). The new not-to-exceed amount of \$60,750.00.

DEPARTMENT HEAD APPROVAL
Jacob D. McCoy, P.E.

VILLAGE ADMINISTRATOR
Scott Eisenhauer



**AMENDMENT NO. 1 to
ENGINEERING SERVICES AGREEMENT
Nutrient Assessment Reduction Plan Study (Project)
Original Agreement Executed February 8, 2022**

This Amendment is by and between:

Village of Rantoul (Owner)
333 South Tanner Street
Rantoul, IL 61866

and

Donohue & Associates, Inc. (Donohue)
1605 South State Street, Suite 1C
Champaign, IL 61820

Who agree to amend the original Agreement, as follows:

PART I – B. SCOPE OF SERVICES

The services have been modified to include the following additional activities:

Task 4 – Monitoring Program

- Follow-up monitoring in 2023 at Rantoul during critical periods in the summer of 2023
- Data management, analysis and monitoring reports for both plants

Phase II - Task 1 (new task) – Preliminary Instream Water Quality Modeling

- Build QUAL2K water quality models
- Run nutrient, DO and pH simulations to evaluate and guide NARP strategies

PART III – A. COMPENSATION

Compensation for the services set forth in Part I shall be increased \$33,740, resulting in a total contract amount of \$60,750.

APPROVED FOR OWNER

By: _____

Printed Name: _____

Title: _____

Date: _____

APPROVED FOR DONOHUE

By: Craig W. Brunner

Printed Name: CRAIG W. BRUNNER

Title: PRESIDENT

Date: Jan. 11, 2023

ORIGINAL

FOR REFERENCE ONLY



ENGINEERING SERVICES AGREEMENT

Nutrient Assessment Reduction Plan Study (Project)

This Agreement is by and between:

Village of Rantoul (Owner)
333 South Tanner Street
Rantoul, IL 61866

and

Donohue & Associates, Inc. (Donohue)
1605 South State Street
Suite 1C
Champaign, IL 61820

Who agree as follows:

Owner hereby engages Donohue to perform the Services set forth in Part I for the compensation set forth in Part III. Donohue will be authorized to commence the Services upon execution and receipt of this Agreement from Owner. Owner and Donohue agree that this signature page, together with Parts I through IV attached, constitute the entire agreement for this Project.

APPROVED FOR OWNER

By: Charles Smith

Printed Name: Charles Smith

Title: MAYOR

Date: 2-8-2022

APPROVED FOR DONOHUE

By: Craig W. Brunner

Printed Name: Craig W. Brunner

Title: President

Date: January 17, 2022

PART I
PROJECT DESCRIPTION/SCOPE OF SERVICES/TIMING

A. PROJECT DESCRIPTION

The Village of Rantoul and the Urbana & Champaign Sanitary District (UCSD) desire to retain Donohue to prepare the Nutrient Assessment Reduction Plan as required by their NPDES permits. The developed NARP will serve to satisfy the NPDES requirements for the Village of Rantoul East STP, the UCSD Southwest Plant, and the UCSD Northeast Plant.

The overall study envisions two phases of work as follows:

Phase 1

- Data Mining, Analysis & Monitoring Plan
- Preliminary Watershed Characterization
- Stakeholder Engagement
- Monitoring Program
- NARP Strategy and Workplan

Phase 2

- Water Quality Models and Targets
- Watershed Management Scenarios
- Implementation Plan and Schedule
- Finalize NARP Documents

Donohue is planning to perform the Phase 1 tasks only under this agreement. Phase 2 scope and fee, if needed, will be negotiated after completion of the Phase 1 tasks. Both UCSD and Rantoul will perform the bulk of the laboratory testing, with the exception of the chlorophyll α testing.

The following is a detailed listing of tasks for the proposed scope of services.

B. SCOPE OF SERVICES

Basic Services to be provided by Donohue for this Project under this Agreement are as follows:

Task 1 – Data Mining, Analysis and Monitoring Plan

The project team will assimilate and synthesize data relevant to both watersheds and the impaired stream segments. Data sources and some initially compiled resources include:

- Plant operation and instream water quality data collected by the USCD and Village of Rantoul
- Academic research projects and applicable data related to the receiving waterbodies
- Data from local, State and Federal agencies (i.e., Illinois EPA and USGS data available in the watersheds, including stations downstream of the POTWs)
- 2018 Upper Kaskaskia River TMDL
- 2016 Water Quality Analysis of the Kaskaskia River Watershed
- 2007 Watershed Implementation Plan for the Upper Salt Fork of the Vermilion River

A data gap analysis will be performed based on the synthesized data in the context of (i) defining site specific water quality targets, and (ii) understanding if historical/existing data are sufficient to verify that an impairment does indeed exist and (iii) define preliminary insights into the impairment causes.

It is important to determine if adequate data are available to justify an impairment or define the watershed and segment as high eutrophication risk (May-October). Relevant water quality parameters include chlorophyll α , pH, dissolved oxygen, and phosphorus. In some cases, the Illinois EPA expects that NARP requirements be lifted for some POTWs during initial data mining/analysis stages of a study.

Based on the results of the data mining and gap analysis, a focused monitoring (data collection) plan will be developed. This monitoring plan shall be focused on data collection from May – October 2022 to fill gaps, support impairment verification, and guide model requirements and completion of the NARP study in Phase 2. It will clearly define any additional monitoring needs to further evaluate eutrophication risk.

A meeting with Illinois EPA staff will be facilitated to discuss results of the data mining and the monitoring plan. The plan will be modified to address Illinois EPA input and comments.

Task 2 – Preliminary Watershed Characterization

A preliminary watershed characterization will be performed for both watersheds. This task is important to understand the watershed and its hydrology, water quality dynamics, and identify potential sources and causes of impairments. This is also recommended to engage the relevant and appropriate stakeholders early in the process. Characterization is also necessary for water quality and hydrology models and calibration, as well as guiding an informed implementation plan in Phase 2.

The watershed characterization activities will include the following:

- Watershed and subwatershed delineation using LIDAR
- Climate
- Surficial geology
- Soils (runoff, erosion etc.)
- Hydrology and streamflow
- Water quality (relevant to NARP)
- Landuse/landcover/agricultural setting
- Potential nonpoint sources (general screening)
- Potential point sources

Task 3 – Stakeholder Engagement

Should eutrophication risk indicators remain high upon completion of Task 1, dialogue with stakeholders will be initiated. The project team will compile a list for each of the watersheds and put together a recommended strategy for working with and engaging the various stakeholders based on our experience in watershed planning and our local network. If the monitoring (Task 4) is necessary

prior to finalizing the eutrophication risk designation with the Illinois EPA, we may recommend waiting for the completion of Task 4 prior to engaging certain stakeholders.

The project team will however reach out to the Salt Fork Steering Committee and others in the Kaskaskia watershed such as the Kaskaskia Watershed Association (KWA). It is our understanding that the Salt Fork Steering Committee is a primary stakeholder and will participate in an initial kickoff meeting. Their input will be solicited throughout Phase 1 and Phase 2 of the NARP study.

In addition to existing and active groups, stakeholder engagement may be expanded to others critical to a successful implementation plan:

- State and County Farm Bureau(s)
- County Soil and Water Conservation Districts (SWCD) and the Natural Resources Conservation Service (NRCS)
- Environmental groups such as Prairie Rivers Network and urban residents
- Agricultural industry groups such as the Illinois Fertilizer and Chemical Association or Illinois Corn Growers
- Institutions of higher education and researchers

Depending on how the project progresses, we may also engage non-profit organizations with existing programs and resources to help treatment plants build and maintain a working stakeholder group and facilitate water quality trading. One such group is the Sand County Foundation which has received funding through the Walton Family Foundation to form municipal/agricultural partnerships and agreements to meet NARP requirements.

Task 4 – Monitoring Program

If existing data is inadequate to make a risk determination and/or to support cost-effective modeling and implementation planning, the monitoring program will be executed based on feedback from the Illinois EPA and relevant stakeholders.

It is important that the program occur from May through October 2022. The specific scope and budget will be finalized and presented to USCD and Rantoul.

The preliminary monitoring scope is outlined below:

1. Monitoring at up to six stations, one above and below each of the three treatment plant outfalls:
 - a. Data loggers for stream stage, dissolved oxygen, pH, temperature, and chlorophyll-a.
 - b. Bi-weekly or monthly sampling for stream flow, nutrients, field parameters (DO, ORP, EC, temperature, pH) and data logger upload/calibration/maintenance.
 - c. Other data that may be important for instream water quality models and simulations.

A monitoring report will be produced at the conclusion of the period in October 2022 to support the finalization of the NARP Strategy and Workplan.

Task 5 – NARP Strategy and Workplan

The NARP Strategy and Workplan will be developed based on the results of Task 1-4 and input from the Illinois EPA.

The NARP Strategy and Workplan will include the following components and serve as the basis for the approach, scope and costs for Phase 2.

- Background and executive summary of Phase 1
- Strategy to establish water quality targets (adopt INSAC guidelines or pursue site-specific)
- Water quality and watershed modeling strategy and scope
- Approach to identify and evaluate nutrient management scenarios and alternatives
- Implementation plan outline to achieve water quality targets
- Definition of deliverables based on Illinois EPA input

Depending on Phase 1 results, it will be determined whether there are regulatory advantages, efficiencies and cost-benefits to pursue one or multiple NARPs to capture the NPDES permit requirements.

C. PROJECT TIMING

1. Donohue shall be authorized to commence the Services set forth herein upon execution of this Agreement. Donohue will submit deliverables according to the following schedule, assuming a February 1, 2022 Notice to Proceed date from the Village:

a. Task 1: Data Mining, Analysis & Monitoring Plan	– February to March, 2022
b. Task 2: Preliminary Watershed Characterization	– April to June, 2022
c. Task 3: Stakeholder Engagement	– February 2022 to May 2023
d. Task 4: Monitoring Program	– May to October, 2022
e. Task 5: NARP Strategy and Workplan	– May to December, 2022
2. Donohue's services under this Agreement will be considered complete when Donohue has delivered to Owner the Final NARP Strategy and Workplan deliverable defined under Scope of Services.

PART II OWNER RESPONSIBILITIES

A. In addition to other responsibilities of Owner set forth in this Agreement, Owner shall:

1. Identify a person authorized to act as the Owner's representative to respond to questions and make decisions on behalf of Owner, accept completed documents, approve payments to Donohue, and serve as liaison with Donohue as necessary for Donohue to complete its Services.
2. Furnish to Donohue copies of existing documents and data pertinent to Donohue's Scope of Services, including but not limited to and where applicable: design and record drawings for existing facilities; property descriptions, land use restrictions, surveys, geotechnical and environmental studies, or assessments. In addition, furnish any available historical water quality and flow data in digital format. The Owner shall provide any relevant or available GIS data and assists with data mining where appropriate.

3. Owner shall be responsible for all requirements and instructions that it furnishes to Donohue pursuant to this Agreement, and for the accuracy and completeness of all reports, data, programs, and other information furnished by Owner to Donohue pursuant to this Agreement. Donohue may use and rely upon such requirements, instructions, reports, data, programs, and information in performing or furnishing services under this Agreement, subject to any express limitations or reservations provided by Owner applicable to the furnished items.
4. Provide Donohue safe access to premises necessary for Donohue to provide the Services.
5. Inform Donohue whenever Owner observes or becomes aware of a Hazardous Environmental Conditions, as defined in Part IV.3. of this Agreement, that may affect Donohue's Scope of Services or time for performance.

PART III COMPENSATION, BILLING AND PAYMENT

- A. Compensation for the work as defined in the Scope of Services (Part I) of this Agreement shall be in accordance with Donohue's standard chargeout rates in effect at the time the Services are performed. Routine expenses will be billed at cost and subconsultant costs will include a 10% markup. The total cost for these Services and expenses will not exceed \$27,010.
- B. Donohue will bill Owner monthly, with net payment due in 30 days.
- C. Donohue will notify Owner if Project scope changes require modifications/amendments to this Agreement and the above-stated contract value. Donohue shall provide to the Owner a written Amendment to this Agreement outlining the proposed scope changes and the cost of the proposed scope changes for Owner's review and approval. Services relative to the scope changes will not be initiated without a signed Amendment from Owner.
- D. Laboratory testing will be completed by the UCSD and Village of Rantoul laboratories or by an outside laboratory. Fees for these testing services are not included in Donohue's fee and will be paid for separately by the District or the Village of Rantoul.
- E. The overall fee includes an \$85,000 expense for the Monitoring Program that covers the estimated costs for the following items:
 - i. Monitoring at up to six stations, one above and below each of the three treatment plant outfalls which will consist of data loggers for stream stage, dissolved oxygen, pH, temperature, and chlorophyll α at an estimated cost of \$80,000.
 - ii. Additional laboratory costs for chlorophyll α to calibrate the instream monitoring data loggers at an estimated cost of \$5,000.
- F. It is acknowledged that the Village of Rantoul and the UCSD are partnering on this project through an intergovernmental agreement that is separate from this agreement.

PART IV - STANDARD TERMS AND CONDITIONS

1. STANDARD OF CARE. Donohue's Services shall be performed in accordance with the standard of professional practice ordinarily exercised by the applicable profession under similar circumstances at the same time and in the locality where the Services are performed. Professional services are not subject to, and Donohue does not provide, any warranty or guarantee, express or implied. Any warranties or guarantees contained in any purchase orders, requisitions, or notices to proceed issued by Owner are void and not binding upon Donohue. Notwithstanding any other representations made elsewhere in this Agreement or in the execution of the Project, this Standard of Care shall not be modified. Donohue shall act as an independent consultant at all times during the performance of its services, and no terms of this Agreement, either express or implied, shall create an agency or fiduciary relationship.

2. CHANGE OF SCOPE. The Scope of Services set forth in this Agreement is based on facts known at the time of execution of this Agreement, including, if applicable, information supplied by Owner. For some projects involving conceptual or process development services, scope may not be fully definable during initial phases. As the Project progresses, facts discovered may indicate that the scope must be redefined. Donohue will promptly provide Owner with a written amendment to this Agreement to recognize such change.

3. HAZARDOUS ENVIRONMENTAL CONDITIONS. Unless expressly stated otherwise in the Scope of Services (Part I) of this Agreement, Donohue's scope of services does not include any services relating to a Hazardous Environmental Condition, including but not limited to the presence at the Project site of asbestos, mold, PCBs, petroleum, hazardous substances or any other pollutant or contaminant, as those terms are defined in pertinent federal, state, and local laws. In the event Donohue or any other party encounters a Hazardous Environmental Condition, Donohue may at its option suspend performance of services until Owner: a) retains appropriate consultants or contractors to identify and remediate or remove the Hazardous Environmental Condition; and b) warrants that the Project site is in full compliance with all applicable environmental laws.

4. SAFETY. Unless specifically included as a service to be provided under this Agreement, Donohue specifically disclaims any authority or responsibility for general job site safety, or the safety of persons (other than Donohue employees) or property.

5. DELAYS. If performance of Donohue's Services is delayed through no fault of Donohue, Donohue shall be entitled to an extension of time equal to the delay and an equitable adjustment in compensation.

6. TERMINATION/SUSPENSION. Either party may terminate this Agreement upon 30 days written notice to the other party. Owner shall pay Donohue for all Services, including profit relating thereto, rendered prior to termination, plus any expenses of termination. If either party defaults in its obligations under this Agreement (including Owner's obligation to make required payments), the non-defaulting party may, after giving seven days written notice, suspend performance under this Agreement. The non-defaulting party may not suspend performance if the defaulting party commences to cure such default within the seven-day notice period and completes such cure within a reasonable period of time.

Donohue may terminate this Agreement upon seven days written notice if: a) Donohue believes that Donohue is being requested by Owner to perform services contrary to law or Donohue's responsibilities as a licensed professional; or b) Donohue's Services for the Project are delayed, suspended, or interrupted for a period of at least 90 days for reasons not attributable to Donohue's performance of Services; or c) Owner has failed to pay any amount due and owing to Donohue for a period of at least 60 days. Donohue shall have no liability to Owner on account of such termination.

7. OPINIONS OF CONSTRUCTION COST. Any opinion of construction costs prepared by Donohue is supplied for the general guidance of the Owner only. Since Donohue has no control over competitive bidding or market conditions, Donohue cannot guarantee the accuracy of such opinions as compared to contract bids or actual costs to Owner.

8. RELATIONSHIP TO CONTRACTORS. Donohue shall serve as Owner's professional representative for the Services, and may make recommendations to Owner concerning actions relating to Owner's contractors. Donohue specifically disclaims any authority to direct or supervise the means, methods, techniques, sequences or procedures of construction selected or used by Owner's contractors. Donohue neither guarantees the performance of any construction contractor nor assumes responsibility for any contractor's failure to perform in accordance with the construction contract documents.

9. CONSTRUCTION REVIEW. For projects involving construction, Owner acknowledges that under generally accepted professional practice, interpretations of construction documents in the field are normally required, and that performance of construction-related services by the design professional for the Project permits errors or omissions to be identified and corrected at comparatively low cost. Performance of construction-related professional services by a third party or the Owner risks misinterpretation or alternate interpretation of the design intent. Owner agrees to hold Donohue harmless from any claims resulting from performance of construction-related professional services by persons other than Donohue.

10. BETTERMENT. If any item or component of the Project is required due to omission from the construction documents, Donohue's liability shall be limited to the reasonable costs of correction of the construction, less the cost to the Owner if the omitted item or component had been initially included in the construction contract documents. It is intended by this provision that Donohue will not be responsible for any cost or expense that provides betterment, upgrade, or enhancement of the Project.

11. INSURANCE. Donohue will maintain Professional Liability, Commercial General Liability, Automobile, Worker's Compensation, and Employer's Liability insurance coverage in amounts in accordance with legal and Donohue's business requirements. Donohue shall provide to Owner certificates demonstrating such coverage upon request. For projects involving construction, Owner agrees to protect Donohue's interests through appropriate property and liability insurance, and to require its construction contractor, if any, to include Donohue as an additional insured on Contractor's policies relating to the Project. Donohue's coverages referenced above shall, in such case, be excess over contractor's primary coverage.

12. INDEMNIFICATION. To the fullest extent permitted by law, Owner and Donohue each agree to indemnify the other party and the other party's officers, directors, partners, employees, and representatives, but not defend, from and against losses, damages, and judgments arising from claims by third parties, including reasonable attorneys' fees and expenses recoverable under applicable law, but only to the extent they are found to be

caused by a negligent act, error, or omission of the indemnifying party or any of the indemnifying party's officers, directors, members, partners, agents, employees, or subconsultants in the performance of services under this Agreement. If claims, losses, damages, and judgments are found to be caused by the joint or concurrent negligence of Owner and Donohue, they shall be borne by each party in proportion to its negligence.

To the fullest extent permitted by law, Owner shall indemnify and hold harmless Donohue, its employees, agents, and representatives, and Donohue's subconsultants, from and against any loss, liability, claims and damages caused by, arising out of, or resulting from the presence at the Project site of asbestos, mold, PCBs, petroleum, hazardous substances, or any other pollutant or contaminant, as those terms are defined in pertinent federal, state, and local laws, except to the extent that the loss, liability, or damages are caused solely by the willful misconduct or negligence of Donohue, its agents or employees.

13. LIMITATIONS OF LIABILITY. No owner, shareholder, principal, employee or agent of Donohue shall have individual liability to Owner; and Owner covenants and agrees not to sue any such individual in connection with the Services under this Agreement.

Neither Donohue, Donohue's subconsultants, nor their agents or employees shall be jointly, severally or individually liable to the Owner in excess of the compensation to be paid pursuant to this Agreement or two hundred fifty thousand dollars (\$250,000), whichever is greater, by reason of any act or omission, in tort or contract, including breach of contract, breach of warranty or negligence. To the fullest extent permitted by Laws and Regulations, Owner and Donohue waive against each other, and the other's employees, officers, directors, members, insurers, partners, and consultants, any and all claims for or entitlement to special, incidental, indirect, or consequential damages arising out of, resulting from, or in any way related to this Agreement or the Project, from any cause or causes.

14. OWNERSHIP AND REUSE OF PROJECT DOCUMENTS. All documents and other deliverables, in all media, prepared by or on behalf of Donohue in connection with this Agreement are instruments of service, and Donohue shall hold the copyright to and all other ownership and property interests in such instruments of service. Upon payment for services rendered, Donohue grants Owner a license to use instruments of Donohue's services for the purpose of constructing, occupying or maintaining the Project. Owner shall not reuse any such documents or other deliverables pertaining to the Project for any purpose other than that for which such documents or deliverables were originally prepared. Owner shall not cause or allow the alteration of such documents or deliverables without written verification and approval by Donohue for the specific purpose intended, and any alteration by Owner shall be at the Owner's sole risk. Owner agrees to indemnify and hold harmless Donohue from all claims, damages, and expenses (including reasonable attorneys' and consultants' fees), arising out of such reuse or alteration by Owner or others acting through Owner.

15. ELECTRONIC MEDIA. Copies of documents that may be relied upon by Owner are limited to printed copies that are signed and sealed by Donohue. Files or information in electronic media are furnished by Donohue to Owner solely for convenience of Owner. Because data stored in electronic media format can deteriorate or be modified, the Owner agrees to perform acceptance tests within 60 days. Donohue will not be responsible to correct any errors or for maintenance of documents in electronic media format after the acceptance period.

16. RECORDS RETENTION. Donohue shall retain on file, for a period of five years following completion or termination of its services, copies of contract documents, final deliverables, and accounting records related to Engineer's services under this Agreement. Upon Owner's request, Donohue shall provide a copy of maintained item to Owner at cost.

17. AMENDMENT. This Agreement, upon execution by both parties hereto, can be amended only by a written instrument signed by both parties.

18. SUCCESSORS, BENEFICIARIES AND ASSIGNEES. This Agreement shall be binding upon and inure to the benefit of the owners, administrators, executors, successors, and legal representatives of the Owner and Donohue. The rights and obligations of this Agreement cannot be assigned by either party without written permission of the other party. This Agreement shall be binding upon and inure to the benefit of any permitted assignees.

19. NO THIRD-PARTY BENEFICIARY. Nothing contained in this Agreement, nor the performance of the parties hereunder, is intended to benefit, nor shall inure to the benefit of, any third party, including Owner's construction contractors, if any.

20. STATUTE OF LIMITATION. To the fullest extent permitted by law, parties agree that, except for claims for indemnification, the time period for bringing claims under this Agreement shall expire one year after Substantial Completion, as defined by the construction documents prepared by Donohue, or, if no construction documents are prepared, one year after the submittal date of Donohue's most recent invoice for this Agreement. Any action not brought within that one-year time period shall be barred, without regard to any other limitations period set forth by law or statute.

21. DISPUTE RESOLUTION. Owner and Donohue shall provide written notice of a dispute within a reasonable time and after the event giving rise to the dispute. Owner and Donohue agree to negotiate any dispute between them in good faith for a period of 30 days following such notice. Owner and Donohue may mutually agree to submit any dispute to mediation or binding arbitration, but doing so shall not be required or a prerequisite to initiating a lawsuit to enforce this Agreement.

22. CONTROLLING LAW. This Agreement is governed by the laws of the state in which the Project is located.

23. NO WAIVER. No waiver by either party of any default by the other party in the performance of any particular section of this Agreement shall invalidate any other section of this Agreement or operate as a waiver of any future default, whether like or different in character.

24. SEVERABILITY. The various terms, provisions and covenants herein contained shall be deemed to be separate and severable, and the invalidity or unenforceability of any of them shall not affect or impair the validity or enforceability of the remainder.

25. AUTHORITY. The persons signing this Agreement warrant that they have the authority to sign as, or on behalf of, the party for whom they are signing.

26. SURVIVAL. All express representations, indemnifications and limitations of liability included in this Agreement will survive its completion or termination for any reason.

UCSD and Village of Rantoul NARP Study
2022 Fee Estimate Summary
Dorohue & Associates

Task Description	PM	Proc Eng	Principal Geoscientist	Watershed Specialist	Water Qual Modeler	Geol/Env Engineer	Hydrogeol Hydrologist	Env Scientist	Total Hours	Total Labor	Expense	Total Cost	Subtotal
Phase 1													\$ 184,690
Task 1: Data Mining, Analysis & Monitoring Plan	16	4	20	24	1	16	48	24	153	\$ 19,120	\$ 500	\$ 19,620	
Task 2: Preliminary Watershed Characterization	2	4	5	12	-	6	2	40	71	\$ 7,200	\$ 750	\$ 7,950	
Task 3: Stakeholder Engagement	12	12	12	60	-	-	-	-	96	\$ 15,360	\$ 2,500	\$ 17,860	
Task 4: Monitoring Program	16	24	70	30	4	40	30	110	324	\$ 38,440	\$ 85,000	\$ 123,440	
Task 5: NARP Strategy and Workplan	24	4	20	35	4	-	-	4	91	\$ 15,320	\$ 500	\$ 15,820	
<i>Phase 2 scope and fee - if needed - will be determined at the completion of Phase 1</i>													
Phase 2													\$ -
Task 6: Water Quality Models and Targets									-	\$ -		\$ -	
Task 7: Watershed Management Scenarios									-	\$ -		\$ -	
Task 8: Implementation Plan and Schedule									-	\$ -		\$ -	
Task 9: Finalize NARP Documents									-	\$ -		\$ -	
Total	70	48	127	161	9	62	80	178	735	\$ 95,440	\$ 89,250	\$ 184,690	\$ 184,690
Total Labor Dollars by Staff	\$ 16,800	\$ 9,600	\$ 17,780	\$ 22,540	\$ 1,800	\$ 7,750	\$ 7,600	\$ 11,570				TOTAL	\$ 184,700

Rantoul Contribution **\$27,010**

UCSD NEP and SWP Contribution **\$157,690**

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Ordinance 2736, An Ordinance to Readopt, Ratify, and Reaffirm the License, Permit, and Service Fees, and Administrative Penalties Schedule with Amendments	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS: 1. 04-23-2736 - Ordinance to Readopt, Ratify, and Reaffirm License and Permit Fees and the Administrative Penalty Schedule	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR Scott Eisenhauer

ORDINANCE NO. 2736

**AN ORDINANCE TO READOPT, RATIFY, AND REAFFIRM
THE LICENSE, PERMIT, AND SERVICE FEES, AND THE
ADMINISTRATIVE PENALTIES SCHEDULE WITH AMENDMENTS**

**VILLAGE OF RANTOUL
CHAMPAIGN COUNTY, ILLINOIS**

CERTIFICATE OF PUBLICATION

Published in pamphlet form this 11th day of April, 2023, by authority of the President and Board of Trustees of the Village of Rantoul, Champaign County, Illinois.

Village Clerk

ORDINANCE NO. 2736

**AN ORDINANCE TO READOPT, RATIFY, AND REAFFIRM
THE LICENSE, PERMIT, AND SERVICE FEES AND THE
ADMINISTRATIVE PENALTIES SCHEDULE WITH AMENDMENTS**

WHEREAS, under and pursuant to Ordinance No. 2664, passed and approved on December 8, 2020, the President and Board of Trustees (the **“Corporate Authorities”**) of the Village of Rantoul, Champaign County, Illinois (the **“Village”**) readopted, ratified, and re-affirmed the License, Permit, Service Fees, and the Administrative Penalties Schedule (the **“Schedule”**), as well as enacting amendments to such Schedule to establish the amount of the fees for certain licenses and permits, service fees, and the administrative penalty for certain violations under various provisions of the Rantoul Code (the **“Code”**); and

WHEREAS, it now becomes necessary and desirable to amend certain fees within such Schedule by readopting, ratifying, and reaffirming the fees within the Schedule, including certain amendments for the Liquor License Class VG License Rider fees and the Permit for Non-Highway Vehicles, as attached hereto and made a part hereof.

NOW, THEREFORE, BE IT ORDAINED BY THE PRESIDENT AND BOARD OF TRUSTEES OF THE VILLAGE OF RANTOUL, CHAMPAIGN COUNTY, ILLINOIS, as follows:

Section 1. Adoption of Schedule. The License, Permit, and Service Fees, and Administrative Penalties Schedule (Revised 04-2023) be and the same is hereby readopted, ratified, and reaffirmed, with amendments to increase the fees for the Non-Emergency Assistance fees for the Rantoul Fire Department pursuant to Section 16-82, and the Liquor License Class VG License Rider pursuant to Section 4-38(d) of the Village Code, to be effective on May 1, 2023, and inserting a new section for permits for Non-Highway Vehicles pursuant to Section 38-402 of the Village Code.

Section 2. Publication. The Village Clerk is hereby authorized and directed to cause this Ordinance to be published in pamphlet form.

This Ordinance is hereby passed, the “ayes” and “nays” being called, by the concurrence of a majority of the members of the Corporate Authorities then holding office on the date set forth below.

PASSED this 11th day of April, 2023.

Village Clerk

APPROVED this 11th day of April, 2023.

Village President

**LICENSE, PERMIT AND SERVICE FEES, AND
ADMINISTRATIVE PENALTIES SCHEDULE
(Revised 04-2023)**

Section	Description	Fee Amount
Chapter 4 – Alcoholic Beverages		
Retail Licenses:		
4-27	Registration fee for limited license classification	\$100.00
4-28	Application fee for license	\$250.00
4-31(1)c	Class A, general retail license, annually	\$2,200.00
4-31(2)d	Class C, club license, annually	\$1,100.00
4-31(3)e	Class GC, golf course license, annually	\$2,200.00
4-31(4)c	Class H/M, hotel/motel license, annually	\$1,100.00
4-31(5)e	Class P-1, package liquor license, annually	\$2,200.00
4-31(6)f	Class P-2, package beer and wine license, annually	\$1,650.00
4-31(7)g	Class R, restaurant license, annually	\$1,650.00
4-32	Lapsed certificate of insurance fee	\$250.00
4-38(d)	Class VG (video gaming) license rider, except Class C, per video gaming terminal, annually	\$250.00
	Class VG (video gaming) license rider, Class C, per video gaming terminal, annually	\$100.00
Temporary Permits:		
4-63(1)d	Class T-1 permit, per permit	\$55.00
4-63(2)d	Class T-2 permit, per permit	\$55.00
4-63(3)d	Class T-3 permit, per permit	\$55.00
4-63(4)d	Class T-4 permit, per permit	\$165.00
4-63(5)d	Class T-5 permit, per permit	\$165.00
Chapter 6 – Amusements		
6-134(b)	Place of entertainment license application fee	\$100.00
6-178	Raffle license application fee:	
	For any license for one raffle, the following applicable amount:	
	Where the aggregate retail value of all prizes given is \$1,000 and below	\$5.00
	Where the aggregate retail value of all prizes given is more than \$1,000	\$10.00
	For any license for a specified number of raffles to be conducted during a specified period not to exceed one year, the following applicable amount:	
	Where the aggregate retail value of all prizes given is \$1,000 and below	\$50.00
	Where the aggregate retail value of all prizes given is more than \$1,000	\$75.00

Section	Description	Fee Amount
Chapter 8 – Animals		
8-160(a)	Redemption of impounded animal:	
	General impoundment fee	\$50.00
	Plus, daily impoundment fee, per day or partial day	\$10.00
8-225	Small animal shop license	\$25.00
Chapter 10 – Buildings and Building Regulations		
10-5	The fee for each permit as required by any provision of this Chapter shall be paid in advance of the issuance of any such permit in accordance with the following schedule:	
	Building Code permits:	
	All Non-Residential (including additions, but excepting one- and two-family dwellings)	0.25% of Construction Costs
	Tower	\$75.00
	Deck	\$40.00
	Fence	\$40.00
	Sign, per \$1,000.00 of estimated costs but not less than \$40.00	\$10.00
	Demolition:	
	Any building or structure except one- and two-family dwellings and detached garages and sheds, per \$1,000.00 of estimated costs but not less than \$50.00	\$5.00
	Any one- and two-family dwelling	\$35.00
	Any detached garage or shed	\$25.00
	Moving (when not crossing or occupying any public street, alley or right-of-way)	\$50.00
	Automatic fire extinguishing system, fire pumps and related equipment, per \$1,000.00 of estimated costs but not less than \$100.00	\$5.00
	Plan review fees (for all new construction, including additions):	
	Construction cost (\$)	
	Up to 20,000.00	\$50.00
	Over \$20,000	0.25% of Construction Costs
	Sprinkler system review fee	\$75.00
	Residential Code permits:	
	New Construction	
	2,200 square feet or less	\$250.00
	2,201 square feet or more	\$325.00

Section	Description	Fee Amount
	Additions, alterations, renovations:	
	Per inspection, but not less than \$45.00	\$40.00
	Disability Accessibility Projects	\$40.00
	Plan review fee	\$75.00
	Sprinkler system review fee	\$75.00
	Mechanical Fees:	
	Residential Heating, air conditioning, gas lines, commercial heating & Air conditioning, commercial refrigeration, ventilation, fire suppression, gas piping, and the like covered by the Mechanical Code.	
	Estimated Project Cost:	
	Up to \$50,000.00	2.5% of Construction Costs
	Over \$50,000.00	\$1,250.00 plus 0.10% of Construction Costs over \$50,000.00
	Minimum Mechanical Fee	\$40.00
	Plumbing Fees:	
	Each Plumbing fixture	\$10.00
	Each waste opening (for future use)	\$10.00
	Water service line	\$10.00
	Backflow preventer	\$10.00
	Installation of water heater	\$10.00
	Water softener/conditioner	\$10.00
	Yard sprinklers	\$30.00
	Existing sewer tap/water tap	\$100.00
	Minimum Plumbing Permit Fee	\$40.00
	Electrical Fees:	
	Estimated Project Costs:	
	Up to \$50,000.00	2.5% of Construction Costs
	Over \$50,000.00	\$1,250.00 plus 0.10% of Construction Costs over \$50,000.00
	Minimum Electrical Permit Fee	\$40.00

Section	Description	Fee Amount
	All Electrical Services:	
	Service Installations	
	100 to 400amp service	\$50.00
	Each additional 100 amp above 400, per 100 amp	\$30.00
	Fire Prevention Code Permits:	
	Storage of Compressed Gases, Flammable and Combustible Liquids, Hazardous Materials and LP-Gas:	
	Tanks containing 2,000 water gallons and less	\$100.00
	Tanks containing more than 2,000 water gallons	\$200.00
	Installation, Construction or Alteration of Equipment Used to Store, Dispense or Use Compressed Gases, Flammable and Combustible Liquids, Hazardous Materials and LP-Gas	\$15.00
	Silviculture or Range or Wildlife Management Practices, Prevention or Control of Disease or Pests, or a Bonfire	\$30.00
	Moving Permit (across any public street, alley or right-of-way)	\$50.00
	Work Without a Permit:	
	For any work or use commenced without a permit for which a permit is required, an additional fee shall apply in addition to the regularly prescribed fee	\$200.00
10-54(4)	Mechanical contractor license application fee	\$50.00
10-55	Annual registration fee for mechanical contractor licensed in another city	\$50.00
10-57	Mechanical contractor license annual renewal fee	\$50.00
10-79(4)	Electrical contractor license application fee, all types	\$50.00
10-80	Electrical contractor annual registration fee	\$50.00
10-82	Electrical contractor annual license renewal fee:	\$50.00
	General electrical contractor	\$50.00
	Maintenance electrical contractor	\$25.00
10-414	Fees for each registration or reinspection of rental residential premises:	
	Each Registration Statement, per dwelling or condominium unit	\$40.00
	Each late registration statement	\$100.00
	Each failure to appear for or cancel a scheduled inspection or reinspection	\$100.00
	Each reinspection	\$100.00
10-504	Mobile Home Park License, per Mobile Home Site	\$25.00
10-513	Certificate of Occupancy-Mobile Home	\$40.00

Section	Description	Fee Amount
	As used in this Schedule for Chapter 10:	
	Construction costs shall be calculated by multiplying the gross square footage of any new building, structure or addition by the most recent square foot construction cost as revised and published from time to time in the <u>Building Safety Journal</u> by the International Code Council	
	Estimated costs shall be calculated by totaling the cost of all services, labor, materials, equipment, scaffolding and any other appliances or devices entering into and necessary to the prosecution and completion of the installation or the work ready for occupancy; provided that the cost of excavation or grading, and of painting, decorating or other work that is merely for embellishment and not otherwise necessary for the safe and lawful use is not deemed a part of such installation or work	
	Plumbing fixtures includes any opening in plumbing systems for fixtures or for waste or ventilation pipes regardless of whether an actual fixture is set or not	
Chapter 12 – Business Regulation		
12-54(b)	Motel license fee, per room, annually	\$5.00
Chapter 16 – Fire Protection and Prevention		
	Fee for responding to a call outside the corporate limits of the Village without a contract for fire service:	
	Vehicle charge per vehicle per hour or fraction thereof	\$300.00
	Personnel charge per hour or fraction thereof per responding firefighter	\$100.00
	Other charge for any special equipment used in connection with response	Actual cost
16-82	Non-Emergency Assistance Fee	\$300.00
	Personnel charge per additional hour or fraction thereof	\$100.00
Chapter 26 – Solicitors and Transient Merchants		
26-23(b)	Application fee for registration to act as a solicitor within the Village	\$10.00
26-49	Application fee for license to engage in business or occupation of transient merchant	\$100.00
Chapter 28 – Solid Waste		
28-59	Waste hauler license, annually	\$250.00
28-59	Collection vehicle inspection permit, annually	\$50.00

Section	Description	Fee Amount
Chapter 38 – Traffic		
38-258(b)	Application to operate as a relocater	\$100.00
38-402	Non-Highway Vehicle permit, annually	\$50.00
	Non-Highway Vehicle permit, 65 & Older, annually	\$25.00
Chapter 44 – Vehicles for Hire		
44-44(d)	Annual operator's license fee	\$75.00
44-44(d)	Annual registration sticker fee for each vehicle for hire	\$25.00
44-45	Duplicate copy of operator's license or registration sticker to replace one lost or destroyed	\$10.00
44-53	Transfer fee for transfer of registration sticker from one vehicle to another	\$10.00
44-69	Annual driver's license fee	\$25.00
44-72	Duplicate driver's license fee	\$10.00
Chapter 46 -- Zoning		
46-298(d)	Certificates of occupancy	
	Original	\$5.00
	Each copy	\$2.00
46-301	Application for amendment, special use or variance	\$100.00
46-329(6)c.4.	Fee in lieu of planting	
	Large canopy tree	\$500.00
	Ornamental tree	\$300.00
	Evergreen	\$300.00
	Shrub	\$75.00
	Ornamental grass	\$30.00
	Perennial	\$30.00

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Discussion Regarding Fiscal Year 2023-2024 Budget	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS:	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Legal Update Presentation	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS:	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Motion to enter into Closed Session pursuant to 5 ILCS 120/2 (C) 2, to consider collective negotiating matters between the public body and its employees or their representatives, or deliberations concerning salary schedules for one or more classes of employees	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS:	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR

**BOARD OF TRUSTEES
VILLAGE OF RANTOUL**

AGENDA ITEM

ITEM: Motion to enter into Closed Session pursuant to 5 ILCS 120/2 (C) 1, to consider the employment, compensation, discipline, performance, or dismissal of an employee	DEPARTMENT: Administration
DATE: April 4, 2023	AMOUNT:
ATTACHMENTS:	ADMINISTRATIVE NOTES:
SUMMARY HIGHLIGHTS:	
RECOMMENDED ACTION:	
DEPARTMENT HEAD APPROVAL	VILLAGE ADMINISTRATOR