



**Idaho State
University**

**Disaster Response
Complex**

College of Science and Engineering

Department of Civil and Environmental Engineering

IGEM20-001

A Disaster Response Complex for Emergency Responders in Idaho

1st Year Annual Report

July 1 – December 31, 2020

December 29, 2020

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Appendix 1 Sample Student Activities

1.0 Basic Project Information

Funding Agency

Higher Education Research Council - Idaho Global Entrepreneurial Mission Program

Awarded Institution

Idaho State University, College of Science and Engineering, Department of Civil and Environmental Engineering

Grant Number

IGEM20-001

Project Title

A Disaster Response Complex for Emergency Responders in Idaho

Principal Investigator

Mustafa Mashal, Ph.D., P.E., Associate Professor

Co-Principal Investigator

Bruce Savage, Ph.D., P.E., Professor and Department Chair

Report Type

2nd Year Progress Report: July 1, 2020 – December 31, 2020

2.0 Executive Summary

In the post 9/11 years, the national demand for training of emergency responders from the military and law enforcement branches has grown rapidly. There is a higher demand for training of emergency responders than the current facilities can support. In 2019, researchers at Idaho State University were awarded funding from the State of Idaho under the HERC-IGEM grant. The focus of the project is the development of a Disaster Response Complex (DRC) for research, certification, and training of emergency responders in collaboration with the Directorate of National & Homeland Security at the Idaho National Laboratory (INL), and the Center for Advanced Energy Studies (CAES). The DRC has three pillars: 1) research, 2) curriculum and certification, and 3) training. All three pillars include the development of new indoor and outdoor complexes with training lanes/simulations to be used in both research, teaching, and training of emergency responders and the instrumentation of a collapsed structure. The training lanes will be used in combination with Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) surrogates/markers, the use of robots/small Unmanned Aerial Vehicle (sUAV), Virtual Reality (VR), Augmented Reality (AR), Geographic Information System (ArcGIS), Light Detection and Ranging (LiDAR), and Radio-Frequency Identification (RFID). The curriculum pillar includes offering courses in topics such as emergency response, gamma/chem spectroscopy, and safety culture. For the training pillar, the facility can be used to host events for clients such as the Department of Defense (DoD) CBRNE Response Enterprise (CRE), military personnel, Idaho National Guard, and law enforcement agencies/fire departments from Idaho and the region. It is expected that the DRC will be a comprehensive facility that will incorporate natural (earthquakes, hurricanes, flooding) and man-made hazards in the training of emergency responders.

3.0 Summary of Project Accomplishments

This is the progress report for the second year of the project. The second-year budget for the project was \$271,400, which included a \$4,000 budget cut due to the developments with COVID-19. The project personnel would like to thank the State Board of Education for offering a no-cost extension for the first year of the project. This certainly assisted in making more progress during a pandemic. Despite the ongoing global pandemic, the project personnel made substantial progress in the first half of the second year toward all three pillars of the DRC as described below. The DRC facilities were used for training of first responders and students in the fall of 2020. More training is scheduled for 2021. In addition, in line with ISU's branding, logos and white pages for the DRC were created. A website has also been launched (<https://isu.edu/cee/research-facilities/drc/>).

A. Research Pillar

Efforts in the research pillar were primarily focused on the use of robotics, AR, VR, Arc GIS, LiDAR, and RFID. Other research areas such as markers/surrogates for CBRNE training were also discussed with researchers from INL and ISU. Updates in each area of the research pillar are outlined as follows.

- **Robotics:** ISU researchers have continued their collaboration with colleagues from the Idaho National Laboratory (INL). An ISU graduate student has been working on the robotic aspects of the project in collaboration with the ISU and INL researchers. The student successfully passed his qualifier exam for a doctorate degree. An application for a prestigious INL Graduate Fellowship was submitted for an ISU PhD student to work with INL collaborators on the DRC project with a focus on robotics. The application was not successful.
- **AR/VR:** ISU partnered with INL researchers and developed a concept paper for the use of new technologies in disaster response and training. CAES provided \$24,700 in funding for INL researchers to develop the concept paper in collaboration with ISU researchers. Two ISU students worked under the supervision of the INL researchers on this aspect of the project. The researchers from ISU and INL have been holding regular weekly meetings to identify further research opportunities in this area. The AR/VR is an emerging area of research interest to many public and

private institutions, especially during a pandemic when travel is limited. The project personnel discussed the use of AR/VR for the training of emergency responders with both private and public entities. In December 2020, Dr. Mashal was awarded \$20,000 for research in AR/VR through Idaho State University – Center for Advanced Energy Studies (ISU-CAES) funding. The project aims to develop AR/VR templates (e.g. exercises) for responders from both military and civil sectors. ISU is collaborating with researchers from INL on this project. Furthermore, a new Visualization laboratory was established to assist with AR/VR research at ISU. Funding for the laboratory was provided through ISU-CAES. The new “Visualization Laboratory” is equipped with two pro-grade virtual reality (VR) headsets with eye-tracking; one Vive Cosmo and one Oculus Quest headsets that allow users to visualize information in a 3D immersive virtual environment. Additional equipment includes one Dell Alienware laptop and two Alienware desktops to develop VR environments; and an iPad pro with built in Light Detection and Ranging (LiDAR) scanner for augmented reality (AR); four monitors and other accessories. Three students from Mechanical Engineering have already started using the Visualization Laboratory for research as part of the DRC project.

- ISU-CAES provided approximately \$10,800 to engage ISU students in the DRC project and the students are co-supervised by INL researchers. This funding provided the student’s hourly pay to work on the research pillar of the project.
- ISU Research Office as part of the Higher Education Research Council’s Research Infrastructure provided \$225,000 in funding toward materials and supplies, and building infrastructure in the Department of Civil and Environmental Engineering. A part of this funding (approximately \$30,000) was spent toward the construction of the DRC outdoor training campus and installation of a perimeter fence around the site.
- Arc GIS and LiDAR: the outdoor collapsed structure was surveyed and shot using LiDAR during different construction stages. Results will be used for the AR/VR aspect of the project.
- RFID: a faculty with expertise in Electrical and Computer Engineering at ISU has been collaborating with the project personnel on the use of RFID in civil engineering applications. The researchers at ISU have been collaborating with INL to explore the application of RFID technology in disaster response.
- CBRNE: several meetings were held at the CAES between ISU and INL researchers. The meetings were focused on the development of chemical and biological markers. Collaborators from INL are well-established in the radiological and nuclear detection areas. Available opportunities for research in the development of markers/surrogates from agencies such as the Defense Threat Reduction Agency (DTRA) were discussed. One of the initiatives for the project has been to explore electronic technologies that simulate CBRNE and plume. On this aspect, ISU has started to explore a partnership with a private company that offers such capabilities.
- Other technologies such as the use of sUAV have also been considered for applications in disaster response. INL has good capabilities in sUAV. In addition, the project personnel have discussed collaborating with the College of Technology at ISU, which has several sUAVs; some equipped with LiDAR. INL is in the process of loaning a training resource for the DRC to ISU. There are plans to use sUAV for the preparation of this resource before it is shipped to ISU.
- A journal paper titled “A Disaster Response Complex for Training of First Responders in Idaho” was submitted to “Countering WMD Journal” which is published by the United States Army Nuclear and Countering WMD Agency.
- Another journal paper focused on the application of AR/VR is currently being prepared by ISU/INL researchers for submission.

- Numerous meetings and tours of the DRC were held to discuss research collaboration with INL, CAES, ISU, law enforcement, office of emergency management, local fire departments, and private industry.
- Tours of the DRC were held for dignitaries from the Department of Energy, INL, and ISU. All parties are interested in incorporating emerging technologies for disaster response, as some of these technologies were previously outlined.

B. Curriculum and Certification Pillar

- On the curriculum side, the project personnel and INL researchers/instructors have been holding regular weekly meetings to develop new curriculum in disaster response that uses the indoor DRC facility (Old Armory Building at ISU).
- In partnership with Battelle Energy Alliance (BEA) and CAES, Idaho State University offered the Laboratory Operations Supervisor Academy (LOSA) at no cost to 30 participating faculty, staff and students in August 2020. LOSA is a prestigious training program developed by BEA, the operating contractor for INL and several other national labs for the Department of Energy. This half-day training discussed principles for the Safe Conduct of Research (SCoR) and utilized simulations and scenarios to demonstrate and build a lab safety culture. The Project PI (Dr. Mashal) and Project Manager (Jared Cantrell) offered this training at ISU. The LOSA Pilot training was sponsored by BEA for nearly \$14,000. The project personnel have plans to expand LOSA for other faculty, staff, and students at ISU and make it a class under the DRC for the upcoming semesters.
- ISU, INL, and other non-profit entities are pursuing funding to develop a pandemic focused version of LOSA. The training is titled LOSA-COVID-19 and will target employees of the lab, ISU, and other state entities. Initiatives such as “Train-the-Trainer” are part of this plan. ISU submitted a \$50,000 proposal to CAES on the LOSA-COVID-19 initiative.
- ISU is in the process of completing a Memorandum of Understanding (MoU) with a private industry in Idaho to offer curriculum for the DRC. 38 courses have been shortlisted and discussed for this initiative.
- The project personnel have had discussions and tours of the outdoor DRC with potential instructors/partners from local fire departments and the private industry to develop curriculum for emergency responders in the military, law enforcement, emergency management, and fire departments.
- The project personnel followed up with ISU’s College of Technology’s Continuing Education/Workforce Training and private industry to explore the initiative of getting Continuing Education Units (CEUs) for the responders taking curriculum at ISU.
- Dr. Mashal made an online presentation during the December 3 meeting of the Eastern Idaho Fire Chiefs Association and shared information about the DRC. The project personnel reached out to local fire departments to consider collaborating with ISU on the curriculum/certification and training/exercise pillars of the DRC.

C. Training and Exercise Pillar

- In the second half of the second year, despite the COVID-19 and lockdown restriction, the project personnel were able to work on the following tasks:
 - Purchased and transferred multiple conex boxes and various materials and supplies that will be used for construction of outdoor and indoor training lanes.
 - Finalized design and drawings for the three basic lanes.

- Completed construction of a complex subterranean lane (Figure 1).
- Completed construction of a shoring lane inside a conex box.
- Hosted visits and open houses during construction of the facility to gather more feedback from the potential users which included Public Safety, Emergency Management from ISU, Idaho State Police, Idaho Falls Fire Department, Pocatello Fire Department, Office of Emergency Management, Pocatello Police Department, INL, Department of Energy, Idaho National Guard, Idaho Civil Support Team, INL Oversight Program, and many others from public/private entities (Figure 2).
- The project personnel worked with ISU's Facilities and were granted the Old Armory Building (Figure 3) for research and academic use. This selection was based on the feedback from INL, Idaho National Guard, and other clients. The Armory Building is an ideal place for smaller-scale training and offering special focused courses. The Armory Building was built in 1939 and originally housed the National Guard Armory. It was subsequently used by ISU for the Diesel Technology program. With the move of the Diesel Technology program in August 2020 to another location on campus, the Armory Building was re-purposed to be used toward serving the National Guard units again. The building has a high-bay area as well as classrooms and vaults. It also includes offices and classrooms that will be used for the DRC project. ISU's Facilities worked diligently with relevant state entities to transfer this building to the DRC. Together with the outdoor facility, the Armory building will provide substantial support for all three pillars of the DRC. The project personnel have prepared extensive designs and drawings for the indoor facility, which will house a mock- city block (Figure 4) for indoor training scenarios. Construction is underway for the mock-city block (Figure 5).



Figure 1. Completed subterranean lane

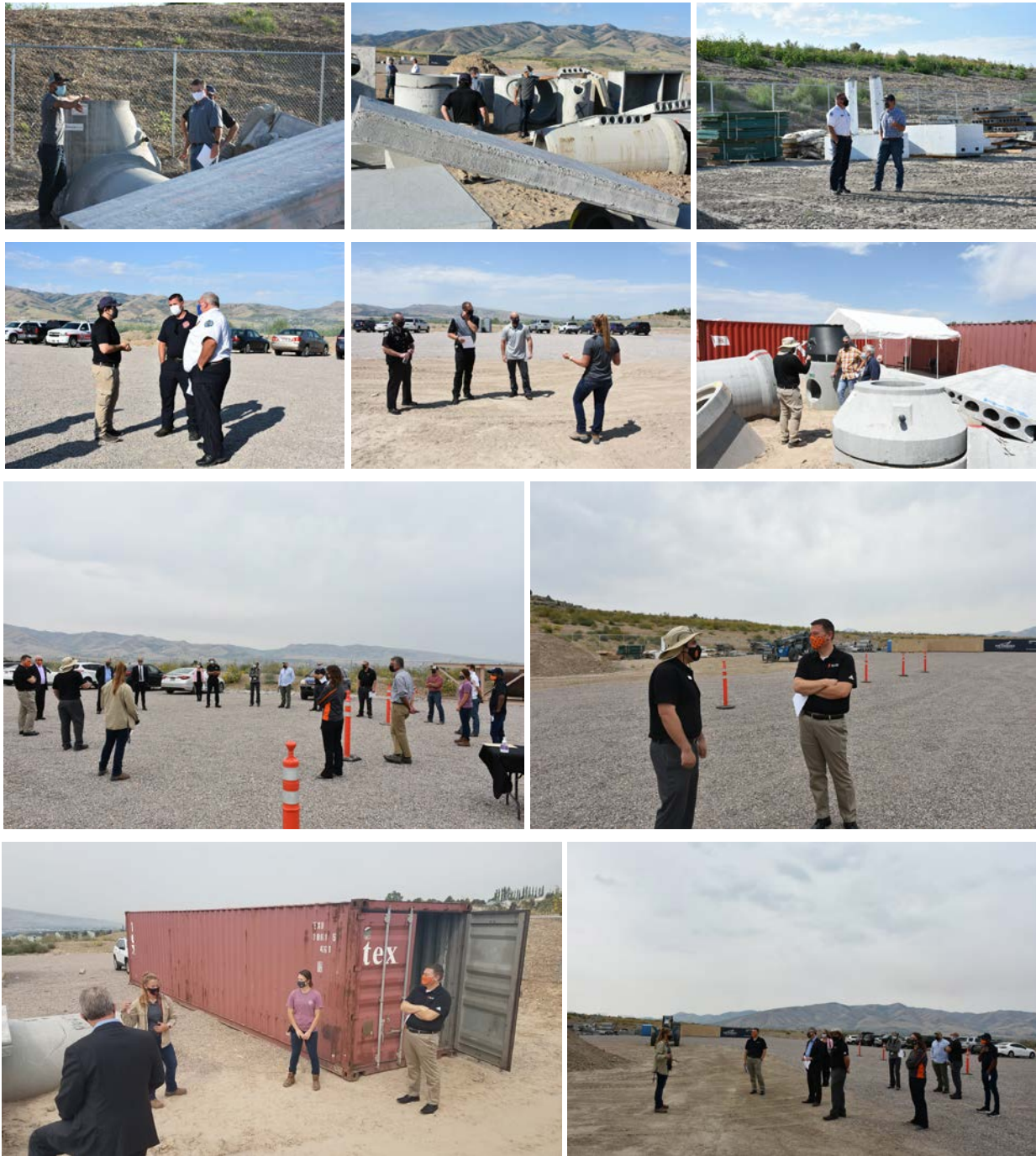


Figure 2. DRC Open House in Fall 2020



(a) Front View



(b) Parking Lot on the West Side

Figure 3. Armory Building at ISU

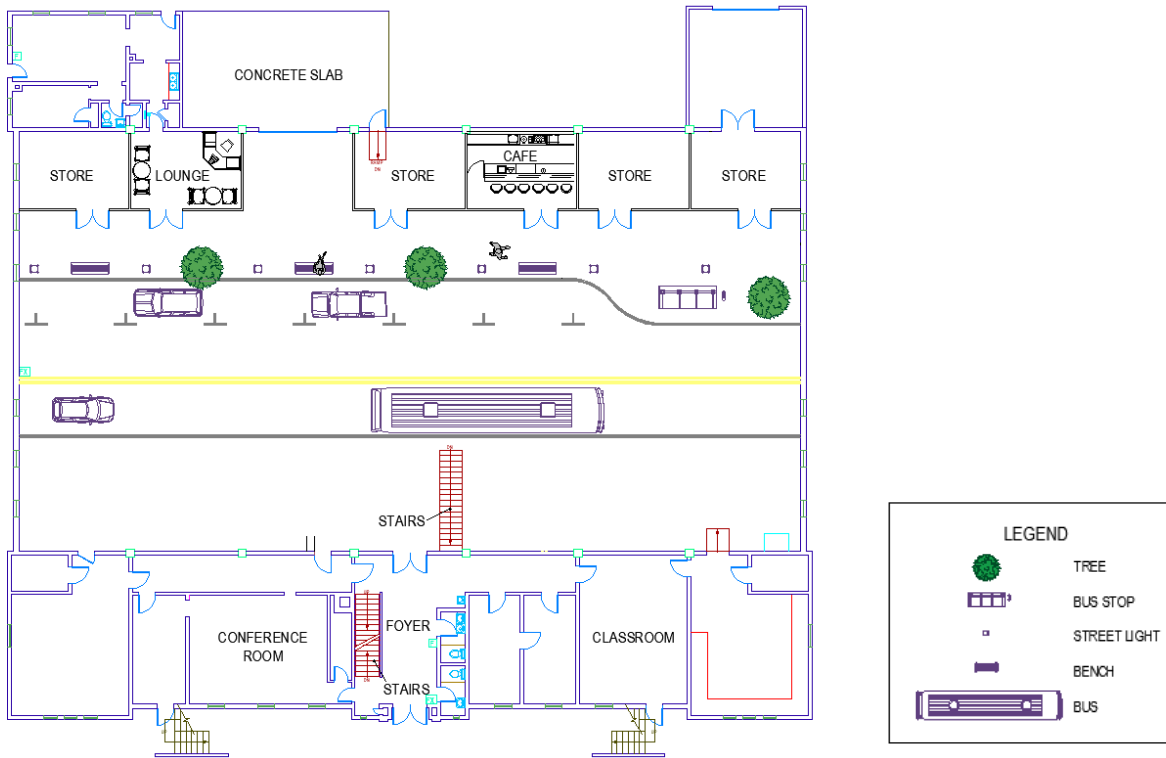


Figure 4. Mock-City Layout at the Armory Building at ISU



Figure 5. Construction is underway for Mock-City Block in the indoor DRC

- In 2020, multiple training events hosting more than 100 military and civilian responders were scheduled at ISU. Unfortunately, due to the lockdown, travel/gathering restrictions, spread of the virus, civil unrest and deployment of National Guard units in the locations of the participants who were planned to take part in the exercise at ISU, all the training events had to be canceled.
- In October 2020, twenty students and six instructors in the Idaho State University College of Technology’s Emergency Medical Technician program utilized the outdoor DRC for a real-world training. One of the articles (<https://www.isu.edu/news/2020-fall/idaho-state-emt-program-partners-with-the-disaster-response-complex-for-real-world-training.html>) published about this training is included below. Another similar article was published by the Idaho State Journal (https://www.idahostatejournal.com/community/isu-s-emt-program-partners-with-the-disaster-response-complex-for-training/article_335920c3-04c2-5f15-b8c8-26de999f3acd.html).

----- Training article -----



Idaho State EMT program partners with the Disaster Response Complex for 'real-world' training

By Miriam Dance, COSE Director of Public Relations | November 5, 2020

POCATELLO – Twenty students and six instructors in the Idaho State University College of Technology’s Emergency Medical Technician program received real-world emergency response training at the new ISU Disaster Response Complex, which is run by the Department of Civil and Environmental Engineering.

Training scenarios were constructed to simulate emergency situations. The simulated scenario training is a typical component of the EMT program, which is part of the College of Technology’s Continuing Education and Workforce Training programs. However, conducting the training at the Disaster Response Complex allowed for the development of new mass casualty and individual injury incidents of an industrial nature that were not possible before, including extractions from buildings that may have collapsed or dark tunnels that may have flooded. “We were thrilled to be able to conduct training at the new DRC facility,” said RaeLyn Price, health programs coordinator for Continuing Education and Workforce Training. “The training exercise on Saturday went as well as anyone could ever expect. Students and instructors all enjoyed the experience.”



During the Halloween Day training, trainees worked together to assess the situation and then determine how to enter the scene to safely assist and treat injured individuals. Once rescued, trainees prepared the injured for transport to appropriate medical facilities. Each training scenario required the students to work as a team to safely rescue the mock victims.



To set the stage for the emergency scenarios, victims were dressed in full moulage, which involves creating realistic-looking mock injuries on volunteer ‘victims.’ Using moulage created a new element for the trainees since they hadn’t yet experienced anything as true to life while in the course. One challenge participants faced was getting past the realistic appearance of victims and using the skills they learned in the course to address the situation.

“It was awesome to watch the students seriously take on their roles and work together to provide appropriate treatments and rescue,” Price said. “We look forward to utilizing the DRC for more training opportunities in the future.”

The Idaho State Disaster Response Complex is a unique facility recently added to the university’s research portfolio. It was created with a nearly \$1.1 million grant from the Higher Education Research Council of the Idaho State Board of Education through the Idaho Global Entrepreneurial Mission.

“The DRC is a unique facility in the Northwestern United States,” said Mustafa Mashal, associate

professor in the Department of Civil and Environmental Engineering and Principal Investigator for the Disaster Response Complex project. “We have capabilities to simulate various scenarios for training emergency responders. There are numerous collaborators, faculty, and students working on the DRC project. The ultimate goal of the project is to save lives during an emergency scenario, through efficient and effective responses.”

The DRC has three focus areas: research, curriculum and certification, and training and exercise. The training and exercise focus area encourages local and regional emergency responders to use the DRC for real-world simulations of natural and man-made disasters. Search-and-rescue scenarios can be structured in several ways using precast concrete elements to create situations that require navigating training lanes such as collapsed structures, confined spaces, and vehicle rescue.

“From the perspective of an educational institution, the project benefits our students through a wide variety of learning and research processes,” Mashal said. “From a community perspective, this project benefits Idahoans and beyond by helping ensure the emergency responders have an exceptional facility to conduct training and exercise events.”

The DRC outdoor facility is still under construction and more training lanes are planned to be added in the upcoming months. The EMT program is the first group to use the DRC’s outdoor facility.

“We welcome emergency responders from our community, region, and nation to use the DRC for their training and exercise events,” Mashal said. “The doors of the DRC are open for anyone who wants to explore collaboration with ISU on disaster response. The DRC is a long-term resource for our emergency responders and we are very glad to have this facility here in Pocatello.”

To learn more about the DRC, please visit <https://www.isu.edu/cee/research-facilities/drc/>.

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- In November 2020, twenty-five members of the Pocatello Fire Department’s Urban Search and Rescue team used the outdoor DRC facility to conduct a special operation exercise. The newly constructed subterranean lane was utilized for the training. The event received coverage on Local News 8 (<https://localnews8.com/isu/2020/11/17/local-first-responders-train-at-isus-new-disaster-response-complex/>) as well as Idaho State Journal (https://www.idahostatejournal.com/news/local/saving-lives-pocatello-firefighters-practice-rescuing-victims-from-collapsed-structures-at-new-isu-facility/article_c5924635-e7cd-5f79-9703-21df08dff407.html). The articles are included as follows:

Local first responders train at ISU's new Disaster Response Complex

By Emma Iannacone



POCATELLO, Idaho (KIFI/KIDK) - Local first responders trained at Idaho State University's new Disaster Response Complex on Tuesday.

Members of the Pocatello Fire Department's search and rescue team spent hours in a simulated building collapse, trying to rescue a mannequin. In light of the many recent earthquakes in our area, PFD felt it was a good time to brush up on their rescue skills.

The training is one of the first of its kind at the Disaster Response Complex. The Complex was created with a nearly \$1.1 million grant from the Higher Education Research Council of the Idaho State Board of Education.

ISU's Department of Civil and Environmental Engineering associate professor Mustafa Mashal was the principal investigator for the project.

"When we started this project, we noticed there is no facility of this kind in the Northwestern United States," Mashal said.

Mashal's team successfully applied for a grant in 2019, opening the door to create a curriculum in emergency response at ISU.

The structural collapse training is the second to take place at the Disaster Response Center near Alvin Ricken Road in Pocatello.

"We're just really excited to have the facility ISU has provided here. We normally would have to go out of town, as far as Texas, to get a facility like this," said Captain Devin Christensen, with PFD.

The Disaster Response Complex offers more than just training for our first responders. It also offers technological research opportunities for ISU students and faculty.

Engineering students were tasked with creating the simulated building collapse.

"It's kind of a real-life exercise," said Bruce Savage, department chair of Civil and Environmental Engineering. "They get to evaluate the different forces and different scenarios the training teams want to partake in, and then evaluate what's going to make this safe but still allow them a realistic opportunity to test their skills."

The Disaster Response Complex is available to first responders all over the region. New scenarios will be created by engineering students.

IDAHO STATE JOURNAL
empowering the community

'Saving lives': Pocatello firefighters practice rescuing victims from collapsed structures at new ISU facility

By JOHN O'CONNELL/IDAHO STATE JOURNAL

POCATELLO — One group of Pocatello firefighters cut through structural steel with a blowtorch Tuesday morning while others sawed into a slab of concrete, making certain no debris would fall on the dummy trapped below.



Members of the Pocatello Fire Department's Urban Search and Rescue team practice rescuing trapped victims from collapsed concrete structures at a new research and training facility opened by Idaho State University.

Members of the department's Urban Search and Rescue team got to simulate tactics to rescue survivors from a collapsed concrete structure at Idaho State University's new Disaster Response Complex.

The facility, located east of campus in a spacious, fenced area above the Idaho Accelerator Center, is unique in the Pacific Northwest. It's primary purpose is university research, but it should also provide an invaluable

training and certification resource for several ISU departments, local and regional emergency responders and even soldiers with the Idaho National Guard.

Devin Christensen, a captain with the fire department who heads the special team, had to travel to Texas A&M University in College Station, Texas, with another member of the department the last time he participated in structural collapse training. He anticipates the team will now train locally at least twice per year, at a considerable savings to local taxpayers.

“We can train 25 guys here today for the money it takes to send two to a class in Texas,” Christensen said.

The training grounds include several concrete culverts arranged in a winding tunnel, piles of debris and steel supports and concrete slabs that can be cut during rescue training and replaced afterwards.

Christensen explained the training could prepare his team to rescue victims trapped under a collapsed highway bridge, or covered beneath rubble after a bombing or an earthquake.

“I think the main thing is it’s a great opportunity to work with ISU and to bring departments from the region together,” Christensen said.

ISU engineering students designed the facility. It was funded with a \$1.1 million grant from the Higher Education Research Council of the Idaho State Board of Education through the Idaho Global Entrepreneurial Mission.

Mustafa Mashal is an associate professor in the Department of Environmental Engineering and the principal investigator for the Disaster Response Complex project. He said additional lanes at the facility will include an area to simulate vehicle rescues and a structure that simulates roof collapses.

ISU engineering students are designing the facilities. Mashal said they’re also using the facility to test robotic and virtual reality technology they’re developing for use in rescues. Some students, for example, are writing a Ph.D. dissertation on adding capabilities to a rescue robot enabling it to navigate through confined spaces. The new collapsed structure facility will enable them to conduct a full-scale validation of those capabilities, he said.

Mashal said the facility will also be useful in develop curriculum and obtaining certifications.

Mashal witnessed the need for such research and training during the aftermath of the 2011 earthquake while in Christchurch, New Zealand.

“Saving lives is the ultimate goal of this project,” Mashal said.

Jared Cantrell, project manager of the Disaster Response Complex, said ISU’s College of Technology recently used the facility to conduct mass casualty training for future emergency medical technicians. He said the university’s GIS program is also interested in using the facility.

Cantrell expects the facility will be self-sustaining with funding from users throughout the community who take advantage of training opportunities.

He hopes to conduct one to two small trainings per week and a couple of larger trainings per month at the facility, with the goal of keeping the cost to users as affordable as possible.

“We’re trying to make this as open and available as possible to serve the community,” Cantrell said.



More Training Photos the Pocatello Fire Department's Urban Search and Rescue team

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- A training in the indoor DRC is planned with Snake River Search and Rescue. Ten K9s and handlers are planning for a training at the Armory Building in early January 2021.
 - Several other trainings are planned for the Spring/Summer of 2021.

4.0 Plans for the Upcoming Reporting Period

Plans for each pillar of the DRC project are discussed below.

A. Research Pillar

- Continuing collaboration with ISU and INL researchers and developing the templates for a trench rescue and radiological training using AR/VR for civilian and military responders, respectively.
- Exploring funding opportunities in different areas such as AR/VR, instrumentation, and new technologies for disaster response.
- Publishing 1-2 papers from the research work.

B. Curriculum and Certification Pillar

- Completing MoUs with collaborators from the private industry, development of materials, identifying the instructors, and procuring the resources (e.g. advertisement, payment system etc.) for short classes in partnership with private and public entities.
- Developing curriculum for the indoor DRC and training lanes in collaboration with INL.
- Obtaining input from stakeholders.

C. Training and Exercise Pillar

- Completing construction of the basic training lanes for the outdoor DRC.
- Completing construction of the mock city for the indoor DRC.
- Scheduling and conducting multiple training events for potential partners and events, pending COVID-19 development.

5.0 Summary of Budget Expenditures

The project expenditure until December 31, 2020 is presented in Table 1. The project will spend all allocated budget of \$271,400 for the second year.

Table 1. Summary of Budget Expenditures

Salaries (faculty, graduate students, research engineer)	\$54,974.55
Fringes (faculty, graduate students, research engineer)	\$11,298.60
Travel for Materials and Supplies	\$924.69
Capital Expense	\$38,012.00
Services and Supplies	\$17,371.99
Tuition Remission (graduate student)	\$4,962.98
Approximate Total Expenditure posted through December 31, 2020	\$127,544.81

6.0 Partnerships and Impact

The project personnel have had discussions with the interested individuals and entities listed in Table 2 on this project with one or more pillars of the DRC project. The impact of the partnership with some of the entities named in Table 2 has created opportunities for students and faculty at ISU as well as the collaborators.

A full-time Research Engineer/Lab Manager position was created for this project. The position was filled and the Research Engineer/Lab Manager started on November 4, 2019. The Research Engineer/Manager helps with all three pillars of the DRC project as well as co-supervising the students.

Table 2. Entities that have toured/visited/briefed/or collaborated on the DRC project

No	Entity Name
1	Idaho National Laboratory <ul style="list-style-type: none"> • National and Homeland Security Directorate • Energy and Environment Science and Technology • Nuclear Science and Technology
2	The Center for Advanced Energy Studies
3	Department of Energy <ul style="list-style-type: none"> • Idaho Operations Office
4	Idaho Department of Environmental Quality <ul style="list-style-type: none"> • INL Oversight Program
5	Idaho Office of Emergency Management

	<ul style="list-style-type: none"> • Southeast Idaho • East Idaho • Boise Area
6	Idaho National Guard <ul style="list-style-type: none"> • Homeland Response Force • Civil Support Team
7	Idaho Falls Fire Department
8	Pocatello Fire Department
9	Pocatello Police Department
10	Idaho State Police
11	Qal-Tek Associates, LLC
12	Technical Resources Group, Inc.
13	Snake River Search and Rescue, Inc.
14	Argon Electronics
15	Preparedness Innovations
16	Eastern Idaho Fire Chiefs Association
17	Idaho State University <ul style="list-style-type: none"> • College of Technology <ul style="list-style-type: none"> - Nuclear Operations Technology - Continuing Education/Workforce Training) • Kasiska Division of Health Sciences <ul style="list-style-type: none"> - Institute of Emergency Management • College of Science and Engineering <ul style="list-style-type: none"> - Department of Mechanical Engineering - Department of Computer Science - Health Physics - Physics - Department of Chemistry - Electrical and Computer Engineering - Environmental Monitoring Laboratory • Department of Public Safety • Emergency Management • GIS Center • Idaho Accelerator Center

7.0 Faculty and Student Participation

Through December 31, 2020, the numbers of faculty, students, and other researchers who participated in one or more areas on the DRC project at ISU are listed in Table 3. Appendix 1 provides sample student activities for some of the students working on the project.

Table 3. Participating Researchers

Position	Numbers
Faculty	7 (including the PIs)
Graduate Students	6
Undergraduate Students	10
Researchers	6
Total	29

8.0 Metrics for Establishing Project Success and Economic Impact

Table 4 presents a summary of the metrics for establishing project success and economic impact for the second year of the project.

Table 4. Summary of the Criteria for Measuring Success for Year 2

Criteria	Pillars of the Disaster Response Complex		
	Research	Curriculum & Certification	Training & Exercise
Original Proposal (Jul 2020 – Jun 2021)	<ol style="list-style-type: none"> Detailed design/construction of the Phase II rubble pile, addition of new training lanes. Publication of 3-4 papers. Hiring two additional graduate students. 	<ol style="list-style-type: none"> Development of two additional classes in emergency training in collaboration with INL/CAES. Obtaining certification from Idaho State Board of Education. Offering training courses to 100 students/first responders. 	<ol style="list-style-type: none"> Training of 400 DoD CRE customers/Idaho National Guard personnel. Expanded customer base offering CBRN training.
Actual Performance (Jul – Dec 2020)	<ol style="list-style-type: none"> Detail design and construction of the rubble pile was completed. A city-mock for the indoor DRC has been developed and construction is currently underway. Logos were created, a website was launched. A journal paper was submitted; another journal paper is currently under preparation; a concept paper was prepared by INL researchers. Three graduates and one undergraduate were hired to work on the DRC project under the supervision of ISU/INL researchers. In addition, several other graduate students worked 	<ol style="list-style-type: none"> Course description and topics were developed for a class in gamma spectroscopy. Unfortunately, this class will not go through after receiving instructions from the government. Instead curriculum for another class is underway. A training for building safety culture (LOSA) was piloted to 30 students/faculty/staff at no-cost under a contract with BEA. LOSA is planned to become a curriculum that will be offered under the DRC at ISU. Thirty-eight classes were shortlisted and discussed between ISU and a private industry. Materials for the classes are ready. ISU will 	<ol style="list-style-type: none"> Multiple training events were scheduled at ISU under the DRC project in 2020. The number of emergency responders in these training events was projected to be more than 100. Unfortunately, the pandemic, lockdown, and travel/gathering restrictions did not allow for holding training events. This was beyond the control of the project personnel or ISU. The project personnel are actively looking to schedule training events as the condition in Idaho and the national situation with COVID-19 would allow. An indoor facility (Armory Building) was identified for the DRC. Preliminary design and drawings were completed for the indoor DRC.

	<p>on the project as student employees and assistants.</p>	<p>work with the collaborators to advertise some of these classes under the DRC in 2021 pending COVID-19 developments.</p>	<p>3. Twenty students and six instructors in the Idaho State University College of Technology’s Emergency Medical Technician program utilized the outdoor DRC for a real-world training.</p> <p>4. Twenty-five members of the Pocatello Fire Department’s Urban Search and Rescue team used the outdoor DRC facility to conduct a special operation exercise. Devin Christensen, a captain with the fire department who heads the special team, had to travel to Texas A&M University in College Station, Texas, with another member of the department the last time he participated in structural collapse training. He anticipates the team will now train locally at least twice per year, at a considerable savings to local taxpayers. “We can train 25 guys here today for the money it takes to send two to a class in Texas,” Christensen said.</p> <p>5. A training in the indoor DRC is planned with Snake River Search and Rescue. 10 K9s and handlers are planning for a training at the Armory Building in early January 2021.</p> <p>6. Other trainings are planned for the Spring/Summer of 2021 pending COVID-19 situation.</p>
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9.0 Future Plans

Several training and exercise events are planned for 2021. The intent of the DRC was originally to be a self-sustaining entity by the end of the three years of funding. The pandemic and lockdown have put limitations on hosting training events in Pocatello and at ISU. Several planned training events for 2020 had to be canceled. Given the uncertainty with the pandemic and how the situation for the rest of 2020 and 2021 will be, it is possible that DRC will need more than three years from the start of the project in August 2019 to become self-sustaining. Additional funding and opportunities will be explored in 2021 to make the DRC a long-term resource for training of emergency responders from Idaho and the region.

Future improvements and renovations of the Armory Building, adding new training lanes in the indoor/outdoor facility, partnerships with the private and public industry, hiring new researchers and students to work on different pillars of the project, training more emergency responders, and spreading the word about the DRC in Idaho and Northwestern United States are part of the future plans. Additionally, future grants will be pursued to further develop the facilities for project continuation and expansion.

10.0 Expenditure Report

A summary of the budget expenditures has been provided in the above. A full breakdown of the cost will be included in the second annual report due in June 2021.

11.0 Commercialization Revenue

Nothing to report for the period Jul-Dec, 2020. The Project though has potential for developing intellectual property.

Appendix 1: Sample Student Activities

Dates	Daniel Garz	Katie Hogarth	Uma Shankar Medasetti	Mahesh Acharya	Mahesh Mahat	Samantha Kerr	Rachel Brownell	Zachary Free
July		DRC precast inventory Conex lane 1 drawings White page development Journal completion	Finalize purchases for Viz lab Setup lab in ERC Tested/setup lab equipment	Outdoor DRC rubble pile construction	Outdoor DRC rubble pile construction	Indoor drawing development Outdoor DRC rubble pile construction	White page development Garage structure drawings Material lists	Setup lab and equipment Test equipment
August	Open House Cityscape roof design Journal summaries	Open House Began conex lane fabrication Began 3D conex drawing Finalize journal	Open House Funding proposals	Open House	Open House Inventory of incoming materials for DRC Footings construction	Open House Continue indoor development	Open House Journal summaries for writing Assit with conex lane fabrication	Open House Funding proposals
September	Presidents visit GIS drone flight	Presidents visit Conex lane fabrication	Presidents visit Develop concept paper	Presidents visit	Presidents visit Continue inventory Footings construction Clean and empty armory	Presidents visit Begin trench deveopment Determine materials for indoor cityscape Determine final cityscape layout Create cut sheets for construction	Presidents visit Conex lane fabrication DRC materials inventory Review journal Began handling DRC website DRC tower drawing	Presidents visit Develop concept paper
October	Armory layout Finalize cityscape layout	Finished conex lane fabrication relocated conex and other materials to DRC	Develop concept paper		Finish footing construction Clean old armory building	Develop budget and pricing of materials Search for cheap options for cityscape Finalize drawings and cutsheets for cityscape	Finish conex lane fabrication CMS website training Continue website work	Develop concept paper
November	Construction staking for conex tower Cityscape framing	Continue conex drawings	Finalize concept paper	Set lane for PFD training	Set lane for PFD training Cityscape framing	Lead indoor cityscape framing Continue searching for materials	Website maintenance	Finalize concept paper
December	Cityscape framing Walls, sheeting, drywall	Place conex footings Transfer materials		Cityscape framing Walls, sheeting, drywall	Cityscape framing Walls, sheeting, drywall	Cityscape framing Continue searching for materials	Website maintenance	