



# Specialized Safety Training and Tracking for KYTC Construction and Maintenance Personnel

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Kentucky Transportation Center  
College of Engineering, University of Kentucky, Lexington, Kentucky

in cooperation with  
Kentucky Transportation Cabinet  
Commonwealth of Kentucky

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**Research Report**  
KTC-22-18/SPR21-608-1F

**Specialized Safety Training and Tracking for KYTC Construction and Maintenance  
Personnel**

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<b>16. Abstract</b> High-quality safety training is critical for educating employees in the highway construction and maintenance industry about workplace hazards and giving them tools to remove and/or minimize associated risks. But researchers and state transportation agencies have not committed enough resources to develop safety trainings that address the unique needs of this sector. This report fills in this gap for the Kentucky Transportation Cabinet (KYTC) by cataloguing safety training resources available through other state and federal transportation agencies, documenting trainings available to Cabinet staff, identifying and prioritizing training gaps, and critically evaluating the content, quality, and duration of training resources. A web-based tool developed as part of this effort can be used by KYTC employees to quickly identify training resources by topic and view evaluations. In collaboration with the Kentucky Transportation Center's Technology Transfer Program, researchers propose recommendations for safety trainings that can address needs beyond the Occupational Safety and Health Administration (OSHA) 10-hour course Cabinet employees take. Future efforts should work to integrate these training modules into KYTC's recently acquired comprehensive safety management system.			
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## Executive Summary

Effective safety training is an essential component of an organization’s safety program. Training helps employees fill knowledge, skills, and abilities gaps and sets the tone for expectations and behaviors. Nowhere is good safety training more important than on highway construction jobsites. Between 2003 and 2017, in the United States 1,844 workers died at roadway construction sites — an average of 123 per year.

The KYTC Secretary’s Office of Safety (SOS) has dedicated staff who help deliver the agency’s safety training program, which includes training distributed by the American Association of State Highway and Transportation Officials and acquired through Kentucky’s Personnel Cabinet. However, SOS leadership needed to catalogue safety training offerings, evaluate those programs, and identify gaps in the curriculum. This report addresses this need by documenting current KYTC safety training programs, identifying gaps and needs, investigating and evaluating the quality of available trainings to fill those needs, and recommending programs for adoption. This was done by (1) exploring training resources available through other departments of transportation (DOTs), the Federal Highway Administration (FHWA), and other publicly available materials; (2) developing a safety training matrix to map the Cabinet’s current safety training programs; (3) identifying and prioritizing training gaps; and (4) gathering and evaluating training resources in terms of duration, content, format, and methods of testing knowledge retention. The research team developed a web-based tool that lets users identify training resources for specific topics, view evaluations of training, and identify points of contact. Recommendations for each training topic were made based on evaluations or recommendations from the Kentucky Transportation Center’s (KTC) Technology Transfer (T2) program. Table E2 summarizes information on recommended safety training resources using a color coding scheme outlined in Table E1.

KYTC SOS leadership can use these recommendations to improve the Cabinet’s overall safety training program and explore other resources and training types should additional needs emerge. As the KYTC SOS advances its efforts in the future through a holistic safety management system (SMS), refining and improving its safety training offerings will be a useful and impactful parallel endeavor.

**Table E1** Interpretive Key for Recommended Safety Training Resources Table

Color	Definition
Green	<ul style="list-style-type: none"> <li>Received a good overall evaluation</li> </ul>
Yellow	<ul style="list-style-type: none"> <li>Received an acceptable overall evaluation</li> </ul>
Blue	<ul style="list-style-type: none"> <li>Training recommended by KTC T2</li> <li>No material was available to review of the project</li> <li>Appendix C lists potential training sources identified by KTC’s T2 group for future consideration</li> </ul>
Gray	<ul style="list-style-type: none"> <li>Training topic the research team could not access available training materials for (i.e., wheel/tire servicing hazard training)</li> </ul>
<b>Bold</b>	<ul style="list-style-type: none"> <li>Recommended source is the only available source of material the research team could access. No comparisons could be made.</li> </ul>

**Table E2** Summary of Recommended Safety Training Resources

<b>Topic</b>	<b>Recommended Training Resource</b>
<b>Haz Comm / GHS</b>	<b>TC3TS016 — Recognition and Avoidance of Unsafe Conditions</b>
Bloodborne Pathogens	TC3TS015 — Bloodborne Pathogens
Ergonomics — Basic	MARCOM — Industrial Ergonomics
Physical threat / Hostile Situation — Recognition / Avoidance / De-escalation	MARCOM — Active Shooter; Conflict Resolution in the Office
Defensive Driving	MARCOM — Driving Defensively
Equipment / Jobsite Hazards Awareness	MARCOM — Safety Orientation
Confined Space — Awareness	TC3TS029 — Confined Spaces
Hazardous Materials	TC3TS030 — Hazardous Materials
Stored Energy Hazards & Controls — Basic	MARCOM — Electrical Safety
Hand/Portable Power Tools	MARCOM — Hand and Power Tool Safety
Shop Hoists / Lifts / Rigging Basic Awareness	MARCOM — Rigging Safety in Industrial and Construction Environments
Machine / Machine Guarding	MARCOM — Machine Guard Safety
Wheel/Tire Servicing Hazards	
Cranes — Basic Inspection, Ops, Rigging	TC3TS026 — Crane Safety
Scaffolds — User Training	TC3TS019 — Scaffolding Safety
General Energy Control — LO/TO	ClickSafety
<b>Confined Space — Entry/Attendant Training</b>	<b>MARCOM — Confined Space Entry</b>
Welding, Cutting, Brazing	National Safety Council
Chromium IV (Hexavalent Chrome)	Washington State Dept of Labor and Industries
Respiratory Protection (User)	MARCOM — Respiratory Protection and Safety
Exhaust / Ventilation	CED Engineering
Air Monitoring	BIS Safety Software
Formaldehyde	HSI — Formaldehyde Safety
<b>Asbestos</b>	<b>MARCOM — Asbestos Awareness</b>
<b>Lead</b>	<b>MARCOM — Lead Exposure in General Industry</b>
<b>Carbon Monoxide</b>	<b>TC3TS016 — Recognition and Avoidance of Unsafe Conditions</b>
<b>Occupational Noise Exposure</b>	<b>MARCOM — Hearing Conservation and Safety</b>
Ionizing Radiation — User / Exposed Training	Troxler — Nuclear Gauge Operator Training



## Chapter 1 Background and Scope of Work

### 1.1 Introduction

Construction industry jobsites are volatile working environments. In 2019, 1,061 fatal injuries were reported, a 5% increase over 2018 and the sector's most fatal year since 2007 (Slowey, 2020). Highway work zones are considered extremely hazardous for both drivers and workers who build, repair, and maintain them. From 2003 to 2017, 1,844 workers died at road construction sites — an average of 123 per year (NIOSH, 2019). However, very limited research has focused on the safety and health of highway maintenance workers. Several efforts have sought to lower death rates and improve occupational safety and health in the construction industry, including prevention through design, improved engineering controls, increased regulations, and enhanced personal protective equipment (Probst et al., 2019).

### 1.2 Problem Statement

Training is an important tool for informing employees about workplace hazards and increasing their awareness of safety controls that remove and/or minimize risk. According to the Occupational Safety and Health Administration's (OSHA) recommended practices for safety and health programs, workers and supervisors need specialized training when workplaces present unique hazards. Minimal attention has been paid to specialized training programs for the highway construction and maintenance sector. There is also notable lack of training resources available for highway construction and maintenance crews. This indicates an urgent need for the Kentucky Transportation Cabinet (KYTC) to develop a specialized training program for highway construction and maintenance employees specific to their work scope that addresses safety issues which fall beyond OSHA's 10-hour course. This project identified key needs and developed a specialized training program in cooperation with the KYTC Secretary's Office of Safety (SOS).

### 1.3 Objectives

This research documented KYTC's existing safety training opportunities and evaluated available training resources. The Cabinet can use findings to understand the current state of training programs and identify gaps or opportunities for improved programs. Secondary project objectives included:

1. Map KYTC's current safety program.
2. Identify and prioritize KYTC's safety training needs.
3. Evaluate KYTC's existing safety training resources.
4. Prepare recommendations on gaps with the KYTC safety training program.

## Chapter 2 Literature Review

Although the construction industry has seen improvements in safety performance recently, the goal of zero incidents has not been achieved. The injury and fatality rate in construction is often higher than in other industries (BLS, 2011). Construction industry fatalities account for 20% of all workplace fatalities (OSHA, 2016). Haslam et al. (2005) found that 70% of construction accidents are linked to insufficient knowledge of safety. Concordant with this reasoning, Mullen (2004) held that many accidents are due to worker behaviors. Although maintaining an injury-free workplace is extremely difficult, identifying and eliminating root causes can reduce the number of incidents (Karakhan, 2017). According to the Center for Construction Research and Training (CPWR), construction ranked last in the percentage of employers providing formal training to workers CPWR (1997). Training workers increases their understanding of occupational hazards that arise on jobsites. Zou and Zhang (2009) found that workers with better safety training perceive risk differently than those with little or no safety training.

Companies where employees are exposed to dangerous hazards assume that investing in safety training yields positive safety outcomes. Quality of training is a primary consideration for such companies. Because of poor training, their desired effect may have a reduced impact on construction accidents. Others have actually found that workers with safety training are more likely to be involved in accidents than those without safety training (Hale, 1984). Some studies have even found no relationship between safety training and safety outcomes (Li et al., 2012). Researchers have used different methods to assess the impact of training on safety performance. Tam and Fung IV (1998) studied the safety records of 45 Hong Kong construction companies, finding that safety training was one of the four effective components of any safety program. Different methods have been used to assess and improve safety training, ranging from traditional surveys to visualization and simulation assessment. Safety trainings can generate positive or negative outcomes depending on the quality of training programs used.

Some researchers have focused on the relationship between the level of engagement in training and subsequent safety performance. For instance, Namian et al.'s (2016) study of engagement levels found a group workers with high engagement could better recognize hazards, which resulted in better safety performance. The Council of Labor Affairs reported that 67.82% of all workers injured each year do not receive labor safety education training (BLS, 2006). According to Wang et al. (2008) common barriers to conducting training in construction include lack of adequate instructors, lack of financial resources, lack of support from job site supervisors, and language barriers. In a study of health and safety training with open shop contractors, Goldenhar et al. (2001) found that 98% of respondents said their companies place special importance on safety, while 78% had no control over training from subcontractors. Only 63% of respondents measured the effectiveness of safety training, which was conducted by observing the on-the-job performance, measuring employee satisfaction, looking at incident rates and experience modification ratings (EMR), assessing worker's compensation rates, and conducting formal testing. Out of the 63% who measured the effectiveness of the safety training, only 28% formally tested worker performance after safety training.

Previous research has highlighted the importance of evaluating the quality of safety training and its impact on safety performance, however, no previous work has looked at safety training evaluation for the construction industry in general and for high-risk working groups (e.g., maintenance staff) in particular. This research fills this gap by proposing a safety training evaluation matrix for KYTC's highway construction and maintenance sector.

## Chapter 3 Methodology

We began by documenting highway construction and maintenance training available through state departments of transportation (DOTs), the Federal Highway Administration (FHWA), the Kentucky Transportation Center’s (KTC) Technology Transfer group (T2), and other publicly available materials. This exercise resulted in a foundational database of training options. Working closely with KYTC’s SOS, we developed a training matrix that identifies current KYTC safety topics, frequencies, formats, and employee groups. This matrix formed the basis of a gap analysis that identified and prioritized improvements in safety training offerings. After gap analysis, we documented, reviewed, and evaluated available training offerings. Finally, we developed recommendations on the best resources for each training topic.

### 3.1 Available Highway Construction and Maintenance Training Sources

A review of transportation agency websites for the 50 states, District of Columbia, and Puerto Rico found that a fraction of DOTs (13 or 25%) publish a safety manual focused on employees and/or occupational safety (Table 3.1) Few include information on what training topics exist, and none publish publicly available training materials. Table 3.2 contains names and references for available training topics from the few DOTs that have documentation.

**Table 3.1** Review of DOT Safety Manuals

State	Safety Manual	Link	Safety & Health Manual
Alabama	No	<a href="https://www.dot.state.al.us/">https://www.dot.state.al.us/</a>	
Alaska	Yes	<a href="http://dot.alaska.gov/">http://dot.alaska.gov/</a>	ADOT&PF Safety Manual Safety & Health Training
Arizona	No	<a href="https://azdot.gov/">https://azdot.gov/</a>	
Arkansas	Yes	<a href="http://www.arkansashighways.com/manuals/manuals.aspx">http://www.arkansashighways.com/manuals/manuals.aspx</a>	Safety Manual
California	Yes	<a href="https://dot.ca.gov/programs/safety-programs">https://dot.ca.gov/programs/safety-programs</a>	Code of Safe Practice
Colorado	Yes	<a href="https://www.codot.gov/">https://www.codot.gov/</a>	Work Zone Best Practices Safety Guide
Connecticut	No	<a href="https://portal.ct.gov/DOT">https://portal.ct.gov/DOT</a>	
Delaware	No	<a href="https://deldot.gov/">https://deldot.gov/</a>	
District of Columbia	No	<a href="https://ddot.dc.gov/">https://ddot.dc.gov/</a>	
Florida	No	<a href="https://www.fdot.gov/">https://www.fdot.gov/</a>	
Georgia	No	<a href="http://www.dot.ga.gov/">http://www.dot.ga.gov/</a>	
Hawaii	No	<a href="http://hidot.hawaii.gov/">http://hidot.hawaii.gov/</a>	
Idaho	No	<a href="https://itd.idaho.gov/safety/">https://itd.idaho.gov/safety/</a>	
Illinois	No	<a href="http://www.idot.illinois.gov/">http://www.idot.illinois.gov/</a>	
Indiana	Yes	<a href="https://www.in.gov/indot/">https://www.in.gov/indot/</a>	INDOT 2018 Safety and Health Manual (very comprehensive & detailed)
Iowa	Yes	<a href="https://iowadot.gov/#/services">https://iowadot.gov/#/services</a>	
Kansas	No	<a href="http://www.ksdot.org/index.asp">http://www.ksdot.org/index.asp</a>	

State	Safety Manual	Link	Safety & Health Manual
Kentucky	Yes	<a href="https://transportation.ky.gov/Pages/Home.aspx">https://transportation.ky.gov/Pages/Home.aspx</a>	Employee Safety & Health Manual
Louisiana	No	<a href="http://wwwsp.dotd.la.gov/Pages/default.aspx">http://wwwsp.dotd.la.gov/Pages/default.aspx</a>	
Maine	No	<a href="https://www.maine.gov/mdot/">https://www.maine.gov/mdot/</a>	
Maryland	No	<a href="http://www.mdot.maryland.gov/">http://www.mdot.maryland.gov/</a>	
Massachusetts	No	<a href="https://www.mass.gov/orgs/massachusetts-department-of-transportation">https://www.mass.gov/orgs/massachusetts-department-of-transportation</a>	
Michigan	No	<a href="https://www.michigan.gov/mdot/">https://www.michigan.gov/mdot/</a>	
Minnesota	No	<a href="http://www.dot.state.mn.us/">http://www.dot.state.mn.us/</a>	
Mississippi	No	<a href="https://mdot.ms.gov/">https://mdot.ms.gov/</a>	
Missouri	No	<a href="https://www.modot.org/">https://www.modot.org/</a>	
Montana	No	<a href="https://www.mdt.mt.gov/">https://www.mdt.mt.gov/</a>	
Nebraska	No	<a href="https://dot.nebraska.gov/">https://dot.nebraska.gov/</a>	
Nevada	No	<a href="https://nv.gov/">https://nv.gov/</a>	
New Hampshire	No	<a href="https://www.nh.gov/dot/">https://www.nh.gov/dot/</a>	
New Jersey	No	<a href="https://www.state.nj.us/transportation/">https://www.state.nj.us/transportation/</a>	
New Mexico	No	<a href="https://dot.state.nm.us/">https://dot.state.nm.us/</a>	
New York			
North Carolina	Yes	<a href="https://www.ncdot.gov/Pages/default.aspx">https://www.ncdot.gov/Pages/default.aspx</a>	Safety Handbook
North Dakota	No	<a href="http://www.dot.nd.gov/">http://www.dot.nd.gov/</a>	
Ohio	No	<a href="https://www.transportation.ohio.gov/wps/portal/gov/odot/">https://www.transportation.ohio.gov/wps/portal/gov/odot/</a>	Not a safety manual but safety Procedures
Oklahoma	No	<a href="https://www.ok.gov/odot/">https://www.ok.gov/odot/</a>	
Oregon	Yes	<a href="https://www.oregon.gov/odot/Pages/index.aspx">https://www.oregon.gov/odot/Pages/index.aspx</a>	Survey Safety Manual (Not for all employees)
Pennsylvania	Yes	<a href="https://www.penndot.gov/Pages/default.aspx">https://www.penndot.gov/Pages/default.aspx</a>	Safety Policy Handbook
Puerto Rico		<a href="http://www.dtop.gov.pr/">http://www.dtop.gov.pr/</a>	
Rhode Island	No	<a href="http://www.dot.ri.gov/">http://www.dot.ri.gov/</a>	
South Carolina	No	<a href="https://www.scdot.org/">https://www.scdot.org/</a>	
South Dakota	No	<a href="https://dot.sd.gov/">https://dot.sd.gov/</a>	

State	Safety Manual	Link	Safety & Health Manual
Tennessee	No	<a href="https://www.tn.gov/tdot.html">https://www.tn.gov/tdot.html</a>	
Texas	No	<a href="https://www.txdot.gov/">https://www.txdot.gov/</a>	
Utah	Yes	<a href="https://www.udot.utah.gov/connect/">https://www.udot.utah.gov/connect/</a>	Safety and Health Manual
Vermont	Yes	<a href="https://www.vermont.gov/#gsc.tab=0">https://www.vermont.gov/#gsc.tab=0</a>	Employee Safety Manual
Virginia	No	<a href="http://www.viriniadot.org/">http://www.viriniadot.org/</a>	
Washington	Yes	<a href="https://wsdot.wa.gov/">https://wsdot.wa.gov/</a>	Safety Procedures and Guidelines Manual <i>(Very detailed &amp; Comprehensive)</i>
West Virginia	No	<a href="https://transportation.wv.gov/Pages/default.aspx">https://transportation.wv.gov/Pages/default.aspx</a>	Highway Worker Safety Program



**Table 3.2 DOT Safety Training Topics and Links**

Agency	Training Category	29 CFR Code	Relevant Information
Arkansas	Flagger Training		
Alaska	Accident Prevention and Signs	1910.145	<a href="http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9794">http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9794</a>
	Asbestos Awareness	1910.1001	<a href="http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9995">http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9995</a>
	Avalanche Control & Response		
	Explosives handling	1910.109	<a href="http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9755">http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9755</a> ; <a href="http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=10806">http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=10806</a>
	Exposure to hazardous Chemicals	1910.145	<a href="http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=10106">http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=10106</a>
	Electrical Safety Related Work Practices	1910.331-335	<a href="http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9909">http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9909</a>
	Housekeeping at Construction Sites	1926.25	<a href="http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=10611">http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=10611</a> ; <a href="https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9790">https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=9790</a>
	Illumination	1926.56	<a href="http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=10630">http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&amp;p_id=10630</a>
	Ionizing Radiation	1910.1096/1926.53	
	Nonionizing Radiation-Laser	1910.97&1926.54	
	Mining-New Miner	30CFR Part 46.5 and 46.8	
	Mining-Experienced Miner	30CFR Part 46.6 and 46.8	
	Mining-New Task	30CFR Part 48.27	
	Mining-Hazard Awareness	30CFR Part 48.31	
	Right of Inspection	1903-1926.03	
	Safety Color Markings for Hazards	1910.44-1910.45/1926.200	
	Safety & Health Training	1926.21	
Sanitation	1910.141		

	Slings	1910.48	
	Spray Finishing	1910.107	
	Wildlife Safety		
Indiana	Facilities & Laboratories	1910.1450/1910.1200	
	Mobile Devices	Federal Code 49 C.F.R. 392.82	<a href="https://www.law.cornell.edu/cfr/text/49/392.82">https://www.law.cornell.edu/cfr/text/49/392.82</a>
	Walking & Working Surfaces	1910.22	<a href="https://www.osha.gov/pls/oshaweb/owadis.p.show_document?p_table=STANDARDS&amp;p_id=9714">https://www.osha.gov/pls/oshaweb/owadis.p.show_document?p_table=STANDARDS&amp;p_id=9714</a>
	Weather Hazard		
Oregon	Survey Safety		
Utah	Drug Free Workplace		
West Virginia	Highway Worker Training		

The FHWA maintains a collection of training materials for highway construction and maintenance crews through its On-the-Job Training (OJT) Program. The OJT program requires DOTs to establish apprenticeship and training programs that target women, minorities, and disadvantaged individuals for journey-level positions. Efforts identified by this program are directly applicable to KYTC's needs, however, details on training materials are limited and not easily accessible for review.

Two training vendors are readily accessible to KYTC staff:

- The American Association of State Highway and Transportation Officials (AASHTO) Transportation Curriculum Coordination Council (TC3). TC3 is a technical service program focused on developing training products for technical staff in construction, maintenance, and materials. AASHTO members receive open access to these training materials.
- MARCOM Group Ltd. MARCOM's Safety, Regulatory Compliance, and Human Resource training courses provide companies with the tools that they need to create safer, more productive, and more profitable workplaces. KYTC has an agreement with MARCOM to integrate on-demand learning modules into KYTC's internal training portal (MyPURPOSE). MyPURPOSE was procured and is hosted through the Personnel Cabinet.

### 3.2 KYTC Safety Training Matrix

Next we identified KYTC's current training offerings and documented delivery methods, frequencies, and targeted personnel. In collaboration with KYTC's SOS, we generated a training matrix to map training offerings (Figure 3.1).

Appendix A contains the full training matrix. Section A of the matrix focuses on the timing, training block, target group, required training hours, content summary, and OSHA training topic. The OSHA training topic column uses the following color coding scheme:

- Green — A new training program that needs to be adapted to KYTC’s current program and needs
- Red — A training topic for which KYTC has few or no training materials
- Blue — A current training program that satisfies KYTC needs

Figure 3.1 only shows Part 1, which focuses on new or transferred employees on a safety training track. Part 2 deals with specific hazard exposures through task or position duties.

Section B addresses who should receive training. Cells shaded blue indicate an employee group that requires a training. Employee groups include:

- All KYTC
- In-Field: Administration or Engineering
- In-Field: Technician/ Maintenance/CCAD Operations
- Lab/Warehouse/Equipment Maintenance/Shop Employees
- Department of Highways Highway Technician series
- Any Employee based on work authority or specific hazard exposure

Section C includes notes on training topics, training frequency (annual or periodic), KYTC policy manual references, and OSHA standard references.

Section D documents delivery options (e.g., in-person, live virtual/interactive classroom, or virtual independent/on demand) and training sources (through KYTC’s SOS, a contracted vendor, or external link).



### **3.3 KYTC Safety Training Prioritization**

Next we conducted a prioritization exercise to facilitate identification and evaluation of training sources. KYTC's SOS led this effort, which focused on the largest gaps between what was desired and what existed in terms of training content and the highest-risk training categories. Gap analysis results and prioritization can be seen in Figure 3.2. Full results can be found in Appendix B.

Strong training priorities included:

- Hazard communication
- Bloodborne pathogens
- Ergonomics
- Hostile situation training

Although still needed, specific hazard training (e.g., ionizing radiation, occupational noise exposure, carbon monoxide, lead, asbestos, and formaldehyde issues) ranked at the bottom of the priority list.

The priority list also includes intended training audiences, desired content and format, and references to KYTC policy manuals and OSHA regulations. We used these findings to identify, review, and evaluate potential training sources for KYTC's SOS.



UK SPR21-608 Project Topic Development List		Rev 02/03/2022							
Training Block	Topic Type	Topic	Audience	Content		Priority	Rank	SHA reference	OSHA regs
New EE Safety 1	New EE / Awareness	Haz Comm / GHS	All KYTC Employees	EE right-to-know statutes, GHS labeling, reading SDS, general emergency actions, KYTC policy. Appropriate for KYTC operations & typical exposures	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	High	1	SHA-410	29CFR 1910.1200 Sub. Z
		Bloodborne Pathogens		OSHA BBP requirements, exposure routes, protective measures, KYTC policy. Include KYTC / road maint typical exposures - used syringes, dead animals, trash, trash, first aid exposure.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training	High	2	SHA-702, SHA-703	29CFR 1910.1030
		Ergonomics - Basic		Awareness - lifting, repetitive motion, twist/strain injury hazards & control measures including workplace optimization, clear travel paths, lift assists & equipment, stretching/warm-up before exertion, etc	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	High	3	SHA-1200, SHA-1201, SHA-1202, SHA-1302,SHA-1303	
		Physical threat / hostile situation - Recognition / Avoidance / De-escalation		Basic skills for EE to recognize escalating or potential hostile interactions with co-workers or public on the job, how to avoid, de-escalate, or escape. Include situations inside state facilities and on private property / uncontrolled ROW.	Stand-alone content to offer as ODT via MyPurpose or Origami LMS as adjunct to OHRM workplace violence ODT program.	High	4	none	29CFR 1907 Gen. Duty Clause
		Defensive Driving		<b>**NOTE: We have identified a currently available program to use until a KYTC-focused program is available.**</b> Basic defensive / safe driving skills for drivers of state passenger cars/SUVs or light trucks. Ideally would include backing safety.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	Med		SHA-1622, SHA-1701, SHA-1702, SHA-1704, SHA-1705, SHA-1724	
New EE Safety 2.A.	New EE / Awareness	Equipment / Jobsite hazards awareness	All In-Field Ees	Safe work around mobile equipment & traffic through sites, buried/overhead utilities, severe/hot/cold weather, animals/plants. KYTC would incorporate into OSHA 10 materials also for later reinforcement.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	High	5	SHA-409-3, SHA-506, SHA-513, SHA-1600, SHA-1601, SHA-1700, SHA-1701, SHA-1707, SHA-1725, SHA-1726, SHA-1727, SHA-1731	
		Confined Space - Awareness	All In-Field Ees	Recognizing potential confined spaces and hazards therein. Focus on knowing when NOT to enter for all In-Field EE's. Include exposures on KYTC ROWs & property i.e. sewer pump stations, utility vaults, drainage systems, other underground structures, tanks, bins, silos.	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	Low	6	SHA-407-5, SHA-1624	29CFR 1910.146 Sub. J / 1926 Sub. AA
New EE Safety 2.B	New EE / Awareness	Hazardous Materials	All Garage / Shop / Lab EEs	Awareness of hazards, storage, handling of flammable & combustible liquids and gases, corrosive, solvents, irritants used in typical maintenance operations, i.e. automotive fluids, lubricants, fuels, welding/cutting gases, etc. Also awareness of CO & general shop/garage ventilation esp. with running engines, fuel burners (steam washers) are in use in enclosed spaces.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	Medium	7	SHA-410, SHA-504, SHA-505, SHA-512, SHA-516, SHA-900, SHA-901, SHA-904, SHA-1001, SHA-1015, SHA-1021, SHA-1101, SHA-1102	29CFR 1910 Sub. H
		Stored Energy Hazards & Controls - Basic		Awareness of hazards & types of stored energy, i.e. electric, pneumatic, high pressure fluid, springs, elevated equipment like raised truck dump beds, etc. Actual energy control & LOTO is separate more in-depth later.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	Medium	8	SHA-502, SHA-504, SHA-505, SHA-508, SHA-511	29CFR 1910.147 Sub. J
		Hand/Portable Power Tools		Not including chainsaws / polesaws which are covered in other training. Hazard awareness only - basic electric / air power tools (cords, safety switches, elect grounding, reaction forces) and hand tools (hammer, chisels, pry bars). Proper tool for purpose, hand/eye hazards,etc).	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	Medium	10	SHA-504, SHA-505, SHA-508, SHA-1002, SHA-1003, SHA-1006, SHA-1021, SHA-1400 through 1407, SHA-1615, Exh. 9027	29CFR 1910 Sub. P
		Shop Hoists / Lifts / Rigging basic awareness		Not crane or rigging detailed, only basic awareness of beam/trolley chain hoists in buildings - capacity, inspection, basic chain/sling ratings, inspection, use for lifting & positioning equipment (not cargo securement)	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	Low	11	SHA-1007, SHA-1019	
		Machine / Machine Guarding		Awareness - importance of maintaining guarding for chain drives, belt/pulley systems (example of air compressors), rotating shafts, hot parts, saw & grinder guards, etc.	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	Low	12	SHA-1003, SHA-1006, SHA-1011,SHA-1016, SHA1018, SHA-1730, Exh 9027, Exh 9035	29CFR 1910 Sub. O / 1926 Sub. I
		Wheel/tire Servicing Hazards	Equipment & Highway Maint Techs	Hazards of explosive failure of tires/rims, use of safety cages, clearance distance from tires being inflated, etc.	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	Low	13	SHA-406-1, SHA-1010	29CFR 1910.177 Sub. N

Figure 3.2 Safety Training Prioritization Matrix

### 3.4 Available Training Sources Evaluation

We acquired training materials from MARCOM and AASHTO TC3 that overlapped with the safety training for further evaluation. Additionally, training sources and/or materials were identified by KTC's T2 group. After acquiring training materials, we holistically evaluated each training source using the methodology described below.

We used a three-point scale to assess each training in four categories: format, content, assessment, and duration. An overall score was calculated based on the average score of these categories. Figure 3.3. presents scores using a color coded system, where Green = 3, Yellow = 2, and Red = 1. These scores are defined for each category below.

The format evaluation focused on KYTC's desired format and the format available for the training source. Scores were defined as follows:

- 3 — Meets KYTC's desired format and has the option to be added and assigned through MyPURPOSE
- 2 — Some alignment with KYTC's desired format but cannot be assigned or tracked through MyPURPOSE
- 1 — No alignment with KYTC's desired format. No potential for tracking by KYTC.

The content evaluation looked at how well training material content aligns with KYTC's desired content. Scores were defined as follows:

- 3 — Strong alignment (> 90%) with KYTC's desired content
- 2 — Moderate alignment (approximately 75% or greater) with KYTC's desired content
- 1 — Weak alignment (< 50% ) with KYTC's desired content

The assessment evaluation looked at the kind, length, and style of learning assessment included in training materials. Scores were defined as follows:

- 3 — Learning assessments focus on analysis, application, or have multi-stage evaluations
- 2 — Learning assessments strictly test rote knowledge or do not have appropriate stops tailored to the length of the training
- 1 — Learning assessments do not require any form of knowledge demonstration

The final evaluation looked at duration. Scores were defined as follows:

- 3 — Duration is  $\pm 10\%$  of what KYTC prefers
- 2 — Duration is  $\pm 25\%$  of what KYTC prefers
- 1 — Duration is  $\pm 50\%$  of what KYTC prefers

An average score was calculated to provide an overall evaluation. Scores were defined as follows:

- Green: > 2.5
- Yellow: 1.5 – 2.5
- Red: < 1.5

This exercise was critical to reference available training materials on each training topic quickly and easily; it also informed the final results and recommendations. **Error! Reference source not found.** shows a sample of the evaluation form.

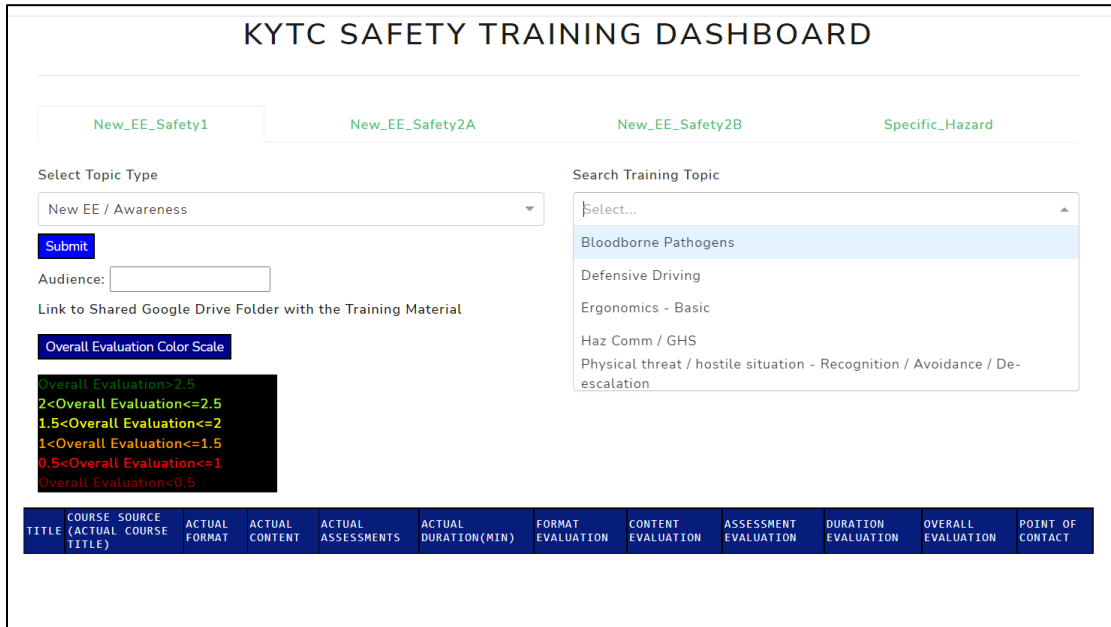
Title	Course Source (Actual Course Title)	Actual Format	KYTC Desired Format	Actual Content	KYTC Desired Content	Actual Assessments
Haz Comm / GHS	TC3T5016	Stand-alone content	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	<ul style="list-style-type: none"> <li>Describe the employer's role in construction safety and health program</li> <li>Describe how to properly assess possible hazards when entering a work zone</li> <li>List the various types of hazards present on any given job site</li> </ul>	EE right-to-know statutes, GHS labeling, reading SDS, general emergency actions, KYTC policy. Appropriate for KYTC operations & typical exposures	Periodic Knowledge Checks
Bloodborne Pathogens	MARCOM's MicroLearning curriculum	Video	Stand-alone content to include with in-person or virtual ILT NEO or refresher training	<ul style="list-style-type: none"> <li>Deepen worker's understanding of bloodborne pathogens</li> </ul>	OSHA BBP requirements, exposure routes, protective measures, KYTC policy. Include KYTC / road maint typical exposures - used syringes, dead animals, trash, trash, first aid exposure.	Final Quiz - 10 Questions
Bloodborne Pathogens	TC3T5015	Stand-alone content	Stand-alone content to include with in-person or virtual ILT NEO or refresher training	<ul style="list-style-type: none"> <li>Explain the importance of bloodborne pathogen safety <ul style="list-style-type: none"> <li>List training applicability and requirements</li> </ul> </li> <li>Describe the transmission routes and symptoms of Hepatitis B, Hepatitis C, and HIV</li> <li>Describe safe work practices used to limit bloodborne pathogen exposure</li> <li>Describe the process for reporting exposure incidents</li> </ul>	OSHA BBP requirements, exposure routes, protective measures, KYTC policy. Include KYTC / road maint typical exposures - used syringes, dead animals, trash, trash, first aid exposure.	Periodic Knowledge Checks
Bloodborne Pathogens	KTC Technology Transfer	N/A	Stand-alone content to include with in-person or virtual ILT NEO or refresher training	N/A	OSHA BBP requirements, exposure routes, protective measures, KYTC policy. Include KYTC / road maint typical exposures - used syringes, dead animals, trash, trash, first aid exposure.	N/A
Ergonomics - Basic	MARCOM's MicroLearning curriculum (Industrial Ergonomics)	Video	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	MARCOM's Micro-Learning curriculum on Industrial Ergonomics provides employees with the information they need to understand ergonomic hazards, recognize them in their workplace and know how to avoid them.	Awareness - lifting, repetitive motion, twist/strain injury hazards & control measures including workplace optimization, clear travel paths, lift assists & equipment, stretching/warm-up before exertion, etc.	Final Quiz - 10 Questions

Actual Duration(min)	KYTC Desired Duration (min)	Duration Deviation Ratio	Format Evaluation	Content Evaluation	Assessment Evaluation	Duration Evaluation	Overall Evaluation
30	15	2.00					
15	15	1.00					
40	15	2.67					
30	15	2.00					
12	15	0.80					

Figure 3.3 Safety Training Evaluation Tool

### 3.5 Training Sources User Interface Webtool

Next we coded a user interface webtool using Dash and generated a website to reference available sources for each training topic. The evaluation form in Figure 3.4 drove the contents of the webtool. Users choose the *Training Block* from the four tabs (i.e., New EE Safety1, New EE Safety2A, New EE Safety 2B, and Specific Hazard). After choosing a training block, the user selects the *Topic Type* and *Training Topic* from the dropdown list. Once a user selects the training topic they click the *Submit* button to view the associated Audience and Priority. This generates a table of available training courses on the selected topic, evaluations for the four categories, overall evaluation, and points of contact (if available). Figure 3.5 is the screen users see after selecting the first tab (i.e., New EE Safety1, New EE/Awareness, Bloodborne Pathogens).



**Figure 3.4** KYTC Safety Training Dashboard User Interface Webtool

Users can download training materials by clicking the link. In Figure 3.5, materials were stored on a Google Drive Folder and a link was generated for the shared folder and embedded in the webtool. To help users interpret overall evaluation scores, a color scale is provided (black box on the lower-left side of Figure 3.4). This will help users assess differences between training materials.



Figure 3.5 KYTC Safety Training Dashboard User Interface Webtool (Course Evaluation Table)

### Final Recommendations

Table 3.4 provides recommendations for training sources along with justifications and unknowns or uncertainties for each. A color-coding scheme is used to categorize training sources (Table 3.3).

Table 3.3 Color Codes Used to Classify Training Sources

Color	Definition
Green	<ul style="list-style-type: none"> <li>Received a good overall evaluation</li> </ul>
Yellow	<ul style="list-style-type: none"> <li>Received an acceptable overall evaluation</li> </ul>
Blue	<ul style="list-style-type: none"> <li>Training recommended by KTC T2</li> <li>No material was available to review for the project</li> <li>Appendix C lists potential training sources identified by KTC's T2 group for future consideration</li> </ul>
Gray	<ul style="list-style-type: none"> <li>Training topic the research team could not access available training materials for (i.e., wheel/tire servicing hazard training)</li> </ul>
<b>Bold</b>	<ul style="list-style-type: none"> <li>Recommended source is the only available source of material the research team could access. No comparisons could be made.</li> </ul>

Information on unknowns and uncertainties is critical. Many limitations relate to trainings being shorter or longer than KYTC prefers. Content and assessments were prioritized over length as there is some control over duration. Additionally, training sources recommended by KTC's T2 often did not have content, assessments, or information on duration available for review; and a few required payment for access. These issues can be significant barriers to integrating training into KYTC's portfolio. The Cabinet also did not specify a preferred duration for many of the hazard training topics.



**Table 3.4** Detailed Recommended Safety Training Sources

Training Block	Topic Type	Topic	Recommended Training Source	Why It's Recommended'	Unknown/Uncertainties	Relevant Links
New EE Safety 1	New EE / Awareness	Haz Comm / GHS	TC3TS016 — Recognition and Avoidance of Unsafe Conditions	Only training for this topic that we currently have access to. Training content somewhat aligns with KYTC's desired content. Training format directly aligns with KYTC's desired format. Periodic knowledge checks to assess trainees throughout the training.	Currently lack access to other training sources, and training duration (30 min) is double that of KYTC's desired duration (15 min).	
		Bloodborne Pathogens	TC3TS015 — Bloodborne Pathogens	Training content aligns best with KYTC's desired content. Training format directly aligns with KYTC's desired format. Periodic knowledge checks throughout the training.	Training duration (40 min) is over double that of KYTC's desired duration (15 min).	
		Ergonomics — Basic	MARCOM — Industrial Ergonomics	Received good overall evaluation in training assessment tool. Training content aligns well with KYTC's desired content. Training format directly aligns with KYTC's desired format. Training duration is approximately equal to KYTC's desired duration. 10-question final quiz training assessment. General training that is applicable to nearly all employees, which is desired for this overarching topic.	Titled <i>Industrial Ergonomics</i> , not completely construction focused. However, the content can also apply to construction-related activities.	
		Physical threat / Hostile Situation — Recognition / Avoidance / De-escalation	MARCOM — Active Shooter; Conflict Resolution in the Office	Training format aligns well with KYTC's desired format. Training durations align with KYTC's desired duration. Two 10-question final quiz training assessments. Utilizing both training modules allows for KYTC desired content to be covered.	Two training modules to cover all of KYTC's desired content.	

		Defensive Driving	MARCOM — Driving Defensively	Received good overall evaluation in training assessment tool. Training content aligns well with KYTC’s desired content. Training format somewhat aligns with KYTC’s desired format. Training duration is approximately equal to KYTC’s desired duration. 10-question final quiz training assessment. General training that is applicable to nearly all employees, which is desired for this overarching topic.	N/A	
New EE Safety 2.A.	New EE / Awareness	Equipment / Jobsite Hazards Awareness	MARCOM — Safety Orientation	Training content aligns best with KYTC’s desired content. Training format somewhat aligns with KYTC’s desired format. Training duration is nearly equal to KYTC’s desired duration. 10-question final quiz training assessment.	Titled <i>Safety Orientation</i> , but content description aligns well with KYTC’s desired content.	
		Confined Space — Awareness	TC3TS029 — Confined Spaces	Training content aligns well with KYTC’s desired content. Training format somewhat aligns with KYTC’s desired format. Periodic knowledge checks to assess trainees throughout the training.	Training duration (60 min) is triple that of KYTC’s desired duration (20 min).	
New EE Safety 2.B	New EE / Awareness	Hazardous Materials	TC3TS030 — Hazardous Materials	Training content aligns well with KYTC’s desired content. Training format directly aligns with KYTC’s desired format. Periodic knowledge checks to assess trainees throughout the training.	Training duration (60 min) is four times that of KYTC’s desired duration (15 min).	
		Stored Energy Hazards & Controls — Basic	MARCOM — Electrical Safety	Received good overall evaluation in training assessment tool. Training content somewhat aligns with KYTC’s desired content. Training format somewhat aligns with KYTC’s desired format. Training duration is equal to	Training only covers electrical stored energy rather than all stored energies (e.g., high pressure fluids, springs, elevated equipment).	

		KYTC's desired duration. 10 question final quiz training assessment.		
Hand/Portable Power Tools	MARCOM — Hand and Power Tool Safety	Received great overall evaluation in training assessment tool. Training content aligns well with KYTC's desired content. Training format directly aligns with KYTC's desired format. Training duration is approximately equal to KYTC's desired duration. 10-question final quiz training assessment. General training that is applicable to nearly all employees, which is desired for this overarching topic.	N/A	
Shop Hoists / Lifts / Rigging Basic Awareness	MARCOM — Rigging Safety in Industrial and Construction Environments	Received good overall evaluation in training assessment tool. Training content aligns well with KYTC's desired content. Training format directly aligns with KYTC's desired format. Training duration is approximately equal to KYTC's desired duration. 10-question final quiz training assessment.	Titled <i>Rigging Safety in Industrial and Construction Environments</i> , it is not completely construction focused. However, the content of this training can also apply to construction related activities.	
Machine / Machine Guarding	MARCOM — Machine Guard Safety	Received great overall evaluation in training assessment tool. Training content aligns well with KYTC's desired content. Training format directly aligns with KYTC's desired format. Training duration is approximately equal to KYTC's desired duration. 10-question final quiz training assessment. General training that is applicable for nearly all employees, which is desired for this overarching topic.	N/A	

		Wheel/tire Servicing Hazards				
Specific Hazard / Work Authorization Training	Aerial / At-Height Work	Cranes — Basic Inspection, Ops, Rigging	TC3TS026 — Crane Safety	Training content somewhat aligns with KYTC's desired content. Training format directly aligns with KYTC's desired format. Periodic knowledge checks to assess trainees throughout the training.	Training duration (30 min) is only half of KYTC's desired duration (60 min). KYTC may desire in-person instructor-led training for this topic.	
		Scaffolds — User Training	TC3TS019 — Scaffolding Safety	Received good overall evaluation in training assessment tool. Training content aligns well with KYTC's desired content. Training format directly aligns with KYTC's desired format. Periodic knowledge checks to assess trainees throughout the training.	Training duration (30 min) is only half of the KYTC's desired duration (60 min). KYTC may desire in-person instructor-led training for this topic.	
	Energy Control	General Energy Control — LO/TO	ClickSafety	Training content aligns well with KYTC's desired content. Training format directly aligns with KYTC's desired format.	Training duration (60 min) is only half of the KYTC's desired duration (120 min). Training assessment is unknown. Do not have access to entire training — must pay for access.	<a href="#">Click Safety and LOTO for General Industry</a>
	Confined Space Entry	Confined Space — Entry/Attendant Training	MARCOM — Confined Space Entry	<b>Only training for this topic that we currently have access to. Training content aligns well with KYTC's desired content. 10-question final quiz training assessment.</b>	<b>Training format is video while KYTC desired format is hands-on external / contracted instructor-led training . KYTC desired duration is TBD.</b>	
	Welding Hazards	Welding, Cutting, Brazing	National Safety Council	Training content aligns well with KYTC's desired content. Training format directly aligns with KYTC's desired format.	KYTC's desired duration is TBD. Training assessment is unknown. Do not have access to entire training, must pay for access.	<a href="#">National Safety Council Welding, Cutting and Brazing Training</a>

		Chromium IV (Hexavalent Chrome)	Washington State Dept of Labor and Industries	Training content aligns well with KYTC's desired content. Training format directly aligns with KYTC's desired format. Periodic knowledge checks to assess trainees throughout the training.	KYTC's desired duration is TBD. Do not have access to entire training, must pay for access.	<a href="#">Washington State Department of Labor &amp; Industries Hexavalent Chromium</a>
Respiratory Hazards		Respiratory Protection (User)	MARCOM — Respiratory Protection and Safety	Training content aligns well with KYTC's desired content. Training format somewhat aligns with KYTC's desired format. 10- question final quiz training assessment.	KYTC's desired duration is TBD.	
		Exhaust / Ventilation	CED Engineering	Training content aligns well with KYTC's desired content. Training format somewhat aligns with KYTC's desired format. 20-question final quiz training assessment.	KYTC's desired duration is TBD.	<a href="#">CED Engineering Ventilation and Exhaust Systems</a>
		Air Monitoring	BIS Safety Software	Training content aligns well with KYTC's desired content. Training format directly aligns with KYTC's desired format. Periodic knowledge checks to assess trainees throughout the training.	KYTC's desired duration is TBD. Training assessment is unknown. Do not have access to entire training, must pay for access.	<a href="#">BIS Safety Software Indoor Air Quality Online Course</a>
		Formaldehyde	HSI — Formaldehyde Safety	Training content aligns with KYTC's desired content. Training format somewhat aligns with KYTC's desired format. Training is a free video.	KYTC's desired duration is TBD. Training assessment is unknown.	<a href="https://hsi.com/course-library/safety-compliance/osha/formaldehyde-safety">https://hsi.com/course-library/safety-compliance/osha/formaldehyde-safety</a>
Other Environmental health hazards		Asbestos	MARCOM — Asbestos Awareness	<b>Only training for this topic that we currently have access to. Training format somewhat aligns with KYTC's desired format. 10-question final quiz training assessment.</b>	KYTC's desired content is unknown (not provided). KYTC's desired duration is TBD.	
		Lead	MARCOM — Lead Exposure in General Industry	<b>Only training for this topic that we currently have access to. Training format somewhat aligns with KYTC's desired format. 10- question final quiz training assessment.</b>	KYTC's desired content is unknown (Not Provided). KYTC's desired duration is TBD. Training does not focus on the topic of lead.	



		<b>Carbon Monoxide</b>	<b>TC3TS016 — Recognition and Avoidance of Unsafe Conditions</b>	<b>Only training for this topic that we currently have access to. Training format directly aligns with KYTC’s desired format. Periodic knowledge checks to assess trainees throughout training.</b>	<b>KYTC’s desired content is unknown (Not Provided). KYTC’s desired duration is TBD. Training does not focus on carbon monoxide.</b>	
		<b>Occupational Noise Exposure</b>	<b>MARCOM — Hearing Conservation and Safety</b>	<b>Only training for this topic that we currently have access to. Training format somewhat aligns with KYTC’s desired format. 10- question final quiz training assessment.</b>	<b>KYTC’s desired content is unknown (Not Provided). KYTC desired duration is TBD.</b>	
	Ionizing Radiation — User / Exposed training	Ionizing Radiation — User / Exposed training	Troxler — Nuclear Gauge Operator Training	Training content somewhat aligns with KYTC’s desired content. Training format can be either classroom or online.	KYTC desired format is unknown. KYTC’s desired duration is TBD. Training assessment is unknown. Do not have access to entire training, must pay for access.	<a href="https://www.troxlerlabs.com/Services/Training/Online-Training-TLC">https://www.troxlerlabs.com/Services/Training/Online-Training-TLC</a>

## Chapter 4 Conclusion and Recommendations

Robust safety training is an essential piece of any organization's safety program. Training equips staff with the knowledge, skills, and abilities to identify hazards, assess risks, and mitigate harm on the job. With the options available to educate, inform, and train KYTC staff on safety-related issues being so numerous, KYTC's SOS needed to understand what options exist and the quality of training they provide. Most recommended trainings can be readily accessed and assigned to Cabinet personnel.

We also developed an interactive webtool to catalogue training resource evaluations. Users can look at source material on a range of training topics and evaluations of training duration, content, assessments, format, and overall quality. It serves as a decision-making and reference tool for leadership in KYTC's SOS.

Future work on safety training at KYTC could involve integrating training modules into a recently acquired comprehensive safety management system (SMS). A safety coordinator training playbook would be useful as well to specify who should attend trainings, when they should be held, and describe expectations for performing incident investigations, job briefings, and other safety-related procedures. This will improve consistency among safety coordinators in KYTC's 12 districts.

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Section A						Section B					Section C				Section D															
Part 2: Hazard Exposure, Task, or Position Specific Training - IF applicable						By Exposure / Position Type					Applicability Notes, Recurrence, Standard				Possible delivery option															
Timing	Training Block	Target Group	Training Hours	Content Summary	OSHA / ESH Training Topic	All - KYTC	In-Field: Admin. or Eng.	In-Field: Tech./ Maint.	Lab, Wsh., Repair Facility	HT or HTTS Series Position Req.	Any EE per work authority or exposure	Notes on applicability	Required Recurring A=Annual P=Periodic	Only affected employees	KYTC Safety & Health Resource Guide Reference(s)	Applicable Standard or Statute	In-person	Live Virtual /Interactive classroom	Virtual independent / on demand	KYTC SOS (existing)	KYTC SOS (new)	Contracted / Vendor	Possible curriculum source							
At time of new hazard exposure or authorization to work / task specified	Aerial / At-Height Work	Aerial/Above Ground Safety authorized	1	Cranes - Operator / rigging, aerial lift/bucket truck operator, fall protection /PFAS user, scaffold user	Cranes- Basic inspection, ops, rigging					HTTA I	Aerial Lift Operator authorized or > 4 ft height work - Exposed	Truck cranes inc. sign crew truck	P	X	SHA-1016, SHA-1709, SHA-1717	29CFR 1910 Sub. N							TC373026-20-T1 Construction Safety: Crane Safety? General rigging/lifting safety + small truck cranes+building gantry hoists would be equipment that is used by KYTC that must be addressed.							
			4		Aerial Lift / Bucket Truck - Operator training							HTTA II req. + all other expected to operate aerial lifts	P	X		29CFR 1910 217 / 1926 Sub. L							(needed)							
			2		Fall Prevention / Protection -User training								HTTA II req. + all expected to be work >4ft above ground	P	X		29CFR 1910 Sub. F /1926 Sub. M.							Current materials for OSHA 10 are usable & appropriate						
			1		Scaffolds - User training								Req for EE using mobile or fixed scaffold, incl. bridge paint inspectors, structural inspectors and maintenance		X	SHA-409-2, SHA-514, SHA-1732	29CFR 1910.28 Sub D / 1926.451 Sub. L								TC373019-19-T1 Construction Safety: Scaffolding Safety??					
	Hazardous Energy Control (LOTO)	Exposed to Elect/ Hazardous Energy Source	2	Energy Control / Lock Out / Tag Out (electric, hydraulic, kinetic)	Energy Control / Lock Out / Tag Out	Any LVMH/Elect Auth. other S.E. exposed					HTTA I	HTTA I req. + all EE working with electric current >60V OR OSHA-defined stored energy incl. all equipment, signal, facility techs. others as exposed.	P	X	SHA-407-7, SHA-1002, SHA-1003,	29CFR 1910.147 Sub. J								Only current training was recently provided virtually by Ky Labor Cabinet, Need appropriate materials for KYTC exposures / tasks.						
	High/Low Voltage Qualification	Electrical Work Authorized >60V	2	High / Low Voltage Electrical Safety	Electrical PPE - Use/Maintenance/Inspection	Any LVMHV Authorized					HTT I	HTT I req. + all EE working with electric current >60V incl. all signal, facility techs. others as exposed.	P		SHA-407-7, SHA-408, SHA-408-1 through SHA-408-12, Exh 9017	NFPA70E														
	Confined Space Entry	Confined Space Entry authorized	TBD	Confined Space - Entry/Attendee training incl. entry permit process	Permit Req. Confined Space - Entry/Attendee training	Any Conf. Space entry /assistant						Only for authorized confined space entrants, attendants, rescue personnel		X	SHA-407, SHA-407-5, SHA-1624, Exh. 9015	29CFR 1910.146 Sub. J / 1926 Sub. AA									No usable / appropriate material for entire category currently					
																													No usable / appropriate material for entire category currently	
Respiratory Hazards	Welders / Equip Techs	TBD	Welding, Cutting, Brazing, Metal fumes	Respiratory protection -user, ventilation/exhaust, air monitoring, occupational noise	Any Exposed to welding						Reqd for affected or exposed Annual, for EE with potential exposure	A	X	SHA-603, SHA-515, SHA-901, SHA-902, SHA-903, SHA-905	29CFR 1910.253 Sub. Q / 1926 Sub. J															
Ionizing Radiation	Nuclear Density Gauge users	TBD	Ionizing Radiation - User / Exposed users	Ionizing Radiation - User / Exposed training	Nuclear Density Gauge auth.						Req for any EE exposed to nuclear density gauges. Additional to required NRC training		X	SHA-1625, SHA-1804	29CFR 1926.53															
Upon authorization to operate specified equipment	DOH ROW Maintenance Equipment	Authorized Operators	Excavator / Backhoe, Grader, Loader, Boom Mower, Skid-steer, others TBD	Excavator / Backhoe Operation Grader Operation Boom Mower Operation Skid-Steer Loader Operation	Any expected to operate																									
With promotion to position	HT Acad. Lvl. 3 / HT Lead. Acad. Lvl. 1	DOH HT-series	8 hrs	Work Zone TTC Technician	Work Zone TTC Technician					HTS I / HTTA II	Any Supervising TTC plans													Existing materials are usable & appropriate						
			2 hrs	Foundations for Safety Leadership	Foundations for Safety Leadership						HTS I / HTTS	Req. 5 year recert	P (5 yr)												UK Transportation Center LTAP					
With promotion to position	HT Lead. Acad. Lvl. 2	DOH HT-series	1 hr	Recordkeeping Injury & Illness	Recordkeeping Injury & Illness					HTS I	Reqd for HTS I & HTTS, recommend for all													CPWR curriculum delivered by KYTC SOS staff						
			8 hrs	Work Zone TTC Supervisor	Work Zone TTC Supervisor						HTS II / HTT I	Req. for HTS I: Recommend for any Supervisor													Need to update from existing					
With promotion to position	HT Lead. Acad. Lvl. 2	DOH HT-series	3 hrs	Traffic Incident Management	Traffic Incident Management					HTS II / HTTS	Req. any EE Approving TTC plans; Req. for HTS II & HTT I req. 5 yr recert													UK Transportation Center LTAP						
																									UK offers class but it's difficult to get and must be done by UK instructor					

FHWA on the job training program  
<https://bitof.org/safety-center/resources/drives-different.com> (Smith System)  
 Drivesaonline.org  
 CPWR  
 ATSSA  
 APWA



## Appendix B – KYTC Safety Training Needs Prioritization

JK SPR21-608 Project Topic Development List		Rev 02/03/2022							
Training Block	Topic Type	Topic	Audience	Content	Priority	Rank	SHA reference	OSHA regs	
New EE Safety 1	New EE / Awareness	Haz Comm / GHS	All KYTC Employees	EE right-to-know statutes, GHS labeling, reading SDS, general emergency actions, KYTC policy. Appropriate for KYTC operations & typical exposures	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	High	1 SHA-410	29CFR 1910.1200 Sub. Z	
		Bloodborne Pathogens		OSHA BBP requirements, exposure routes, protective measures, KYTC policy. Include KYTC / road maint typical exposures - used syringes, dead animals, trash, first aid exposure.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training	High	2 SHA-702, SHA-703	29CFR 1910.1030	
		Ergonomics - Basic		Awareness - lifting, repetitive motion, twist/strain injury hazards & control measures including workplace optimization, clear travel paths, lift assists & equipment, stretching/warm-up before exertion, etc	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	High	3 SHA-1200, SHA-1201, SHA-1202, SHA-1302, SHA-1303		
		Physical threat / hostile situation - Recognition / Avoidance / De-escalation		Basic skills for EE to recognize escalating or potential hostile interactions with workers or public on the job, how to avoid, de-escalate, or escape. Include situations inside state facilities and on private property / uncontrolled ROW.	Stand-alone content to offer as ODT via MyPurpose or Origami LMS as adjunct to OHRM workplace violence ODT program.	High	4 none	29CFR 1907 Gen. Duty Clause	
		Defensive Driving		<b>**NOTE: We have identified a currently available program to use until a KYTC-focused program is available.**</b> Basic defensive / safe driving skills for drivers of state passenger cars/SUVs or light trucks. Ideally would include backing safety.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	Med	SHA-1622, SHA-1701, SHA-1702, SHA-1704, SHA-1705, SHA-1724		
New EE Safety 2.A	New EE / Awareness	Equipment / Jobsite hazards awareness	All In-Field Ees	Safe work around mobile equipment & traffic through sites, buried/overhead utilities, severe/hot/cold weather, animals/plants. KYTC would incorporate into OSHA 10 materials also for later reinforcement.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	High	5 SHA-409-3, SHA-506, SHA-513, SHA-1600, SHA-1601, SHA-1700, SHA-1701, SHA-1707, SHA-1725, SHA-1726, SHA-1727, SHA-1731		
		Confined Space - Awareness	All In-Field Ees	Recognizing potential confined spaces and hazards therein. Focus on knowing when NOT to enter for all In-Field EEs. Include exposures on KYTC ROWs & property i.e. sewer pump stations, utility vaults, drainage systems, other underground structures, tanks, bins, silos.	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	Low	6 SHA-407-6, SHA-1624	29CFR 1910.146 Sub. J / 1926 Sub. AA	
New EE Safety 2.B	New EE / Awareness	Hazardous Materials	All Garage / Shop / Lab EEs	Awareness of hazards, storage, handling of flammable & combustible liquids and gases, corrosive, solvents, irritants used in typical maintenance operations, i.e. automotive fluids, lubricants, fuels, welding/cutting gases, etc. Also awareness of CO & general shop/garage ventilation esp. with running engines, fuel burners (steam washers) are in use in enclosed spaces.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	Medium	7 SHA-410, SHA-504, SHA-505, SHA-512, SHA-516, SHA-900, SHA-901, SHA-904, SHA-1001, SHA-1015, SHA-1021, SHA-1101, SHA-1102	29CFR 1910 Sub. H	
		Stored Energy Hazards & Controls Basic		Awareness of hazards & types of stored energy, i.e. electric, pneumatic, high pressure fluid, springs, elevated equipment like raised truck dump beds, etc. Actual energy control & LOTO is separate more in-depth later.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	Medium	8 SHA-502, SHA-504, SHA-505, SHA-508, SHA-511	29CFR 1910.147 Sub. J	
		Hand/Portable Power Tools		Not including chainsaws / polesaws which are covered in other training. Hazard awareness only - basic electric / air power tools (cords, safety switches, elect grounding, reaction forces) and hand tools (hammer, chisels, pry bars). Proper tool for purpose, hand/eye hazards, etc.	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	Medium	10 SHA-504, SHA-505, SHA-508, SHA-1002, SHA-1003, SHA-1006, SHA-1021, SHA-1400 through 1407, SHA-1615, Exh. 9027	29CFR 1910 Sub. P	
		Shop Hoists / Lifts / Rigging basic awareness		Not crane or rigging detailed, only basic awareness of beam/trrolley chain hoists in buildings - capacity, inspection, basic chain/sling ratings, inspection, use for lifting & positioning equipment (not cargo securing)	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	Low	11 SHA-1007, SHA-1019		
		Machine / Machine Guarding		Awareness - importance of maintaining guarding for chain drives, belt/pulley systems (example of air compressors), rotating shafts, hot parts, saw & grinder guards, etc.	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	Low	12 SHA-1003, SHA-1006, SHA-1011, SHA-1016, SHA-1018, SHA-1730, Exh 9027, Exh 9035	29CFR 1910 Sub. O / 1926 Sub. I	
		Wheel/Tire Servicing Hazards	Equipment & Highway Maint Techs	Hazards of explosive failure of tires/tires, use of safety cages, clearance distance from tires being inflated, etc.	Brief content slides or video to incorporate into live or virtual ILT NEO training OR incorporate into ODT NEO module via MyPurpose or Origami LMS platform	Low	13 SHA-406-1, SHA-1010	29CFR 1910.177 Sub. N	
		Fire-Extinguisher operation		<b>**Remove from UKTC project will adapt current KYTC materials**</b>		None			29CFR 1910 Sub. L / 1926 Sub. F
Specific Hazard / Work Authorization Training	Aerial / AH-Height Work	Cranes- Basic Inspection, ops, rigging	Sign Crews / Equipment Repair Techs - using truck mounted cranes	Focused on smaller truck mounted hydraulic service booms with wire rope winches used on equipment & sign service trucks. Basic principles of chain/sling rigging for lifting small or irregular objects (equipment parts, sign posts, etc.) Incl regular inspections, capacity, hazards.	Content with option to stand-alone or incorporate into in-person or virtual ILT on related topics i.e. forklift/PIT, bucket truck, aerial lift	Low	14 SHA-1019, SHA-1709, SHA-1717	29CFR 1910 Sub. N	
		Scaffolds - User training	Structures Maint. Techs, Bridge Blast/Paint Inspectors, Structures Inspectors	Adjunct to OSHA10 / KYTC Fall Protection training & aerial lift training. Inspection, erection, use of modular build-up stationary platform scaffolds, and mobile scaffolds like used by Structures maint & inspectors.	Content with option to stand-alone or incorporate into in-person or virtual ILT on related topics i.e. forklift/PIT, bucket truck, aerial lift	Low	15 SHA-409-2, SHA-514, SHA-1732	29CFR 1910.28 Sub. D / 1926.451 Sub. L	
	Energy Control	H-Low Voltage Electric Qualification - LOTO	Traffic Signal Techs & Facility Maint. Techs exposed to High/Low voltage AC	Existing UK E-Hazard Hi-Lo Voltage & Energy Control training. Included here only to distinguish it from "General Energy Control - LOTO training below.	Existing external / contracted ILT	None		SHA-407-7, SHA-408, SHA-408-1 through SHA-408-12, Exh 9017	29CFR 1910.147 Sub. J
		General Energy Control - LOTO	Equipment Techs exposed primarily to non-electric energy hazards	Geared more toward mechanical/kinetic energy control that would be encountered by a truck or equipment tech. May cover low voltage DC (12/24/36 VDC) in equipment also.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	Medium	9 SHA-407-7, SHA-1002, SHA-1003,		
	Confined Space Entry	Confined Space - Entry/Attendant training	Various positions- only for authorized confined space entrants & attendants.	Small potential target group here. Focus on entry into drainage structures, pump stations, etc. Will need to define this further.	Stand-alone hands-one External / contracted ILT	Low	16 SHA-407, SHA-407-5, SHA-1624, Exh. 9015	29CFR 1910.146 Sub. J / 1926 Sub. AA	
	Welding Hazards	Welding, Cutting, Brazing	Equipment repair "Welders" primarily - others based on exposure	Basic hazards of electric welding - PPE, shock hazards, inhalation of shielding flux/gas/metal vapors. Also basic hazards of oxy/fuel torch cutting	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	Low	17 SHA-503, SHA-515, SHA-901, SHA-902, SHA-903, SHA-905	29CFR 1910.253 Sub. Q / 1926 Sub. J	
		Chromium IV (Hexavalent Chrome)		Specific to stainless steel welding focused on hex chrome but not limited to that.		Low	18 SHA-905	29CFR 1910.1048 Sub. Z	
	Respiratory Hazards	Respiratory Protection (User)	Any required to wear respirators, or authorized for confined space entry, or exposed to resp. hazards > PEL or AL	Selection/use/requirements for use of resp protection; specific use of half-face APR & loose-fitting hood-type PAPR for sandblasting. Only for those required to use respirators including Structures maintenance and bridge paint/blast inspectors.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	Low	19 SHA-407, SHA-407-1, SHA-506, Exh. 9031, 9032, 9033	29CFR 1910.134 Sub. I / 1926.103 Sub. E	
		Exhaust / Ventilation		For anyone that is subject to resp hazards requiring respirator or confined space entry - Equipment Garage / welders.	Brief content with option to stand-alone or incorporate into in-person or virtual ILT on related topics i.e. respiratory protection, shop/garage safety	Low	20 SHA-1017, SHA-1021, Exh. 9035	29CFR 1910 Sub. G	
		Air Monitoring		Bridge paint/blast inspectors, confined space entry.	Brief awareness content with option to stand-alone or incorporate into in-person or virtual ILT on related topics i.e. respiratory protection, welding, etc	Low	21 SHA-407-5, Exh 9014	29CFR 1910 Sub. Z / 1926 Sub. D	
Other Environmental health hazards		Formaldehyde	No specific positions, Any exposed to specified hazard threshold at right	Only EE w/ exposure >=0.1 ppm	Adjunct to Respiratory Protection / Exhaust/Ventilation, and Air Monitoring for those subject to exposure. Need to define applicable employees further	Low	27 SHA-407	29CFR 1910.1048 Sub. Z	
		Asbestos		Only employees exposed to PEL		Low	26 SHA-407, SHA-407-3	29CFR 1910.1048 Sub. Z	
		Lead		Only EE with exposure to Pb at any level		Low	25 SHA-407, SHA-407-4, Exh. 9010	29CFR 1910.1048 Sub. Z	
		Carbon Monoxide		Only EE exposed to 50 ppm 8 hr TWA PEL		Low	23 SHA-407	29CFR 1926.55T Table 1	
		Occupational Noise Exposure		Only EE w/ exposure >=85 db 8 hr TWA	Need to define applicable employees further	Low	24 SHA-510, SHA-1803	29CFR 1910.95 Sub. G / 1926.65 Sub. D	
Ionizing Radiation - User / Exposed training	Ionizing Radiation - User / Exposed training	EE's with authorization to use nuclear density gauges. Primarily will be Div. of Construction, Materials, Geotech, and District Section office staff.	Adjunct to NRC training on use, handling, transportation, inspection, etc.	Stand-alone content to include with in-person or virtual ILT NEO or refresher training OR to use as ODT via MyPurpose or Origami LMS for refresher.	Low	22 SHA-1625, SHA-1804	29CFR 1926.53		



## Appendix C – KTC Technology Transfer Recommended Safety Training Resources

Title	Sources	About
Defensive Driving	<a href="#">National Safety Council Online Defensive Driving Course</a>	4-hour and 2-hour course; self-paced
	<a href="#">Drive Safe Online Defensive Driving Course</a>	1-hour and 6-hour
	<a href="#">Washington State Department of Labor &amp; Industries Driving Safely</a>	
Equipment/Jobsite Hazards Awareness	<a href="#">Click Safety Working Around Mobile Equipment Awareness for Construction</a>	10 minute introductory course
	<a href="#">Click Safety Electrical Hazard Recognition &amp; Control for Construction</a>	45 minute intermediate course
	<a href="#">OSHAcademy Heavy Equipment Safety</a>	6-hour
	<a href="#">Washington State Department of Labor &amp; Industries Work Zone Safety for Road Construction</a>	
	<a href="#">Washington State Department of Labor &amp; Industries Workplace Hazard Basics</a>	
	<a href="#">OSHA Heavy Equipment Safety Awareness</a>	
	<a href="#">T2 Work Zone Courses</a>	
	<a href="#">ARTBA PPE Training</a>	1 PDH
	<a href="#">ARTBA Preventing Runovers and Backovers</a>	
	<a href="#">ARTBA Scaffolds, Steps &amp; Ladders</a>	
	<a href="#">TC3 Job Hazard Analysis</a>	
	<a href="#">TC3 Construction Safety: Recognition and Avoidance of Unsafe Conditions</a>	
Hand/Portable Power Tools	<a href="#">Click Safety Hand and Power Tools for Construction</a>	1-hour intermediate course
	<a href="#">OSHAcademy Hand and Power Tool Safety</a>	
	<a href="#">OSHA Education Center Hand and Power Tools Online Course</a>	1-hour
	<a href="#">SafetySkills Hand and Power Tool Safety</a>	24 minutes
	<a href="#">HSI Hand and Power Tools</a>	20 minutes
	<a href="#">HSI Hand and Portable Power Tools</a>	20 minutes
	<a href="#">HSI Hand and Power Tool Safety Overview</a>	6 minutes
Machine/Machine Guarding	<a href="#">National Safety Council Machine Guarding Training</a>	
	<a href="#">Machine Safety Specialists Machine Guarding Training</a>	
	<a href="#">National Safety Education Center Machine Guarding Course</a>	2-hour or 4-hour
	<a href="#">USFOSHA Machine Guarding Compliance Training</a>	self-paced
	<a href="#">OSHAcademy Introduction to Machine Guarding</a>	
	<a href="#">eSafety Machine Guarding</a>	20 minutes
	<a href="#">HSI Machine Guarding</a>	20 minutes
	<a href="#">University of Washington Environmental Health &amp; Safety Machine Guarding</a>	20 minutes
	<a href="#">HSI Machine Guarding</a>	20 minutes
General Energy Control - LO/TO	<a href="#">Click Safety Working Safely with Electricity for Construction</a>	20 minute introductory course
	<a href="#">Click Safety Electrical Safety Awareness for Construction</a>	10 minute introductory course

Title	Sources	About
	<a href="#">Click Safety and LOTO for General Industry</a>	1-hour intermediate course
	<a href="#">Click Safety Electrical Hazard Recognition &amp; Control for Construction</a>	45 minute intermediate course
	<a href="#">Washington State Department of Labor &amp; Industries Lockout/Tagout</a>	PPT
	<a href="#">Washington State Department of Labor &amp; Industries Lockout/Tagout - Control of Hazardous Energy</a>	
	<a href="#">Virginia Tech Environmental Health and Safety Lockout/Tagout Awareness</a>	1-hour
	<a href="#">HSI Lockout/Tagout</a>	20 minutes
	<a href="#">eHazard NFPA 70E Training</a>	
Welding, Cutting, Brazing	<a href="#">National Safety Council Welding, Cutting and Brazing Training</a>	4-hour
	<a href="#">OSHAcademy Welding, Cutting, and Brazing Safety</a>	
	<a href="#">USFOSHA Welding and Cutting Safety Training</a>	
	<a href="#">NASP Welding Cutting Brazing Specialist (WCB)</a>	13 hours/1.3 CEUs
	<a href="#">Virginia Tech Environmental Health and Safety Welding and Cutting Safety</a>	1-hour
	<a href="#">Berkeley Lab Training Welding, Cutting and Brazing</a>	web-based
Chromium IV (Hexvalent Chrome)	<a href="#">Washington State Department of Labor &amp; Industries Hexavalent Chromium</a>	
	<a href="#">Advanced Safety Training Hexavalent Chromium 6 or (VI)</a>	35 minutes
	<a href="#">OSHA Education Center Hexavalent Chromium Certificate</a>	self-paced
	<a href="#">NASF Chromium Plating for Engineering Applications</a>	home study
	<a href="#">HSI Intro to Hexavalent Chromium Hazards</a>	5 minutes
Respiratory Protection (User)	<a href="#">Washington State Department of Labor &amp; Industries Respiratory Protection</a>	PPT
	<a href="#">Washington State Department of Labor &amp; Industries Respiratory Protection - An Overview of Respirators</a>	PPT
	<a href="#">Virginia Tech Environmental Health and Safety Respiratory Protection Training</a>	30 minutes
	<a href="#">OSHA Respiratory Protection Videos</a>	videos
	<a href="#">OSHA Education Center Respiratory Protection Course</a>	1-hour
	<a href="#">HSI Respiratory Protection</a>	25 minutes
Exhaust/Ventilation	<a href="#">CED Engineering Ventilation and Exhaust Systems</a>	4 PDH
	<a href="#">Udemy HVAC: Ventilation and Smoke Exhaust</a>	6-hour
	<a href="#">Local Exhaust Ventilation (LEV) Basics Course</a>	20-40 minutes
	<a href="#">University of Washington Department of Environmental &amp; Occupational Health Sciences Industrial Hygiene Series: Ventilation - Principles for the Practicing Industrial Hygienist</a>	10-hours
	<a href="#">TLNT Industrial Ventilation Design</a>	1.2 CEUs, self-paced
Air Monitoring	<a href="#">HSI Indoor Air Quality</a>	30 minutes
	<a href="#">HSI Air Emissions Management</a>	24 minutes
	<a href="#">World Bank Group Introduction to Air Quality Management</a>	30-hours, self-paced
	<a href="#">Class Central Introduction to Indoor Air Quality</a>	12-hours

Title	Sources	About
	<a href="#">The Asbestos Institute OSHA EPA Asbestos Air Monitoring: Initial/Refresher</a>	4-hours
	<a href="#">BIS Safety Software Indoor Air Quality Online Course</a>	45 minutes
	<a href="#">Marama Principles of Ambient Air Monitoring</a>	
	<a href="#">TC3 Environmental Triggers Series: Air Quality Impacts</a>	