Electrical power system protection training pdf

Working with electricity can be dangerous. Engineers, electricians, and other professionals work with electricity directly, including working on overhead lines, cable harnesses, and circuit assemblies. Others, such as office workers and sales people, work with electricity indirectly and may also be exposed to electrical hazards. Electricity has long been recognized as a serious workplace hazard. OSHA's electrical standards are designed to protect employees exposed to dangers such as electric shock, electrocution, fires, and explosions. Electricity has long been recognized as a serious workplace hazard. OSHA's electrical standards are designed to protect employees exposed to dangers such as electric shock, electrocution, fires, and explosions. Includes references that provide information related to electrical in construction including OSHA's electrical construction regulations, hazard recogition, possible solutions and additional resources. More » Many workers are unaware of the potential electrical hazards present in their work environment, which makes them more vulnerable to the danger of electrocution. The following hazards are the most frequent causes of electrical injuries: contact with power lines, lack of ground-fault protection, path to ground missing or discontinuous, equipment not used in manner prescribed, and improper use of extension and flexible cords. More » A variety of possible solutions may be implemented to reduce or eliminate the risk of injury associated with electrical work. Examples of solutions include the use of insulation, guarding, grounding, electrical protective devices, and safe work practices. This page provides information that may aid in controlling electrical hazards in the workplace. More » When employees are trained to work safely, through the requirements, they should be able to anticipate and avoid injury from job related hazards. More » Sources that provide helpful information about electrical in the workplace. More » ETAP is a powerful, user friendly and easy to use tool with trusted output data and calculations. We are very satisfied with ETAP’s performance; it is one of the major tools that we are using, ETAP is a great help in running and performing complex analysis on our power system especially our Transmission system. Novec ETAP is always coming up with new and better ways of doing things and adding new features in the program. Exelon ETAP has been one of our major tools in solving various studies on our projects. Since our company first started using ETAP in 1987, we found it user friendly and accurate. Most importantly, we were able to depend on the technical staff at ETAP whenever we needed help. Parsons The ITER Project selected ETAP as the electrical analysis tool for several reasons. The U.S. nuclear qualification ensures high level of quality. Moreover, in an international environment like ITER, ETAP demonstrated a high level of support in all the countries involved in the project. ITER ETAP is a powerful piece of software and extremely user-friendly. The one-line Graphical User Interface makes modeling easy. Furthermore, ETAP engineers are very helpful and responsive. Duke Energy ETAP is an intelligent tool that has brought a very large and complex electrical system within our reach, enabling us to achieve all the things that we could not do before. Ontario Power Generation We have been using ETAP since 1992 and have found the program extremely user-friendly and very helpful in performing many station analyses for our twin unit Nuclear Power plants. ETAP has been very helpful in enhancing the program to meet client needs. FirstEnergy Having used the software since 1986, I find ETAP to be the most powerful design tool for power system designers. Equilon ETAP output reports are concise and easy to understand without a lot of additional explanation. The reports can be tailored to meet each specific need with as little or as much information printed as needed. Brown & Root I was very satisfied with the ease of use of ETAP and would certainly recommend it to others. Years ago, I used SKM power tools. I find your product far easier to use and understand. OMICRON The functionality of our SmartPlant Electrical solution, combined with ETAP, provides a superior offering for owner operators and the EPC companies that design and construct industrial power systems. Intergraph Using ETAP software in our electric power course provides students with a unique experience in analyzing real world electric system issues. They have a great opportunity to simulate and study issues common in industrial plants and electric utility systems with state-of-the-art software. ETAP better equips our students to advance in their chosen field of interest. As graduates they are better prepared and trained in electrical system design and analysis. USI With the 2010 [ETAP Nuclear User Utility] conference having the largest attendance in recent memory it shows how proactive nuclear industry users are in sharing solutions and discussing issues with their knowledgeable peers. Sargent & Lundy From protective device coordination, arc flash, load flow and voltage profile calculations to transient analysis with auxiliary power systems interfaces, we must stay current with the latest in software technology, and [the ETAP 2010 Nuclear User Utility Conference] is a best practice in achieving that. Dominion I have been a long time user of SKM and recently was asked to perform a Short Circuit Analysis, Coordination Study and ARC Flash Analysis using ETAP. We performed the studies as requested by our client and found ETAP to be very powerful, easy to use and very intuitive. From now on, we will be using ETAP regularly as it has made the task of performing studies very easy. AIM As a user and client since ETAP V2, this fabulous program continues to get better and better. You and your smarts have played a major role in the success that Power System Solutions has enjoyed. I am indebted to you and the ETAP family. In all sincerity, I thank you for all you do. Power System Solutions The investment in ETAP has proven to be most valuable to our engineering consultancy as both Lota and its customer have significantly benefited from the power of ETAP. This was so successful that now customers are suggesting new ETAP analysis, a result of their increased trust in both Lota and the ETAP software. Lota.Ltd Export summary to Word Export summary to PDF Notify me of changes The content being displayed has been produced by a third party, while all attempts have been made to make this content as accessible as possible it cannot be guaranteed. If you are encountering issues following the content on this page please consider downloading the content in its original form Unit Of competency Release 1. This is the first release of this unit of competency in the UET Transmission, Distribution and Rail Sector Training Package. Application This unit covers compliance with working safely up to the defined safe approach distance (SAD) near energised electrical apparatus, including electrical powerlines, for non-electrical workers. It includes work functions that may be performed, such as vegetation control, scaffolding, rigging, painting and/or any other activity that requires working safely and complying with requirements and/or established procedures near live electrical apparatus by a non-electrical worker. Also included is the preparation of risk assessment control measures that encompass job safety assessment. It does not include any work that is or may be performed by other competent operatives within the defined safe working zone. The defined safe working zone is that so defined by relevant state or territory regulatory agencies/bodies, local government legislation, industry bi-partite bodies, guidelines/codes of practices or other related requirements for safe work and access near live electrical and mechanical apparatus. The application of the skills and knowledge described in this unit may require a licence/registration to practice in the workplace subject to regulations for undertaking of electrical work. Other conditions may apply under state and territory legislative and regulatory licencing requirements which must be confirmed prior to commencing this unit. Pre-requisite Unit There are no prerequisite competencies to this unit. Competency Field Entry Level Cross Discipline Unit Sector Elements and Performance Criteria ELEMENTS PERFORMANCE CRITERIA Elements describe the essential outcomes. Performance criteria describe the performance needed to demonstrate achievement of the element. 1 Prepare to work safely near live electrical apparatus as non-electrical worker 1.1 Instructions related to the work to be performed safely near live electrical apparatus as non-electrical worker are received and confirmed 1.2 Relevant requirements and established procedures to be followed and relevant personnel to be communicated with for the work to be performed are identified 1.3 Work health and safety (WHS)/occupational health and safety (OHS) policies and procedures to be followed for the work to be performed are received and confirmed 1.4 Suggestions to assist in meeting the safety requirements for working near live electrical apparatus as a non-electrical worker are made to others involved in the work 1.5 Hazards are identified, WHS/OHS risks assessed and control measures prioritised, implemented and monitored, including emergency exits kept clear, according to established procedures 1.6 Scope of responsibility and process of relevant work permit(s) issue are identified, received and confirmed according to requirements and established procedures 1.7 Relevant responsibility associated with first aid, safety observers and/or other related work safety procedures at the worksite are identified in accordance with requirements and established procedures to ensure safety measures are followed in the instance of an incident 1.8 Processes for identifying and reporting client issues to appropriate personnel are identified in accordance with industry/community standards 1.9 Site and the work schedule to be prepared are confirmed according to given instructions for a quality outcome and to minimise risk and damage to property, commerce, stock and individuals in accordance and established procedures 1.10 Electricity infrastructure assets, related voltages and requirements for working safely near live electrical apparatus as non-electrical worker are identified 1.11 SAD, including any zones thereof that may apply, as defined in industry guidelines, requirements and/or established procedures for the intended work are confirmed 2 Carry out work safely near live electrical apparatus as non-electrical worker 2.1 WHS/OHS principles and practices to reduce the incidents of accidents are identified in accordance with given instructions, requirements and/or established procedures 2.2 Working safely and complying with all safety requirements for working near live electrical apparatus as a non-electrical worker are followed in accordance with given instructions and established routines/procedures 2.3 Processes for monitoring and reporting/referring hazards and WHS/OHS risks to immediate authorised personnel for directions according to established procedures are followed 2.4 Non-routine events are referred to immediate authorised personnel for directions according to established procedures 2.5 Unexpected events associated with working safely near live electrical apparatus as a non-electrical worker are responded to using acquired known solutions and skills related to routine procedures to ensure work instructions and established procedures are met 3 Complete work safely near live electrical apparatus as non-electrical worker 3.1 Work schedule and anomalies for completion and checking of the work are reported to authorised personnel in accordance with established procedures 3.2 Processes for reporting to accidents and/or incidents authorised personnel are confirmed in accordance with established procedures 3.3 Requirements for returning work permits and/or access authorisation permits are confirmed 3.4 Appropriate personnel are notified of work completion according to established procedures 3.5 Works completion records and report forms/data sheets are completed accurately in accordance with given instructions and established procedures Foundation Skills Foundation skills essential to performance are explicit in the performance criteria of this unit of competency. Range of Conditions Range is restricted to essential operating conditions and any other variables essential to the work environment. Non-essential conditions may be found in the Companion Volume Implementation Guide. Unit Mapping Information This unit replaces and is equivalent to UETTDREL14A Working safely near live electrical apparatus as a non-electrical worker. Links UET Training Package Companion Volume Implementation Guide is found in VETNet - Assessment requirements Release 1. This is the first release of this unit of competency in the UET Transmission, Distribution and Rail Sector Training Package. Performance Evidence Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria on at least two separate occasions and include: applying relevant work health and safety (WHS)/occupational health and safety (OHS) requirements, including the use of risk control measures applying sustainable energy principles and practices completing all of the following:confirming the safe working zone for safe work and access near live electrical apparatus identifying relevant technical standards, acts, regulations and codes/guidelines identifying established (enterprise) procedurescompleting all of the following:confirming the principles of electricity, the three phase power system, electric shock and resuscitation, and power system recognising aerial voltage systems identifying low voltage (LV) aerial circuits identifying high voltage (HV)identifying all of the following:procedures in the event of an incident events constituting an incident procedures for responding to incidents hazard and risk assessment procedure conduct worksite hazard assessment confirmation of essential components of hazard assessment checks applying hazard identification in electrical work confirmation of the basic safety principles for work on electrical works hazard identification and risk assessment hazard control risk assessment and management (job safety analysis (JSA)) control the hierarchy of controls, including evaluation, worksite hazard and risk assessment checklist, pre-job hazard assessment check (HAC) items, planned inspection and pre-work hazard risk assessment formidentifying all of the following:use of work permits and/or authorisation permits sustainable energy principles and practices possible effects of weather conditions on working near electrical apparatus as a non-electrical workerdealing with unplanned events on at least one (1) occasion. Knowledge Evidence Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of: basic electrical principles encompassing:fundamental units - basic measurement of units electrical characteristics of material - characteristics of solid materials; insulators; and terms electrical charge, electrical current and electromagnetic forces nature of electrical current and change - basic rules of electrical current flow sources of electricity - basic fundaments of alternating current (a.c.), direct current (d.c.) and single electromagnetic field source (induction) simple circuits - circuit protection devices used on the network; effects of an open circuit, a closed circuit and a short circuit and earthing – using the ground as a form of conductor to return current back to a source resistance - relationship between voltage and current and resistance (Ohms Law) effects of current - physiological effects and protection for physiological effects; basic principle by which electrical current can result in the production of heat, light and electromagnetic fields and typical effects of current three phase and single-phase power systems - star delta configurations, three phase star connections, relationship between line and phase voltages, three phase 4 wire systems - purpose of the neutral consequences of short circuits - arc flash, electricity supply industry (ESI) protection schemes magnetism - magnetic field patterns, concepts of electromagnetism, effects of electromagnetism and magnetic fields around straight conductors hazards encountered in an ESI environment - touch and step potentials, electric shock, fire, chemicals, falls and safe use of tools and equipmenttransmission, distribution and rail power systems encompassing:relationship between the transmission, distribution and rail/tram system within an overall power system - different organisations responsible for generation, transmission, distribution and rail/tram; how they correlate and their functions characteristics of a transmission, distribution and rail system - principal components; typical voltage levels and methods of transmission and distribution, including grid type transmission systems, radial, parallel and ring main feeders relationship between an overhead and underground supply systems within an overall power system - advantages/disadvantages and applications single line drawings and layouts - drawings and layouts of transmission and distribution systems, including radial, parallel and ring main feeders and the HV equipment associated with substationsfundamentals for working safely near live electrical apparatus for non-electrical worker encompassing:standards, guidelines/codes of practice, Commonwealth/state/territory/local government legislation, supply authority regulations and/or enterprise requirements, including relevant certification and licensing applicable to working safely up to the defined safe working zone near energised electrical apparatus, including electrical powerlines, for non-electrical worker definitions of terminologies - ‘safe working zone’, ‘risk assessment’, ‘safe approach distances (SAD) zones’, ‘safe working distances’,’ work permits’, access authorisation permits’, ‘technical standards’, ‘isolation procedures’ and 'compliance requirements’ WHS/OHS policies and procedures for working safely - duties of a safety observer, permit to work systems and isolation procedures, safe application of different types of tools and equipment and operation of mobile plant and machinery (e.g. elevated work platform (EWP)) near live electrical apparatus techniques and precautions in undertaking different work functions and working safely up to the defined safe working zone near energised electrical apparatus (including electrical powerlines) for non-electrical worker (work functions that may be performed include vegetation control, scaffolding, rigging, painting and/or any other activity that requires working safely near live electrical apparatus by a non-electrical worker). Assessment Conditions Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment. Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment. Assessment must occur in workplace operational situations where it is appropriate to do so; where this is not appropriate, assessment must occur in simulated conditions involving realistic and authentic activities that replicate operational workplace conditions. Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate. Resources for assessment must include access to:a range of relevant exercises, case studies and/or other simulations relevant and appropriate materials, tools, equipment and personal protective equipment (PPE) currently used in industry applicable documentation, including workplace procedures, equipment specifications, regulations, codes of practice and operation manuals. Links UET Training Package Companion Volume Implementation Guide is found in VETNet -

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