Instructional Framework

Technology Devices Maintenance

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This Instructional Framework identifies, explains, and expands the content of the standards/measurement criteria, and, as well, guides the development of multiple-choice items for the Technical Skills Assessment. This document corresponds with the Technical Standards reviewed on July 13, 2025.

Domain 1: Device Hardware Installation and Maintenance **Instructional Time: 30 - 35%**	
STANDARD 6.0 INSTALL, CONFIGURE, UPGRADE, AND MAINTAIN TECHNOLOGY	
6.1 Identify the purpose and characteristics of common system components (i.e., storage devices, power supply, removable media, expansion cards, memory, etc.)	● Computer Components: ○ Central Processing Unit (CPU)/heat sink/cooling fan ○ Motherboard ○ Hard Disk Drive (HDD) vs. Solid State Drive (SSD) ○ Random Access Memory (RAM)
6.2 Identify the purpose and characteristics of mobile device components (i.e., power supply, removable media, screens, batteries, speakers, ports, etc.)	● Mobile Device Components ○ Digitizer ○ Advanced RISC Machines (ARM) ○ Memory/storage ○ Cameras ○ Sensors ○ Radios/modems ○ Microphone ○ Motherboard/logic board
6.3 Identify issues to be considered when upgrading technology components [i.e., safety (electrical), data integrity, compatibility, user privacy, power efficiency, etc.]	● Cable connections ● Cable management ● Male/female connections ● Power supply connections ● Power supply overhead ● Electrostatic discharge
6.4 Demonstrate basic procedures for adding and removing common system components and recognizing associated cable connections (i.e., compatibility and serialization, architecture, etc.)	● Video ports ○ VGA, DVI, HDMI, etc. ● Network ports ○ RJ45

	● Audio ports ● Universal Serial Bus (USB)
6.5 Distinguish the names, purposes, and performance characteristics of common peripheral ports	● Plug and play ● USB ● VGA ● RJ-45 (Ethernet) ○ CAT5E, CAT6, CAT7
6.6 Demonstrate proper procedures for installing and configuring common peripheral devices	● Safety ● Data integrity ● Compatibility ● User privacy ● Cost analysis ● RAM ● Hard drive ● Optical drive ● Drivers (printer, graphics card, etc.)
6.7 Follow procedures for preventive maintenance of computers and peripherals (i.e., physical cleaning, S.M.A.R.T. goals, data backup, security updates, etc.)	● S.M.A.R.T. goals ● Cleaning hardware ● Latest drivers for hardware ● Latest antivirus protection ● Software utilities ○ Defrag ○ ScanDisk ○ Data remnants ● Deleting unused programs ● Rebooting
6.8 Determine the cost-benefit of repair or replacement of hardware/software	● Direct ○ Hardware and software invoices ○ Purchase orders ○ Labor cost ○ Website ○ Helpdesk ○ Network cost ● Indirect ○ Productivity loss/gains

STANDARD 7.0 ASSESS INFORMATION SYSTEM COMPONENTS AND HARDWARE	
7.1 Identify CPU chip types, architecture, manufacturers, water and air cooling, and associated sockets	● Types ○ Single-core ○ Multi-core (dual, quad, octa, etc.) ● Manufacturers ○ Intel ○ Advanced Micro Devices (AMD) ● Sockets ○ Ball grid array (BGA) ○ Pin grid array (PGA) ○ Land grid array (LGA)
7.2 Identify operational characteristics of RAM (e.g., speed, type, and size)	● Type ○ DRAM ■ SDRAM ■ SDR SDRAM ■ DDR4 SDRAM ■ DDR5 SDRAM ○ SRAM ○ DIMM (Dual In-Line Memory Module) ○ SO-DIMM (Small Outline Dual In-Line Memory Module) ● ROM (Read Only Memory)
7.3 Identify the responsibility of the various components of the motherboard (i.e., integrated ports, expansion slots, chipsets, battery, etc.)	● Central Processing Unit (CPU) ● Northbridge ○ PCIe controller ○ Memory controller ● Southbridge ○ ATA interface ○ Serial ATA ○ Onboard audio ○ PCI expansion bus ○ Onboard USB/serial/parallel ○ Onboard LAN ● Motherboard connectors ● Chipset
7.4 Identify basic compatibility guidelines of the motherboard, processors, and memory	● Packaging/labels ● Components compatibility ● Order of selection for assembly ○ Central Processing Unit (CPU)

	○ Motherboard ○ Random Access Memory (RAM) ○ Case ● Types ○ ATX ○ micro ATX ○ ITX ○ micro ITX ● Motherboard manual ● Socket
7.5 Explain the role of BIOS/UEFI and CMOS in computer technology	● BIOS/UEFI ○ Input ○ Output ● CMOS ● CMOS battery ● Firmware ● Security boot ● T2 security chip
7.6 Explain how environmental factors including heat, airborne particulates, humidity, vibration, and shocks can affect equipment	● Various environmental factors ○ Vibrations/shocks ○ Humidity ○ Airborne particles ○ Internal/external temperature ● Prevention and resolution
7.7 Explain the relationship of clock speeds and bus speeds and width (i.e., megahertz, gigahertz, etc.)	● Hertz ● Processor speed ● Clock cycle ● Bus speed ○ Processor ○ RAM
7.8 Explain the relationship of bits and bytes to common memory and storage capacities	● Bit (b) ● Byte (B) ● Kilobyte (KB) ● Megabyte (MB) ● Gigabyte (GB) ● Terabyte (TB) ● Petabyte (PB)

7.9 Explain basic Ohm's law theory and common electrical terms (i.e., voltage, amperage, resistance, capacitance, etc.)	● Ohm's law ● International Symbols for current, power, resistance
7.10 Identify power supply characteristics (e.g., wattage calculation, draw, efficiency ratings, and connectors)	● Wattage ● Overhead
STANDARD 8.0 PERFORM PRE-PRODUCTION TASKS	
8.1 Compare and contrast printer technologies (e.g., laser, ink, 3D, thermal, and impact)	● Laser printing process ● Laser printer components ○ EP (Electrophotographic) ○ LED (Light-Emitting Diodes) ○ Page vs. line ○ Toner cartridge ● Inkjet ○ Ink cartridge ○ Head carriage, belt, stepper motor ○ Paper feed ○ Control, interface, power circuitry ● Thermal ○ Receipt ○ Fax ● Impact ○ Dot-matrix
8.2 Explore connection options for printer and scanner technology (i.e., wired vs. wireless, cable types, local infrastructures, etc.)	● Types ○ USB ○ Ethernet ○ Wireless ■ 802.11 ■ Bluetooth ■ Infrastructure vs. ad hoc
8.3 Troubleshoot common printer problems (i.e., paper jam, connectivity, consumables, maintenance cycle, power, security protocols, etc.)	● Common printer problems ○ Streaks/smears ○ Scrambling on paper ○ Ghost images ○ Toner not fused to paper ○ Vertical lines on page ○ Communication failure

Domain 2: Device Software and Installation Maintenance **Instructional Time: 20 - 25%**	
STANDARD 10.0 COMPARE THE BASICS OF COMMON OPERATING SYSTEMS	
10.1 Differentiate the characteristics, features, and applications of different operating systems (i.e., Windows, iOS, Android, Linux, MacOS, etc.)	● User Interface (UI) ○ Intuitiveness/user-friendliness ● Kernel ● Compatibility
10.2 Navigate major software functions by operating system (i.e., taskbar, menus, notification bars, hot keys, gestures, etc.)	● Software features and functions by operating system ● Windows settings menu ● macOS settings menu ● Linux command line
10.3 Use major operating system management tools (i.e., file management, administrative tools, command line, REGEDIT, Task Manager, system utilities, etc.)	● Administrative ○ Computer Management ○ Device Manager ○ Local Users and Groups ○ Local Security Policy ○ Performance Monitor ○ Services ○ System Configuration ○ Task Scheduler ○ Component Services ○ Data Sources ○ Print Management ○ Windows Memory Diagnostics ○ Windows Firewall ○ Advanced Security ○ Event Viewer ○ User Account Management ● MSConfig ○ General ○ Boot ○ Services ○ Startup ○ Tools ● Task Manager ○ Applications ○ Processes ○ Performance

	○ Networking ○ Users ● Disk Management ○ Dive Status ○ Mounting ○ Initializing ○ Extending Partitions ○ Splitting Partitions ○ Shrink Partitions ○ Assigning/Changing Drive Letters ○ Adding Drives ○ Adding Arrays ○ Storage Spaces ● System utilities ○ Regedit ○ Command ○ Services.msc ○ MMC ○ MSTSC ○ Notepad ○ Explorer ○ Msinfo32 ○ DxDiag ○ Disk Defragmenter ○ System Restore ○ Windows Updates ● Equivalent tools for macOS
10.4 Explain command-line functions and utilities used to manage the operating system including the proper syntax and switches (i.e., scripts, PowerShell, file attributes, commands for creating, viewing, and managing drives, directories, files, etc.)	● Managing drives, directories, and files ● Basic command line tool ○ Linux ○ Microsoft ○ Mac IOS
STANDARD 11.0 INSTALL, CONFIGURE, AND UPDATE OPERATING SYSTEMS	
11.1 Compare and contrast the differences between native and virtualized operating system environments	● Pros and Cons ○ Native operating system (installed on one computer per person) ○ Virtualized operating system (installed on a thin client on an as-needed basis) ○ Cost vs. needs

11.2 Install operating systems using default and customized installation options (i.e., PXE, answer file, attended vs. unattended installations, etc.)	● System requirements
	  ○ Drive space
	  ○ RAM
	● OS requirements
	  ○ Compatibility
	● Attended vs. unattended installations
	● Partitioning

11.3 Configure backups and restore data (i.e., network attached storage, software RAID, cloud storage, ZFS, File History, Window Server Backup, Time Machine, images, clones, 3-2-1 rule, etc.)	● Local backup ● Remote backup ● Cloud backup ● Entire system ● Local files ● Local settings (bookmarks, etc.) ● 3-2-1 rule
11.4 Identify common issues and resolutions encountered during installations and version upgrades (i.e., upgrade paths, procedures, etc.)	● No mountable hard disk detected ● File not found ● BIOS/UEFI settings

11.5 Perform operating system security and feature updates	● Boot methods
	  ○ USB
	  ○ PXE
	  ○ Solid state/flash drives
	  ○ Netboot
	  ○ External/hot-swappable drive
	  ○ Internal hard drive (partition)

11.6 Set up basic system boot sequences and boot methods including recovery options (i.e., boot order, secure boot, etc.)	● BIOS/UEFI ● Boot menu ● Recovery partition ● Recovery media
11.7 Install and update device drivers	● Drivers ● Find and download drivers ● Install drivers ● Device manager
11.8 Optimize the operating system (i.e., deleting temporary files, custom startup settings, built-in optimization tools, uninstall unnecessary applications and services, etc.)	● Disk Manager ● Disk Cleanup, etc.

11.9 Explain the cross-platform migration process and limitations (i.e., computers, tablets, smartphones, etc.)	● User settings backup ● Bookmarks ● Favorites ● Files

Domain 3: Introduction to Technology Devices Maintenance **Instructional Time: 15 - 20%**	
STANDARD 1.0 APPLY PROBLEM-SOLVING AND CRITICAL THINKING TO ESTABLISHING AND MAINTAINING TECHNOLOGY DEVICES	
1.1 Assess the technology environment or electronic surroundings in a small or large working group or organization, including IT systems, network configurations, and storage methods	● Assessment ○ Device location ○ Environment ○ Device usage
1.2 Explain technology assessment (e.g., process used to determine strengths, weaknesses, and potential risks, and aligning technology with personal or business goals)	● Risk analysis ● AI readiness ● Compatibility
1.3 Communicate with clients to establish and maintain computers/electronic devices (e.g., hardware needs and maintenance, software needs and updates, and security needs and updates)	● Different priority level tasks ● Priority assessment and assignment ● Conversation etiquette ● Open and closed-ended questions
1.4 Apply problem-solving skills to solve problems with computers/electronic devices (i.e., reproduce the problem, define the problem, identify the cause, research the solution, select and test a solution, verify the results, etc.)	● Troubleshooting methodology ○ Identify problem ○ Establish a theory of probable cause ○ Test the theory to determine the cause ○ Establish a plan of action ○ Verify full system functionality and solution ○ Implement preventive maintenance ○ Documentation
1.5 Document the results and update the problem-solving process as needed (i.e., ticketing systems, notations, communications, troubleshooting, etc.)	● Customer Relationship Management (CRM) ○ Documentation for current/future reference ■ Ticket ■ Quick-reference guide ■ Repair logs, etc.

STANDARD 2.0 MAINTAIN A SAFE AND ENVIRONMENTALLY CONSCIOUS TECHNOLOGY WORKPLACE	
2.1 Take personal responsibility for a safe and healthy work environment (i.e., conform to industry standards, recycle toxic/non-toxic materials, avoid/eliminate electrical hazards, etc.)	● Equipment grounding ● Proper component handling and storage ○ Antistatic bags ○ ESD straps ○ ESD mats ○ Self-grounding ● Proper disposal ○ Batteries ○ Toner ○ Cell phones ○ Tablets ○ Safety Data Sheet (SDS) ○ Compliance with government regulation ○ Recyclable components ● Personal safety ○ Power disconnection ○ No jewelry/loose clothing ○ Lifting techniques ○ Weight limitations ○ Electrical fire safety ○ Cable management ○ Safety goggles
2.2 Use the appropriate tools, materials, and equipment to establish and maintain technology	● Combination ratchet/screwdriver ○ Philips ○ Flat head ○ Torx/Star ○ Hex ● Network cable tester ● Wire stripper ● Punch down ● Crimper ● Multimeter ● Power supply tester ● Three-pronged parts retriever, etc.
2.3 Identify ergonomics and repetitive strain injuries experienced in technology maintenance occupations	● Seating position ● Carpal tunnel ● Repetitive Stress Injury (RSI) prevention

2.4 Explain safety measures and procedures including electrostatic discharge and explain how inadequate measures can damage equipment (i.e., proper handling/disposing of lithium batteries, using proper lifting of heavy objects, etc.)	● Static electricity ○ Causes ○ Effects ○ Safety ● Anti-static tools ○ Bag ○ Mat/pad ○ Wrist strap

Domain 4: Introduction to Networking **Instructional Time: 10 - 15%**	
STANDARD 9.0 EXPLAIN BASIC NETWORKING	
9.1 Differentiate common types of network cables, media and their characteristics (i.e., wire categories, copper versus fiber, wireless and wired, WIFI generations, WIFI frequency and channels, etc.)	● Network cables ○ Ethernet ■ Cat 5e ■ Cat 6 ■ Cat 7 ■ Plenum ■ Shielded twisted pair ■ Unshielded twisted pair ■ 568A/B ○ Fiber ○ Coaxial ○ Speed and transmission limitations ● Network topologies ○ Physical vs. logical ● Wi-fi ○ 2.4GHz vs. 5G
9.2 Install and configure network cards and adapters	● Network card properties ○ Half duplex/full duplex/auto ○ Speed ○ BIOS (on-board NIC) ■ Wake-on-LAN ■ QoS
9.3 Differentiate common technologies available for establishing network connectivity (i.e., routers, wireless, modem, switches, repeaters, mesh networks, etc.)	● Internet connection types ○ Cable ○ DSL

	○ Dial-up ○ Fiber ○ Satellite ● ISDN ● Cellular ○ Tethering ○ Mobile hotspot ● Line-of-sight wireless Internet service ● Wireless networking protocols ○ 802.11n ○ 802.11ac ● Frequencies ○ 2.4Ghz ○ 5Ghz ● Channels ○ 1–11 ● Bluetooth ● NFC ● RFID ● Zigbee ● Z-Wave ● 4G/LTE ● 5G
9.4 Explain the different OSI (open system interconnection) model layers	● The seven OSI layers and their functions: ○ Physical ○ Data Link ○ Network ○ Transport ○ Session ○ Presentation ○ Application
9.5 Explain the different network authentication terms (i.e., WPA, RADIUS, SSID, passphrase, etc.)	● SSID not found ● Troubleshooting methodology ● Security standards ○ WPA ○ WPA2 ○ WEP

STANDARD 12.0 APPLY NETWORK TROUBLESHOOTING	

12.1 Diagnose infrastructure issues and procedures for establishing internet connectivity (i.e., hardware problems, network equipment, etc.)	• IP addressing
	  ○ Static
	  ○ Dynamic
	  ○ APIPA
	  ○ Link local
	• DNS
	• DHCP
	  ○ Reservations
	• IPv4
	• IPv6
	• Subnet mask
	• Gateway
	• VPN
	• VLAN
	• NAT

12.2 Identify relevant protocols (i.e., HTTP, HTTPS, FTP, SMTP, DNS, DHCP, POP, etc.)	• IMAP

12.3 Use network troubleshooting applications (i.e., IPCONFIG, PING, TRACERT, NSLOOKUP, DIG, NETSTAT, NBTSTAT, ARP, etc.)	• Network Troubleshooting Apps
	  ○ ifconfig (Linux, macOS, BSD)
	  ○ traceroute

12.4 Verify resolution of issue and implement preventative measures	• Verification • Testing • Validation • Viability

Domain 5: Device Security and Future Prospects
Instructional Time: 10 - 15%

STANDARD 3.0 ADDRESS SECURITY ISSUES RELATED TO TECHNOLOGY DEVICES	

3.1 Identify and apply security policies to maintain data integrity and security (i.e., computer lock out time, minimum password requirements, data encryption, etc.)	• Asset identification
	• Regulatory and compliance policy
	• Security policies
	  ○ Authentication
	  ▪ Single/multi-factor
	  ○ Password
	  ○ Acceptable use

	○ Remote access
3.2 Explain the importance of physical security of computer hardware and electronic devices (i.e., biometrics, mantraps, 2-factor authentication, locked server rooms, etc.)	● Device security best practices ● Physical security measures ● Drive destruction and disposal ● Inventory management
3.3 Explain user-related threats (i.e., ransomware, phishing, malware, etc.) and delivery mechanisms (i.e., email attachments, social engineering, spoofing, identify theft, spamming, malicious extensions, etc.)	● Types of Malware ○ Virus ○ Trojan horse ○ Worms ○ Adware ○ Spyware ○ Rootkits ○ Spam ○ Keylogging ○ Botnet ○ Zombie ● Guidelines for users ● Social engineering ○ Regulated data ■ Personally Identifiable Information (PII) ■ Payment Card Industry (PCI) ○ General Data Protection Regulation (GDPR) ■ Protected Health Information (PHI) ○ Types of attacks ■ Dumpster diving ■ Shoulder surfing ■ Piggybacking ■ Masquerading ■ Eavesdropping ■ Phishing
3.4 Identify methods to protect and prevent security threats [i.e., signature based, sandboxing, behavior-based and automated behavioral analysis (ABA), human review, user instructions/training, etc.]	● Virtual machines ● Firewall
3.5 Explain external threats (i.e., denial of service, hacking/cracking, IDS/IPS, etc.)	● TCP/IP attacks ○ Denial of Service (DoS) ○ Distributed Denial-of-Service (DDoS) ○ Spoofing ○ DNS poisoning ○ Man-in-the-Middle (MITM)

	● Zero-day attacks
STANDARD 4.0 EXPLORE LEGAL AND ETHICAL ISSUES RELATED TO INFORMATION TECHNOLOGY	
4.1 Identify issues specific to intellectual property rights including copyright, software licensing, patents, and software piracy	● Digital Content Management ○ Software licensing ○ Digital Rights Management (DRM) ● End User License Agreement (EULA) ● Software types ○ Open source ○ Proprietary ● Software piracy and duplication ● Software and systems patenting
4.2 Identify issues and trends affecting data and information privacy [e.g., CMMC (Cybersecurity Maturity Model Certification), HIPAA (Health Insurance Portability and Accountability Act), and FERPA (Family Education Rights and Privacy Act)]	● Significance of data privacy ● Information privacy protection laws ● File encryption ● Big data: processing and handling ○ AI bots/harvesting
4.3 Differentiate between ethical and unethical uses of technology [i.e., black hat/white hat hacking, industry-specific restrictions, responsible disclosure, AUP (Acceptable Use Policy), abuse of access, etc.]	● Code of ethics ● Industry guidelines and restrictions on access
STANDARD 5.0 EXPLORE RAMIFICATIONS OF TECHNOLOGY DEVELOPMENT	
5.1 Explore future trends in technology with positive and negative implications	● Technological advancements ● Artificial Intelligence (AI)
5.2 Explore challenges regarding the evolution of technology and their impact on our lives (i.e., AI, immutable backups, automation, shift in occupations, data compatibility, security, privacy, consumer history, etc.)	● Internet of Things (IoT) ○ Smart homes ○ Smart devices ● Occupations in technology ○ Programmer ○ Network technician ○ IT Technician ○ Data analyst, etc. ● Automation and its impact
5.3 Explore methods for keeping up with technology changes (i.e., forums, digital newsletters, trade mailing lists, technology announcements, certifications, continuing education, etc.)	● Current industry standards and requirements ● Benefits of staying current ● Ways to keep up with technology trends ○ Enrollment in online courses ○ Technology blogs/forums/podcasts/webinars

	○ Social media, etc.