

STATE OF NEBRASKA
501 BUILDING--DATA CENTER
LINCOLN, NE

10-16206-01

SECTION 011001 - PROCEDURES AND GUIDELINES FOR WORKING IN AN ACTIVE DATA
CENTER

Critical Procedures and Guidelines must be followed to correctly and safely perform work in an active data center.

This document is intended to establish the proper procedures for safely performing facilities work in an active data center and to guide either internal staff or outside suppliers and technicians in correctly accomplishing the required tasks.

CONTENTS	PAGE
Personal Accountability Registration	2
General Work Rules	3
Data Center Chain of Command	5
Call List	6
Computer Room Specific Work Rules	6
Building Security	7
Method and Procedure (MAP)	8
Critical Power	8
"Hot Work," Lock-Out and Tag-Out Procedures	10
Welding and Cutting Permits	10
Mechanical Work	10
Cleanup As Work Progresses	10
Deliveries/Shipments, Dock Protocols, Computer Equipment	11
Packing/Unpacking, and Storage	11
Vacuums	12
Installation/Removal of Computer Equipment Non-Electrical Cables	13
Installation of Computer Equipment Power Cables and Circuit Breakers	14
Removal of Computer Equipment Power Cables and Circuit Breakers	15

STATE OF NEBRASKA
501 BUILDING--DATA CENTER
LINCOLN, NE

10-16206-01

Personal Accountability Registration

Failure to know or comply with the following procedures is grounds for immediate removal from the site, perhaps permanently. All people allowed access to critical areas must review these Work Procedures and demonstrate their knowledge of the procedures most applicable to their activity on site at least every six months.

It is vitally important that you understand the severe negative impact your actions can have on this site as a result of working inappropriately. These procedures and guidelines have been developed to clarify our quality expectations and to reduce the chance of mistakes and unintended events. Failure to comply with any procedure will result in your immediate removal from the site, may result in permanent loss of your access to the facility, and possible loss of business for you or your company.

I have been given a copy of the *State of Nebraska OCIO 501 Building Procedures and Guidelines for Safely Performing and Work in an Active Data Center* and have read them. I have had an opportunity to ask clarifying questions about the procedures, their reasons and their intent. I agree to follow these procedures and to the best of my ability, I will make every effort to avoid accidents and mistakes, which will result in downtime.

Company _____

Name [print] _____

Signature _____

Date _____

Accepted by State of Nebraska _____

Data Center Manager

Facilities Department Manager

Date _____

Escort Status:

- Required
- Required to computer room
- Not required

STATE OF NEBRASKA
501 BUILDING RENOVATION
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LINCOLN, NE

10-16206-01

General Work Rules

1. Background Checks
 - a. All individuals accessing the building will be subject to a Nebraska State Patrol background check prior to being given temporary access to the facility.
2. Personal behavior
 - a. All vendors, contractors and other service providers must be appropriately attired and act in a professional manner.
 - b. No firearms, explosive chemicals or devices, or weapon of any type is allowed on the Site.
 - c. No smoking is allowed inside the building.
 - d. Profane language, abusive behavior, being under the influence of alcohol or drugs, sexual comments to or about employees, leering, and other offensive or inappropriate behavior will not be permitted and offenders will be asked to permanently leave the premises.
 - e. Cell phones, radios, iPods, etc. are not permitted in computer rooms or critical electrical and communications spaces.
 - i) Short Wave Radio's will be permitted in the Data Center.
 - ii) Cellphones are permitted only by Project Forman and all photography is prohibited.
 - f. Food and drink are permitted only in designated locations, which include the cafeteria and snack machine areas or specific areas designated by Owner. Under no circumstance will food or drink be allowed in the Data Center.
3. Safety
 - a. Safety cones with caution tape will be erected around all electrical work areas prior to the start of work. Signs will be posted with the cones instructing people to avoid this dangerous work area.
 - b. Be safe!
 - i. When in doubt, ask! If you're not sure, don't touch it!
 - ii. Be sure you thoroughly understand what you are going to do before you proceed. You may not have a second chance to correct a mistake.
 - iii. When in doubt be conservative!
 - c. Avoid safety cones, barricades, caution tape, or other safety equipment that has been installed to guide you around hazardous areas including open floor tiles.
4. Fire detection and suppression systems
 - a. Pre-action water sprinklers protect under and above the raised floor and above office and support spaces. The sprinklers will function automatically when a temperature exceeds a preset level and the fire detection system is in alarm. Every effort shall be made to prevent such a condition from ever occurring.
 - i. A gaseous suppression system is not present in this building.
 - b. Fire rated doors must not be propped open. Leaving fire doors open can help fires to spread and can prevent the Halon gas from reaching sufficient suppression concentration. Leaving doors open also affects computer room temperature, humidity stability and security.
 - c. A fire watch will be established any time fire detection, fire alarm, or suppression systems are disabled. A fire watch requires a complete physical tour of all spaces in the de-activated fire detection zone at least once every two hours. Technicians will not be permitted to leave the site until all fire systems have been re-enabled.
5. Emergency Power Off (EPO) systems are located at each computer room exit. These physically protected buttons disable computer power in a major emergency. **Accidental operation must be avoided**. Additional instructions are contained in a later section.

STATE OF NEBRASKA
501 BUILDING RENOVATION
PRINT SHOP BUILDOUT & STRUCTURAL DEFICIENCY RENOVATION
LINCOLN, NE

10-16206-01

6. Building security is important to protecting the information and physical assets of the State of Nebraska. Security is staffed 24 hours a day and staff is specially trained in emergency medical response procedures. They are the first line of defense in assuring the safety of all building occupants.
7. Access
 - a. Normal access is limited to normal hours and emergency responses.
 - b. The Security Desk must be notified before moving large equipment into or out of the building, or the Data Center, or from the dock area, so open doors and door alarms may be managed.
 - c. Contractor badges will be issued and must be turned in at the end of the day and reissued at the beginning of each day.
8. Keys/Access Cards
 - a. Contact the Security Desk, the Office of the CIO (OCIO) or the Facilities Department to access any secured areas such as the Data Center, UPS Room, equipment rooms, storerooms, etc.
 - b. Equipment, power panel, and door keys and/or key rings must never leave the building. All keys must be kept by the Security Desk and the Operations Center.
9. Chain of command and call lists are critical in an emergency. See the following section for more details.
10. Requirements for Working In This Site
 - a. Starting and leaving work each day
 - i. All work will take place at a time designated by the Facilities Department. Facilities Prime Contractors will announce their arrival to the Facilities Department and Security Department and determine it is still ok to proceed with planned work.
 - ii. Pre-plan the tools and materials required for each day's work.
 - iii. Do not set things on top of equipment or block access to any aisle ways, doors, air conditioning or Power Distribution Units, EPO, chillers, or electrical panels.
 - iv. Use safety cones, barricades, caution tape, or other safety equipment and devices to direct people away from hazardous areas. Replace all floor tiles at the end of each day.
 - v. Do not cross protective barriers or devices without asking permission. Be especially aware in areas where floor tiles can be removed exposing the underfloor area.
 - vi. The dock area is for unloading only - no parking is permitted. Vendor trucks are to be parked in the locations specified by the Security Desk, the Office of the CIO or the Facilities Department. All packing material must be removed from computer equipment/components in the specified staging areas before being moved onto the active raised floor.
 - vii. Nothing shall be stored in the computer room or under the raised floor.
 - viii. Removal of a computer room raised floor tile or ceiling tile must be authorized by the OCIO. Be especially mindful of cabling, fire detectors, water sprinkler heads, suppression systems and other devices which can be knocked off. Under floor systems include water leak detection systems, smoke detectors, communications cabling and other sub-floor devices and equipment.
 - ix. Consult the Facilities Department before bringing pressurized refrigerants or any other liquids or chemicals into the building.
 - x. Paints, solvents, adhesives, or any other flammable materials inside the building must be kept to a minimum and will be stored in metal fire rated cabinets when not in use.
 - xi. OSHA standards must be strictly adhered to for Blood Borne Pathogens and for all other hazardous or toxic materials. Immediately notify the Security Desk, the Office of the CIO or the Facilities Department of any contamination.
 - xii. Any maintenance equipment that generates audible noise (floor buffers, etc.) can be used only with approval.

STATE OF NEBRASKA
501 BUILDING RENOVATION
PRINT SHOP BUILDOUT & STRUCTURAL DEFICIENCY RENOVATION
LINCOLN, NE

10-16206-01

- xiii. You may only use electrical outlets marked "NON UPS". NO UPS Power shall be used for construction related equipment purposes. If an outlet is not labeled, you must consult the Facilities Department which will identify and label such power sources for your use.
 - xiv. Put things away at the end of the day.
 - xv. Penetrations to rated firewalls or smoke barriers must be maintained on a daily basis.
 - xvi. Workers will not leave at the end of the day or job until they have been released by the Security Department. In special circumstances, Facilities may also require release.
- b. Initiating a project
- i. All work must have a written Work Order issued by the sponsoring department. The only exception to having a Work Order is routine facility operations. Verbal or handwritten instructions are not binding and should never be accepted by a Vendor.
 - ii. All work affecting or potentially affecting site uptime or network operations will be scheduled through Change Management. Approved Methods And Procedures (MAP)s are required on all critical work. A qualified vendor foreman or supervisor must be on site and "in-charge" at all times during critical work.
 - iii. Any deviations from the approved work scope must be evaluated prior to work performance. Changes affecting safety or risk will be re-scheduled through Change Management.
 - iv. Use of the dock and storage of equipment, materials and tools will be discussed with Facilities and Operations Center prior to start of a project. Agreement will be reached on hours of loading/unloading, duration of dock use, and storage arrangements.
- c. Closing out a completed project
- i. Work must be done to the satisfaction of the Department paying the bill and any Professional Architectural/Engineering Services Firm responsible or Construction Firms responsible.
 - ii. All temporary or interim solutions must be permanently completed, all penetrations must be permanently sealed, tools and materials must be removed, as-built documentation must be completed, Operations and Maintenance Manuals must be provided and any close-out documentation required as a part of any Contract must be certified.
 - iii. Work area must be clean.
 - iv. Work Order and MAP paperwork must be closed out.
- d. Essential documents for working in this facility:
- i. Data Center Work Procedures. All personnel must comply with the latest version of these procedures.
 - ii. Work Orders. You must have a Work Order for all work to be done. The Work Order must identify the sponsoring department and their authorized representative(s) who are responsible for supervising the task and ensuring all procedures are followed.
 - iii. Methods and Procedures (MAP). The approved MAP must be posted in the work area and visible where critical work is being performed. Work will be immediately halted if the approved MAP is not posted or is not being followed.
 - iv. Welding and Cutting Permits. No welding or open torches will be used without a permit and without disabling the fire detection and suppression systems in the affected area.
 - v. Materials Safety Data Sheet (MSDS). Provide a Materials Safety Data Sheet for any material you bring into the facility. The MSDS will be kept in the Facility Department.
 - vi. Other documents may be required depending upon the work to be performed.

STATE OF NEBRASKA
 501 BUILDING RENOVATION
 PRINT SHOP BUILDOUT & STRUCTURAL DEFICIENCY RENOVATION
 LINCOLN, NE

10-16206-01

DATA CENTER CHAIN OF COMMAND

1. The State of Nebraska Departments are responsible to the government and the public for information availability. Other departments work to serve the needs of computer operations. The major support departments are:
 - a. Operations Center (OCIO). #402-471-3851
 - b. Facilities Department (State). # 402- 326-2215 After Hours: 402-471-0437
 - c. Security (State) - 402-471-2400
2. In an emergency, The State of Nebraska will set priorities and decide what risks will be taken. Other departments are charged with providing Computer Operations with the best available information upon which risk management decisions can be based.
 - a. In the event of a fire alarm, all employees, vendors, and contractors are to evacuate the building along with others in the same area. Foremen or lead persons are responsible for checking worker headcount and reporting to the fire official in charge that their people are out of the building.
 - b. It is a good practice to always make sure you are aware of the nearest fire exit.
3. In the event of an emergency, do not to congregate in the area of the problem unless you can make a direct contribution to solving the problem. Excess personnel increase the psychological pressure on those responsible for fixing the problem. In a Facilities emergency, the available staff will be divided into those solving the problem according to a planned protocol and one person will be assigned to communicate the status of problem and its resolution to responsible others. Typically, the communicator will be the foreman of the trade not directly involved in the problem.

DATA CENTER SPECIFIC WORK RULES

1. Do not perform work on or under the computer room raised floor or related infrastructure support equipment between the hours of 6:00 am and 7:00 p.m. Monday through Friday if it has any potential for impacting Computer Operations. Such work automatically includes computer equipment installations or upgrades, installations or removals of computer cables (electrical or signal), or any work requiring floor tile removal. Exceptions will be granted by the Operations Center and Facilities Department on a case by case basis.
1. No food, drink, or smoking is allowed within the computer rooms.
2. Radios, iPods or similar electronic devices are not allowed within the computer rooms.
3. Be especially careful around any computer hardware that has had the protective outer metal skin removed. With its covers off, such equipment is usually more susceptible to nearby electrical disturbances.
4. Do not touch any equipment unless it is specifically identified in your Work Order or MAP.
5. Each floor tile has a specific location identification using a street and perpendicular avenue designation like some cities use for roads. Floor tile A34 (and the equipment on top of this tile) can be found by looking at the numbers posted on the computer room's walls above eye level. The code sequence is floor number, followed by number of two-foot floor tiles from the Northwest corner of the room. The A western most row 34 tiles south.
6. Pipe cutting, pipe threading, cement cutting or other drilling within the computer room is not desirable. If such work cannot be avoided, use cutting oil, metal debris, and dust protection to prevent contamination from falling on the floor, staining the finishes, from becoming airborne or falling on equipment.

STATE OF NEBRASKA
501 BUILDING RENOVATION
PRINT SHOP BUILDOUT & STRUCTURAL DEFICIENCY RENOVATION
LINCOLN, NE

10-16206-01

7. Be careful to identify and carefully manage any physical changes or penetrations affecting where leaking water will flow. Seal penetrations between floors that might allow water to leak through to the floor below.
 - a. Underfloor leak detectors are provided to sense the presence of water in specific areas. Be careful to make sure that these detectors remain in the path of water flow at lowest point where water might be expected.
8. Permanently fire stop all holes or cable openings in fire walls or fire barriers upon job completion. Temporarily fire stop them at the end of each workday. Make sure all fire stopping materials and their application has been pre-approved by Facilities.
9. Any vacuum used in the computer room or in a fire detection zone must have a HEPA filter on the discharge.
10. Gunpowder discharge activated construction tools or devices are not permitted.
11. Raised floor tile rules.
 - a. Remove no more than six (6) raised floor tiles at any time in any one area. This will ensure maximum static pressure and structural stability of the raised floor. Close open tiles as soon as possible, no later than the end of each day.
 - b. Use safety cones, barricades, caution tape, or other safety equipment or devices to direct people away from hazardous areas, especially when a floor tile is removed and the underfloor area is open with the potential for someone to fall.
 - c. To protect floor surfaces in hallways from being damaged when moving heavy computer equipment, use ¼" tempered Masonite sheets taped with 3" duct tape at all seams. Steel plates may be required if the equipment being moved is heavy enough. Masonite, by itself, may not be sufficient. To protect raised floor surfaces from being damaged when moving equipment and material, use minimum ¾" plywood sheets placed over plastic sheeting. Plastic is required to prevent cosmetic damage to the raised floor tiles. Plywood is required per raised floor manufacturer guidelines to prevent permanent damage to the raised floor system from rolling loads.
 - d. Minimize the size of cable cutouts to limit the unnecessary loss of cooling air and static pressure.
 - e. Cutouts in floor tiles will be protected with permanent plastic trim strips to prevent cables from rubbing against raw or rough metal edges. Brushes shall be added to any openings created to minimize excess air leakage.
 - f. Replace all previously cut floor tiles no longer in use with full tiles to prevent loss of static pressure and to increase the efficiency of the cooling system.
 - g. The location of perforated floor tiles, which allow cooling air to come up from under the raised floor, is critical to maintaining static pressure and proper computer room cooling. Moving of perforated floor tiles without first consulting Facilities is a serious offense and will result in removal from the site.
12. Equipment installation standards.
 - a. Install computer equipment only in designated areas planned for equipment placement and service.
 - b. Keep servers, central processing units, all peripherals, terminals, consoles, modems, keyboards, and other types of computer and communications equipment within a cabinet or rack specifically designed for the purpose. Do not use tables or desks for this purpose.
 - c. Be sure to locate all computer or communication devices, which consume power, specifically including modems, above the raised floor.

STATE OF NEBRASKA
 501 BUILDING RENOVATION
 PRINT SHOP BUILDOUT & STRUCTURAL DEFICIENCY RENOVATION
 LINCOLN, NE

10-16206-01

13. Emergency Power Off (EPO).

- a. EPO buttons are located by each door exit and are carefully labeled. Operation of an EPO button removes all power within a particular computer room zone and results in a failure of the State of Nebraska Data Center operations. This is an extremely serious event.
- b. Do not mistake the Door Exit button or the manual Fire Alarm station by the each computer room door for the EPO buttons. Special protection is provided for these devices to prevent accidental operation.
- c. Use the EPO button only in the event of a major life-threatening emergency. If possible and prudent, attempt to localize the problem before using the EPO which shuts off power to an entire computer room and has a major impact on the entire operation.
- d. Operation of the EPO button requires opening the protective cover. A very, very loud local alarm will immediately sound to discourage people from lifting the cover in error. Closing the cover will shut off the alarm. Once the protective cover is open, lift each protective covers on the two push-buttons and press and hold both simultaneously.
- e. When in doubt about whether a button is an EPO button or whether to activate an EPO button, use the telephone to call the OCIO, Faculties or the Security Desk.
- f. Any type of work on or near an EPO button requires an approved MAP.

14. Escorting

- a. All personnel (internal as well as external) not certified on Page 1 of this document as being qualified for working on the computer room raised floor or in site infrastructure support spaces will be 100% escorted by a representative of their sponsoring organization.
- b. To be raised floor certified, each individual must have a need for raised floor or support space access, review these procedures and guidelines at least once every six months and demonstrate a thorough understanding of their application to the satisfaction of an authorized representative of their sponsoring organization.

BUILDING SECURITY

1. Building security standards will be maintained at all times.
2. Only individuals listed and approved by the OCIO will be granted access to the Data Center. This list will be kept by the OCIO's designated staff Security staff and will be subject to strict enforcement.
3. Contractor personnel must display a Temporary Security Badge at all times. Return this badge to the Security Desk daily.
4. The Security staff conducts rounds of the building. They are authorized to request Work Orders or MAPs for the work being done. They can order work stopped if they feel the procedures contained in this document are not being followed.

METHOD AND PROCEDURE (MAP)

1. Nearly 70% of all data center site infrastructure failures are coincident with maintenance or other human activity. To control the risk of an unintended failure, a MAP is required for all work that may even remotely affect computing operations. The Facilities Department is responsible for determining which work activities will require a MAP. The MAP may be prepared by the Facilities Department or by the outside vendor performing the work.
2. The MAP will summarize in non-technical terms the work to be done, the expected work duration, the planned time and date, and the potential downtime risks which may occur.
3. The MAP will also identify the work to be done in great technical detail including the tools required, the skill level of the people doing the work, and a detailed work sequence checklist itemizing the steps

STATE OF NEBRASKA
501 BUILDING RENOVATION
PRINT SHOP BUILDOUT & STRUCTURAL DEFICIENCY RENOVATION
LINCOLN, NE

10-16206-01

to be performed. It will also include a circuit manipulation flow chart if the work involves circuit breaker installation/de-installation.

4. The MAP will contain a "backout" paragraph which discusses what will happen if unexpected conditions are encountered, who will make the decision of what to do, and how original conditions can be restored. Part of this paragraph will identify at what point it is no longer possible to backout from the work that has already been done.
5. Each step on a MAP Checklist will have a space for the people doing the work to initial that they have followed each detail of the MAP. There will also be room for written comments to be recorded.
6. Finalized MAPs will be generated at least two weeks before the work activity to allow discussion with Computer Operations and for scheduling through Change Management.
7. Any activity important enough to require a MAP will require at least two qualified people to perform the work. The first person is responsible for performing the work and the second person is responsible for reading the MAP checklist, to assist the first person, and to provide safety backup. The same technician team must consistently perform circuit breaker installation/de-installation work.
8. Prior to initiating any work, the second person will read the next step on the MAP Checklist and the first person will initial that step on the MAP Checklist indicating they understand what is required. Only after the first person has initialed the MAP step may the work for that step then be performed. When the step is completed, the second person will check the work and personally initial the MAP Checklist to confirm the step has been completed. Then, the sequence starts over with the next step on the MAP Checklist. The objective of initialing each step is to intentionally slow down the pace of critical steps to prevent doing things out of sequence.
9. Work is to be stopped if the MAP sequence appears to be incorrect.
10. Equipment not specifically listed in a MAP may not be touched for any reason.
11. If a failure occurs as a result of work covered by a MAP, the process will be exhaustively studied by all involved plus disinterested outsiders to identify the root cause. The only possible root causes are a process error, an execution error, or an accident. For the failure to be considered an accident, the MAP must have 1) been correct, 2) identified the risk which actually occurred, and 3) the steps in the MAP were faithfully followed.
12. An authorized Department Representative must be present during the performance of all MAPs involving high levels of risk which may affect operations.
13. While working on a MAP controlled project, vendors will not leave the site until released by an authorized OCIO and/or the Facilities representative.

CRITICAL POWER

1. The critical power distribution system takes conditioned power from the Uninterruptible Power System (UPS) and distributes it throughout the facility to individual loads. Most site failures occur in this area where hot electrical work is required and it is difficult to perform physical maintenance. Frequent problems include:
 - a. Dead front cover slipped while accessing load panel.
 - b. Overheated breakers which trip unexpectedly.
 - c. Wires which are not physically secured under screws.
 - d. Screws which are not torqued adequately.
 - e. Wires or circuit breaker handles which are dislodged while adjacent work is being performed.
 - f. Stripped screws.
 - g. Skinned insulation, faulted wires.
 - h. Reversed rotations.

STATE OF NEBRASKA
501 BUILDING RENOVATION
PRINT SHOP BUILDOUT & STRUCTURAL DEFICIENCY RENOVATION
LINCOLN, NE

10-16206-01

2. A MAP and at least two qualified electricians (one must be a foreman and both must be CPR qualified) are required whenever any type of hot or "live" electrical work is performed. A contractor should never operate a circuit breaker unless specifically directed by a OCIO and Facilities Department representative.
3. Electricians must always work at eye level, use insulated and tethered tools, and wear safety glasses. Hats and jewelry will not be worn.
4. All OSHA and NFPA 70E required safety equipment and standards must be followed.
5. Access to critical power distribution components including electrical panel boards and PDUs is restricted and all panels should be locked. Contact the OCIO and Facilities for access.
6. Electrical installation standards.
 - a. Non-metallic fish tapes will be used for all electrical work.
 - b. All circuits (electrical or non-electrical i.e. coax, bus & tag, fiber optic, etc.) must be dedicated home runs with no splices or intermediate plugs or connections.
 - c. All electrical circuits in the computer room will terminate in a female twist lock receptacle unless the circuit is hardwired directly to the hardware.
 - d. Power for rack or cabinet mounted equipment must be dedicated to that rack or cabinet.
 - e. Internally connecting power between adjacent racks or cabinets is poor practice because it has the potential for overloading a circuit. It also has the potential for removing power in the subsidiary rack in an unplanned way when the primary rack is shutoff for maintenance.
 - f. Independent standalone micro-UPS systems are not permitted in the computer room.
 - g. All power cables and their receptacles will be tested prior to installation.
 - h. Power cable length must be kept to a minimum and strain relief provided within 12" of either end of cables, supported off the floor on strut, and be brought up and tied off at the stanchion or stringer near each end.
 - i. Clearly label all power cables with indelible marker and permanent tags.
 - j. Install UPS receptacles using a red outlet. Use standard (gray) for house power.
 - k. Underfloor raceways: When providing dual power distribution, use blue for one UPS source, gray for the second (separate) UPS source in both its labeling and in its flexible raceway.
 - l. Flat spade plugs and receptacles are not allowed in the computer room unless the plug and receptacle are tie-wrapped together using three tie wraps, or contain a clamp built into the receptacle. Immediately report any computer room hardware with flat-spade push type plugs that have not been tie-wrapped to Facilities.
 - m. Use of power plug strips is poor practice and is discouraged. If a power strip is absolutely necessary:
 - i. Justification for the use of a power strip is required and will include a detailed plan and risk assessment.
 - ii. Specific models have been investigated by Facilities and approved for use in the computer room.
 - iii. The power strip should not contain internal circuit breakers or switches.
 - iv. The wiring connections internal to the power strip should be positively fastened to the receptacles and not "pushed on".
 - v. Strips shall contain built-in phase current metering. Network SNMP/Ethernet capabilities shall be provided where required by Facilities.
 - vi. Consult Facilities for the brands and models to buy.
 - vii. Permanently attach power strips to the cabinets.
 - viii. Cover all unused outlets with special cover plates using tamper proof devices.

STATE OF NEBRASKA
 501 BUILDING RENOVATION
 PRINT SHOP BUILDOUT & STRUCTURAL DEFICIENCY RENOVATION
 LINCOLN, NE

10-16206-01

- ix. Do not daisy-chain power strips, i.e. one power strip cable plugged into a receptacle of another power strip to provide additional outlet receptacles. Each power strip should be a dedicated home run back to its own source of power.
- x. Be sure to physically locate all power strips above the raised floor where they can be seen.

"HOT WORK," LOCK-OUT AND TAG-OUT PROCEDURES

1. "Hot" work requires at least two CPR-trained journeyman electricians and all associated safety equipment appropriate for the voltage being worked to include at least a safety hook and insulated mats.
2. Service technicians and mechanics must provide their own equipment locks and tags, and each tag must be filled out properly and legibly.
3. Inform the Facilities Department of any component to be locked out. Notify the Facilities Department before unlocking any tagged out piece of equipment. Log all actions in the Facilities Department permanent TAG OUT LOG.
4. Do not remove or apply power to any piece of equipment without first informing and receiving clearance from Facilities and/or the appropriate department supervisor. Any actions affecting critical power or cooling must be part of a previously scheduled MAP.

WELDING AND CUTTING PERMITS

1. You must acquire a Welding Permit or a Cutting Permit for any temporary operation involving open flames or which produces heat and/or sparks.
2. The Facilities Department must fill out the Permit.
3. Be sure to adhere strictly to the Precautions Checklist contained on the Permit.
4. You must implement an approved means of ventilating smoke from the area.
5. Notify Facilities and/or the appropriate Department Supervisor upon completion of the work.

MECHANICAL WORK

1. The vendor's Supervising Technician/Mechanic must be a qualified Journeyman with previous experience within the Data Center, unless otherwise specified by the Facilities Department.
2. All work must be performed by a qualified Journeyman.
3. Before any work can begin, the Supervising Technician/Mechanic must notify the Facilities Department.
4. Remove no more than six (6) raised floor tiles from any area. This will preserve static pressure, prevent the raised floor from shifting or collapsing, and minimize the risk of people or equipment falling through. Mark all open floor tiles with safety cones or other barriers.
5. No open torches or welding equipment is permitted unless a Welding and Cutting Permit has been approved.
6. Do not turn any valves on or off without permission.
7. When draining a pipe or line, use hoses to bring the water to a floor drain. When laying out and retrieving the hose lines, be especially mindful of not disturbing cabling, fire detectors, electrical connections, and other equipment or spilling water left in the hose or pipe.

CLEAN-UP AS WORK PROGRESSES

1. Do not accumulate trash or debris. Remove all trash and debris from the site daily.
2. Clean all areas where work is being performed of tools, equipment, and debris at the end of each shift. Store tools and equipment as directed.

STATE OF NEBRASKA
501 BUILDING RENOVATION
PRINT SHOP BUILDOUT & STRUCTURAL DEFICIENCY RENOVATION
LINCOLN, NE

10-16206-01

3. Clean all work areas using a vacuum or damp mopping with an absolute minimum amount of water and cleaning solution. Dry all spills. Be sure to handle chemical spills appropriately.
4. Leave the work area "cleaner than found." Clean any dirt or debris regardless of its source or origin.
5. Sticky "Walk-off" mats should be provided at all points of egress from the work area. Vacuum and change the mats when they are loaded or on a regular basis.

**DELIVERIES/SHIPMENTS, DOCK PROTOCOLS, COMPUTER EQUIPMENT
PACKING/UNPACKING AND STORAGE**

1. Notify the Facilities Department 24 hours in advance of any shipments or deliveries. This will ensure sufficient dock personnel are available for prompt loading or unloading and that storage or staging space is available. Any delivery attempt made without prior scheduling may be rejected or its handling delayed.
2. Do not store equipment or parts awaiting installation on active computer room raised floor for longer than one week. Keep all tools associated with equipment installation off the computer room raised floor.
3. Do not store equipment awaiting shipment in the computer room or in hallways.
4. Do not store anything in hallways. This includes tools, equipment, materials, parts, and components.
5. Do not block the dumpsters or loading dock areas.

VACUUMS

1. To limit the amount of airborne particles, all vacuums used in the data center will have a HEPA discharge filter capable of limiting discharged particles to 0.3 microns. Broom sweeping and unfiltered Sears "Shopvacs" can create large quantities of air borne contamination which can be sucked into computer equipment or which can set off the fire detection system and are specifically prohibited. Data centers are very sensitive to contamination. Dirt and dust can get into computer hardware and cause erratic operation. Airborne dirt can also trigger sensitive fire detection systems.

INSTALLATION/REMOVAL OF COMPUTER EQUIPMENT NON-ELECTRICAL CABLES

1. Acquire an approved MAP and Change Control approval before starting to install nonelectrical cables (fiber optic, coaxial, bus and tag, communications, phone, etc.). Perform all work under the direct supervision of a departments authorized representative. Existing cables should not be pulled, tugged, stretched, or disturbed under any circumstances.
2. Place all fiber optic cables inside the fiber optic conveyance system, innerduct, armored jacket or approved means.
3. Be sure to properly support any cables run above the dropped ceiling. Do not attach or tie off cables to sprinkler pipes, sprinkler heads, ceiling grid, ceiling hangers, or smoke detectors.
4. Two people must be present at all times for the removal of existing non-electrical cables. First, carefully trace all cables to identify what is inactive, then cut the inactive cables one at a time in no more than 10-15 foot sections, and then unweave and remove the cut pieces. Do not cut, disturb, or inadvertently pull on existing cables while removing other cables.
 - a. In congested areas, conduct cable mining with the active assistance of the operators of the equipment who can restore uptime in the event you inadvertently pull a single wire required for equipment operation loose.

INSTALLATION OF COMPUTER EQUIPMENT POWER CABLES AND CIRCUIT BREAKERS

1. Pre-planning activities
 - a. Acquire a Work Order containing the following elements
 - i. A summary sheet describing the work to be done and the dates expected
 - ii. A separate sheet for each piece of equipment describing the work to be performed with information on heat load, power requirements, receptacle types, floor tile cutout type, specific floor tile location where the equipment will be located and any other special instructions. Identify whether the equipment is dual powered. If the equipment is not dual powered, are there any requirements of where power should or should not come from to ensure IT equipment or architectural redundancy is not compromised? Provide computer hardware equipment identification information so tags can be prepared and equipment properly labeled. Additionally, verify that the panel and circuits are properly marked.
 - b. Facilities will use the Work Order information to determine if sufficient power from the correct source is available. If existing capacity is adequate, Facilities will assign a PDU, a panel board within the PDU and a circuit breaker position within the panel board. If adequate capacity is not available or the dates are unrealistic, Facilities will inform OCIO Computer Operations.
 - c. Prepare the power cable assemblies ahead of time and outside the computer room (if at all possible). Make sure all power cable assembly
 - i. Complies with all NFPA 70 (NEC) requirements and design documents.
 - ii. Is hardwired directly to the computer hardware or uses twist locks.
 - iii. Is tested for wire continuity, wire insulation nicks or grounds, receptacle wiring and, if applicable, phase rotation.
 - iv. Have permanent identification labels on the conduit within 12" of each end. The labels will be identical and will indicate the specific load being served, its floor tile location, the PDU power source and its floor tile location, the PDU load panel and the circuit breaker number within the load panel.
 - d. Perform a walk through (rehearsal) of all steps in the MAP
 - e. Check all service clearances within the PDU or load panel to ensure there is room to work safely.
 - f. Acquire Change Control Approval prior to installing under floor installation of power cable assemblies or turning ON previously installed circuits.
2. Schedule work under the raised floor and in the PDU only when you have received Change Control Approval.
 - a. Comply with all installation procedures contained in MAP ### dated MM/DD/YYYY.
 - i. Open, at a minimum, every other floor tile along the cable route (to a maximum of 12 feet) during installation to prevent mishaps.
 - ii. Handle all cable pulls in short runs of 12 feet maximum, following street and avenue routings under the accessible floor tiles or in the cable runways provided above. Do not use direct radial underfloor routings unless specifically directed by Computer Operations.
 - iii. Lock newly installed circuits off and wrap the receptacle with yellow tape (to prevent unauthorized use). The yellow color indicates the receptacle is specifically intended for a future use.
 - iv. Double-check dual powered equipment to ensure power comes via different paths from different sources. If independent sources are not available, ensure the paths are independent. Installing both dual power circuits within the same PDU is grounds for permanent removal from the site.

STATE OF NEBRASKA
 501 BUILDING RENOVATION
 PRINT SHOP BUILDOUT & STRUCTURAL DEFICIENCY RENOVATION
 LINCOLN, NE

10-16206-01

- v. Check for shorts or opens, phasing, and plug orientation on the Facility side of the circuit before energizing any circuit. Make a reasonable effort to check for shorts on the computer equipment side of the circuit.
 - vi. Be sure to have a OCIO and Facilities representatives present when you first energize a computer hardware circuit. The Facilities representative will personally tie-wrap twist lock plugs and receptacles together in the approved manner to prevent future inadvertent disconnection.
 - vii. Use a pen to update the existing Panel schedules and record the initials of the person doing the work and the date.
- b. Enter all “as-built” computer equipment and circuit information in the master PDU/panelboard schedule immediately upon completion of work. Enter the physical tile location where the power cable assembly actually terminates. Create new Panel schedules and equipment slap cards and install them on the PDU/panelboard and computer equipment by the end of the next business day.

REMOVAL OF COMPUTER EQUIPMENT POWER CABLES AND CIRCUIT BREAKERS

1. Obtain a formal Work Order (oral or hand written instructions are not acceptable) containing the following elements:
 - a. A summary sheet describing the work to be done and the dates expected.
 - b. A separate sheet for each piece of equipment identifying the floor tile location, the equipment to be removed, whether the equipment is still there, and any special instructions.
 - c. A floor plan identifying the floor tile locations for each piece of equipment.
2. Facilities will use the Work Order information to request Change Control Approval.
3. When you have received Change Control Approval, schedule work under the raised floor and in the PDU.
 - a. Comply with the procedures contained in MAP ### dated MM/DD/YYYY during the removal.
 - b. Do not disconnect any plugs or turn off an active circuit until two people have independently determined the circuit is inactive. This involves both:
 - i. Tracing the cable and determining nothing is connected to the other end and
 - ii. Testing the circuit using an “Amp Probe” and determining that no current is flowing.
 - c. Once the circuit has absolutely and beyond any shadow of doubt been determined to be inactive by two people, open the circuit breaker and
 - i. Tape the circuit breaker open.
 - ii. Field update the panel schedule.
 - d. Do not leave any inactive power cable assemblies under the raised floor. "Mine" all power cable assemblies once their circuit breaker has been turned OFF.
 - i. At least two qualified people are required to mine power cable assemblies.
 - ii. Open, at a minimum, every other floor tile along the cable route (to a maximum of 12 feet) during removal to prevent mishaps.
 - iii. Handle all cable removals in short pulls of 12 feet maximum.
 - iv. Remove components from the computer room at the end of each shift.
 - v. Wrap red tape around the end of any temporarily inactive power assembly cables you leave under the raised floor. The red tape means the receptacle is inactive and is intended to be removed the next day.

STATE OF NEBRASKA
501 BUILDING RENOVATION
PRINT SHOP BUILDOUT & STRUCTURAL DEFICIENCY RENOVATION
LINCOLN, NE

10-16206-01

- e. Enter any “as-built” and all computer equipment and circuit removal information in the master PDU/panelboard schedule program immediately upon completion of work. Create new Panel Schedules and install them on the PDU by the end of the next business day.

END OF SECTION 011001