DEPARTMENT OF ~~CONSUMER AND INDUSTRY SERVICES~~ **LICENSING AND REGULATORY AFFAIRS**

DIRECTOR'S OFFICE

CONSTRUCTION SAFETY STANDARDS

Filed with the Secretary of State on April 22, 2013

~~These rules take effect 7 days after filing with the Secretary of State~~

These rules become effective immediately upon filing with the Secretary of State unless adopted under section 33, 44, or 45a(6) of 1969 PA 306. Rules adopted under these sections become effective 7 days after filing with the Secretary of State.

(By authority conferred on the director of the department of **licensing and regulatory affairs** ~~consumer and industry services~~ by sections 19 and 21 of 1974 PA 154 and Executive Reorganization Order **Nos. 1996-2, 2003-1, 2008-4, and 2011-4, MCL 445.2001, 445,2011, 445.2025, and 445.2030** ~~No. 1996-2, MCL 408.1019, 408.1021, and 445.2001~~)

R 408.41410, R 408.41462, R 408.41464, R 408.41465, R 408.41466, R 408.41467, R 408.41472, R 408.41475, R 408.41476, R 408.41477, R 408.41478, and R 408.41482 of the Michigan Administrative Code are amended, R 408.41075a and R 408.41077a are added to the Code, and R 408.41468 of the Code is rescinded as follows:

PART 14. TUNNELS, SHAFTS, CAISSONS, AND COFFERDAMS

R 408.41410 Adoption of standards by reference.

Rule 1410. (1) The standards specified in this rule, except for the standards specified in subrules (2) and (3) of this rule, are adopted by reference.

(a) The following standards are available from the United States Government Bookstore, Patrick V. McNamara Federal Building, Suite 160, 477 Michigan Avenue, Detroit, Michigan 48226; or via the internet at web-site: http://bookstore.gpo.gov: or at the Michigan Department of ~~Consumer and Industry Services~~ **Licensing and Regulatory Affairs**, MIOSHA Standards **Section** ~~Division~~, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143, at a cost as of the time of adoption of these amendments, as stated in this subdivision.

(i) The provisions of 30 C.F.R. Parts 1-199, Mineral Resources, revised July 1, 2000. cost: ~~$52.00~~ **$4.00**.

(ii) The provisions of 42 C.F.R. Part 84, Public Health Service, revised October 1, 2001. Cost: ~~$65.00~~ **$4.00**.

~~(b) The following standards are available from Global Engineering Documents, 15 Inverness Way East, Englewood, Colorado 80112; telephone number 1-800-854-7179; or via the internet at web-site www.global.ihs.com; or at the Michigan Department of Consumer and Industry Services, MIOSHA Standards Division, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan 48909-8143, at a cost as of the time of adoption of these amendments, as stated in this subdivision.~~

~~(i) National Fire Protection Association Standard NFPA 70: "Standard for National Electrical Code," 1999 edition. Cost: $98.00~~

~~(ii) American Welding Society (AWS) Standard: IHS AWSC "AWS-Structural Welding Code," 2000 edition. Cost: $350.00~~

(2) The Bureau of Construction Codes, Elevator Safety Board 1967 PA 227, MCL 408.801 ~~et seq.~~ **to 408.824 and** R 408.8511 to R 408.8524 are referenced in these rules and are available from the Michigan Department of **Licensing and Regulatory Affairs** ~~Consumer and Industry Services~~, Bureau of Construction Codes, **Elevator Safety Division, P.O. Box 30255, Lansing,** ~~2501 Woodlake Circle, Okemos,~~ Michigan 48909; or via the internet at web-site: **www.michigan.gov/bcc** ~~www.michigan.gov/cis;~~ or from the Michigan Department of **Licensing and Regulatory Affairs** ~~Consumer and Industry Services~~, MIOSHA Standards **Section** ~~Division~~, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143, at no cost as of the time of adoption of these amendments.

(3) The following occupational safety and health administrative standards are referenced in these rules and are available from the Michigan Department of **Licensing and Regulatory Affairs** ~~Consumer and Industry Services~~, MIOSHA Standards **Section** ~~Division~~, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143; or via the internet at web-site: www.michigan.gov/miosha, at no cost as of the time of adoption of these amendments:

(a) Construction safety standard Part 1. General Rules, ~~being~~ R 408.40101 et seq. of the Michigan administrative code.

~~(b) Construction safety standard Part 6. Personal Protective Equipment, being R 408.40601 et seq. of the Michigan administrative code~~.

(b) ~~(c)~~ Construction safety standard Part 7. Welding and Cutting, ~~being~~ R 408.40701 et seq. of the Michigan administrative code.

(c) ~~(d)~~ Construction safety standard Part 9. Excavation, Trenching, and Shoring, ~~being~~ R 408.40901 et seq. of the Michigan administrative code.

(d) ~~(e)~~ Construction safety standard Part 10. Lifting and Digging Equipment, ~~being~~ R 408.41001 et seq. of the Michigan administrative code.

~~(f) Construction safety standard Part 11. Fixed and Portable Ladders, being R 408.41101 et seq. of the Michigan administrative code.~~

(e) ~~(g)~~ Construction safety standard Part 16. Power Transmission and Distribution, ~~being~~ R 408.41601 et seq. of the Michigan administrative code.

(f) ~~(h)~~ Construction safety standard Part 17. Electrical Installations, ~~being~~ R 408.41701 et seq. of the Michigan administrative code.

(g) ~~(i)~~ Construction safety standard Part 18. Fire Protection and Prevention, ~~being~~ R 408.41801 et seq. of the Michigan administrative code.

(h) ~~(j)~~ Construction safety standard Part 21. Guarding of Walking and Working Areas, ~~being~~ R 408.42101 et seq. of the Michigan administrative code.

(i) ~~(k)~~ Construction safety standard Part 22. Signals, Signs, Tags, and Barricades, ~~being~~ R 408.42201 et seq. of the Michigan administrative code.

(j) ~~(l)~~ Construction safety standard Part 27. Blasting and Use of Explosives, ~~being~~ R 408.42701 et seq. of the Michigan administrative code.

(k) ~~(m)~~ Construction safety standard Part 45. Fall Protection, ~~being~~ R 408.44501 et seq. of the Michigan administrative code.

(l) ~~(n)~~ Occupational health standard Part 451. Respiratory Protection, ~~being~~ R 325.60051 et seq. of the Michigan administrative code.

(m) ~~(o)~~ Occupational health standard Part 665. Underground Construction, Caissons, Cofferdams, and Compressed Air, ~~being~~ R 325.62991 et seq. of the Michigan administrative code.

R 408.41462 Safety generally.

Rule 1462. (1) The employer shall inform oncoming shifts of any hazardous occurrences or conditions that have affected or might affect employee safety, including liberation of gas, equipment failures, earth or rock slides, cave-ins, floodings, fires, or explosions.

(2) A safe means of egress and access to all work areas shall be provided and maintained free of hazards.

~~(3) Form scrap material, lumber that has protruding nails, and all other debris shall be kept cleared from the work areas, passageways, stairs, locks, and change houses.~~

~~(4) Combustible debris shall be removed daily during the course of construction.~~

~~(5) If a haulage roadbed consists of track and ties, then the employer shall provide a walkway. The walkway shall be a minimum of 2 2-inch planks, side by side, abutted, joined, and secured to a tie or other equivalent means. If space is not adequate for 2 2-inch by 10-inch planks, then the walkway shall be as wide as space permits.~~

(3) ~~(6)~~ When work is not being performed, access to an underground opening shall be covered, bulkheaded, fenced off, or restricted by gates or doors and appropriately posted.

(4) ~~(7)~~ Any section of tunnel that is not in use shall be barricaded to prevent ingress by an unauthorized employee.

(5) ~~(8)~~ Construction of a trench, manhole, or other opening for use in a tunnel or shaft operation shall be as prescribed in ~~R 408.40901 et seq.,~~ construction safety standard Part 9. Excavation, Trenching, and Shoring and ~~R 408.44501 et seq.,~~ construction safety standard Part 45. Fall Protection**, which is referenced in R 408.41410**.

~~(9) The power source to a tunneling machine shall be disconnected or locked out when an employee is working in the area of the cutting head or performing maintenance work on the tunneling machine where motion could cause an injury.~~

(6) ~~(10)~~ An area subject to subsidence that is hazardous to an employee shall be fenced and appropriately posted.

(7) ~~(11)~~ Each operation shall have a check-in and check-out system that will provide positive identification of an employee by number or name and will identify the location of each employee who is underground. An accurate record shall be kept on the surface. However, a check-in and check-out system is not required when the construction of underground facilities that are designed for human occupancy has been completed so that the permanent environmental controls are effective and the remaining construction activity will not cause any environmental hazard or structural failure within the facilities.

~~(12) A ladder or stairway that is provided in a shaft, caisson, or steep incline shall be as prescribed in R 408.41101 et seq., construction safety standard Part 11. Fixed and Portable Ladders and R 408.42101 et seq., construction safety standard Part 21. Guarding of Walking and Working Areas.~~

~~(13) An employer shall establish and coordinate with the employees an accident prevention program and a safety training program as prescribed in R 408.40101 et seq., construction safety standard Part 1. General Rules.~~

(8) ~~(14)~~ All employees shall be instructed in the recognition and avoidance of hazards that are associated with all of the following underground construction activities:

(a) Air monitoring.

(b) Ventilation.

(c) Illumination.

(d) Communications.

(e) Flood control.

(f) Mechanical equipment.

(g) Personal protective equipment.
(h) Explosives.
(i) Fire prevention and protection.
(j) Emergency procedures, including evacuation plans and check-in and check-out systems.

(9) ~~(15)~~ The employer shall issue each employee a copy of the project's general safety rules before the employee commences work at the project.

(10) ~~(16)~~ Each employer shall designate a qualified person who is responsible for administering the safety program. A written record shall be maintained of the safety training program.

(11) ~~(17)~~ Before an employee enters a tunnel where the atmosphere may be hazardous due to a condition such as a deficiency of oxygen, or may be toxic in excess of the maximum allowable limits, the tunnel shall be tested and the results shall be recorded as prescribed in ~~R 325.62991 et seq.,~~ occupational health standard Part 665. Underground Construction, Caissons, Cofferdams, and Compressed Air**, which is referenced in R 408.41410**. The records shall be maintained at the jobsite. If the atmosphere is hazardous, either sufficient ventilation to eliminate the hazard shall be provided or respiratory equipment as prescribed by the ~~D~~**d**epartment of **licensing and regulatory affairs** ~~Consumer and Industry Services~~ shall be worn.

(12) ~~(18)~~ If an atmosphere is found to be explosive, then sparks, flame, and other sources of ignition shall be prohibited and ventilation shall be provided until the hazard has been reduced and maintained at or below the maximum allowable limits as prescribed by the ~~D~~**d**epartment of **licensing and regulatory affairs** ~~Consumer and Industry Services~~.

~~(19) An occupied auger or pipe jacking tunnel shall be monitored for air quality immediately before entering the tunnel and during the period of occupancy in the tunnel.~~

R 408.41464 Communication system; location; signals

Rule 1464. (1) In a tunnel that is more than 225 feet long, a communication system shall be provided at all of the following locations:
(a) The working face.
(b) The top of the shaft.
(c) The bottom of the shaft.
(d) The hoisting station, if provided.
(e) Each 1,000 feet of tunnel.
(f) The office, if provided. A public telephone or other communication system shall be provided or available to each tunnel project to secure outside emergency help.
(g) Hoist operators shall be provided with a closed-circuit voice communication system to each landing station. The system shall have speaker microphones located so that the operator can communicate with individual landing stations during hoist use.

(2) An employer shall establish and maintain direct communications for coordination of activities with other employers whose operations at the jobsite affect or may affect the safety of employees who are underground.

(3) If a tunnel is pressurized, then all of the following additional locations shall also be provided with a communication system:
(a) The working chamber side of the manlock near the door.
(b) The interior of all locks.
(c) The lock attendant's station.
(d) The compressor plant.
(e) The first aid station.

(4) Communication systems shall be tested upon initial entry of each shift to the underground, and as often as necessary thereafter, to ensure that they are in working order.

(5) An employee who works alone underground in a hazardous location and who is both out of the range of natural unassisted voice communication and not under observation by other persons shall be provided with an effective means of obtaining assistance in an emergency.

~~(6) For an occupied pipe jacking tunnel that is more than 225 feet long, there shall be a telephone or other signal communication system established between the working face, the shaft tunnel portal, and at least 1 location on the surface.~~

~~(7) When a hoist house is provided, there shall be a second independent method of signaling, either audibly or visibly, to the hoist engineer from all landings in the shaft or slope.~~

~~(8) A signal code for hoisting shall be posted prominently in the engine house and at all places where signals are given. The signal code shall be as prescribed in R 408.41001 et seq., construction safety standard, Part 10. Lifting and Digging Equipment.~~

(6) ~~(9)~~ If a gassy condition exists, then all phones that are located within the tunnel shall conform to the United States Bureau of Mines Schedule 9b, Part 23 of the provisions of 30 C.F.R. Parts 1-199, Mineral Resources, revised July 1, 2000, which is adopted by reference in R 408.41410. The telephone or other signal communication systems shall be independent of the tunnel power supply and shall be installed so that the use or disruption of any one phone or signal location will not disrupt the operation of the system from any other location.

R 408.41465 Protective clothing or equipment.

Rule 1465. ~~(1) Protective clothing or equipment shall be required to be used as prescribed in R 408.40601 et seq., construction safety standard, Part 6. Personal Protective Equipment.~~

~~(2)~~ An employee working in a wet shaft, tunnel, or caisson shall wear safety toe rubber boots which have flat gripper-type soles and which are provided by the employer, at no expense to the employee.

~~(3) An employee working in a shaft, tunnel, or caisson shall wear a protective helmet, which shall be provided for and as prescribed in R 408.40601 et seq., construction safety standard, Part 6. Personal Protective Equipment.~~

R 408.41466 Electrical requirements.

Rule 1466. (1) A power line shall be well separated or insulated from water lines, telephone lines, and air lines.

(2) Lighting circuits shall be located so that the movement of personnel or equipment will not damage the circuits or disrupt service.

(3) Electrical equipment and wiring shall be installed and maintained as prescribed in the provisions of subparts F to J of part 77 of the provisions of 30 C.F.R. Parts 1-199, Mineral Resources, revised July 1, 2000, which is adopted by reference in R 408.41410. The provisions of subparts F to J are adopted by reference with the following amendments:

(a) Article 305-1(a) is amended to read as follows: Temporary electrical power and lighting installations shall be permitted during the period of construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities which are located at ground level and which are part of facilities used for the construction of tunnels, shafts, and cofferdams.

(b) Article 310-15, is amended to read as follows: The maximum continuous ampacities for copper, aluminum, and copper-clad aluminum conductors shall be as specified in table 310-16 to 310-19 and accompanying notes 1 to 12. Power and lighting circuits may be loaded to the maximum design temperatures of the wire or cable insulation under the following conditions:

(i) A means shall be provided to disconnect the load if the feeder cable exceeds design temperature by more than 10% for 1 minute.

(ii) Power cable shall have a grounding and a pilot wire that conforms to the Insulated Power Cable Engineers Association (IPCEA) type G grounded cable (G-GC) or equivalent.

(iii) Power cable shall have a loose connector emergency shutdown ability.

(iv) Power cable shall have a ground fault emergency shutdown ability.

(v) Power cable shall have an arc between phases emergency shutdown ability.

(c) Oil filled transformers shall not be used underground unless they are located in a fire-resistant enclosure suitably vented to the outside and surrounded by a dike to retain the contents of the transformer in the event of rupture.

(4) All electrical power circuits that supply portable or hand-held tools, lights, or equipment shall be protected by approved ground-fault interrupters as prescribed in ~~R 408.41701 et seq.,~~ construction safety standard, Part 17. Electrical Installations**, which is referenced in R 408.41410**.

(5) The regular system of illumination shall be supplemented by lighting that can be activated upon the failure of the regular system. Supplemental lighting, such as approved flashlights or lanterns, shall be sufficient to allow all employees to evacuate the tunnel.

~~(6) A tunnel excavating machine that is built and designed after 1977 shall conform to the provisions of the National Fire Protection Association Standard NFPA 70: Standard for National Electrical Code, 1999 Edition, which is adopted by reference in R 408.41410.~~

~~(7) A tunnel excavating machine that is designed and built after 1977 shall be equipped with a limit switch to prevent the accidental rotation of the main structure of the machine.~~

(6) ~~(8)~~ Electrical installation in underground areas where oil, grease, or diesel fuel are stored shall be used only for lighting fixtures.

(7) ~~(9)~~ Lighting fixtures in storage areas, or within 25 feet (7.62 meters) of underground areas where oil, grease, or diesel fuel are stored, shall be approved for class I, division 2 locations, as prescribed in ~~R 408.41701 et seq.,~~ construction safety standard Part 17. Electrical Installation**, which is referenced in R 408.41410**.

R 408.41467 Fire prevention and protection.

Rule 1467. (1) The applicable requirements for fire prevention and protection as prescribed in R 408.41801 et seq., construction safety standard Part 18. Fire Prevention and Protection shall be complied with in all tunnel and shaft operations.

(2) Smoking and open flames are prohibited. An employer is responsible for collecting all personal sources of ignition, such as matches and lighters, from all persons. Welding and cutting, where required, shall be in compliance with the provisions of subrules (9), (10), (11), **and** (12)~~, and (13)~~ of this rule. A fire watch shall be maintained when hot work is performed.

(3) Not more than a 1-day supply of diesel fuel shall be stored in a tunnel or shaft. Gasoline or liquefied petroleum gas shall not be taken in a tunnel or shaft. Acetylene or methylacetylene propadiene stabilized gas may be used underground solely for welding, cutting, and other hot work and only as prescribed in ~~R 408.40701 et seq.,~~ construction safety standard Part 7. Welding and Cutting**, which is referenced in R 408.41410**.

(4) The piping of diesel fuel from the surface to an underground location is permitted only if all of the following provisions are complied with:

(a) Diesel fuel is contained at the surface in a tank with a maximum capacity that is not more than the amount of fuel required to supply, for a 24-hour period, the equipment that is serviced by the underground fueling station.

(b) The surface tank is connected to the underground fueling station of an acceptable pipe or hose system that is controlled at the surface by a valve and at the shaft bottom by a hose nozzle.

(c) The pipe is empty at all times, except when transferring diesel fuel from the surface tank to a piece of equipment in use underground.

(d) Hoisting operations in the shaft are suspended during refueling operations if the supply piping in the shaft is not protected from damage.

(e) Acetylene, liquefied petroleum gas, and methylacetylene propadiene stabilized gas may be used underground only for welding, cutting, and other hot work and only in accordance with the provisions of subrules (9), (10), (11), **and** (12), ~~and (13)~~ of this rule. Not more than the amount of fuel gas and oxygen cylinders necessary to perform welding, cutting, or other hot work during the next 24-hour period shall be permitted underground.

(f) Not more than the amount of fuel gas and oxygen cylinders necessary to perform welding, cutting, or other hot work during the next 24-hour period shall be permitted underground.

(5) Leaks and spills of flammable or combustible fluids shall be cleaned up immediately.

(6) Oil, grease, or diesel fuel that is stored in a tunnel or shaft shall be kept in tightly sealed containers in fire-resistant areas at safe distances from explosives, magazines, electrical installations, and shaft stations. Electrical installations in underground areas where oil, grease, or diesel fuel are stored shall be used only for lighting fixtures. Lighting fixtures in storage areas, or within 25 feet (7.62 meters) of underground areas where oil, grease, or diesel fuel are stored, shall be approved for class I, division 2 locations.

(7) Fire-resistant hydraulic fluids shall be used in hydraulically actuated underground machinery and equipment. For the purpose of this requirement, a fire-resistant hydraulic fluid means any liquid which has a flash point above 200 degrees Fahrenheit and which has a vapor pressure of not more than 40 p.s.i. (absolute) at 100 degrees Fahrenheit.

(8) An approved 4A:40B:C rating fire extinguisher or equivalent protection shall be provided at the drive pulley of an underground conveyor and at 300-foot intervals along the belt. A minimum of 2 2A-10BC approved fire extinguishers shall be provided at the tunneling machine.

~~(9) A pressurized tunnel in which combustible materials are stored or used shall be equipped with a 2-inch minimum diameter water line with an outlet that is connected to a 1 1/2-inch nominal diameter fire hose which is capable of reaching the combustible materials. The water supply shall be of sufficient volume and pressure to efficiently operate the type of nozzle used on the fire hose for a minimum of 1 minute. Fire extinguishers may be substituted for the water and fire hose if they meet the requirements for the water service.~~

(9) ~~(10)~~ All of the following are additional requirements for gassy operations:

(a) Only acceptable equipment, maintained in suitable condition, shall be used in gassy operations.

(b) Mobile diesel-powered equipment used in gassy operations shall be either approved as prescribed in the requirements of 30 C.F.R. Part 36, Mineral Resources, revised July 1, 2000, which is adopted by reference in R 408.41410 or shall be demonstrated by the employer to be fully equivalent to the Mine Safety and Health Administration approved equipment and shall be operated in accordance with that part.

(c) Each entrance to a gassy operation shall be prominently posted with signs notifying all entrants of the gassy classification.

~~(11) A minimum of 1 approved 2A-10BC fire extinguisher shall be provided for each electrical, diesel, or hydraulic powered machine used in a tunnel or shaft.~~

(10) Fire-resistant hydraulic fluids shall be used in hydraulically-actuated underground machinery and equipment unless such equipment is protected by a fire suppression system or by multipurpose fire extinguisher or fire extinguishers rated at of sufficient capacity for the type and size of hydraulic equipment involved, but rated at least 4A:40B:C.

(11) ~~(12)~~ A noncombustible barrier shall be installed below welding or burning operations.

(12) ~~(13)~~ In an underground operation, local gas checks shall be made before and during a welding or cutting operation and during a drilling operation that would penetrate the tunnel.

~~(14) If more than .25% of methane by volume or 5% of the LEL, lower explosive limit, of a flammable gas or petroleum vapor is detected, then the welding, cutting, heating, or drilling operation shall cease until the hazard has been eliminated.~~

(13) Whenever 5% or more of the lower explosive limit for methane or other flammable gases is detected in any underground work area or in the air return, steps shall be taken to increase ventilation air volume or otherwise control the gas concentration, unless the employer is operating in accordance with the potentially gassy or gassy operation requirements. Such additional ventilation controls may be discontinued when gas concentrations are reduced below 5% of the lower explosive limit, but shall be reinstituted whenever the 5% level is exceeded.

(14) Whenever 10% or more of the lower explosive limit for methane or other flammable gases is detected in the vicinity of welding, cutting, or other hot work, such work shall be suspended until the concentration of such flammable gas is reduced to less than 10% of the lower explosive limit.

(15) A fire watch shall be maintained around welding and cutting operations until all possibility of fire is eliminated. The fire watch shall be provided with a minimum of 1 approved 2A-10BC fire extinguisher.

(16) Flammable materials or supplies, other than those used during 1 shift, shall not be stored within 100 feet (30.48 meters) of any tunnel or shaft opening. If this is not feasible because of space limitations on the jobsite, then such materials may be located within the 100 foot limit, if both of the following provisions are complied with:

(a) The materials are located as far as practicable from the opening.

(b) A fire resistant barrier of not less than a 1-hour rating is placed between the stored material and the opening or additional precautions are taken that will protect the materials from ignition sources.

~~(17) A head frame shall be constructed of steel or other fire resistant material. A hoist house and other temporary surface building or structures within 100 feet of the shaft, caisson, or tunnel opening shall be built of fire-resistant materials that have a fire resistance rating of not less than 1 hour.~~

R 408.41468 ~~Guards for power transmissions and hot surfaces.~~ **Rescinded.**

~~Rule 1468. (1) A means of power transmission, such as, but not limited to, gears, pulleys, sprockets, belts, chains, and shafts which are exposed to contact by an employee shall be guarded.~~

~~(2) The exhaust pipe of an internal combustion engine shall be guarded to prevent contact by an employee with the hot surface.~~

R 408.41472 Shafts; supports; inspections; lifelines.

Rule 1472. (1) A shaft that an employee is required to enter shall be provided with steel casing, concrete pipe, timber, or other material that is strong enough to support the surrounding earth.

~~(2) For rescue operations, a lifeline shall be securely fastened to a safety harness on each employee who enters a shaft that is less than 4 feet in diameter. The lifeline and safety harness shall be provided as prescribed in R 408.44501 et seq., construction safety standard Part 45. Fall Protection.~~

(2) ~~(3)~~ A shaft that is more than 5 feet in depth shall be braced to support the surrounding earth. The bracing shall be provided the full depth of the shaft, or, if rock is encountered, to not less than 5 feet into solid rock, and shall extend not less than 1 foot above the ground level.

(3) ~~(4)~~ After a blasting operation, the bracing shall be inspected. If the bracing is found to be unsafe, then corrections shall be made before the shift operations are continued.

(4) ~~(5)~~ A shaft or caisson shall be protected with a guardrail system as prescribed in ~~R 408.44501 et seq.,~~ construction safety standard Part 45. Fall Protection**, which is referenced in R 408.41410**, or barricaded as prescribed in ~~R 408.42201 et seq.,~~ construction safety standard Part 22. Signals, Signs, Tags, and Barricades**, which is referenced in R 408.41410**. A gate opening into the shaft shall be provided and shall be closed at all times, except when necessary to enter or leave the shaft or caisson.

R 408.41475 Haulage; inspection; braking; riding.

Rule 1475. (1) Haulage equipment that is to be used during a shift shall be inspected by a qualified person before the start of the shift. Known defects that affect the safety of employees shall be corrected before the equipment is used.

~~(2) The roadbed, rails, joints, switches, frogs, and other elements of the track of a haulage road shall be constructed, installed, and maintained in a manner that is consistent with the speed and type of the haulage operations to be conducted.~~

~~(3) A track switch shall be provided with a locking or spring-loaded thrown bridle bar and guardrail. The switch throw, where possible, shall be placed on the clearance side, and the switch throw shall operate parallel to the haulage road.~~

(2) ~~(4)~~ A powered locomotive or other mobile equipment shall be provided with suitable brakes, an audible warning device for use by the operator as needed, and lights at both ends.

(3) ~~(5)~~ Powered mobile haulage equipment that is subject to falling materials shall be equipped with a cab, canopy, or other protective device that is capable of protecting the operator from shifting or falling materials. For cabs where glazing is used, the glass shall be safety glass, or its equivalent, and shall be maintained and cleaned so that vision is not obstructed.

(4) ~~(6)~~ Powered mobile equipment shall not be left unattended unless the power is off, all operating controls are in the neutral position, and the brakes are set or other equivalent precautions are taken to prevent rolling. The operating controls shall be designed to automatically return to a neutral position or shall be equipped with a deadman control.

~~(7) A trolley wire shall be protected from contact with employees. Energized rails shall not be used, except when used as a ground return for a trolley wire. If rails serve as a return for a trolley circuit, then both rails shall be bonded at every joint and cross bonded every 200 feet (60.96 meters).~~

(5) ~~(8)~~ Backstops or automatic braking shall be installed on an inclined conveyor to prevent the conveyor from running out of control and creating a hazard for the employee.

(6) ~~(9)~~ An employee shall not ride on ~~any~~ **either** of the following unless specifically designed or adapted for transporting employees:

(a) A power-driven chain, belt, or bucket conveyor.

~~(b) A dipper.~~

~~(c) A shovel bucket.~~

~~(d) Forks.~~
~~(e) A clamshell.~~
~~(f) The bed of a dump truck.~~
(b) ~~(g)~~ Haulage equipment. An employee shall not ride haulage equipment unless it is equipped with seating for each passenger and protects passengers from being struck, crushed, or caught between other equipment or surfaces.
(7) ~~(10)~~ An employer shall not use an endless belt-type man lift in underground construction.
(8) ~~(11)~~ Cars that are dumped by hand shall be provided with tie-down chains or dumper blocks to prevent the cars from overturning.
(9) ~~(12)~~ A rocker bottom or bottom-dump car shall be equipped with positive-locking devices.
(10) ~~(13)~~ Equipment that is to be hauled shall be loaded or protected so as to prevent sliding or spillage.
(11) ~~(14)~~ Parked rail haulage equipment shall be chocked or chained if subject to accidental movement.
(12) ~~(15)~~ Berms, bumper blocks, safety hooks, or similar means shall be provided to prevent overtravel or overturning at dumping locations and, where necessary, at track dead ends.
(13) ~~(16)~~ Supplies, materials, and tools, other than small hand tools shall not be transported with employees in the same car and shall not be transported on top of a locomotive.
~~(17) A refuge station shall be provided not more than every 300 feet where a clearance of 2 feet from moving equipment cannot be provided for employees unless the employees are prohibited from walking the haulage route during movement of a haulage train along the route.~~
(14) ~~(18)~~ A train that is used on an incline which would cause the cars to run out of control shall, in addition to couplings, have safety chains, or the equivalent, to connect the cars and the power haulage equipment in a train. The safety chains or other connections shall be capable of maintaining connection between cars in the event of either coupler disconnect, failure, or breakage.
(15) ~~(19)~~ When an employee is being transported in a train, the operator shall have clear vision beyond the forward end of the train for safe operation.
(16) ~~(20)~~ Mobile equipment, including rail-mounted equipment, shall be stopped for manual connecting or service work.
(17) ~~(21)~~ Employees shall not reach between moving cars during coupling operations.
(18) ~~(22)~~ Couplings shall not be aligned, shifted, or cleaned when cars or locomotives are moving.
(19) ~~(23)~~ Where switching facilities are available, occupied personnel cars shall be pulled, not pushed. If occupied personnel cars must be pushed and the visibility of the track is hampered, then a qualified person shall be stationed in the lead car to give signals to the locomotive operator.

R 408.41475a Hoisting unique to underground construction.
Rule 1475a. Except as modified by this standard, employers shall comply with all of the following:
(a) The requirements of construction safety standard Part 10. Lifting and Digging Equipment, which is referenced in R 408.41410, except that the limitation in R 408.41021a does not apply to routine access of employees to an underground worksite via a shaft.
(b) Ensure that material hoists comply with R 408.41065a, R 408.41070b, R 408.41074a, and R 408.41075a of construction safety standard Part 10. Lifting and Digging Equipment, which is referenced in R 408.41410.
(c) Ensure that personnel hoists comply with the personnel hoists requirements of R 408.41065a, R 408.41072a, R 408.41074a, and R 408.41075a and the elevator requirements of R 408.41065a, R 408.41074a, R 408.41075a of construction safety standard Part 10. Lifting and Digging Equipment, which is referenced in R 408.41410.

R 408.41476 ~~Stationary hoists generally~~ **General requirements for cranes and hoists**.
Rule 1476. ~~(1) To ensure suitable operation and safe condition of all functions and safety devices, each hoist assembly shall be inspected and load-tested to 100% of its rated capacity at the time of installation, after any repairs or alterations affecting its structural integrity, after the operation of any safety device, and annually when in use. The employer shall prepare a certification record that includes all of the following information:~~
~~(a) The date each inspection and load-test was performed.~~
~~(b) The signature of the person who performed the inspection and test.~~
~~(c) A serial number or other identifier for the hoist that was inspected and tested.~~
~~The most recent certification record shall be maintained on file until completion of the project.~~
(1) Each safety device shall be checked by a competent person at least weekly during hoist use to ensure suitable operation and safe condition.
(2) Before hoisting personnel or material, the operator shall perform a test run of any cage or skip whenever it has been out of service for one complete shift, and whenever the assembly or components have been repaired or adjusted.
~~(2) A qualified person who shall be designated by the employer, shall visually inspect the stationary hoist assembly, anchorages, and hoisting rope at the beginning of each shift.~~
~~(3) All unsafe conditions that are revealed by tests, checks, or inspections shall be corrected before use of the equipment.~~
(3) ~~(4)~~ An employee shall not be permitted to ride on a material hoist, unless the hoist is in compliance with the requirements of R 408.41478(1).

(4) ~~(5)~~ Before maintenance, repairs, or other work is commenced in the shaft that is served by a hoist, the hoist operator shall be informed of the maintenance, repairs, or other work **and given suitable instructions**. **A sign warning that work is being done in the shaft shall be installed at the shaft collar, at the operator's station, and at each underground landing.** ~~A notice shall be installed at the top of the shaft and at the operator controls and shall state that work is being done in the shaft.~~

(5) ~~(6)~~ Employees who are at the bottom of an excavated shaft shall be protected from the movement of equipment, tools, or materials overhead or the shaft shall be vacated during the operations that may be hazardous to persons below.

(6) ~~(7)~~ If an employee is raised or lowered in a shaft, then all other hoisting operations in the shaft shall be stopped until the employee has disembarked at the bottom or top of the shaft.

(7) ~~(8)~~ When a stationary hoist is being used, the drum-operating lever shall be of a type that returns automatically to the "stop" position when the operator's hand is removed, unless, as a substitute, the throttle that controls the drum speed automatically stops the drum and slows the engine to idling speed when the throttle is released.

(8) ~~(9)~~ Only wire rope shall be used for hoisting and it shall be properly secured at both the drum and cage or skip ends. When the hoist is in use, not less than 2 full turns shall remain on the conventional drum hoist to protect the end that fastens at the drum from an overload.

~~(10) Wire rope shall not be used when any of the following conditions exist:~~

~~(a) Six randomly distributed broken wires in 1 rope lay, 3 broken wires in 1 strand in 1 lay, or 1 valley break. A valley break is a wire break that occurs between 2 adjacent strands.~~

~~(b) Abrasion, scrubbing, flattening, peening, or any severe change that causes the loss of more than 1/3 of the original diameter of the outside wires in any given area.~~

~~(c) Evidence of any heat damage or any damage that is caused by contact with electrical wires or marked corrosion of the rope.~~

~~(d) Reduction from nominal diameter of more than 3/64 of an inch for diameters up to and including 3/4 of an inch, 1/16 of an inch for diameters 7/8 to 1-1/8 inches, and 3/32 of an inch for diameters 1-1/4 to 1-1/2 inches.~~

~~(11) A wire rope that is used for hoisting shall be continuous and shall not have a knot or splice. The hoisting rope shall not be placed around the load.~~

(9) ~~(12)~~ The connection between the hoisting rope and the cage or skip shall be of a type to prevent the cage from spinning.

(10) ~~(13)~~ All hoists shall be equipped with a landing level indicator at the operator's station. **Marking the hoist rope does not satisfy this requirement.**

(11) ~~(14) Limit switches shall be provided to eliminate 2 blocking.~~ **Limit switches shall be used only to limit travel of loads when operational controls malfunction and shall not be used as a substitute for other operational controls.**

(12) ~~(15)~~ A warning light, suitably located to warn employees at the shaft bottom and subsurface shaft entrances, shall flash if a load is above the shaft bottom or subsurface entrances or if the load is being moved in the shaft. This subrule does not apply to fully enclosed hoistways.

(13) ~~(16)~~ If a hoistway is not fully enclosed and employees are at the shaft bottom, then conveyances or equipment shall be stopped not less than 15 feet above the bottom of the shaft and held there until the signalperson at the bottom of the shaft directs the operator to continue lowering the load, except that the load may be lowered without stopping if the load or conveyance is within full view of a bottom signalperson who is in constant voice communication with the operator.

(14) ~~(17)~~ Cage, skips, and load connections to the hoist rope shall be made so that the force of the hoist pull, vibration, misalignment, release of lift force, or impact will not disengage the connection. Moused or latched open-throat hooks do not meet this requirement.

(15) ~~(18)~~ When using wire rope wedge sockets, means shall be provided to prevent wedge escapement and to ensure that the wedge is properly seated.

(16) ~~(19)~~ Hoists shall be designed so that the load hoist-drum is powered in both directions of rotation and so that the brakes are automatically applied upon power release or failure.

(17) ~~(20)~~ If a crane is used for both personnel hoisting and material hoisting, then the load and speed ratings for personnel and for materials shall be assigned to the equipment.

(18) ~~(21)~~ Employees shall not ride on top of any cage, skip, or bucket, except when necessary to perform inspection or maintenance of the hoisting system, in which case they shall be protected by a body belt/harness fall prevention system.

(19) Material, tools, and supplies being raised or lowered, whether within a cage or otherwise, shall be secured or stacked in a manner to prevent the load from shifting, snagging, or falling into the shaft.

(20) Any connection between the hoisting rope and the cage or skip shall be compatible with the type of wire rope used for hoisting.

(21) Spin-type connections, where used, shall be maintained in a clean condition and protected from foreign matter that could affect their operation.

R 408.41477 ~~Stationary material hoists~~ **Additional requirements for hoists**.

Rule 1477. (1) A hoist used for raising or lowering materials in a shaft shall have a minimum factor of safety of 5, shall be designed and rated by a qualified engineer, and shall be constructed in accordance with the design. The design shall be constructed so that the hoist cannot exceed the maximum rated speed.

(2) The rated capacity of the hoist shall be posted at all working levels.

(3) ~~Each hoist assembly shall be load tested to 200% of its rated capacity upon installation, after any repairs or alterations affecting its structural integrity or operation of safety devices, and every 6 months during use. A written record of each test shall be maintained for the duration of the project and shall be made available for inspection by authorized representatives of the director.~~ **To ensure suitable operation and safe condition of all functions and safety devices, each hoist assembly shall be inspected and load-tested to 100% of its rated capacity at the time of installation; after any repairs or alterations affecting its structural integrity; after the operation of any safety device; and annually when in use. The employer shall prepare a certification record which includes the date each inspection and load-test was performed; the signature of the person who performed the inspection and test; and a serial number or other identifier for the hoist that was inspected and tested. The most recent certification record shall be maintained on file until completion of the project.**

(4) A qualified person who shall be designated by the employer, shall visually inspect the stationary hoist assembly, anchorages, and hoisting rope at the beginning of each shift.

(5) All unsafe conditions that are revealed by tests, checks, or inspections shall be corrected before use of the equipment.

(6) ~~(4)~~ Hoist equipment and the operator shall be protected from inclement weather by a hoist house with a comfortable temperature maintained.

(7) ~~(5)~~ Where glass is used in hoist house windows, the glass shall be safety glass or its equivalent.

(8) ~~(6) Hoist controls shall be arranged to make them operable from a single position of the operator.~~ **Hoist controls shall be arranged so that the operator can perform all operating cycle functions and reach the emergency power cutoff without having to reach beyond the operator's normal operating position.**

(9) ~~(7)~~ Controls for powered hoists shall be of the deadman-type with a non-locking switch or control.

~~(8) A device to shut off the power shall be installed ahead of the operating control.~~

~~(9) A hoist machine that has cast metal parts shall be limited to 2,000 pounds single line pull.~~

(10) ~~(10)~~ All hoists shall be equipped with landing level indicators at the operator's station. **Marking the hoist rope does not satisfy this requirement.**

~~(11) Material, tools, and supplies being raised or lowered, whether within a cage or otherwise, shall be secured or stacked in a manner to prevent the load from shifting, snagging, or falling into the shaft.~~

(11) Material hoisting may be performed at speeds higher than the rated speed for personnel hoisting if the hoist and components have been designed for such higher speeds and if shaft conditions permit.

(12) Personnel and materials (other than small tools and supplies secured in a manner that will not create a hazard to employees) shall not be hoisted together in the same conveyance. However, if the operator is protected from the shifting of materials, then the operator may ride with materials in cages or skips which are designed to be controlled by an operator within the cage or skip.

(13) Line speed shall not exceed the design limitations of the systems.

(14) A fire extinguisher that is rated at least 2A:10B:C, multi-purpose, dry chemical, shall be mounted in each hoist house.

(15) Hoists shall be equipped with limit switches to prevent overtravel at the top and bottom of the hoistway.

(16) Hoist operators shall be provided with a closed-circuit voice communication system to each landing station, with speaker microphones located so that the operator can communicate with individual landing stations during hoist use.

(17) When sinking shafts 75 feet (22.86 m) or less in depth, cages, skips, and buckets that may swing, bump, or snag against shaft sides or other structural protrusions shall be guided by fenders, rails, ropes, or a combination of those means.

(18) When sinking shafts more than 75 feet (22.86 m) in depth, all cages, skips, and buckets shall be rope or rail guided to within a rail length from the sinking operation.

(19) Cages, skips, and buckets in all completed shafts, or in all shafts being used as completed shafts, shall be rope or rail-guided for the full length of their travel.

(20) Wire rope used in load lines of material hoists shall be capable of supporting, without failure, at least five times the maximum intended load or the factor recommended by the rope manufacturer, whichever is greater. Refer to R 408.41072a(14)(d) of construction safety standard Part 10. Lifting and Digging Equipment, which is referenced in R 408.41410, for design factors for wire rope used in personnel hoists. The design factor shall be calculated by dividing the breaking strength of wire rope, as reported in the manufacturer's rating tables, by the total static load, including the weight of the wire rope in the shaft when fully extended.

R 408.41477a Additional requirements for cranes.

Rule 1477a. Cranes shall be equipped with a limit switch to prevent overtravel at the boom tip. Limit switches are to be used only to limit travel of loads when operational controls malfunction and shall not be used as a substitute for other operational controls.

R 408.41478 ~~Personnel hoist~~ **Additional requirements for personnel hoists**.

Rule 1478. (1) A personnel hoist shall be used to raise or lower an employee in a tunnel shaft or caisson. A crane may be used to raise or lower an employee, if the crane and the work platform are as prescribed in ~~R 408.41001 et seq.,~~

construction safety standard Part 10. Lifting and Digging Equipment**, which is referenced in R 408.41410**. The hoist shall be in compliance with the provisions of 1967 PA 227, MCL 408.801 **to 408.824** ~~et seq.~~, Bureau of Construction Codes, Elevator Safety Board, R 408.8511 to R 408.8524 which is referenced in R 408.41410. ~~During the excavation of a shaft or caisson, an employee may be raised or lowered on a work platform if the work platform meets the specifications of subrule (2) of this rule.~~

~~(2) A work platform that is attached to the load line of a crane which is used to transport, raise, or lower employees shall be in compliance with all of the following provisions:~~

~~(a) Be designed by a qualified person. All welding shall be in accordance with applicable American Welding Society standards. American Welding Society (AWS) Standard; IHS AWSC AWS--Structural Welding Code, 2000 Edition, which is adopted by reference in R 408.41410.~~

~~(b) Except for the guardrail system, be of welded mild steel construction that has a minimum safety factor of 5 times the maximum intended load.~~

~~(c) Have continuous mild steel guardrails (toprails and midrails) and toeboards as prescribed in R 408.44501 et seq., construction safety standard Part 45. Fall Protection.~~

~~(d) Have wood planking, steel plate, or grating that is bolted or welded to the bottom of the work platform.~~

~~(e) Have a 4-point wire suspension system that utilizes wire which is not less than 1/2 of an inch in diameter. Each leg of the suspension system shall be independent wire rope that has hand-tucked eye splices or swedged fittings on each end. Wire rope clips shall not be used. The independent suspension system shall be attached to the work platform using proper size screw pin shackles.~~

~~(f) Have each leg of the independent 4-point suspension system at a 30-degree angle from the vertical.~~

~~(g) Be connected to the load line by means of a screw pin shackle or a gated hook. Both ends of a minimum 5/8-inch wire rope safety line shall be installed above the headache ball to a screw pin shackle and pass through the eyes of the work platform suspension system to prevent the platform from falling if disengaged from the gated hook. If a screw pin shackle is used in place of a gated hook, then the 5/8-inch wire rope safety line is not required.~~

~~(h) Have overhead protection when there is an overhead hazard.~~

~~(i) Have a permanently affixed sign that specifies the maximum number of passengers, the identification number, and the maximum intended load.~~

~~(j) Be easily identifiable by high-visibility color or marking.~~

~~(3) Before a work platform is used on a jobsite, it shall be load-tested to 2 times the maximum intended load.~~

~~(4) The work platform and the test load shall be raised and lowered to the maximum anticipated change of elevation.~~

~~(5) A record of the load test shall be maintained on the jobsite.~~

~~(6) Employees on the work platform shall be provided with, and be required to use, proper safety equipment as prescribed in R 408.44501 et seq., construction safety standard Part 45. Fall Protection. An employee shall wear a personal fall arrest system that has a lanyard affixed to the top rail of the steel guardrail system of the work platform. Standing on the guardrail system is prohibited.~~

~~(7) Free-spooling is prohibited when using a work platform to lower personnel. The maximum rate of travel shall be 100 feet per minute~~.

(2) ~~(8)~~ All sides of personnel cages shall be enclosed by 1/2-inch (12.70 mm) wire mesh, which shall not be less than no. 14 gauge or its equivalent, to a height of not less than 6 feet (1.83 m). When the cage or skip is being used as a work platform, its sides may be reduced in height to 42 inches (1.07 m) when the conveyance is not in motion. All personnel cages shall be provided with a positive-locking door that only opens inward.

~~(9) The rails on 1 side of personnel cages shall be removed and a chain shall be installed in place of the top rail to provide a door opening. The chain shall be securely fastened during all travel and only be opened during access to, or egress from, the work platform.~~

~~(10) Only hand and portable powered tools shall be permitted on the work platform.~~

(3) ~~(11)~~ Flammable or combustible liquids or gases shall not be permitted on the work platform if the platform is occupied by an employee or employees.

~~(12) Platforms shall not be used during adverse weather conditions that could affect the safety of employees.~~

~~(13) There shall be a communication system, which may be a hand signal, a telephone wire, or a selective frequency radio system, between employees on the work platform and the operator of the crane. The system shall be in compliance with both of the following provisions:~~

~~(a) If hand signals are being employed and employees are being raised, lowered, or positioned and are not in continuous sight of the operator of the crane at all times, then the employer shall designate an employee, who shall not be on the work platform, to be the signalperson.~~

~~(b) The signalperson shall not be assigned any other duties while the work platform is in a suspended position with employees on it and shall remain in a position so that both the work platform and the operator can be seen at all times.~~

~~(14) The crane shall be inspected daily before being used with a work platform. All of the following components shall be inspected:~~

~~(a) The wire rope.~~

~~(b) The hook.~~

~~(c) The brakes.~~

~~(d) The boom.~~

~~(e) Any other mechanical and rigging equipment that is vital to the safety of the operation.~~
~~(15) Any structural or mechanical defect that could adversely affect the safe operation of the crane shall be corrected before an operation that utilizes a work platform begins.~~
~~(16) Inspections shall be logged and the records maintained on the jobsite.~~
~~(17) The operator of a crane that is used to raise or lower a work platform shall be authorized by the employer and properly qualified to perform the operation.~~
~~(18) A qualified crane operator shall not be authorized to raise or lower a platform unless the operator has at least 8 hours of experience in the operation of the specific crane or on a crane of the same type and design.~~
~~(19) A crane that is used to raise or lower a work platform shall not be within 25 feet of an overhead energized power line at the closest point of contact.~~
~~(20) When a crane is being used with a work platform, another load shall not be attached to the work platform.~~
~~(21) Only a crane that is equipped with a boom that has a power control lowering system shall be allowed to raise or lower a work platform. The crane boom shall not be live.~~
~~(22) The operator of the crane shall remain at the controls with the engine running when an occupied work platform is in a suspended position.~~
~~(23) The load line of a crane that is used to raise or lower a work platform shall be equipped with a swivel to prevent any rotation of the work platform. The use of nonspin wire rope is prohibited.~~
~~(24) Neither the load nor the boom shall be lowered below the point where less than 4 full wraps of rope remain on their respective drums.~~
~~(25) A crawler crane that is used to raise or lower a work platform shall be set on a firm base and chocked to prevent movement.~~
~~(26) A crane shall not travel in any direction when personnel are on the work platform.~~
~~(27) A crane that is equipped with outriggers shall have the beams fully extended, the jacks lowered, and each float on a firm base when the work platform is in use.~~

(4) Hoist drum systems shall be equipped with at least 2 means of stopping the load, each of which shall be capable of stopping and holding 150 % of the hoist's rated line pull. A broken-rope safety, safety catch, or arrestment device is not a permissible means of stopping.

(5) The operator shall remain within sight and sound of the signals at the operator's station.

(6) All personnel cages shall be provided with a protective canopy. The canopy shall be made of steel plate, at least 8/16-inch (4.763 mm) in thickness, or material of equivalent strength and impact resistance. The canopy shall be sloped to the outside, and so designed that a section may be readily pushed upward to afford emergency egress. The canopy shall cover the top in such a manner as to protect those inside from objects falling in the shaft.

(7) Personnel platforms operating on guide rails or guide ropes shall be equipped with broken-rope safety devices, safety catches or arrestment devices that will stop and hold 150 % of the weight of the personnel platform and its maximum rates load.

(8) During sinking operations in shafts where guides and safeties are not yet used, the travel speed of the personnel platform shall not exceed 200 feet (60.96 m) per minute. Governor controls set for 200 feet (60.96 m) per minute shall be installed in the control system and shall be used during personnel hoisting.

(9) The personnel platform may travel over the controlled length of the hoistway at rated speeds up to 600 feet (182.88 m) per minute during sinking operations in shafts where guides and safeties are used.

(10) The personnel platform may travel at rated speeds greater than 600 feet (182.88m) per minute in completed shafts.

R 408.41482 Caisson excavation; employee protection.

Rule 1482. (1) An employee who enters a caisson shall be protected by a steel or concrete casing designed by a qualified employee and approved by a registered engineer.

(2) A copy of the design specifications of the casing shall be maintained at the jobsite.

(3) In the case of belled-bottom caissons, the steel or concrete casing shall be provided for the full depth of that part of each caisson hole that is above the bell.

(4) An employee shall not be permitted to work below the casing in running or unstable soil.

(5) The steel or concrete caisson shall extend not less than 12 inches above the ground line.

(6) Each employee who is required to enter a caisson excavation shall have a lanyard attached to a body harness and to the load line of a crane. The attachment to the load line shall utilize a screwpin shackle.

(7) An employee whose lanyard is attached to the load line of a crane shall be permitted to be lowered to the bottom of the caisson in the muck bucket.

(8) The maximum rate of travel when lowering an employee shall be 100 feet per minute. Free-spooling when lowering employees into a caisson is prohibited.

(9) All employees shall be removed from the caisson when material is being hoisted from the caisson.

(10) A secondary mechanical means that is capable of removing an employee from the caisson shall be readily available in case the crane performing the caisson work breaks down.

(11) A top person shall be stationed at the caisson and shall constantly monitor any employees who are in the caisson.

(12) A positive means of communication shall be maintained between employees working in the caisson and the top person.

(13) The air quality of a caisson shall be tested and maintained in accordance with ~~R 325.50211 to R 325.50214 of the Michigan Administrative Code~~ **occupational health standard Part 665 underground construction, caissons, cofferdams, and compressed air, which is referenced in R 408.41410**.

(14) Where space permits, a caisson shall have a stairway for its entire height and shall have landing platforms not more than 20 feet apart. Where this is impracticable, a ladder shall be installed and landing platforms shall be located not more than 20 feet apart to break the climb.