1. PURPOSE

This document provides requirements for performing concrete and masonry construction at the INEEL. This document highlights requirements referenced in the "Source Requirements" section, as well as LMITCO requirements. Any applicable regulatory or LMITCO requirements must be followed, with the most stringent requirement being met.

2. APPLICABILITY

This document applies to all subcontractors who perform concrete and masonry construction at the INEEL, as specified in their contract with LMITCO. Stricter requirements may be imposed by subcontractors upon their employees or subtier contractors. The requirements of this document must be followed by subcontractors; however, the means of implementation may vary as determined by the subcontractor.

3. REQUIREMENTS

3.1 General Instructions

3.1.1 All concrete and masonry operations shall undergo a safety review in accordance with PRD-1007, Work Coordination and Hazard Control.

3.1.2 All concrete or masonry work shall comply with safety requirements (including proper use of PPE) indicated in the safety review.

3.1.3 All lifting operations (such as the lifting of pre-cast concrete slabs or of buckets of concrete) involving cranes or other lifting devices shall comply with the DOE Hoisting and Rigging Standard, DOE-STD-1090-96, as directed by PRD-2007, Hoisting and Rigging.

3.1.4 No employee shall be allowed to be under any suspended load.

3.2 Formwork

3.2.1 Manufactured forms shall be assembled and used following the manufacturer's recommendations.

3.2.2 Form work shall be inspected for defects or deviations from work specifications by a *qualified person* (see def.) before, during, and immediately after placement of the concrete.

3.2.3 Vertical slip forms shall be specifically designed for that purpose. Furthermore, they shall be:

A. designed to prevent excessive distortion

B. safely accessible

C. maintained within design tolerances for specified plumbness during operation.

3.2.4 The jack rods or pipes on which jacks climb or by which slip forms are lifted shall be adequately braced where not encased in concrete.

3.2.5 Jacks and vertical supports shall be positioned in such a manner that the loads do not exceed the rated capacity of the jacks.

3.2.6 Lumber, concrete, form hardware, and other materials shall not be permitted to accumulate on whalers, scaffolds, walkways, and form decks.

3.2.7 Signs and barricades shall be in place to protect others at lower levels.

3.2.8 An architect or qualified person shall specify the strength of the partially cured concrete and/or reshoring necessary to carry proposed construction loads. This information may be contained in the project drawings or specifications.

3.2.9 Construction loads shall not be supported on, or any formwork or shoring system shall not be removed from, any part of the structure, except where that portion of the structure (in combination with the remaining forming and shoring system) has sufficient strength to support its weight and total loads involved.

3.2.10 Employees shall be prevented from entering behind the jack during tensioning operations.

3.2.11 Signs and barricades shall be erected to warn employees of tensioning operations and to identify the post-tensioning area.

3.2.12 Erected shoring equipment shall be inspected by a qualified person to meet all requirements of applicable drawings and specifications included in the work package immediately before, during, and immediately after concrete placement.

3.2.13 Damaged shoring equipment shall not be used.

3.2.14 Forms or shores shall not be removed until concrete has gained sufficient strength to support its weight and the superimposed loads, as demonstrated by appropriate QA inspection or test.

3.2.15 Shoring equipment that is found to be damaged or weakened after erection shall be immediately reinforced.

3.2.16 Sills for shoring shall be sound, rigid, and capable of carrying the maximum intended load.

3.2.17 Eccentric loads shall be prohibited on shore heads and similar members, unless these members have been designed for such loading with the proper safety factor.

3.2.18 All base plates, shore heads, extension devices, and adjustment screws shall be securely connected with the foundation and the form.

3.2.19 Reinforcing steel shall be supported to prevent overturning and collapse when used for walls, piers, columns, or similar structures.

3.3 Concrete Placement

3.3.1 Proper access shall be provided to walkways, scaffolding, and any point of concrete or masonry placement.

3.3.2 Concrete truck drivers and equipment operators shall be briefed about area/site specific hazards.

3.3.3 Concrete trucks and other mobile equipment shall EITHER

A. be equipped with automatic audible backup alarms, OR

B. have a flagman to control backing operations.

NOTE: *In congested or noisy areas, a flagman may be required to control vehicle operations regardless of whether the vehicle is equipped with an audible backup alarm.*

3.3.4 WHEN discharging concrete on a slope, one of the following precautions shall be taken to keep the truck from moving:

A. the driver shall remain in the cab and control the vehicle's movement, OR

B. the wheels shall be chocked and the brakes set to prevent movement.

3.3.5 Concrete shall not be discharged on any type of unstable ground or unstable incline.

3.3.6 Handles of buggies shall not extend beyond the wheels on either side of the buggy.

3.3.7 IF the point of placement is not readily visible to the crane operator, THEN a qualified flagman using a uniform hand signal system shall be positioned in clear view of the operator and the point of placement.

NOTE: *If necessary, the qualified flagman may use a telephone or two-way radio communication.*

3.3.8 Concrete buckets shall be equipped with hydraulic- or pneumatic-operated gates.

3.3.9 Buckets shall have positive safety latches or similar safety devices installed to prevent premature or accidental dumping.

3.3.10 Buckets shall be designed to prevent material from hanging up on the top or sides of the bucket.

3.3.11 Concrete pumping operations shall use the following precautions:

3.3.11.1 Pumping systems shall comply with the manufacturer's recommendations.

3.3.11.2 Concrete pumping systems using discharge pipes shall be provided with pipe supports designed for 100% overload.

3.3.11.3 Air hoses or pipes in the system shall have positive fail-safe joint connectors to prevent separation of sections when pressurized.

3.3.11.4 Manufacturer's specifications shall be followed when air pressure and a clean-out plug are used to clean the transfer lines to prevent the clean-out plug from becoming airborne.

3.3.11.5 Stable footing shall be provided for employees placing concrete through a pneumatic hose.

3.3.11.6 Sections of tremies, elephant trunks, and similar concrete conveyances shall be secured with wire rope or equivalent, in addition to the regular couplings or connections.

3.4 Equipment and Handles

3.4.1 Equipment and handles shall be protected from contacting electrical sources.

3.4.1.1 If handles on bull floats or similar tools are used where they may contact energized electrical conductors, then they shall be constructed of nonconductive material or they shall be insulated with a nonconductive sheath that provides protection equivalent to a nonconducting handle.

3.4.1.2 Electrical sources shall be insulated and/or isolated as necessary.

3.4.2 Manually guided power concrete troweling machines shall be equipped with a control switch that automatically shuts off the power whenever the operator's hands are removed from the equipment handles.

3.4.3 Concrete mixers with one cubic yard or larger loading skips shall be equipped with the following:

A. a mechanical device to clear the skip of material

B. guardrails installed on each side of the skip.

3.5 Precast Concrete

3.5.1 Precast concrete shall be handled and erected under the supervision of a qualified person.

3.5.2 If precast concrete members must be stored, they shall be stored in such a fashion that:

A. they are supported to prevent tipping

B the base is level and stable to prevent differential settlement

C. lifting attachments are undamaged and accessible.

3.5.3 Employees shall be trained in the proper methods of handling and erecting precast concrete products.

3.5.4 Lifting inserts which are embedded or otherwise attached to tilt-up precast concrete members shall be capable of supporting two times the maximum intended load applied or transmitted to them.

3.5.5 Lifting inserts which are embedded or otherwise attached to precast concrete members other than tilt-up shall be capable of supporting four times the maximum intended load applied or transmitted to them.

3.5.6 Lifting hardware shall be designed to provide sufficient strength to withstand the imposed loads with a safety factor of at least five.

3.6 Bracing Pre-cast Concrete

3.6.1 Precast concrete wall units, structural framing, or tilt-up wall panels shall be braced until permanent connections are completed.

NOTE: *Permanent connections may be used in lieu of bracing, provided they are designed to withstand all loads imposed during construction and attachments are made under the supervision of a qualified person.*

3.6.2 Temporary supports or bracing shall be designed by, or their use shall be supervised by, a person qualified in accordance with ANSI A58.1-1982, *American National Standard Minimum Design Loads for Buildings and Other Structures.*

3.7 Safeguards for Pre-cast Concrete

3.7.1 No person shall be permitted under precast members being lifted or tilted into position.

3.7.2 Barricades, warning signals, signs, or other methods shall be provided as needed to safeguard traffic and people in the area of all handling and erection operations.

3.8 Lift-Slab Construction

3.8.1 Equipment used for lift-slab operations shall be marked to indicate rated capacity.

3.8.2 Equipment shall not be loaded beyond its rated capacity.

3.8.3 Equipment shall be capable of supporting 2.5 times the load being lifted.

3.8.4 Equipment shall be installed so that lifting operations stop when equipment is loaded in excess of its rated capacity.

3.8.5 Only essential employees shall position or move lift-slab equipment permitted in the area of jacking operations.

3.9 Patching, Finishing, and Curing

3.9.1 Safe access shall be provided while patching, finishing, or curing work is being done at elevations beyond the reach of workmen.

3.10 Winter Protection/Heating

3.10.1 Adequate fire protection shall be provided for heating equipment used for concrete curing.

3.10.2 Temporary winter protection enclosures shall have adequate light and ventilation for the safety of personnel in these areas.

3.10.3 Temporary heating equipment, including storage containers, valves, piping, and fittings, shall be installed, tested, and operated only with the concurrence of a qualified person.

3.11 Cutting and Sandblasting

3.11.1 All cutting and sandblasting equipment shall be operated in compliance with manufacturer's specifications.

3.11.2 Cutting and sandblasting equipment shall be inspected at regular intervals and shall be maintained in safe operating condition per manufacturer's specifications.

3.12 Storing Cement

3.12.1 Bagged portland cement, masonry cement, and lime shall be stacked in piles or on pallets in a stable position.

3.12.2 Pallets and empty bags shall be disposed of promptly to eliminate fire and tripping hazards.

3.12.3 Returnable pallets shall be stored in an orderly manner until ready for shipment.

3.13 Masonry Construction

3.13.1 Masonry construction shall be performed under the supervision of a qualified person.

3.13.2 Masonry scaffolds shall be erected and inspected per PRD-2004, Scaffolding.

3.13.3 Masonry materials placed on a scaffold shall not exceed the design capacity of the scaffold.

3.13.4 Bricks and blocks shall be stored in a safe manner, on a firm and level surface.

3.13.5 When removing bricks or blocks, stacks shall be kept level and proper step back shall be maintained.

3.13.6 Packages of bricks or blocks shall be lifted as follows:

3.13.6.1 Banded packages of bricks or blocks shall not be lifted by crane or lift truck forks inserted in formed voids in the package unless the voids are spanned with a suitable support and the package is complete and the bands are tight.

3.13.6.2 Packages that are lifted by forks placed in voids in blocks on the bottom layer shall be neatly cubed and shall contain no visible broken blocks.

3.13.6.3 A pallet or other similar device shall be used as needed to lift or move packages of bricks or blocks.

3.13.7 Masonry saws shall be guarded with a semicircular enclosure over the blade.

3.14 Wall Erection/Limited Access Zone

3.14.1 Whenever a masonry wall is being constructed, a limited access zone shall be established before the start of construction of the wall.

3.14.2 The zone shall be maintained until the wall is set and secure.

3.14.3 Only authorized persons shall be permitted to enter the limited access zone.

3.14.4 The limited access zone shall run the entire length of the wall to be constructed and shall be equal to the height of the wall plus 4 ft.

3.14.5 The limited access zone shall be established on the side of the wall that will be unscaffolded.

3.15 Reinforcing Steel

3.15.1 All protruding reinforcing steel which employees could fall onto or walk into shall be guarded to eliminate the hazard of impalement.

3.15.2 Reinforcing steel for walls, piers, columns, or similar vertical structures shall be guyed and supported to prevent collapse.

3.15.3 The following uses of reinforcing steel are prohibited:

A. using reinforcing steel to attach guy wires at anchor points

B. using reinforcing steel as hooks or stirrups for scaffolding, or any other makeshift structural function.

4. DEFINITIONS

See the Glossary (LST-27) for definitions of the following terms:
Qualified Person

5. REFERENCES

5.1 Source Documents

29 CFR 1926, Subpart Q, Concrete and Masonry Construction
ANSI A10.9-1983, Safety Requirements for Concrete and Masonry Work
ANSI A10.9a-1989, Construction and Demolition Operations—Concrete and Masonry Work (supplement to ANSI A10.9-1983)
ANSI A58.1-1982, American National Standard Minimum Design Loads for Buildings and Other Structures
DOE-STD-1090-96, DOE Hoisting and Rigging Standard

5.2 Related Requirements

The following documents may also contain requirements that apply to this activity:

PRD-1007, Work Coordination and Hazard Control
PRD-2001, Personal Protective Equipment
PRD-2002, Fall Protection

PRD-2004, Scaffolding
PRD-2007, Hoisting and Rigging
PRD-2014, Excavation and Surface Penetration
PRD-2016, Material Handling, Storage, and Disposal

6. APPENDICES

None