



800 West Cummings Park, Suite 3950
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Section 13 49 17
HIGH DENSITY CONCRETE MASONRY SHIELDING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.2 SUMMARY

- A. The Work of this Section consists of construction of interlocking concrete unit masonry where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following:
 - 1. Furnish and install the following:
 - a. High-density modular interlocking concrete masonry maze walls, vault walls, and vault ceilings on a mortar bed, and with mortared joints.
 - 2. Daily cleaning and final cleaning of Work of this Section.

1.3 RELATED SECTIONS

- A. Section 01 73 00 - EXECUTION: Administrative and procedure requirements for final cleaning and waste management.
- B. Section 03 30 00 - CAST-IN-PLACE CONCRETE: concrete foundation and slabs-on-grade.
- C. Section 08 34 49 - RADIATION SHIELDING DOORS AND FRAMES.
- D. Section 08 34 49.10 - RADIATION SHIELDING GLAZING AND FRAMES.
- E. Section 08 34 50 - NEUTRON/RADIATION SHIELDING SLIDING DOORS.
- F. Section 08 34 51 - NEUTRON/RADIATION SHIELDING SWINGING DOORS.
- G. Section 13 49 33 – LINEAR ACCELERATOR SHIELDING SYSTEMS.

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section.
 - 1. International Organization for Standardization (ISO): ISO 9001:2008.
 - 2. National Council on Radiation Protection and Measurements (NCRP):
 - a. NCRP Report No. 144 – Radiation Protection for Particle Accelerator Facilities.
 - b. NCRP Report No. 145 – Radiation Protection in Dentistry.
 - c. NCRP Report No. 147 – Structural Shielding for Medical X-Ray Imaging Facilities.



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- d. NCRP Report No. 148 – Radiation Protection in Veterinary Medicine.
- e. NCRP Report No. 151 – Structural Shielding Design and Evaluation for Megavoltage X- and Gamma Ray Radiotherapy Facilities.
3. U.S. Department of Labor Occupational Safety and Health Administration (OSHA):
 - a. OSHA standard 29 CFR 1910.1025 – Lead.
 - b. OSHA standard 29 CFR 1926 – Safety and Health Regulations for Construction.
 - c. OSHA standard 29 CFR 1926.62 – Lead.
 - d. CAL-OSHA Title 8 Sec 1532.1, Sec 5198, and Sec 5216

1.5 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:
 1. Literature: Product data on interlocking masonry unit and mortar products, performance data, physical properties, and installation instructions for each item furnished hereunder.
 - a. Recycled material content: Indicate recycled content and provide manufacturer's written certification of recycled steel and aggregate products (LEED™ NC Version 2.2, MR Credits 4.1 and 4.2).
 - 1) Indicate percentage both post-consumer and pre-consumer recycled content per unit of masonry products.
 - b. Local/regional materials (LEED™ NC Version 2.2, MR Credit 5.1):
 - 1) Indicate location of extraction, harvesting, and recovery; indicate the distance between extraction, harvesting, and recovery and the project site.
 - 2) Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
 2. Certifications:
 - a. Manufacturer's written certification stating that interlocking concrete unit masonry systems and all related items to be furnished hereunder, meet or exceed the requirements specified under this Section and are in compliance with Physicist of Record report(s), and that the applicator is qualified and approved to install the materials in accordance with manufacturer's product data.
 - b. Installer certifications for OSHA 29 CFR 1926.
 3. Shop drawings: Provide plans and elevations of interlocking masonry work showing foundation conditions, block placement, and built-in items. Indicate manufacturer's standard design details where unit masonry will interface with work of other Sections.
- B. Submit the following under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.
 1. Manufacturer's ISO 9001:2008 field quality control reports of field inspections, including manufacturer's final punch list.
 2. Manufacturer's warranties: Include coverage of installation for compliance with shielding requirements based on Physicist of Record report(s).

1.6 QUALITY ASSURANCE

- A. Provide in-house quality control laboratory tests of compressive strength and density for each production batch.



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- B. Single-source responsibility for interlocking concrete masonry units: Obtain interlocking concrete masonry units for the project from a single manufacturer.
- C. Single-source responsibility for mortar materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- D. Installers:
 - 1. All construction workers, foreman, and jobs supervisors for the Work of this Section shall be documented as trained by, and approved by, product manufacturer for installation of radiation protection products.
 - 2. All construction workers, foreman, and jobs supervisors for the work of this section shall have a minimum certification of 10 hours of OSHA training in occupational safety and health.

1.7 DELIVER, STORAGE AND HANDLING

- A. General: Do not deliver cement, lime, and similar perishable materials to the site until suitable storage is available. Store such materials in weatherproof structures, and ensure that materials are in perfectly fresh condition when used. Protect masonry units and manufactured products of all types from wetting, and keep covered when not in use.
- B. Interlocking unit masonry face units: Carefully handle all masonry units in transit and on the site, so as to keep units whole, with edges sharp, and faces clean and undamaged. Deliver all masonry units on pallets; or handle units individually, properly stacked.
- C. Mortar aggregates: Deliver, store and handle aggregate materials so as to prevent contamination with earth or other foreign materials.
 - 1. Store cement, lime, and similar products under cover and from direct contact with earth or floor slabs.
- D. Damaged material: Remove any damaged or contaminated materials from job site immediately, including materials in broken packages, packages containing water marks, or which show other evidence of damage, unless Architect specifically authorizes correction thereof and usage on project.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. General Contractor is fully responsible, maintain ambient temperature above 50 degrees Fahrenheit for 24 hours before, during, and 48 hours after installation of interlocking masonry.

1.9 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Specified Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on "High Density Concrete Block" as



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manufactured by NELCO, 800 West Cummings Park, Suite 3950, Woburn, MA 01801, www.nelcoworldwide.com (telephone 800-635-2613).

1. Manufacturing Facilities:
 - a. NELCO Boston: 3 Gill St - Unit D, Woburn, MA 01801.
 - b. NELCO Houston: 4600 Homestead Road, Houston, TX 77028.
 - c. NELCO San Francisco: 1840 Williams Street, San Leandro, CA 94577.
- B. Alternative products (substitutions): Contractor must furnish appropriate and complete product data, proof of ISO 9001:2008 certification, worker OSHA certifications, environmental characteristics, and sample warranty with bid for the Architect to consider the substitutions as "equal" to the manufacturer, product specified and quality assurance requirements. Further additional information may be requested by the Architect for determination that the proposed product substitution is fully equal to the specified products. There is no guarantee that proposed substitutions will be approved, and the Contractor is hereby directed not to order any materials until said approval(s) are received in writing.
 1. Requesting substitutions is at the Contractor's own risk, with regard to uncompensated delays of the Project. Time is required for sufficient review and for additional requests of information. Delays of work which result from substitution reviews and resubmissions are not grounds for additional time or cost change orders, and will not be considered by the Owner.

2.2 HIGH DENSITY CONCRETE MASONRY UNITS

- A. Provide high density "N-Loc" interlocking concrete masonry units equal to NELCO "High Density Concrete Block" comprised of portland cement, sand, water, and manufacturer's proprietary stone and steel large aggregate.
 1. Compressive strength: 2,800 pounds per square inch minimum.
 2. Size: 6 inches high by 6 inches wide by 12 inches deep.
 3. Provide in density as required by Physicist of Record report(s):
 - a. 145 pounds per cubic foot.
 - b. 240 pounds per cubic foot.
 - c. 288 pounds per cubic foot.

2.3 MORTAR

- A. Mortar: Site-mixed portland cement mortar complying with ASTM C 270 as specified herein.
- B. Mortar materials:
 1. Portland cement for masonry conforming to ASTM C 150, Type I, non-staining, without air entrainment.
 2. Aggregates for mortar: Clean sand, washed uniformly well graded, conforming to ASTM C 144, except use aggregate with 100 percent passing a No. 16 sieve.
 3. Microsilica: Dry densified amorphous silica powder complying with ASTM C 1240.
 - a. Provide as 5 percent of cementitious materials.
 4. Lime: Approved brand of plastic hydrated lime, conforming to ASTM C 207, Type "S".
 5. Water: Clean and fresh without contaminants.

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2.4 MIXING MORTARS

- A. General: Mix mortar and grout in accordance with the requirements of ASTM C270.
 - 1. Control batching procedure to ensure proper proportions by measuring materials by volume. Amount of mixing water and mortar consistency shall be controlled by mason.
 - 2. Control batch sizes to allow for use within manufacturer's recommended pot life.
 - 3. Retempering will be permitted only within the first two hours of initial mix or shorter times as directed by manufacturers.
 - 4. Discard all mortar and grout which exceeds the time limits allowed by the manufacturer Discard mortar that has partially set.
- B. Maintain sand uniformly damp immediately before mixing process.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that all items which are to be enclosed by Work of this Section, have been permanently installed, inspected and approved.
- B. Inspect ceiling framing, foundations, and other substrates; verify that they are in proper condition to receive the work of this Section.
- C. Verify that field conditions are acceptable and are ready to receive the work of this Section.
- D. Beginning of installation means acceptance of site conditions.

3.2 PREPARATION

- A. Foundations:
 - 1. Do not commence installation until foundations are clean, rough, and level.
 - 2. Sandblast the foundation tops, if necessary, and remove all laitance and foreign material.

3.3 INSTALLATION

- A. General: Interlocking high density concrete masonry vault system shall be installed by the manufacturer's trained installers as indicated on the approved shop drawings.

3.4 FIELD QUALITY CONTROL

- A. Field inspection and physicist testing will be performed under separate contract with Owner.

3.5 CLEANING

- A. General: Clean work under provisions of Section 01 73 00 - EXECUTION.
 - 1. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area.
- B. Daily clean work areas by disposing of debris, scraps, and lead. Vacuum floor surfaces with HEPA (High Efficiency Particulate Air filter) vacuum in compliance with OSHA Standard 1926.62.



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- C. After completion of the work of this Section, remove rubbish, tools and equipment, and clean all wall, partition, and floor areas free from deposits of lead, and other materials installed under this Section. Vacuum surfaces with HEPA vacuum in compliance with OSHA Standard 1926.62.
- D. During the progress of the work, keep the exposed surfaces of masonry clean at all times, and protected against damage. As each segment of the masonry is erected, dry-brush the surfaces free from mortar spots and droppings.

3.6 PROTECTION

- A. General Contractor is responsible to protect finished work under provisions of Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.
- B. During the operation of work of this Section, protect existing work against damage by the exercise of reasonable care and precautions. Repair all existing materials which are damaged by Work of this Section, to match original profiles and finishes. Existing materials repaired shall be removed and replaced with new work to match existing.

End of Section