

**SECTION 01 00 00
GENERAL REQUIREMENTS**

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SECTION 01 00 00
GENERAL REQUIREMENTS

1.1 GENERAL INTENTION

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work to demolish and replace a 6-foot wide sidewalk, including but not limited to relocating irrigation lines, modifying sprinkler heads and restoring the site with sod and decorative gravel mulch as required by drawings and specifications.
- B. Prior to commencing work, general contractor shall provide proof that a OSHA certified “competent person” (CP) (29 CFR 1926.20(b)(2)) will maintain a presence at the work site whenever the general or subcontractors are present.
- C. Training:
 - 1. All employees of general contractor or subcontractors shall have the 10-hour OSHA certified Construction Safety course and /or other relevant competency training, as determined by COR.
 - 2. Submit training records of all such employees for approval before the start of work.

1.2 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. AFTER AWARD OF CONTRACT, one (1) set of electronic specifications and drawings will be furnished.
- B. Additional sets of drawings may be made by the Contractor, at Contractor's expense.

1.3 CONSTRUCTION SECURITY REQUIREMENTS

- A. Security Procedures:
 - 1. For working outside the “regular hours” as defined in the contract, The General Contractor shall make the request to the Contracting Officer’s Representative (COR) for approval 3 days in advance. This request is separate from any notices required for utility shutdown described later in this section.
 - 2. No photography of VA premises is allowed without written permission of the Contracting Officer.
 - 3. VA reserves the right to close down or shut down the project site and order General Contractor’s employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

1.4 FIRE SAFETY

- A. Applicable Publications: Publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.
1. American Society for Testing and Materials (ASTM):
E84-2008Surface Burning Characteristics of Building Materials
 2. National Fire Protection Association (NFPA):
10-2006.....Standard for Portable Fire Extinguishers
30-2007.....Flammable and Combustible Liquids Code
51B-2003Standard for Fire Prevention During Welding, Cutting and Other
Hot Work
70-2007.....National Electrical Code
241-2004.....Standard for Safeguarding Construction, Alteration, and
Demolition Operations
 3. Occupational Safety and Health Administration (OSHA):
29 CFR 1926Safety and Health Regulations for Construction
- B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to COR for approval. Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the general contractor's competent person per OSHA requirements. This briefing shall include information on the construction limits, safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of equipment, etc. Documentation shall be provided to the COR that individuals have undergone contractor's safety briefing.
- C. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- D. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- E. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with COR.
- F. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to COR.

- G. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- H. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- I. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COR. Designate contractor's responsible project-site fire prevention program manager to permit hot work.
- J. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to COR.
- K. Smoking: Smoking is prohibited in and adjacent to construction areas except in designated smoking rest areas.
- L. Dispose of waste and debris in accordance with NFPA 241. Remove from cemetery daily.

1.5 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
- C. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

(FAR 52.236-10)

- D. Working space and space available for storing materials shall be as determined by the COR.

- E. Workmen are subject to rules of Cemetery applicable to their conduct.
- F. Execute work in such a manner as to interfere as little as possible with work being done by others. Keep roads clear of construction materials, debris, standing construction equipment and vehicles at all times.
- G. Utilities Services: Where necessary to cut existing pipes of utility services, they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by the COR.
- H. Abandoned Lines: All service lines such as pipes and the like which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged.
- I. To minimize interference of construction activities with flow of Cemetery traffic, comply with the following:
 - 1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles. Wherever excavation for new utility lines cross existing roads, at least one lane must be open to traffic at all times.
 - 2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the COR.
- J. Coordinate the work for this contract with other construction operations as directed by the COR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.
- K. Coordination of Construction with Cemetery Director: The burial activities at a National Cemetery shall take precedence over construction activities. The Contractor must cooperate and coordinate with the Cemetery Director, through the COR, in arranging construction schedule to cause the least possible interference with cemetery activities in actual burial areas. Construction noise during the interment services shall not disturb the service. Trucks and workmen shall not pass through the service area during this period:
 - 1. The Contractor is required to discontinue his work sufficiently in advance of Easter Sunday, Mother's Day, Father's Day, Memorial Day, Veteran's Day and/or Federal holidays, to permit him to clean up all areas of operation adjacent to existing burial plots before these dates.
 - 2. Cleaning up shall include the removal of all equipment, tools, materials and debris and leaving the areas in a clean, neat condition.

1.6 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the COR of areas in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by both to the Contracting Officer. This report shall list:
 - 1. Shall note any discrepancies between drawings and existing conditions at site.
 - 2. Shall designate areas for working space, materials storage and routes of access to areas where alterations occur and which have been agreed upon by Contractor and COR.
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of Resident Engineer to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and the COR together shall make a thorough re-survey of the areas involved. They shall furnish a report on conditions then existing as compared with conditions of same as noted in first condition survey report:
 - 1. Re-survey report shall also list any damage caused by Contractor despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.
- D. Protection: Provide the following protective measures:
 - 1. Temporary protection against damage for portions of grounds where work is to be done, materials handled and equipment moved and/or relocated.

1.7 DISPOSAL AND RETENTION

- A. Materials and equipment accruing from work removed and from demolition shall be disposed of as follows:
 - 1. Reserved items which are to remain property of the Government are noted on drawings or in specifications as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by the COR.

2. Items not reserved shall become property of the Contractor and be removed by Contractor from the Cemetery.

1.8 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site that are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

(FAR 52.236-9)

- C. Refer to Articles, "Alterations", "Restoration", and "Operations and Storage Areas" for additional instructions concerning repair of damage to structures and site improvements.
- D. Refer to FAR clause 52.236-7, "Permits and Responsibilities," which is included in General Conditions.

1.9 RESTORATION

- A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any plumbing, gas, or electric work without approval of the COR. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the COR before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (grounds, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work,

shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work. The Contractor shall prepare and finish the ground in disturbed areas up to but before the point of installing sod; the Government will be responsible for purchase and installation of sod.

- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are indicated on drawings and which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2) of Section 00 72 00, GENERAL CONDITIONS.

1.10 LAYOUT OF WORK

- A. The Contractor shall lay out the work from Government established base lines and bench marks, indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at Contractor's own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

(FAR 52.236-17)

- B. Establish and plainly mark center, and such other lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for each such structure and/or addition, roads, parking lots, gravesite control monuments, are in accordance with lines and elevations shown on contract drawings.
- C. Following completion of general mass excavation and before any other permanent work is performed, establish and plainly mark (through use of appropriate batter boards or other means) sufficient additional survey control points or system of points as may be necessary to assure

proper alignment, orientation, and grade of all major features of work. The Survey shall include, but not be limited to, location of lines and grades of footings, and major:

1. Such additional survey control points or system of points thus established shall be checked and certified by a registered land surveyor or registered civil engineer. Furnish such certification to the COR before any work (such as footings, utilities and other major controlling features) is placed.
- D. The Contractor shall furnish to the COR certificates from a registered land surveyor or registered civil engineer that the following work is complete in every respect as required by contract drawings.
 1. Elevations of bottoms of footings.
 3. Lines and elevations of storm sewers.
 4. Northing/Easting coordinate locations of all storm sewer and irrigation structures, and lines.
- E. Upon completion of the work, the Contractor shall furnish the COR with reproducible drawings, in AutoCAD form, at the scale of the contract drawings, showing the finished grade on the grid developed for constructing the work. These drawings shall bear the seal of the registered land surveyor or registered civil engineer.
- F. The Contractor shall perform the surveying and layout work of this and other articles and specifications in accordance with the provisions of Article "Professional Surveying Services".

1.11 AS-BUILT DRAWINGS

- A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.
- B. All variations shall be shown in the same general detail as used in the contract drawings. To insure compliance, as-built drawings shall be made available for the MSN Engineer's review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings to the MSN Engineer within 15 calendar days after the acceptance of the project by the COR.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

1.12 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on Cemetery property and, when authorized by the Resident Engineer, such temporary roads which are necessary in the

performance of contract work. Temporary roads shall be constructed by the Contractor at Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.

1.13 TEMPORARY TOILETS

- A. Provide for use of all Contractor's workmen ample temporary sanitary toilet accommodations with suitable sewer and water connections, or when approved by the COR provide suitable dry closets where directed. Keep such places clean and free from flies, and all connections and appliances connected therewith are to be removed prior to completion of contract, and premises left perfectly clean.

1.14 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The Contractor shall not be allowed to install temporary connections nor distribution lines.
- B. Electricity (for Construction and Testing): The Contractor shall arrange for and furnish all temporary electric services. The Cemetery electrical distribution system shall not be available to the Contractor to tie into.
- C. Water (for Construction and Testing): Water is available at no cost to the Contractor from existing outlets and supplies. The Contractor shall carefully conserve any utilities furnished without charge.

1.15 HISTORIC PRESERVATION

- A. Where the Contractor or any of the Contractor's employees, prior to, or during the construction work, are advised of or discover any possible archeological, historical and/or cultural resources, the Contractor shall immediately notify the COR verbally, and then with a written follow up.

--- E N D ---

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.
- B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.
- C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:
 - 1. Techniques to minimize waste generation.
 - 2. Sorting and separating of waste materials.
 - 3. Salvage of existing materials and items for reuse or resale.
 - 4. Recycling of materials that cannot be reused or sold.
- D. At a minimum the following waste categories shall be diverted from landfills:
 - 1. Soil.
 - 2. Inerts (eg, concrete, masonry and asphalt).
 - 3. Green waste (biodegradable landscaping materials).
 - 4. Engineered wood products (plywood, particle board and I-joists, etc).
 - 5. Metal products (eg, steel, wire, beverage containers, etc).
 - 6. Cardboard, paper and packaging.
 - 7. Plastics (eg, PVC).

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.

1.3 QUALITY ASSURANCE

- A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible.
Construction /Demolition waste includes products of the following:
 - 1. Excess or unusable construction materials.
 - 2. Packaging used for construction products.
 - 3. Poor planning and/or layout.
 - 4. Construction error.
 - 5. Over ordering.

6. Weather damage.
 7. Contamination.
 8. Mishandling.
 9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
 - C. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.
 - D. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website <http://www.wbdg.org> provides a Construction Waste Management Database that contains information on companies that haul. Collect, and process recyclable debris from construction projects.
 - E. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.
 - F. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.

1.4 TERMINOLOGY

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.
- B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.
- C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.
- E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).

- F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.
- G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.
- H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.
- K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.
- L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
 - 1. On-site Recycling – Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
 - 2. Off-site Recycling – Materials hauled to a location and used in an altered form in the manufacture of new products.
- M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.
- N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.
- O. Return: To give back reusable items or unused products to vendors for credit.
- P. Salvage: To remove waste materials from the site for resale or re-use by a third party.
- Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.
- R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.

- S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.5 SUBMITTALS

- A. Final Summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

1.6 APPLICABLE PUBLICATIONS

Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.

- A. U.S. Green Building Council (USGBC):
LEED Green Building Rating System for New Construction

1.7 RECORDS

Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. List of each material and quantity to be salvaged, recycled, reused.
- B. List of each material and quantity proposed to be taken to a landfill.
- C. Material tracking data: Receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices, net total costs or savings.

PART 3 - EXECUTION

3.1 COLLECTION

- A. Provide all necessary containers, bins and storage areas to facilitate effective waste management.
- B. Clearly identify containers, bins and storage areas so that recyclable materials are separated from trash and can be transported to respective recycling facility for processing.
- C. Hazardous wastes shall be separated, stored, disposed of according to local, state, federal regulations.

3.2 DISPOSAL

- A. Contractor shall be responsible for transporting and disposing of materials that cannot be delivered to a source-separated or mixed materials recycling facility to a transfer station or disposal facility that can accept the materials in accordance with state and federal regulations.

- B. Construction or demolition materials with no practical reuse or that cannot be salvaged or recycled shall be disposed of at a landfill or incinerator.

3.3 REPORT

- A. Quantify all materials diverted from landfill disposal through salvage or recycling during the period with the receiving parties, dates removed, transportation costs, weight tickets, manifests, invoices. Include the net total costs or savings for each salvaged or recycled material.
- B. Quantify all materials disposed of during the period with the receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices. Include the net total costs for each disposal.

- - - E N D - - -

**SECTION 02 41 10
DEMOLITION AND SITE CLEARING**

SPEC WRITER NOTES:

1. Use this section only for NCA projects.
2. Delete between // ---- // if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.
3. Use this Section for projects involving total or large scale demolition. Omit this Section on projects involving minor demolition.
4. Buildings, structures, utilities, etc., required to be removed must be clearly shown.
5. Debris or trash dumps should be shown to the fullest extent. If quantities of materials to be removed cannot be accurately estimated, do not include estimates of quantities. If site clearing is included in project, removal of debris from onsite trash dumps should be included in that specification section, then removal of materials from onsite trash dumps should be included in this specification section.
6. Modify the following paragraphs to reflect specific conditions for the project.

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies all site preparation work, demolition and removal of buildings, portions of buildings, utilities, other structures and debris from trash dumps shown.

1.2 RELATED WORK

- A. Demolition and removal of roads, walks, curbs, and on-grade slabs outside buildings to be demolished: // Section 31 20 00, EARTH MOVING // Section 31 20 11, EARTH MOVING (SHORT FORM) //.
- B. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- E. Asbestos Removal: Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT.
- F. Lead Paint: Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
- G. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

H. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7, INFECTION PREVENTION MEASURES.

I. Waste Management: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT

1.3 PROTECTION

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.
- C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.
- D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.
- E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.

SPEC WRITER NOTES: Unless the building is to be demolished story by story paragraph F2 should not be used.

- F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:
 - 1. No wall or part of wall shall be permitted to fall outwardly from structures.
 - 2. Maintain at least one stairway in each structure in usable condition to highest remaining floor. Keep stairway free of obstructions and debris until that level of structure has been removed.
 - 3. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.
 - 4. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.

- G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Cemetery Property; any damaged items shall be repaired or replaced as approved by the Resident Engineer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have Resident Engineer's approval.
- H. The work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- I. The work shall comply with the requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7 INFECTION PREVENTION MEASURES.

1.4 UTILITY SERVICES

- A. Demolish and remove outside utility service lines shown to be removed.
- B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SITE CLEARING

- A. General: Remove trees, shrubs, grass, and other vegetation, pavements, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.
 - 1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
- B. Erosion Control: Contractor shall provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways. Contractor shall install silt fence and inlet protection as shown and as per requirements of the SWPPP, prior to any soil disturbance activities. Provide temporary seeding as required by the SWPPP.

- C. Maintain site controls in accordance with Storm Water Pollution Prevention Plan and repair as directed by COTR to sustain compliance with SPDES permit. Maintain all records as required by the SWPPP. Perform inspections as required by the SWPPP.
- D. Topsoil - On-site: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 6 inches. Satisfactory topsoil is reasonably free and/or screened of subsoil, clay lumps, stones, and other objects over 1 inch in diameter, and without weeds, roots, and other objectionable material.
 - 1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.
 - a. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
 - 2. Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles to prevent wind erosion in accordance with the Storm Water Pollution Prevention Plan. Refer to Division 2 Section 02900, "Landscape Work" for soil amendments required prior to spreading topsoil.
 - a. Stockpile shall be contained with erosion and sediment controls (silt fence) and stabilized if undisturbed in accordance with the Storm Water Pollution Prevention Plan.
 - 3. Dispose of unsuitable or excess topsoil as specified for disposal of waste material only after approval of the Architect.
- E. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to be left standing.
 - 1. Completely remove stumps, roots, and other debris protruding through ground surface.
 - 2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
 - 3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - a. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.
- F. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

- G. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings and is included under work of related Division 15 and 16 Sections. Removing abandoned underground piping or conduits interfering with construction is included under this Section, except as indicated to be abandoned in-place.
- H. Continue maintenance of erosion controls in compliance with the Storm Water Pollution Prevention Plan until the work is completed and the threat of erosion is gone by either around surface stabilizer or lawn "grow-in" is at 85% complete. Temporary erosion control devices shall not be removed until the area is certified as being stabilized by the Qualified Inspector.

3.2 DEMOLITION

- A. Completely demolish and remove buildings and structures, including all appurtenances related or connected thereto, as noted below:
 - 1. As required for installation of new utility service lines.
 - 2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.
- B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Cemetery Property // to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Resident Engineer. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.
- C. In removing buildings and structures of more than two stories, demolish work story by story starting at highest level and progressing down to third floor level. Demolition of first and second stories may proceed simultaneously.
- D. Remove and legally dispose of all materials, other than earth to remain as part of project work, from any trash dumps shown. Materials removed shall // become property of contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations // be hauled to VA specified disposal site //. All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500mm (5feet) below surrounding grade, shall be included as part of the lump sum compensation for the work of this section. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal

of hazardous material shall be referred to Hazardous Materials specifications. Burning is not permitted on the property.

- E. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Resident Engineer. When Utility lines are encountered that are not indicated on the drawings, the Resident Engineer shall be notified prior to further work in that area.

3.2 CLEAN-UP

On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to Resident Engineer. Clean-up shall include off the Cemetery Property // disposal of all items and materials not required to remain property of the Government as well as all debris and rubbish resulting from demolition operations.

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SECTION 03 30 53
(SHORT-FORM) CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies cast-in-place structural concrete and material and mixes for other concrete.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Concrete roads, walks, and similar exterior site work: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

1.3 TOLERANCES:

- A. ACI 117.
- B. Slab Finishes: ACI 117, F-number method in accordance with ASTM E1155.

1.4 REGULATORY REQUIREMENTS:

- A. ACI SP-66 ACI Detailing Manual
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.

1.5 SUBMITTALS:

- A. Concrete Mix Design.
- B. Manufacturer's Certificates: Air-entraining admixture, chemical admixtures, curing compounds.

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Concrete Institute (ACI):
 - 117R-06Tolerances for Concrete Construction and Materials
 - 211.1-91(R2002).....Proportions for Normal, Heavyweight, and Mass Concrete
 - 211.2-98(R2004).....Proportions for Structural Lightweight Concrete
 - 301-05Specification for Structural Concrete
 - 305R-06Hot Weather Concreting
 - 306R-2002Cold Weather Concreting
 - SP-66-04ACI Detailing Manual
 - 318/318R-05Building Code Requirements for Reinforced Concrete
 - 347R-04Guide to Formwork for Concrete
- C. American Society for Testing And Materials (ASTM):

A185-07	Steel Welded Wire, Fabric, Plain for Concrete Reinforcement
A615/A615M-08.....	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
A996/A996M-06.....	Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
C31/C31M-08	Making and Curing Concrete Test Specimens in the Field
C33-07	Concrete Aggregates
C39/C39M-05	Compressive Strength of Cylindrical Concrete Specimens
C94/C94M-07	Ready-Mixed Concrete
C143/C143M-05	Standard Test Method for Slump of Hydraulic Cement Concrete
C150-07	Portland Cement
C171-07	Sheet Material for Curing Concrete
C172-07	Sampling Freshly Mixed Concrete
C173-07.	Air Content of Freshly Mixed Concrete by the Volumetric Method
C192/C192M-07	Making and Curing Concrete Test Specimens in the Laboratory
C231-08	Air Content of Freshly Mixed Concrete by the Pressure Method
C260-06	Air-Entraining Admixtures for Concrete
C330-05	Lightweight Aggregates for Structural Concrete
C494/C494M-08	Chemical Admixtures for Concrete
C618-08	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
D1751-04.	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
D4397-02	Polyethylene Sheeting for Construction, Industrial and Agricultural Applications
E1155-96(2008)	Determining F_F Floor Flatness and F_L Floor Levelness Numbers

PART 2 - PRODUCTS

2.1 FORMS:

Wood, plywood, metal, or other materials, approved by COR, of grade or type suitable to obtain type of finish specified.

2.2 MATERIALS:

A. Portland Cement: ASTM C150, Type I or II.

- B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalis, and loss on ignition (LOI) not to exceed 5 percent.
- C. Coarse Aggregate: ASTM C33, Size 67. Size 467 may be used for footings and walls over 12 inches (300 mm) thick. Coarse aggregate for applied topping and metal pan stair fill shall be Size 7.
- D. Fine Aggregate: ASTM C33.
- E. Lightweight Aggregate for Structural Concrete: ASTM C330, Table 1
- F. Mixing Water: Fresh, clean, and potable.
- G. Air-Entraining Admixture: ASTM C260.
- H. Chemical Admixtures: ASTM C494.
- J. Reinforcing Steel: ASTM A615 or ASTM A996, deformed. See structural drawings for grade.
- M. Sheet Materials for Curing Concrete: ASTM C171.
- P. Liquid Densifier/Sealer: 100 percent active colorless aqueous silicate solution.
- Q. Grout, Non-Shrinking: Premixed ferrous or non-ferrous, mixed and applied in accordance with manufacturer's recommendations. Grout shall show no settlement or vertical drying shrinkage at 3 days or thereafter based on initial measurement made at time of placement, and produce a compressive strength of at least 2,500 psi (18 Mpa) at 3 days and 5,000 psi (35 Mpa) at 28 days.

2.3 CONCRETE MIXES:

- A. Design of concrete mixes using materials specified shall be the responsibility of the Contractor as set forth under Option C of ASTM C94.
- B. Compressive strength at 28 days shall be not less than 3000 psi (30 Mpa).
- C. Establish strength of concrete by testing prior to beginning concreting operation. Test consists of average of three cylinders made and cured in accordance with ASTM C192 and tested in accordance with ASTM C39.
- D. Maximum slump for vibrated concrete is 4 inches (100 mm) tested in accordance with ASTM C143.
- E. Cement and water factor (See Table I):

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete: Strength	Non-Air-Entrained		Air-Entrained	
Min. 28 Day Comp. Str. Psi (MPa)	Min. Cement lbs/c. yd (kg/m ³)	Max. Water Cement Ratio	Min. Cement lbs/c. yd (kg/m ³)	Max. Water Cement Ratio
5000 (35) ^{1,3}	630 (375)	0.45	650 (385)	0.40
4000 (30) ^{1,3}	550 (325)	0.55	570 (340)	0.50
3000 (25) ^{1,3}	470 (280)	0.65	490 (290)	0.55
3000 (25) ^{1,2}	500 (300)	*	520 (310)	*

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 1200 psi (8.3 MPa) in excess of f'c. For concrete strengths above 5000 psi (35 Mpa), the proposed mix design shall achieve a compressive strength 1400 psi (9.7 MPa) in excess of f'c.
2. Lightweight Structural Concrete. Pump mixes may require higher cement values.
3. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.

* Determined by Laboratory in accordance with ACI 211.1 for normal concrete or ACI 211.2 for lightweight structural concrete.

- F. Air-entrainment is required for all exterior concrete and as required for Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS. Air content shall conform with the following // table: // tables //:

**TABLE II - TOTAL AIR CONTENT
FOR VARIOUS SIZES OF COARSE AGGREGATES (NORMAL CONCRETE)**

Nominal Maximum Size of Coarse Aggregate	Total Air Content Percentage by Volume
3/8 inch (10 mm)	6 to 10
1/2 inch (13 mm)	5 to 9
3/4 inch (19 mm)	4 to 8
1 inch (25 mm)	3 1/2 to 6 1/2
1-1/2 inches (40 mm)	3 to 6

**TABLE III TOTAL AIR CONTENT
AIR CONTENT OF LIGHTWEIGHT STRUCTURAL CONCRETE**

Nominal Maximum size of Total Air Content	Coarse Aggregate, mm's (Inches) Percentage by Volume
Greater than 3/8 inch (10 mm): 4 to 8	3/8 inch (10 mm) or less 5 to 9

2.4 BATCHING & MIXING:

- A. Store, batch, and mix materials as specified in ASTM C94.
 1. Job-Mixed: Concrete mixed at job site shall be mixed in a batch mixer in manner specified for stationary mixers in ASTM C94.
 2. Ready-Mixed: Ready-mixed concrete comply with ASTM C94, except use of non-agitating equipment for transporting concrete to the site will not be permitted. With each load of concrete delivered to project, ready-mixed concrete producer shall furnish, in duplicate, certification as required by ASTM C94.
 3. Mixing structural lightweight concrete: Charge mixer with 2/3 of total mixing water and all of the aggregate. Mix ingredients for not less than 30 seconds in a stationary mixer or not less than 10 revolutions at mixing speed in a truck mixer. Add remaining mixing water and other ingredients and continue mixing. Above procedure may be modified as recommended by aggregate producer.

PART 3 - EXECUTION

3.1 FORMWORK:

- A. Installation conforms to ACI 347. Sufficiently tight to hold concrete without leakage, sufficiently braced to withstand vibration of concrete, and to carry, without appreciable deflection, all dead and live loads to which they may be subjected.
- B. Treating and Wetting: Treat or wet contact forms as follows:
 1. Coat plywood and board forms with non-staining form sealer. In hot weather cool forms by wetting with cool water just before concrete is placed.
 2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather cool metal forms by thoroughly wetting with water just before placing concrete.
 3. Use sealer on reused plywood forms as specified for new material.

- C. Inserts, sleeves, and similar items: Flashing reglets, masonry ties, anchors, inserts, wires, hangers, sleeves, boxes for floor hinges and other items specified as furnished under this and other sections of specifications and required to be in their final position at time concrete is placed shall be properly located, accurately positioned and built into construction, and maintained securely in place.
- D. Construction Tolerances:
 - 1. Contractor is responsible for setting and maintaining concrete formwork to assure erection of completed work within tolerances specified to accommodate installation or other rough and finish materials. Remedial work necessary for correcting excessive tolerances is the responsibility of the Contractor. Erected work that exceeds specified tolerance limits shall be remedied or removed and replaced, at no additional cost to the Government.
 - 2. Permissible surface irregularities for various classes of materials are defined as "finishes" in specification sections covering individual materials. They are to be distinguished from tolerances specified which are applicable to surface irregularities of structural elements.

3.2 REINFORCEMENT:

Details of concrete reinforcement, unless otherwise shown, in accordance with ACI 318 and ACI SP-66. Support and securely tie reinforcing steel to prevent displacement during placing of concrete. Lift and adjust reinforcement to correct position continuously during concrete pour.

3.3 PLACING CONCRETE:

- A. Remove water from excavations before concrete is placed. Remove hardened concrete, debris and other foreign materials from interior of forms, and from inside of mixing and conveying equipment. Obtain approval of COR before placing concrete. Provide screeds at required elevations for concrete slabs.
- B. Before placing new concrete on or against concrete which has set, existing surfaces shall be roughened and cleaned free from all laitance, foreign matter, and loose particles.
- C. Convey concrete from mixer to final place of deposit by method which will prevent segregation or loss of ingredients. Do not deposit in work concrete that has attained its initial set or has contained its water or cement more than 1 1/2 hours. Do not allow concrete to drop freely more than 5 feet (1500 mm) in unexposed work nor more than 3 feet (900 mm) in exposed work. Place and consolidate concrete in horizontal layers not exceeding 12 inches (300 mm) in thickness.

Consolidate concrete by spading, rodding, and mechanical vibrator. Do not secure vibrator to forms or reinforcement. Vibration shall be carried on continuously with placing of concrete.

- D. Hot weather placing of concrete: Follow recommendations of ACI 305R to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete.
- E. Cold weather placing of concrete: Follow recommendations of ACI 306R, to prevent freezing of thin sections less than 300 mm (12 inches) and to permit concrete to gain strength properly, except that use of calcium chloride shall not be permitted without written approval from COR.

3.4 PROTECTION AND CURING:

Protect exposed surfaces of concrete from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature. Curing method shall be subject to approval by MSN Engineer.

3.5 FORM REMOVAL:

Forms remain in place until concrete has a sufficient strength to carry its own weight and loads supported. Removal of forms at any time is the Contractor's sole responsibility.

3.6 SURFACE PREPARATION:

Immediately after forms have been removed and work has been examined and approved by COR, remove loose materials, and patch all stone pockets, surface honeycomb, or similar deficiencies with cement mortar made with 1 part portland cement and 2 to 3 parts sand.

3.7 FINISHES:

A. Slab Finishes:

1. Floating: Ramps, stair treads, and platforms, both interior and exterior, equipment pads, and slabs to receive non-cementitious materials, except as specified, shall be screened and floated to a smooth dense finish. Allow water brought to surface by float used for rough finishing to evaporate before surface is again floated or troweled. Do not sprinkle dry cement on surface. After first floating, while surface is still soft, surfaces shall be checked for alignment using a straightedge or template. Correct high spots by cutting down with a trowel or similar tool and correct low spots by filling in with material of same composition as floor finish. Remove any

- surface projections on floated finish by rubbing or dry grinding. Refloat the slab to a uniform sandy texture.
2. Broom Finish: Finish all exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after the surfaces have been floated.
 3. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:

Slab on grade
Specified overall value F_F 25/ F_L 20
Minimum local value F_F 17/ F_L 15

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SECTION 31 20 11
EARTH MOVING (SHORT FORM)

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the requirements for furnishing all equipment, materials, labor and techniques for earthwork including excavation, fill, backfill and site restoration utilizing fertilizer, seed and/or sod.

1.2 DEFINITIONS

A. Unsuitable Materials:

1. Fills: Topsoil, frozen materials; construction materials and materials subject to decomposition; clods of clay and stones larger than 3 inches (75 mm); organic materials, including silts, which are unstable; and inorganic materials, including silts, too wet to be stable.
2. Existing Subgrade (except footings): Same materials as above paragraph, that are not capable of direct support of slabs, pavement, and similar items, with the possible exception of improvement by compaction, proof rolling, or similar methods of improvement.
3. Existing Subgrade (footings only): Same as Paragraph 1, but no fill or backfill. If materials differ from design requirements, excavate to acceptable strata subject to MSN Engineer's approval.

B. Earthwork: Earthwork operations required within the new construction area. It also includes earthwork required for auxiliary structures and buildings and sewer and other trench work throughout the job site.

C. Degree of Compaction: Degree of compaction is expressed as a percentage of maximum density obtained by the test procedure presented in ASTM D1557 Method A.

D. The term fill means fill or backfill as appropriate.

1.3 RELATED WORK

- A. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Nursery and Landscape Association (ANLA):
2004American Standard for Nursery Stock
- C. American Association of State Highway and Transportation Officials (AASHTO):
T99-01 (R2004)Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb)
Rammer and a 305 mm (12 inch) Drop
T180-01 (2004)Moisture-Density Relations of Soils Using a 4.54-kg [10 lb]
Rammer and a 457 mm (18 inch) Drop
- D. American Society for Testing and Materials (ASTM):
D698-07Laboratory Compaction Characteristics of Soil Using Standard
Effort
D1557-07Laboratory Compaction Characteristics of Soil Using Modified
Effort
- E. Standard Specifications of (Insert name of local state) State Department of Transportation, latest revision.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fills: Materials approved from on site and off site sources having a minimum dry density of 1760 kg/m³ (110 pcf), a maximum Plasticity Index of 6, and a maximum Liquid Limit of 30.
- B. Granular Fill:
 - 1. Under concrete slab, crushed stone or gravel graded from 25 mm (1 inch) to 4.75 mm (No. 4).
- C. Fertilizer: (5-10-5) delivered to site in unopened containers that clearly display the manufacturer's label, indicating the analysis of the contents.
- D. Sod: Comparable species with existing turf. Use State Certified or State Approved sod when available. Deliver sod to site immediately after cutting and in a moist condition. Thickness of cut must be 19 mm to 32 mm (3/4 inch to 1 1/4 inches) excluding top growth. There shall be no broken pads and torn or uneven ends.

PART 3 - EXECUTION

3.1 SITE PREPARATION

- A. Clearing: Clearing within the limits of earthwork operations as described or designated by the COR. Work includes removal of trees, shrubs, fences, foundations, incidental structures, paving, debris, trash and any other obstructions. Remove materials from the Cemetery Property.
- B. Grubbing: Remove stumps and roots 75 mm (3 inches) and larger diameter. Undisturbed sound stumps, roots up to 75 mm (3 inches) diameter, and nonperishable solid objects which will be a minimum of 900 mm (3 feet) below subgrade or finished embankment may be left. Cemetery Projects: do not leave material within the burial profile up to 2400 mm (8 feet) below finished grade.
- C. Stripping Topsoil: Unless otherwise indicated on the drawings, the limits of earthwork operations shall extend anywhere the existing grade is filled or cut or where construction operations have compacted or otherwise disturbed the existing grade or turf. Strip topsoil as defined herein, or as indicated in the geotechnical report, from within the limits of earthwork operations as specified above unless specifically indicated or specified elsewhere in the specifications or shown on the drawings. Topsoil shall be fertile, friable, natural topsoil of loamy character and characteristic of the locality. Topsoil shall be capable of growing healthy horticultural crops of grasses. Stockpile topsoil and protect as directed by the COR. Eliminate foreign material, such as weeds, roots, stones, subsoil, frozen clods, and similar foreign materials, larger than 0.014 m³ (1/2 cubic foot) in volume, from soil as it is stockpiled. Retain topsoil on the station. Remove foreign materials larger than 50 mm (2 inches) in any dimension from topsoil used in final grading. Topsoil work, such as stripping, stockpiling, and similar topsoil work, shall not, under any circumstances, be carried out when the soil is wet so that the tilth of the soil will be destroyed.
- E. Disposal: All materials removed from the property shall be disposed of at a legally approved site, for the specific materials, and all removals shall be in accordance with all applicable Federal, State and local regulations. No burning of materials is permitted onsite.

3.2 EXCAVATION

- A. Excavation Drainage: Operate pumping equipment, and/or provide other materials, means and equipment as required, to keep excavations free of water and subgrades dry, firm, and undisturbed until approval of permanent work has been received from COR. Approval by the COR is also required before placement of the permanent work on all subgrades.
- B. Trench Earthwork:
 - 1. Utility trenches:

- a. Excavate to a width as necessary for sheeting and bracing and proper performance of the work.
 - b. Grade bottom of trenches with bell-holes, scooped-out to provide a uniform bearing.
 - c. Support piping on undisturbed earth unless a mechanical support is shown.
 - d. The length of open trench in advance of pipe laying shall not be greater than is authorized by the Resident Engineer.
- C. Site Earthwork: Excavation shall be accomplished as required by drawings and specifications. Remove subgrade materials, that are determined by the COR as unsuitable, and replace with acceptable material. If there is a question as to whether material is unsuitable or not, the Contractor shall obtain samples of the material, under the direction of the COR, and the materials shall be examined by an independent testing laboratory for soil classification to determine whether it is unsuitable or not. When unsuitable material is encountered and removed, the contract price and time will be adjusted in accordance with Articles, DIFFERING SITE CONDITIONS, CHANGES and CHANGES-SUPPLEMENT of the GENERAL REQUIREMENTS as applicable. Adjustments to be based on meters (yardage) in cut section only.
- D. Finished elevation of subgrade shall be as follows:
 - 1. Pavement Areas - bottom of the pavement or base course as applicable.
 - 2. Planting and Lawn Areas - 100 mm (4 inches) below the finished grade, unless otherwise specified or indicated on the drawings.

3.3 FILLING AND BACKFILLING

- A. General: Do not fill or backfill until all debris, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from the excavation. Proof-roll exposed subgrades with a fully loaded dump truck. Use excavated materials or borrow for fill and backfill, as applicable. Do not use unsuitable excavated materials. Do not backfill until foundation walls have been completed above grade and adequately braced, waterproofing or dampproofing applied, and pipes coming in contact with backfill have been installed, and inspected and approved by the COR.
- B. Proof-rolling Existing Subgrade: Proof-roll with a fully loaded dump truck. Make a minimum of one pass in each direction. Remove unstable uncompactable material and replace with granular fill material completed to mix requirements specified.

- C. Placing: Place material in horizontal layers not exceeding 200 mm (8 inches) in loose depth and then compacted, or as indicated in drawings. Do not place material on surfaces that are muddy, frozen, or contain frost.
- D. Compaction: Use approved equipment (hand or mechanical) well suited to the type of material being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Compact each layer to not less than 95 percent of the maximum density determined in accordance with the following test method ASTM D1557 Method A.

3.4 GRADING

- A. General: Uniformly grade the areas within the limits of this section, including adjacent transition areas. Smooth the finished surface within specified tolerance. Provide uniform levels or slopes between points where elevations are indicated, or between such points and existing finished grades. Provide a smooth transition between abrupt changes in slope.
- B. Cut rough or sloping rock to level beds for foundations. In unfinished areas fill low spots and level off with coarse sand or fine gravel.
- C. Slope backfill outside the building away from the building walls for a minimum distance of 1800 mm (6 feet).
- D. The finished grade shall be 150 mm (6 inches) below bottom line of windows or other building wall openings unless greater depth is shown.
- E. Place crushed stone or gravel fill under concrete slabs on grade tamped and leveled. The thickness of the fill shall be 150 mm (6 inches), unless otherwise indicated.
- F. Finish subgrade in a condition acceptable to the COR at least one day in advance of the paving operations. Maintain finished subgrade in a smooth and compacted condition until the succeeding operation has been accomplished. Scarify, compact, and grade the subgrade prior to further construction when approved compacted subgrade is disturbed by contractor's subsequent operations or adverse weather.
- G. Grading for Paved Areas: Provide final grades for both subgrade and base course to +/- 6 mm (0.25 inches) of indicated grades.

3.5 LAWN AREAS

- A. General: Harrow and till to a depth of 100 mm (4 inches), new or existing lawn areas to remain, which are disturbed during construction. Establish existing or design grades by dragging or similar operations. Do not carry out lawn areas earthwork out when the soil is wet so that the tilth

of the soil will be destroyed. Plant bed must be approved by the COR before sodding operation begins.

- B. Finished Grading: Begin finish grading after rough grading has had sufficient time for settlement. Scarify subgrade surface in lawn areas to a depth of 100 mm (4 inches). Apply topsoil so that after normal compaction, dragging and raking operations (to bring surface to indicated finish grades) there will be a minimum of 76 mm (3 inches) of topsoil over all lawn areas; make smooth, even surface and true grades, which will not allow water to stand at any point. Shape top and bottom of banks to form reverse curves in section; make junctions with undisturbed areas to conform to existing topography. Solid lines within grading limits indicate finished contours. Existing contours, indicated by broken lines are believed approximately correct but are not guaranteed.
- C. Fertilizing: Incorporate fertilizer into the soil to a depth of 100 mm (4 inches) at a rate of 12 kg/100 m² (25 pounds per 1000 square feet).
- D. Sodding: Topsoil shall be firmed by rolling and during periods of high temperature the topsoil shall be watered lightly immediately prior to laying sod. Sod strips shall be tightly butted at the ends and staggered in a running bond fashion. Placement on slopes shall be from the bottom to top of slope with sod strips running across slope. Secure sodded slopes by pegging or other approved methods. Roll sodded area with a roller not to exceed 225 kg/m (150 pounds per foot) of the roller width to improve contact of sod with the soil.
- E. Watering: The COR is responsible for having adequate water available at the site. As sodding is completed in any one section, the entire sodded area shall be thoroughly irrigated by the Contractor, to a sufficient depth, that the underside of the new sod pad and soil, immediately below sod, is thoroughly wet. The COR will be responsible for sod after installation and acceptance.

3.6 DISPOSAL OF UNSUITABLE AND EXCESS EXCAVATED MATERIAL

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Cemetery property.
- B. Place excess excavated materials suitable for fill and/or backfill on site where directed.
- C. Remove from site and dispose of any excess excavated materials after all fill and backfill operations have been completed.
- D. Segregate all excavated contaminated soil designated by the COR from all other excavated soils, and stockpile on site on two 0.15 mm (6 mil) polyethylene sheets with a polyethylene cover. A

designated area shall be selected for this purpose. Dispose of excavated contaminated material in accordance with State and Local requirements.

3.7 CLEAN-UP

Upon completion of earthwork operations, clean areas within contract limits, remove tools, and equipment. Provide site clear, clean, free of debris, and suitable for subsequent construction operations. Remove debris, rubbish, and excess material from the Cemetery Property.

--- E N D ---

SECTION 32 84 00
PLANTING IRRIGATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Contractor is responsible for providing a system with full and complete coverage within the areas indicated on the drawings. Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the fully functional irrigation system, and warranty as shown on the drawings, the installation details, and as specified. Other items of work specifically included are:
1. Procurement of all applicable licenses, permits, and payment of required fees.
 2. Coordination of Utility Locates ("Call Before You Dig").
 3. Sleeving for irrigation pipes as indicated, and/or beneath all hardscape surfaces.

1.2 DEFINITIONS

- A. Lateral Piping: Piping located downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.
- B. Mainline Piping: Located downstream from point of connection to water distribution piping to, and including, control valves. Piping is under system pressure.
- C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.
- D. Hardscape: Site roads, walks, walls, or any other surface improvements for which removal for excavation to perform maintenance or replacement of the irrigation system pipes, or wires will require disturbance of other than landscape materials.

1.3 RELATED WORK

- A. Maintenance of Existing Utilities: Section 01 00 00, GENERAL REQUIREMENTS.
- B. Concrete: Section 03 30 53, CAST-IN-PLACE CONCRETE (SHORT FORM).
- C. Excavation, Backfill: Section 31 20 11, EARTH MOVING (SHORT FORM).

1.4 QUALITY ASSURANCE

- A. Irrigation Contractor:
1. Irrigation Contractor must have demonstrated, using persons directly employed by the Contractor, experience with the construction of at least five (5) irrigation systems of similar construction.

2. Irrigation Contractor must be licensed in the State of Texas.
- B. Equipment Manufacturer: Rain Bird
- C. Products Criteria:
1. Multiple Units: When two or more units of the same type or class of materials or equipment are required, these units are products of one manufacturer.
 2. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
 - a. All components of an assembled unit need not be products of the same manufacturer but component parts which are alike are the product of a single manufacturer.
 - b. Components are compatible with each other and with the total assembly for the intended service.
 3. Nameplates: Nameplate bearing manufacturer's name or identification trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
- D. System Requirements:
1. Full (head to head plus 10%) and complete coverage of the irrigated areas is required.
Contractor shall, at no additional cost to the Government, make necessary adjustments to head locations as required to achieve full coverage of irrigated areas.
 2. Layout work as closely as possible to drawings. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown. Diagrammatic also refers to the location of the pipelines and valves, which may have been adjusted for clarity of the drawings. Lines are to be common trenched wherever possible.
 3. Locations of remote control valves are schematic.
 4. Irrigation lines shall run at boundaries of graves, thru designated utility lanes or beside roadways so that any gravesite may be opened in the future without disruption of the irrigation system.
 5. Irrigation lines shall be run in trenches as indicated on the drawings or as typical for industry standards, if not indicated.
 6. Connect new system to existing mains.
 7. Unless noted otherwise, all irrigation lines shall be run in sleeves or conduit where installed beneath any site hardscape materials.

1.5 SUBMITTALS

- A. Provide two (2) copies of irrigation information in a 3-ring binder with table of contents and index sheet. Provide sections that are indexed and labeled for sprinklers, pipe and fittings, shop drawings, and all other irrigation equipment shown or described on the drawings and within these specifications. Highlight items being supplied on the catalog cut sheets. Submittal package must be complete prior to being reviewed by the COR. Incomplete submittals will be returned without review. Sequentially number each page of the submittal for ease in referencing during submittal review. Pages within a letter or number identified Tab section may be numbered sequentially as long as the process is consistent and provide unique page identification for each page of the submittal.
- B. Materials List: Include all materials and products that are part of the irrigation system including, but not limited to: pipe, fittings, and heads. Quantities of materials need not be included.
- C. Manufacturers' Data: Submit manufacturers' catalog cuts and specifications for equipment to be included in the project work.
- D. Shop Drawings: Complete detailed layout shop drawings covering design of system showing pipe sizes and lengths; fittings, locations, types and sizes of sprinkler heads; and connections to existing services. Do not start work before final shop drawing approval.
- E. Testing: Submit a proof of testing report following completion of each test listed in Part 1 of these specifications. Unless otherwise noted, include name of test, date of test, name of the individual completing the test, name of the company completing the test and a summary of the test results. If system fails test, document any and all retests until system passes test.
- F. Maintenance and Operation Instructions: Submit information listed in Part 3 of these specifications.

1.6 SUBSTITUTIONS

- A. Unless otherwise noted, use specified equipment to match existing equipment. COR must approve equipment prior to construction. Changes and associated design costs to accommodate alternative equipment are Contractor's responsibility.

1.7 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and appurtenances unless otherwise indicated.
 - 1. Irrigation Mainline Piping: 1380 kPa (200 psig).

2. Lateral Piping: 1035 kPa (150 psig).

1.8 CODES AND REGULATIONS

- A. Work and materials will be in accordance with the latest edition of the National Electric Code, the Uniform Plumbing Code, and applicable laws and regulations of the governing authorities.
- B. When the contract documents call for materials or construction of a better quality or larger size than required by the above-mentioned rules and regulations, provide the quality and size required by the contract documents.
- C. If quantities are provided either in these specifications or on the drawings, these quantities are provided for information only. It is the Contractor's responsibility to determine the actual quantities of all material, equipment, and supplies required by the project and to complete an independent estimate of quantities and wastage.

1.9 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The government shall make NO utilities available to the Contractor from existing outlets and supplies except as follows. Upon completion of the new irrigation system for this project or completion of portions thereof, the contractor through the permanent connection of the new irrigation system to the existing fully functional irrigation system, shall be provided water at available flow and pressure, for use by the Contractor, with Contractor provided additional facilities and/or equipment as required to perform the required flushing and testing of the new irrigation system.

1.10 TESTING

- A. Notify the COR three days in advance of testing.
- B. Newly installed irrigation pipelines jointed with rubber gaskets or threaded connections shall be subject to pressure and leakage testing after partial completion of backfill. Pipelines jointed with solvent-welded PVC joints will be allowed to cure at least 24 hours before testing.
- C. Hydrostatic Pressure Test – Solvent Weld Lateral Pipe:
 1. Subject lateral pipe to a hydrostatic pressure equal to the anticipated operating pressure for 30 minutes.
 2. Cap all sprinkler risers.
 3. Backfill to prevent pipe from moving under pressure. Expose couplings and fittings.
 4. Leakage will be detected by visual inspection. Replace defective pipe, fitting, joint, valve, or appurtenance. Repeat the test until the pipe passes test.

5. Cement or caulking to seal leaks is prohibited.
 6. After lateral passes test and prior to operational test, install sprinklers and backfill and compact all pipe, fittings, joints, or appurtenance.
- D. Operational Test – Remote Control Valves, Lateral Piping and Sprinklers:
1. Coordinate with COR to activate the remote control valve. The COR will visually observe operation, water application patterns, and leakage.
 2. Adjust or move water emission devices to correct operational or coverage deficiencies.
 3. Replace defective pipe, fitting, joint, valve, sprinkler, or appurtenance to correct leakage problems. Cement or caulking to seal leaks is prohibited.
 4. Repeat test(s) until each lateral passes all tests. Repeat tests, replace components, and correct deficiencies at no additional cost to the Owner.

1.11 WARRANTY AND REPLACEMENT

- A. The purpose of the warranty is to insure that the Government receives irrigation materials of prime quality, installed and maintained in a thorough and careful manner.
1. Warranty irrigation materials, equipment, and workmanship against defects for a period of one year from Final Acceptance by COR. Fill and repair depressions. Restore landscape, utilities, structures or site features damaged by the settlement of irrigation trenches or excavations. Repair damage to the premises caused by construction or a defective item. Make repairs within 24 hours of notification from COR.
 2. Replace damaged items with identical materials and methods per contract documents or applicable codes. Make replacements at no additional cost to the contract price.
 3. Warranty applies to originally installed materials and equipment and replacements made during the Warranty period.

1.12 GENERAL CONSTRUCTION REQUIREMENTS

- A. Coordinate construction of irrigation system with COR or Cemetery Staff. Coordinate temporary shut-down of existing system with Cemetery Staff prior to construction. Disturbance to cemetery operations must be minimized. See irrigation plans and installation details and Specifications Sections for required coordination efforts related to the installation of specific irrigation components.
- B. Install irrigation lines in sleeves under new roads prior to installation of road base, and under all other concrete or asphalt, either existing or new for this project.

- C. Construction cannot proceed unless staking of irrigation lines and sprinkler locations are reviewed and accepted by the COR.

1.13 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American National Standard Institute (ANSI):
 B40.1-05Gauges-Pressure Indicating Dial Type-Elastic Element
- C. American Society of Sanitary Engineers (ASSE):
 1013-2005Reduced Pressure Principle Backflow Preventers
- D. American Society for Testing and Materials (ASTM):
 A242/A242M-04 (2009)High Strength Low-Alloy Structural Steel
 A536-84 (2009).....Ductile Iron Castings
 B61-08Steam or Valve Bronze Castings
 B62-09Composition Bronze or Ounce Metal Castings
 D1785-06Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and
 120
 D1238-04c Standard Test Method for Melt Flow Rates of Thermoplastics
 by Extrusion Plastometer
 D1784-08Rigid Poly(Vinyl Chloride)(PVC) Compounds and Chlorinated
 Poly(Vinyl Chloride) (CPVC) Compounds
 D1785-06Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, 120
 D1894-08Standard Test Method for Static and Kinetic Coefficients of
 Friction of Plastic Film and Sheet
 D2241-05Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
 D2464-06Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings,
 Schedule 80
 D2466-06Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
 D2564-04e1Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping
 Systems
 D2657-07Standard Practice for Heat Fusion Joining of Polyolefin Pipe and
 Fittings
 D3139-98 (2005).....Joints for Plastic Pressure Pipes Using Flexible Elastomeric
 Seals

- D3350-10Standard Specification for PE Pipe & Fittings Materials
- F477-08Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- E. American Water Works Association (AWWA):
- C110/A21.10-08Ductile-Iron and Gray-Iron Fittings, 3-Inch Through 48-Inch for
Water
- C111/A21.11-06Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- C115/A21.15-05Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron
Threaded Flanges
- C151/A21.51-09Ductile-Iron Pipe, Centrifugally Cast, for Water C153/A21.53-
00 Ductile-Iron Compact Fittings for Water Service
- C504-06Rubber Seated Butterfly Valves
- C509-09Resilient-Seated Gate Valves for Water Supply Service
- C901-08AWWA Standard for Polyethylene (PE) Pressure Pipe and
Tubing, 13 mm (½ In.) through 76 mm (3 In.), for Water
Service
- F. Manufacturers Standardization Society (MSS):
- SP70-2006.....Cast Iron gate Valves, Flanged and Thread Ends
- G. National Electrical Manufacturers Association (NEMA):
- 250-2008Enclosures for Electrical Equipment (1000 Volts Maximum);

PART 2 - PRODUCTS

2.1 QUALITY

- A. Use new materials without flaws or defects.

2.2 SUBSTITUTIONS

Unless noted otherwise, use specified equipment. Equipment used will match the equipment installed in the previous phase as noted. COR must approve equipment prior to construction. The Contactor through written request prior to purchase or installation may request substitutions to the approved equals listed herein. Changes and associated design costs to accommodate alternative equipment are Contractor's.

2.3 SLEEVING

- A. Provide sleeves beneath all hardscape for irrigation pipe.

- B. Use rigid, unplasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting the requirements of Cell Classification 12454-A or 12454-B, ASTM Standard D1784, with an integral belled end.
- C. Use C905, DR-18 rated at 1615 kPa (235 psi) confirming to dimensional and tolerances established by ASTM Standard D2241 for mainline pipe sleeves larger than 300 mm (12-inch).
- D. Use Class 200, SDR-21, rated at 1375 kPa (200 psi), conforming to dimensions and tolerances established by ASTM Standard D2241 or AWWA C905, DR-25 rated at 1135 kPa (165 psi) conforming to AWWA Standard C905, or use C-900 PVC pipe, rated at 1375 kPa (200 psi).
- E. Sleeve sizes are to be as shown on the drawings or twice the nominal diameter of pipe if not shown. The wiring bundle area may not exceed more than 40% of the sleeve cross sectional area, per NEC recommendations.

2.4 PIPE AND FITTINGS

- A. Lateral Pipe:
 - 1. Use rigid, unplasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting the requirements of Cell Classification 12454-A or 12454-B, ASTM Standard D1784, with an integral belled end suitable for solvent welding.
 - 2. Use solvent weld pipe for lateral pipe. Use Class 200, SDR-21, rated 1375 kPa (200 psi), conforming to dimensions and tolerances established by ASTM Standard D2241 for pipe sizes 2 ½ inches and larger. Use Schedule 40, Type 1, PVC conforming to ASTM Standards D2466 and D1784 for smaller pipe sizes.
 - 3. Use primer approved by pipe manufacturer. Solvent cement to conform to ASTM Standard D2564, of type approved by pipe manufacturer.
- B. Fittings:
 - 1. Irrigation Laterals:
 - PVC, schedule 40, solvent welded socket type, ASTM D2466.
 - 2. Swing Joints:
 - Shall be a standard complete assembly by a manufacture, with elastomeric seals that allow 360 degree rotation, and are designed for minimum 1375 kPa (200 psig) working pressure.
- C. Jointing Materials:
 - 1. Irrigation Laterals: Use Schedule 40, Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784 for PVC pipe. Use primer approved by pipe manufacturer.

Solvent cement to conform to ASTM Standard D2564, of type approved by pipe manufacturer.

2.5 RESTRAINTS

A. Thrust Blocks:

1. Use thrust blocks for fittings on pipe greater than or equal to 75 mm (3-inch) diameter or any diameter rubber gasketed pipe. Use of mechanical restraints does not eliminate the need for installation of thrust blocks as specified.
2. Use 20 MPa (3,000-psi) concrete.
3. Use 50 micrometers (2-mil) plastic.
4. Use 12.7 mm (No. 4) Rebar wrapped or painted with asphalt tar based mastic coating.

2.6 SPRINKLER IRRIGATION COMPONENTS

A. Spray Heads:

Nozzle shall be pop-up or fixed spray type of standard, undersize or oversize configuration as noted on plans. The sprinkler body, stem, nozzle and screen shall be constructed of heavy-duty, ultraviolet resistant plastic. It shall have a heavy duty stainless steel retract spring and a ratcheting system for alignment of the pattern. The sprinkler shall have a soft elastomer pressure-activated co-molded wiper seal for cleaning debris from the pop-up stem. The sprinkler shall have a plastic or brass nozzle with an adjusting screw capable of regulating the radius and flow. The sprinkler shall be capable of housing protective, non-clogging filter screens or pressure compensating screens (PCS) under the nozzle.

B. Warning Tape:

1. Standard, 4-Mil polyethylene 76 mm (3 inch) wide tape, // detectable//non-detectable // type blue with black letters (if potable water), or purple with black letters (if reclaimed or untreated well water), and imprinted with "CAUTION BURIED IRRIGATION WATER LINE BELOW".

PART 3 - EXECUTION

3.1 INSPECTIONS AND REVIEWS

A. Site Inspections:

1. The Contractor shall verify construction site conditions and note irregularities affecting work of this section. Report irregularities to the COR prior to beginning work.

B. Utility Locates ("Call Before You Dig"):

1. Arrange for and coordinate with local authorities the location of all underground utilities, and with cemetery maintenance personnel.
 2. Repair any underground utilities damaged during construction. Make repairs at no additional cost to the contract price.
- C. Irrigation System Layout Review: Irrigation system layout review will occur after the staking has been completed. Notify the COR one week in advance of review. The COR will identify and approve modifications during this review.

3.2 LAYOUT OF WORK

- A. Stake locations of alley and sprinklers in existing burial sections using a licensed surveyor. Use alleys as identified on the drawings.
- B. Stake out the irrigation system. Items staked include: irrigation mainline pipe, thrust blocks, isolation gate valve assemblies, air/vacuum relief valve assemblies, quick coupling valves, remote control valves, lateral piping, and sprinklers.
- C. If staked irrigation components conflict with utilities or other components or site features, coordinate rerouting of components with Contracting Officer's Technical Representative.

3.3 EXCAVATION, TRENCHING AND BACKFILLING

- A. Excavate to permit the pipes to be laid at the intended elevations and to permit workspace for installing connections and fittings.
- B. Do not lay pipe on unstable material, in wet trench or when, in the opinion of the COR, trench or weather conditions are unsuitable for the work.
- C. Concrete thrust block shall be installed where the irrigation main changes direction as at ell and tees and where the irrigation main terminates. Pressure tests shall not be made for a period of 36 hours following the completion of pouring of the thrust blocks. Concrete thrust blocks for supply mains shall be sized and placed in strict accordance with the pipe manufacturer's specifications and shall be of an adequate size and so placed as to take all thrust created by the maximum internal water pressure.
- D. Allow a minimum of 80 mm (3 inches) between parallel pipes in the same trench.
- E. Hold pipe securely in place while joint is being made.
- F. Do not work over, or walk on, pipe in trenches until covered by layers of earth well tamped in place to a depth of 300 mm (12 inches) over pipe.
- G. Full length of each section of pipe shall rest upon the pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipe on wood blocking.

- H. Install sprinkler lines to avoid electric ducts, storm and sanitary sewer lines, water and gas mains, all of which have right of way.
- I. Clean interior of pipe of foreign matter before installation. Keep pipe clean during laying operations by means of plugs or other methods. When work is not in progress, securely close open ends of pipe and fittings to prevent water, earth, or other substances from entering.
- J. Minimum cover:
 - 1. 900 mm (36-inches) over irrigation mainline pipe in landscaped areas and to bottom of road base. (distance from top of pipe to finish grade)
 - 2. 450 mm (18-inches) over irrigation lateral pipe to sprinklers. (distance from top of pipe to finish grade)
 - 3. 450 mm (18-inches) over control wire when not in common trench with mainline or lateral piping. (distance from top of control wire to finish grade)
 - 4. 450 mm (18-inches) vertical separation between lateral and mainline pipe installed in a common trench.
 - 5. 75 mm (3-inches) minimum horizontal separation between pipes and wiring in a common trench.
 - 6. Install sleeves at depth to maintain specified depth of pipe or wire routed through sleeve.
 - 7. Tops of remote control valves shall never be less than 75 mm (3 inches) below lid of valve box.
- K. Install and maintain safety fencing around all unattended excavation. Place safety signs adjacent to construction area roadway to the satisfaction of the COR.
- L. All excavations must be backfilled by the end of each workday. Do not leave any open trenches overnight, on weekends or on holidays.
- M. If trenching operation restricts access to a burial section, provide plywood and safety fencing across open trench to allow access to burial section. Provide access to the satisfaction of the COR.
- N. Excavated material is generally satisfactory for backfill. Backfill will be free from rubbish, vegetable matter, frozen materials, and stones larger than 2-inches in maximum dimension. Remove material not suitable for backfill. Backfill placed next to pipe will be free of sharp objects that may damage the pipe.
- O. Enclose pipe and wiring beneath roadways, walks, curbs, etc in sleeves. Backfill sleeves in the following manner:
 - 1. Backfill trench using excavated material in 150 mm to 200 mm (6-inch to 8-inch) layers. Minimum compaction of backfill for sleeves shall be a minimum 95% Standard Proctor

Density, ASTM D698-78. Backfill to bottom of road base under roads or to finish grade under walks and curbs.

- P. Backfill mainline pipe, lateral pipe and wiring in turf areas in the following manner:
 - 1. Backfill the trench by depositing the backfill material equally on both sides of the pipe or wire in 150 mm (6-inch) layers and compacting to the density of surrounding soil.
- Q. Dress backfilled areas to original grade. Remove excess backfill to on-site location as directed by the COR.
- R. Where utilities conflict with irrigation trenching and pipe work, contact the COR for trench depth adjustments.
- S. Existing sidewalks and curbs shall not be cut during trenching and installation of pipe. Install pipe under sidewalks and curbs by jacking, auger boring, or by tunneling. Repair or replace any concrete that cracks, due to settling, during the warranty period.
- T. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water and chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- U. Warning tape shall be continuously placed above sprinkler system water mains at a depth of 200-250 mm (8-10 inches).
- V. Survey monuments:
 - a. Protect markers during construction.
 - b. If a survey marker is disturbed during construction, the Contractor is responsible for replacing the marker. The Contractor must hire a licensed surveyor to resurvey the location of the marker and replace it in the proper location.

3.4 SLEEVING AND BORING

- A. Furnish and install where pipe and control wires pass under walks, paving, walls, and other similar areas.
- B. Install sleeving at a depth that permits the encased pipe or wiring to remain at the specified burial depth.
- C. Extend sleeve ends a minimum of 300 mm (12-inches) beyond the edge of the paved surface. Cover pipe ends and mark edge of pavement with a chisel or saw.
- D. Verify that sleeve sizing is adequate prior to installation. Sleeving to be twice line size or greater to accommodate retrieval for repair of wiring or piping and shall extend 300 mm (12-inches) beyond edges of paving or construction. Cover pipe ends and mark edge of pavement with a

chisel or saw. Note that sleeves required for pipe with restrained casing spacers are larger than twice the diameter of the pipe.

- E. Bed sleeves with a minimum of 100 mm (4 inches) of sand backfill above top of pipe.

3.5 ASSEMBLING PIPE AND FITTINGS

A. General:

1. Keep pipe free from dirt and pipe scale. Cut pipe ends square and debur. Clean pipe ends.
2. Keep ends of assembled pipe capped. Remove caps only when necessary to continue assembly.
3. Trenches may be curved to change direction or avoid obstructions within the limits of the curvature of the pipe. Minimum radius of curvature and offset per 6 meters (20-foot) length of mainline and lateral pipe by pipe size are shown in the following table. All curvature results from the bending of the pipe lengths. No deflection will be allowed at a pipe joint.

SIZE	RADIUS	OFFSET PER 6 m (20') LENGTH
38 mm (1 ½")	7.5 m (25')	2.3 m (7'-8")
50 mm (2")	7.5 m (25')	2.3 m (7'-8")
63 mm (2 ½")	30 m (100')	575 mm (1'-11")
75 mm (3")	30 m (100')	575 mm (1'-11")

B. Lateral Pipe and Fittings:

1. PVC Solvent Weld Pipe:

- a. Use primer and solvent cement. Join pipe in manner recommended by manufacturer and in accordance with accepted industry practices.
- b. Cure for 30 minutes before handling and 24 hours before pressurizing or installing with vibratory plow.
- c. Snake pipe from side to side within trench.
- d. In irrigation isles, coordinate with the location of the monuments to avoid conflicts.

2. Fittings: The use of cross type fittings is not permitted.

C. Thrust Blocks:

1. Use cast-in-place concrete bearing against undisturbed soil.
2. Size, orientation and placement will be as shown on the installation details.
3. Wrap fitting with plastic to protect bolts, joint, and fitting from concrete.
4. Install rebar with mastic coating as shown on the installation details.

3.6 INSTALLATION OF SPRINKLER IRRIGATION COMPONENTS AND QUICK COUPLERS

A. Pop-Up Spray Sprinkler Assembly:

1. Thoroughly flush lateral pipe before installing sprinkler assembly. Water must be clear of any debris before flushing operation stops.
2. Install per the installation details at locations shown on the drawings.
3. Locate rotary sprinklers 3 inches from adjacent edges of paved areas, walls or fences.
4. Install sprinklers perpendicular to the finish grade.
5. Install swing joint with the appropriate angle between the lateral pipe and the lay length nipple per the installation details.
6. Supply appropriate nozzle or adjust arc of coverage of each sprinkler for best performance.
7. Adjust the radius of throw of each sprinkler for best performance.

D. Sprinkler Heads and Quick Couplers:

1. Shall be placed on temporary nipples extending at least 80 mm (3 inches) above finished grade. After turf is established, remove temporary nipples, ensuring that no dirt or foreign matter enters outlet, and install sprinkler heads and quick couplers at ground surface as detailed.
2. Place part-circle rotary sprinkler heads no more than 150 mm (6 inches) from edge, of and flush with top of adjacent walks, header boards, curbs, and mowing aprons, or paved areas at time of installation.
3. Install all shrub sprays, sprinklers and quick couplers on swing joints as detailed on plans.
5. Install sprinklers and quick coupling valves on a swing joint assembly.

3.7 INSTALLATION OF OTHER COMPONENTS

A. Tools and Spare Parts:

1. Prior to the Review at completion of construction, provide operating keys, servicing tools, spare parts, and any other items indicated on the drawings.

- B. Other Materials: Install other materials or equipment shown on the drawings or installation details that are part of the irrigation system, even though such items may not have been referenced in these specifications.

3.8 TEST AND FLUSHING

- A. Test irrigation system per procedures listed in section 1.10.
- B. Flushing: After testing, flush system per procedures listed in section 3.7. beginning with larger mains and continuing through smaller mains in sequence. Flush lines before installing sprinkler heads and quick couplers.
- C. Operation Test: Upon completion of the final adjustment of the sprinkler heads to permanent level at ground surface, test each sprinkler section by the pan test and visual test to indicate a uniform distribution within any one sprinkler head area and over the entire area. Operate the entire installation to demonstrate the complete and successful operation of all equipment.

3.9 MAINTENANCE AND OPERATION INSTRUCTIONS

Manufacturer's Warranty Documentation.

3.10 TESTING, OPERATIONAL PERFORMANCE AND ACCEPTANCE

- A. Provide the testing as indicated in previous sections of the specifications.
- B. Demonstrate the operations of the systems as indicated in the project specifications.
- C. Acceptance shall be predicated upon a successful demonstration of the operation of the systems, as described, or demonstrating a fully functional system in automatic operation for a period of 7 days, whichever is more stringent.

3.11 CLEANUP

- A. Upon completion of work, remove from site all machinery, tools, excess materials, and rubbish. Restore site to normal or original condition.

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